



Environmental Health's Role in Legionella Outbreaks

Charlie Broschart, RS/REHS – Environmental Health Division Manager



Probable Suspects


(Recap and Group Participation)

- Water Supply (Potable)
 - Hot water sources
 - Water heaters
 - Hot water recirculation systems
 - Showers
 - Lavatory sinks
 - Cold water sources
 - Water fountains
 - Ice machines*
 - Incoming water supply







Probable Suspects

- Plumbing Sources
 - Dead-end lines or dead legs
 - Standpipes
 - Boiler system/potable water cross connection
 - Fire suppression system cross connections
 - Bleeding from fixture mixing valves
 - HVAC Systems Sources
 - Cooling towers/evaporator towers
 - Fresh air intakes
 - Air conditioning/PTEC units?
- 



Probable Suspects

- Recreational Water
 - Spas/hot tubs
 - Splash pads/special features
 - Saunas
 - Medical Equipment
 - CPAP/BIPAP
 - Humidifiers
 - Vaporizers
 - Other sources
 - Ornamental fountains
 - Sump pumps (Jehovah's Witness Hall)
- 



What's The EH Connection?

Sanitarians and EH Staff know more about the "Probable Suspects" than just about any other section in a local health department

- Who can help?
 - Water quality sanitarians
 - Pool/spa sanitarians
 - Food sanitarians
 - Housing sanitarians
 - Plumbing inspectors





Why Is This Important?

Legionnaires' Disease Is On The Rise

Between 2000 and 2014, the number of people with Legionnaires' disease grew by nearly four times. This increase is likely due to a number of factors, including:


- A greater number of people who are at risk for Legionnaires' disease because of an underlying illness or medications that weaken the immune system
- An aging U.S. population, with adults over the age of 50 being at a higher risk of getting the disease
- An outdated plumbing infrastructure, which allows for *Legionella* to grow in the pipes

blogs.cdc.gov/publichealthmatters/2016/06/protecting-the-air-we-breathe/





If You Haven't, You Will

- Has your LHD been involved with a Legionella outbreak or investigation?
 - How many of you have been directly involved with a Legionella outbreak or investigation?
 - How many wish they hadn't been asked to work on a Legionella outbreak or investigation?
- 



Wesley Ridge

Retirement Community

Independent Living

Assisted Living

Rehabilitation Services

Alzheimer Dementia Care

Concierge Services

Adult Day Services


Hospice

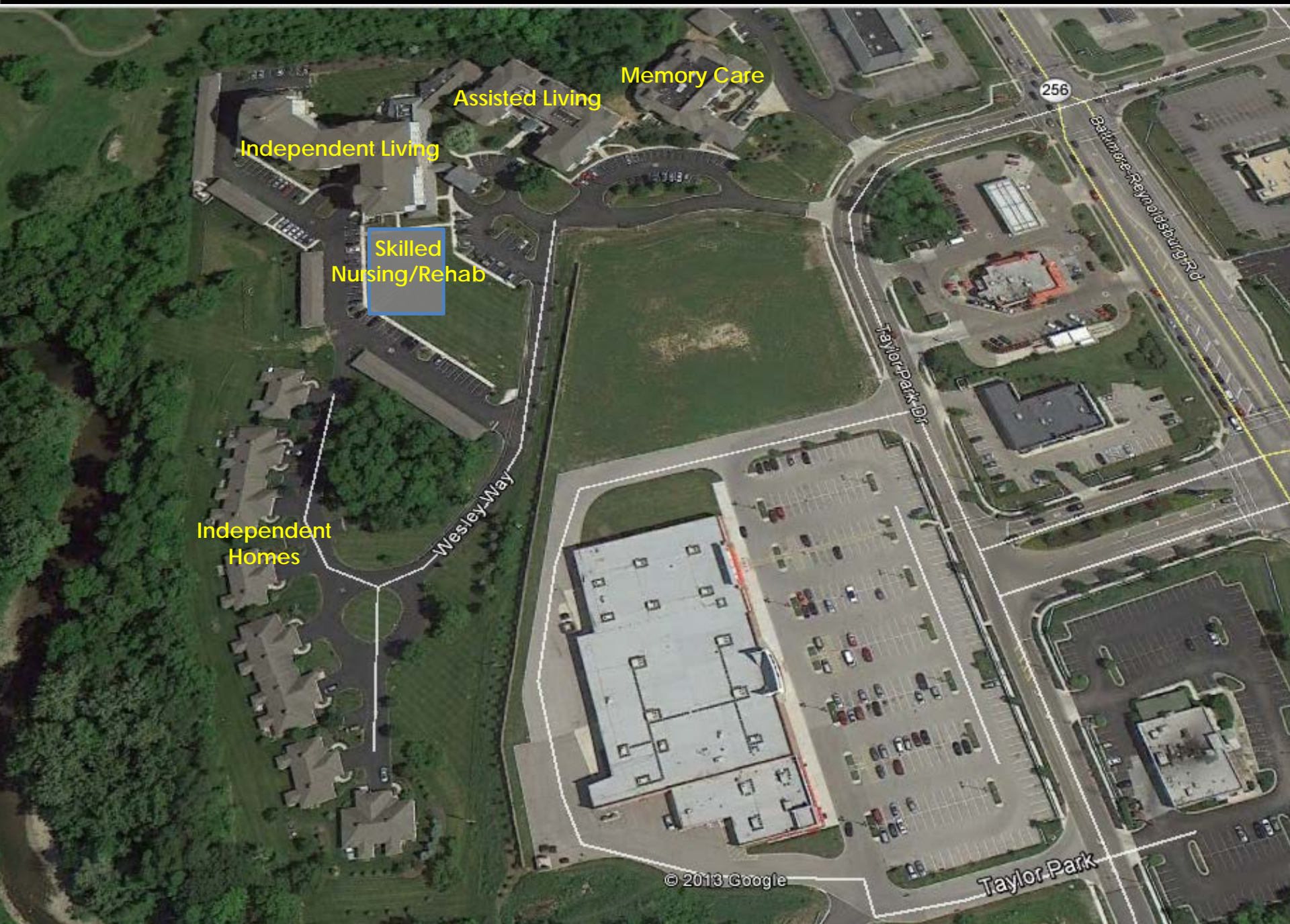
Harcum Fitness & Aquatic Center





Wesley Ridge Overview

- Licensed as a Residential Care Facility by ODH's Bureau of Healthcare Standard and Quality
 - Offers 24 hour nursing and caregiving services (capacity of 136 beds)
 - Layout: 5 buildings consisting of studio apartments, independent living, independent homes, memory care and skilled nursing
 - CDC came to town – never a good sign!
- 



Memory Care

Assisted Living

Independent Living

Skilled
Nursing/Rehab

Independent
Homes

Wesley Way

Taylor Park Dr

256

Baltimore-Reynoldsburg Rd

© 2013 Google

Taylor Park

Case Summary

- 39 Confirmed Case
- 6 Deaths
- Age range: 53-99 years
 - Median age: 87 years
- 27 female; 12 male
- Self-reported medical history available on 35/39
 - 15/35 (43%) reported heart disease
 - 1/35 (3%) currently smoke

Location of Cases	Confirmed
Employee	1
Visitors	7
Independent Living	12
Memory Care	7
Skilled Nursing/Rehab	0
Independent Homes	3
Adult Daycare	1


Reported Exposures

Location	N (% of Confirmed)	Census	Attack Rate	Legionella bacteria present?
Employee(s)	1 (3%)	-	-	
Visitor(s)	7 (18%)	-	-	
Independent Living	12 (31%)	123	10%	YES, LP 3
Assisted Living	8 (21%)	56	14%	YES, LP 1
Memory Care	7 (18%)	37	19%	No
Skilled Nursing/Rehab	0	2	-	No
Independent Homes	3 (8%)	25	12%	No
Adult Daycare	1 (3%)	-	-	Housed in Memory Care

Don't forget, LP1 was found in the Cooling Tower




The Smoking Gun (?)

- We believe the source was the cooling tower
 - We believe the weather conditions allowed the *Legionella* to be blown around the campus AND enter into the building via fresh air intake
 - The facility has since removed the cooler tower and installed a different a HVAC system
- 



What Prevents *Legionella*?

(Review, right?!?)

- Sustained water temperatures above 124° F or below 77° F
 - Sustained disinfection in the water system (or treatment system)
 - Turnover or use of water
 - Backflow prevention
 - Eliminate the reservoir if you can
 - A Water Management Plan
- 

How Does This Whole Thing Get Started?

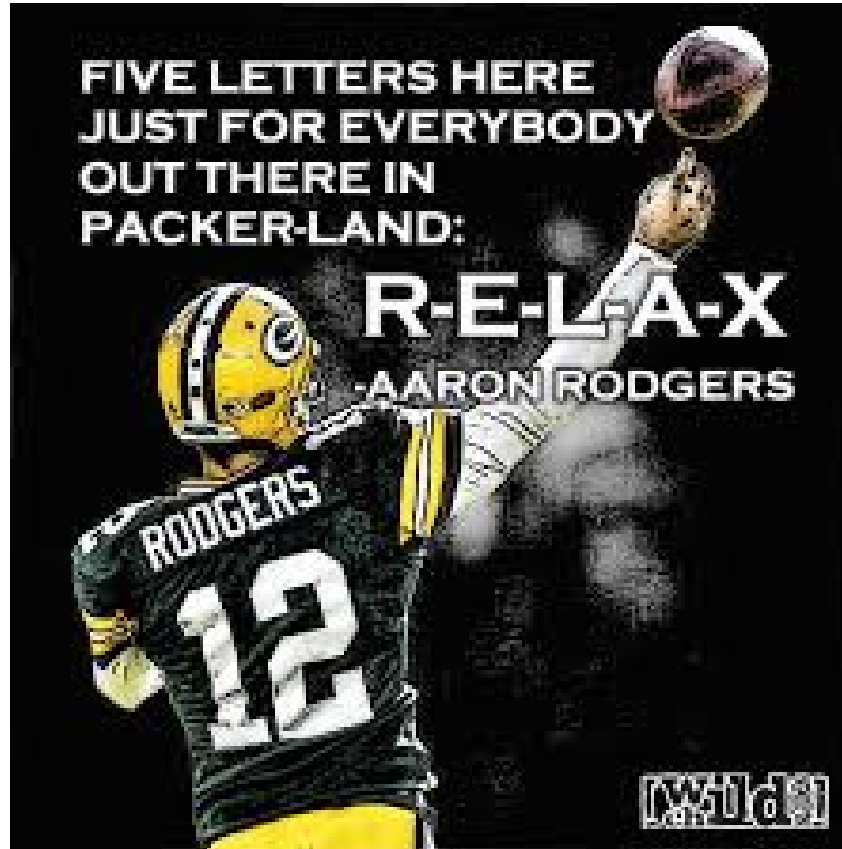
- The EPIs come calling
- Media
- Concerned citizen or family member
- ODH
- A facility calls for help


THE SKY IS
FALLING!
THE SKY IS
FALLING!




© 2009 Pixar Animation Studios

Strategy Before Starting The Investigation





Things To Do & Think About

- Review ALL available information
 - Do some homework
 - Decide who all needs to be involved
 - EPIs, CD Nurse, EH staff, Plumbing Inspector, Communications, Director(s) and Health Commissioner
 - Think a little bit like ICS
 - Bring members in/out as necessary
 - Investigations and eliminating *Legionella* takes time
- 



Tools of the Trade

- CDC *Legionella*

<https://www.cdc.gov/legionella/index.html>

- CDC *Legionella* Environmental Assessment Form

<https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment.pdf>

- CDC Sampling Procedure and Potential Sampling Sites

www.cdc.gov/legionella/downloads/cdc-sampling-procedure.pdf

- ASHRAE Guideline 12-2000
- ANSI/ASHRAE Standard 188-2018




Seton Square East





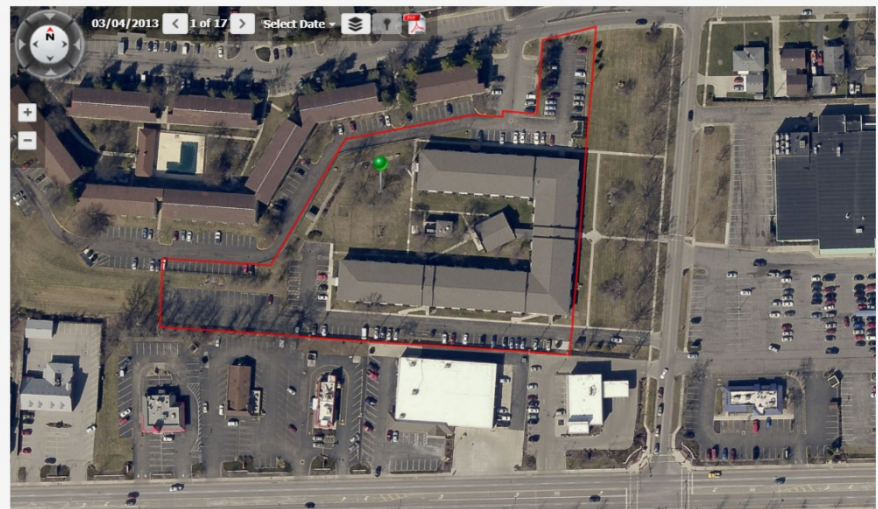
Case Study of Seton Square East

- Late 2016 - January 2017
 - 4 cases of Legionella
 - 2 deaths
 - 2 cases several years ago
 - Senior apartment housing
 - Not skilled nursing or long-term care
 - Unknown construction, HVAC and water systems
- 



- Summary
- Land Profile
- Residential
- Commercial
- Improvements
- Permits
- Mapping
- Sketch
- Photo
- StreetSmart
- Aerial Photos
- Transfers
- BOR Status
- CAUV Status
- Tax & Payments
- Tax Distribution
- Value History
- Rental Contact
- Quick Links

ParcelID: 060-002392-00 Map-Rt: 060-N080B -008-01
NEW SETON SQUARE EAST 1235 BRIARCLIFF RD

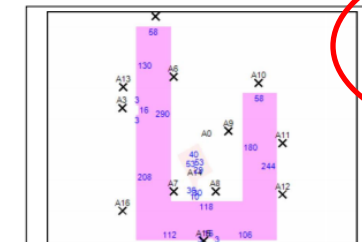


Franklin County Auditor - Clarence E. Mingo

060-002392-00

Owner Name	NEW SETON SQUARE EAST L P	Prop. Class	C - Commercial
Site Address	1235 BRIARCLIFF RD	Land Use	409 - HOUSING-ELDERLY/OTHER COMM
LegalDescriptions	NATIONAL PIKE 4.096AC R20-21 T12-16 S7-12-13-18	Tax District	060 - CITY OF REYNOLDSBURG
Mailing Address	1235 BRIARCLIFF RD REYNOLDSBURG OH 43068	Sch. District	2509 - REYNOLDSBURG CSD
Transfer Date	12/22/2009	App Nbrhcd	X6200
Transfer Price	.00	Tax Lnin	No
Instrument Type	QE	CAUV Property	No
		Owner Occ. Credit	2017: No 2018: No
		Homestead Credit	2017: No 2018: No
		Rental Registration	Yes
		Board of Revision	No
		Zip Code	43068
		Annual Taxes	86,609.36
		Taxes Paid	86,609.36
		Calculated Acreage	4.08
		Legal Acreage	.00

	Current Market Value			Taxable Value		
	Land	Improv	Total	Land	Improv	Total
Base	\$266,200	\$2,444,200	\$2,710,400	\$93,170	\$855,470	\$948,640
TIF	\$0	\$0	\$0	\$0	\$0	\$0
Exempt	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$266,200	\$2,444,200	\$2,710,400	\$93,170	\$855,470	\$948,640
CAUV	\$0					



Building Data
Land Use 409-HOUSING-ELDERLY / OTHER COMM
Year Built 1978
Total Sq Ft 86951
Stories 02
Grade AVERAGE QUALITY

Sketch Legend

- 4 A0 - 013 APTS LHTC 44590 Sq. Ft.
- 3 A01 - CONC PATIO 48 Sq. Ft.
- 5 A5 - EFP-ENCLOSED FRAME PORCH 80 Sq. Ft.
- 6 A6 - BAF-FR BALCONY 80 Sq. Ft.
- 7 A7 - BAF-FR BALCONY 80 Sq. Ft.
- 8 A8 - BAF-FR BALCONY 80 Sq. Ft.
- 9 A9 - BAF-FR BALCONY 280 Sq. Ft.
- 10 A10 - EFP-ENCLOSED FRAME PORCH 80 Sq. Ft.
- 11 A11 - BAF-FR BALCONY 320 Sq. Ft.
- 12 A12 - EFP-ENCLOSED FRAME PORCH 60 Sq. Ft.
- 13 A13 - CP2-CANOPY-WD, ROOF/SLAB 760 Sq. Ft.

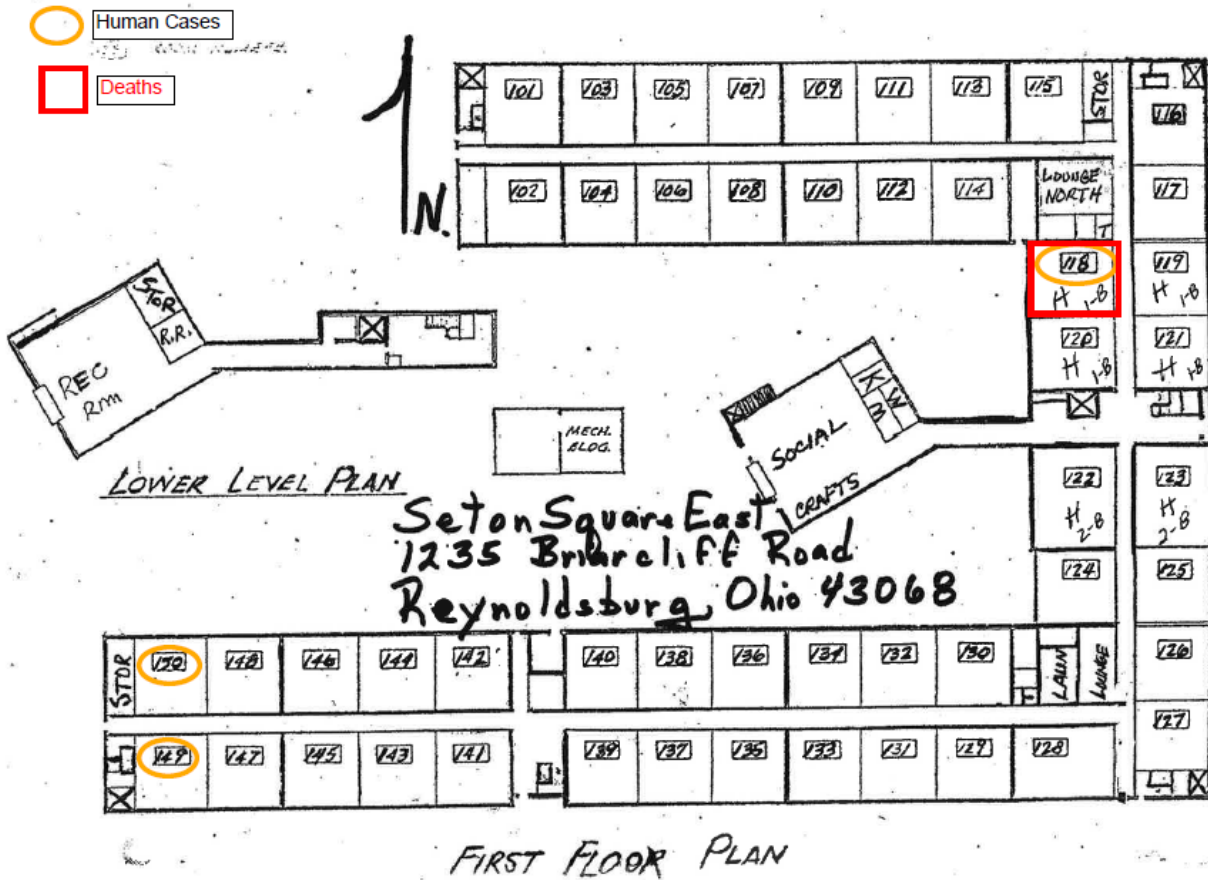


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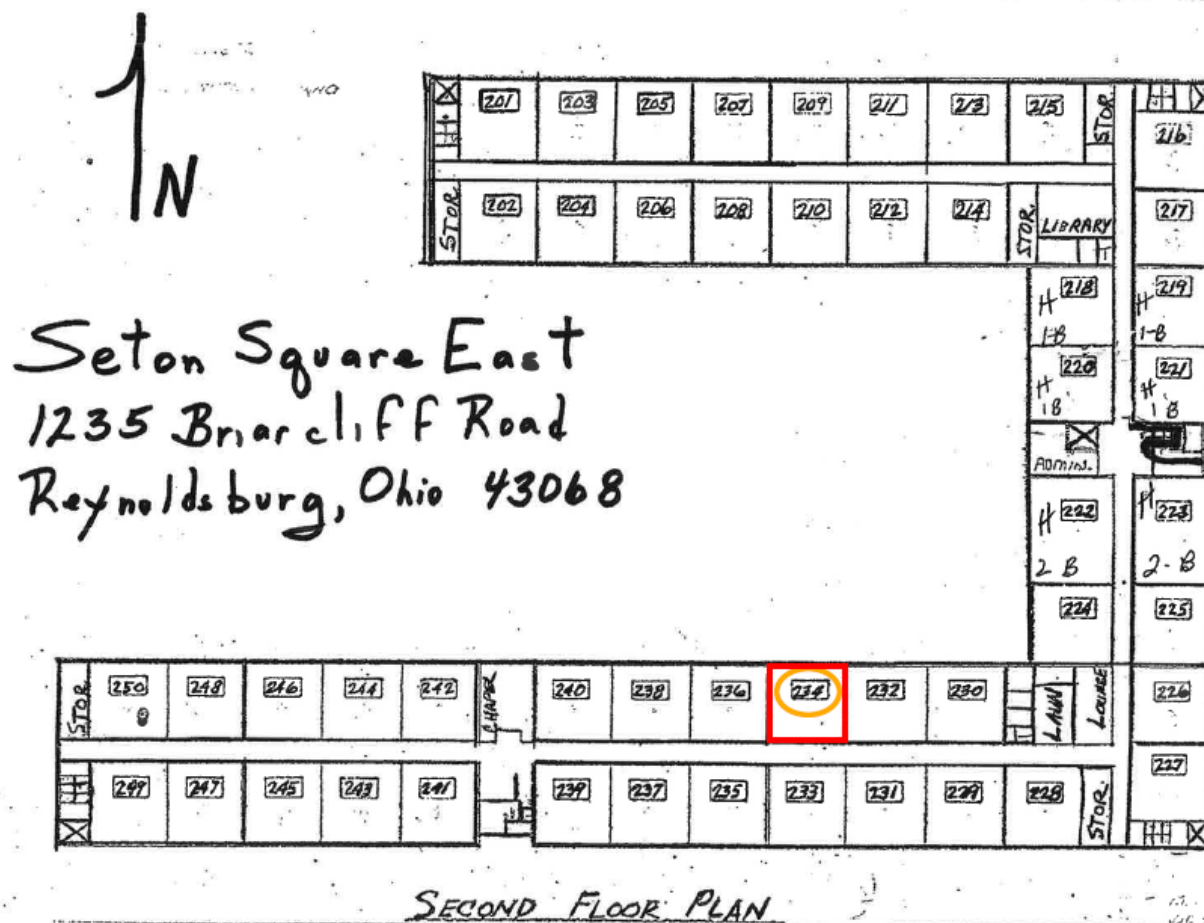
What is that?



Cases (1st floor)



Cases (2nd Floor)





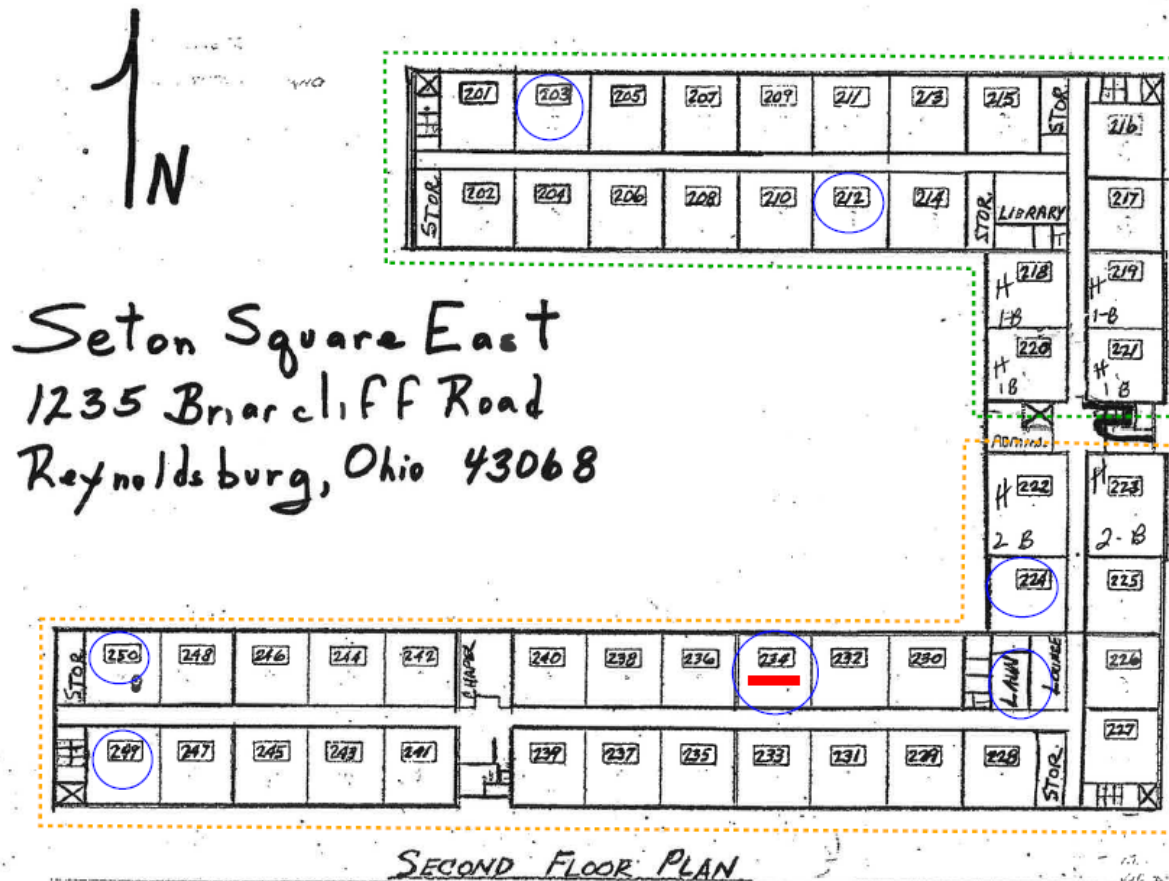
Time for Environmental Assessment

- Read through the Assessment Form
- Make sure you have the right tools
 - Pool DPD test kit for chlorine and PH
 - Digital thermometer
 - Flashlight
 - Camera
- Get the right people together
 - EH staff
 - Facility Staff: administrator, maintenance, etc.
- Plan on spending time at the facility



[illegible]


What Did We Find?



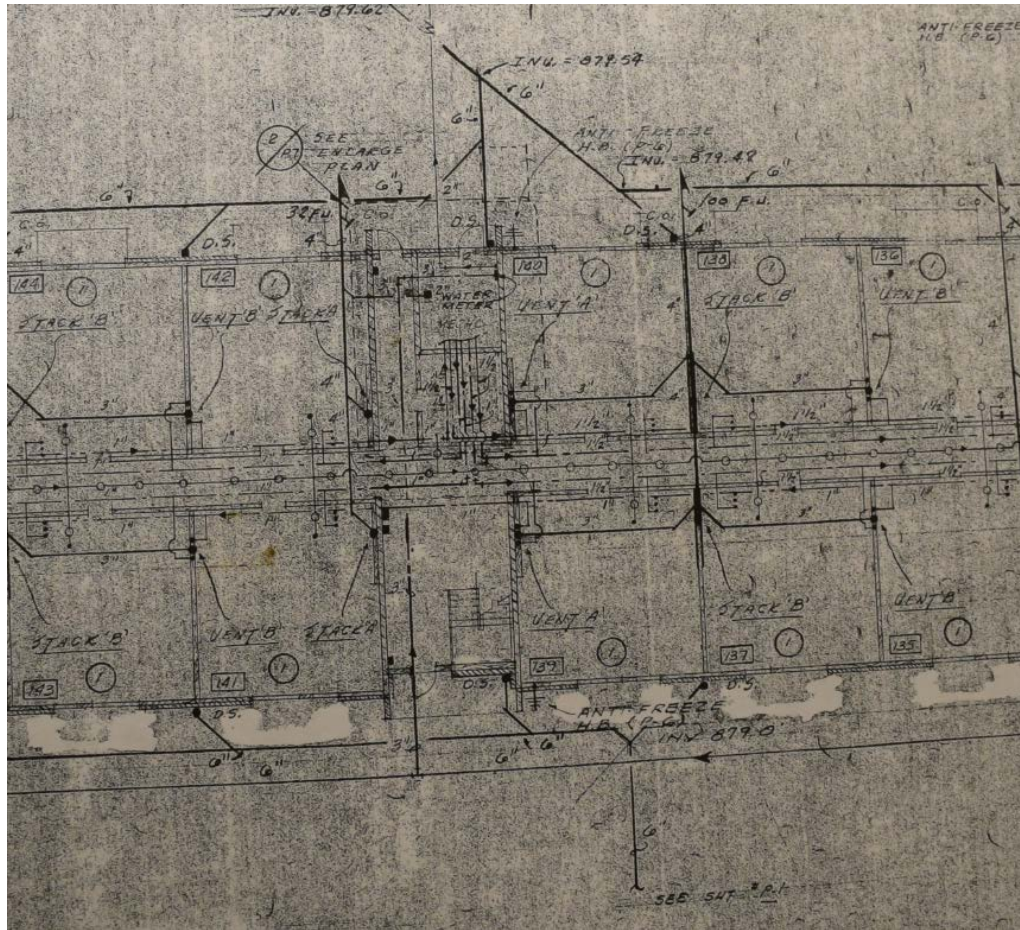


What Else Did We Find?

Potable Water Heating

- South Mechanical
 - 1 water heater and 2 storage tanks
 - 1987 install
 - North Mechanical
 - 1 water heater and one 1 storage tank
 - 2016 install (no permit)
 - Water heaters for laundry rooms and community room
 - Hot water recirculates in the concrete of the first floor
 - 2nd floor hot water comes up from first floor
- 


Plumbing Plans!

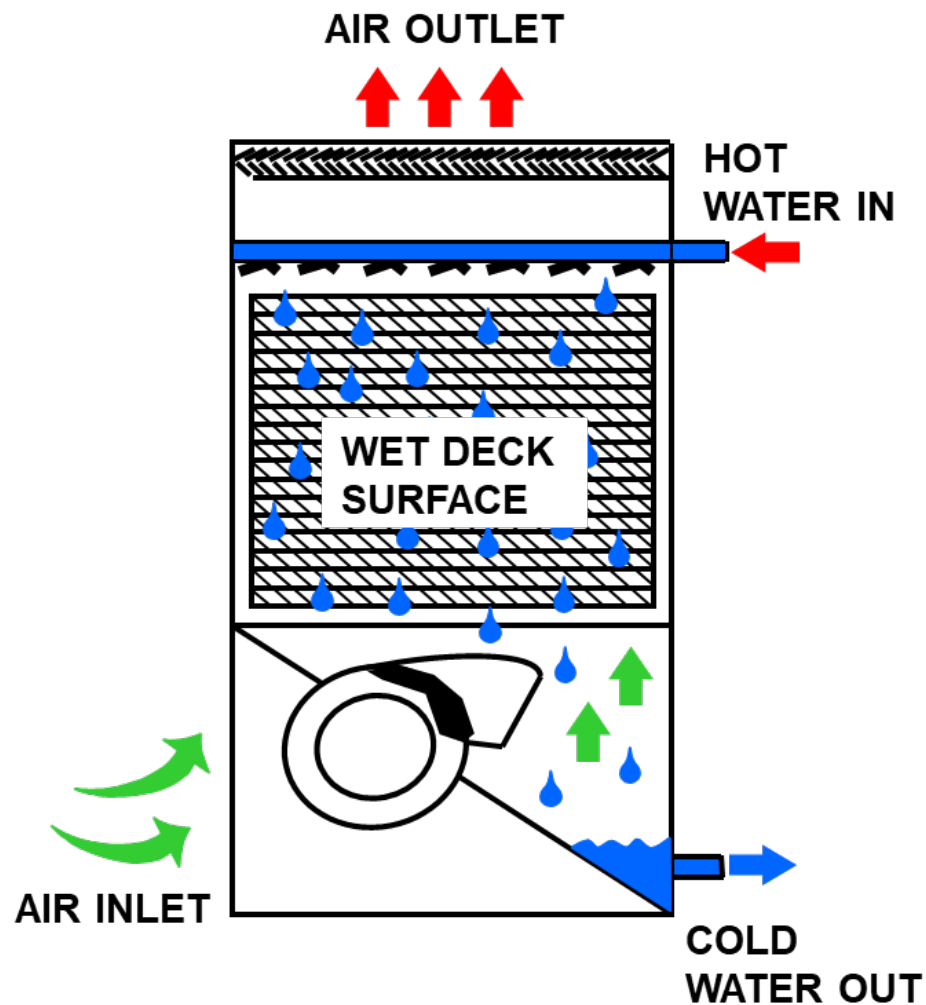




What Else Did We Find?

Cooling Tower

- It's not a cooling tower – it's an evaporator tower!
 - Maintenance records unclear or nonexistent, and disinfection methods were undetermined
 - Runs from about May to September
 - No others found in the area
- 





What Else Did We Find?

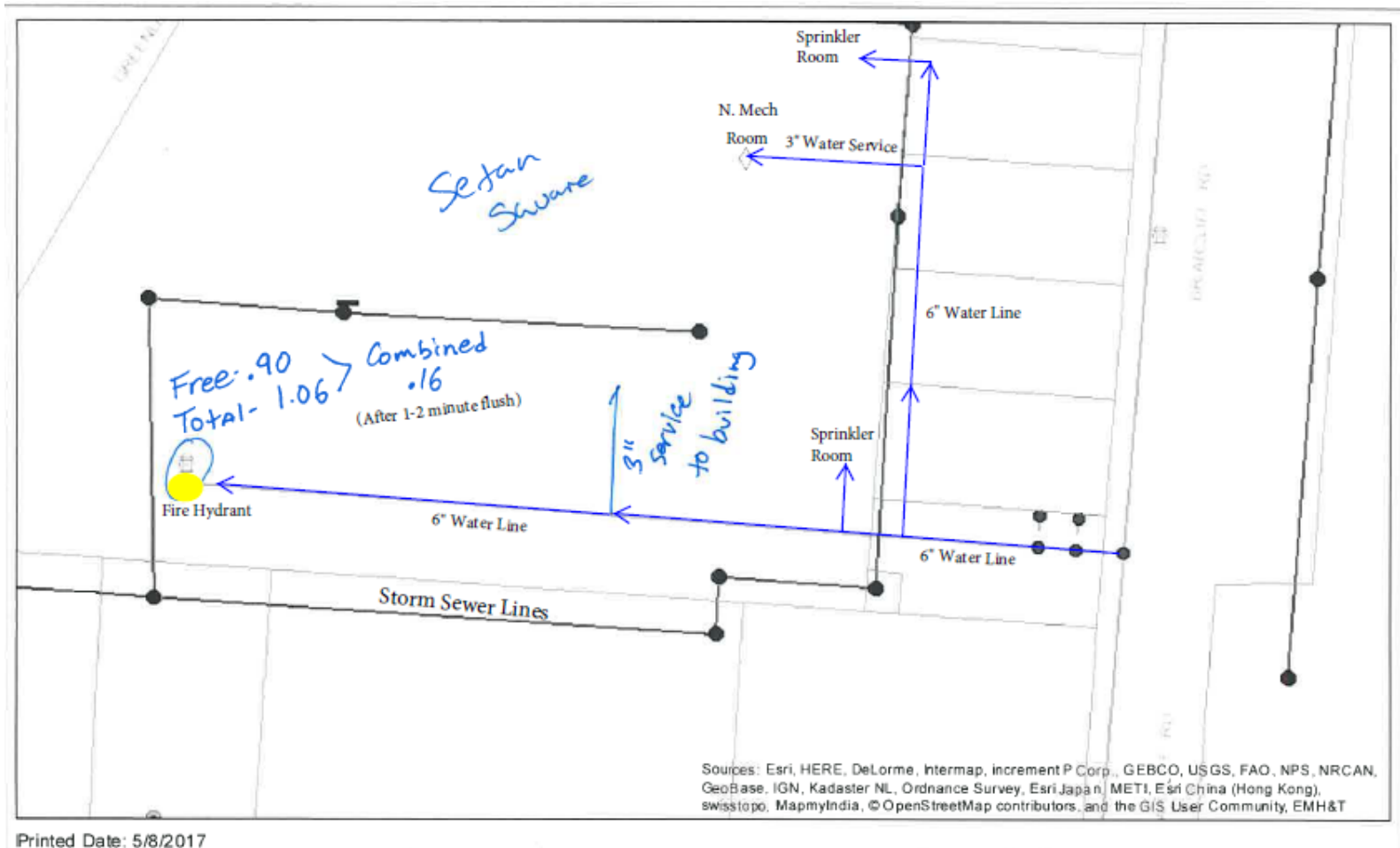
Boiler System

- Used to heat the building and apartments
- Improper backflow devices installed

Fire Suppression

- Installed and tested frequently
 - Backflow prevention acceptable
- 

What Else Did We Find?





Regroup and Share

- Review assessment with LHD team
- Develop recommendations for facility
 - Water restrictions
 - 0.2 micron shower or fixture filters
 - Sampling strategy
 - Remediation and Water Management Plan
 - Plumbing corrections/modifications
 - Communication strategy
 - Timelines
 - **HIRE A LEGIONELLA CONSULTANT**
- Share the recommendations with the facility
 - Blend of consultative and authoritative action





Water Restrictions

Dear Residents:

Seton Square East Apartments has partnered with Franklin County Public Health to investigate why there have been five cases of Legionella confirmed in residents of this apartment complex over the last year.

Legionella bacteria are naturally found in freshwater environments. People can get sick with Legionnaires' disease by breathing in Legionella bacteria in contaminated mist or vapors (small droplets of water in the air) from a man-made water source, such as a cooling tower, whirlpool spa, shower, or decorative fountain. For most people, the risk of developing Legionnaires' disease is low; however, current and former smokers and individuals with chronic, underlying medical conditions are at increased risk.

Franklin County Public Health conducted an environmental assessment of our building and recommended changes and required us to hire a contractor to test our water. We just received those test results and they show there is legionella in our water.

We are working with a contractor to take immediate remediation steps to treat the water to resolve the problem.

For your safety, we are implementing water restrictions and other precautions to address this issue as we want to ensure the safety of our residents. We ask the following:

- Refrain from showering until further notice. Bathing should be performed in a bathtub or with a basin with the use of a sponge or washcloth rather than a water-spraying device. Do not get into the tub until you have turned off the water. This will limit exposure to the small droplets of water, which is how Legionella bacteria may reach the lungs.
- Do not use the bathroom or kitchen faucet for bathing, grooming, hair-washing or brushing your teeth. You may use the bathroom and kitchen faucet for washing your hands but please take care not to splash the water. There is no risk flushing the toilet.
- Use bottled water rather than tap water for drinking until further notice, particularly if you have swallowing difficulties. Swallowing difficulties increase the chance of aspirating (or choking) on small droplets of water.
- Use commercially bagged ice until further notice, rather than ice made from tap water.

- You can use water from the kitchen faucet for cooking but again, please take care not to splash water.
- Always use bottled, sterile water for any medical devices, such as CPAP machines, BiPAP machines or nebulizers. Do not use tap water.

Legionella bacteria are NOT spread from person-to-person. Legionnaires' disease is NOT contagious.

Please refer to the attached fact sheet regarding symptoms of Legionnaires' disease. If you experience symptoms of pneumonia, please talk to your doctor immediately. If at your doctor, please show them this letter and they can contact Franklin County Public Health to obtain further instructions on recommended laboratory testing.

We are working with numerous agencies to ensure that we are doing everything possible and necessary to resolve this matter.

This may be a lengthy process and we do not have a time estimate to give you at this point. We will keep you informed of our progress and will let you know just as soon we are able to lift the water restrictions. We appreciate your patience and understanding as we all go through this trying situation.

We will be holding a resident meeting in the community room on Monday, May 8, 2017 at 1:30 pm along with the Franklin County Public Health to discuss any questions that you may have.


If you have any questions or concerns, please feel free contact the rental office at (614) 861-4860 or Franklin County Public Health at (614) 525-3097.

Sincerely,





Water Sampling

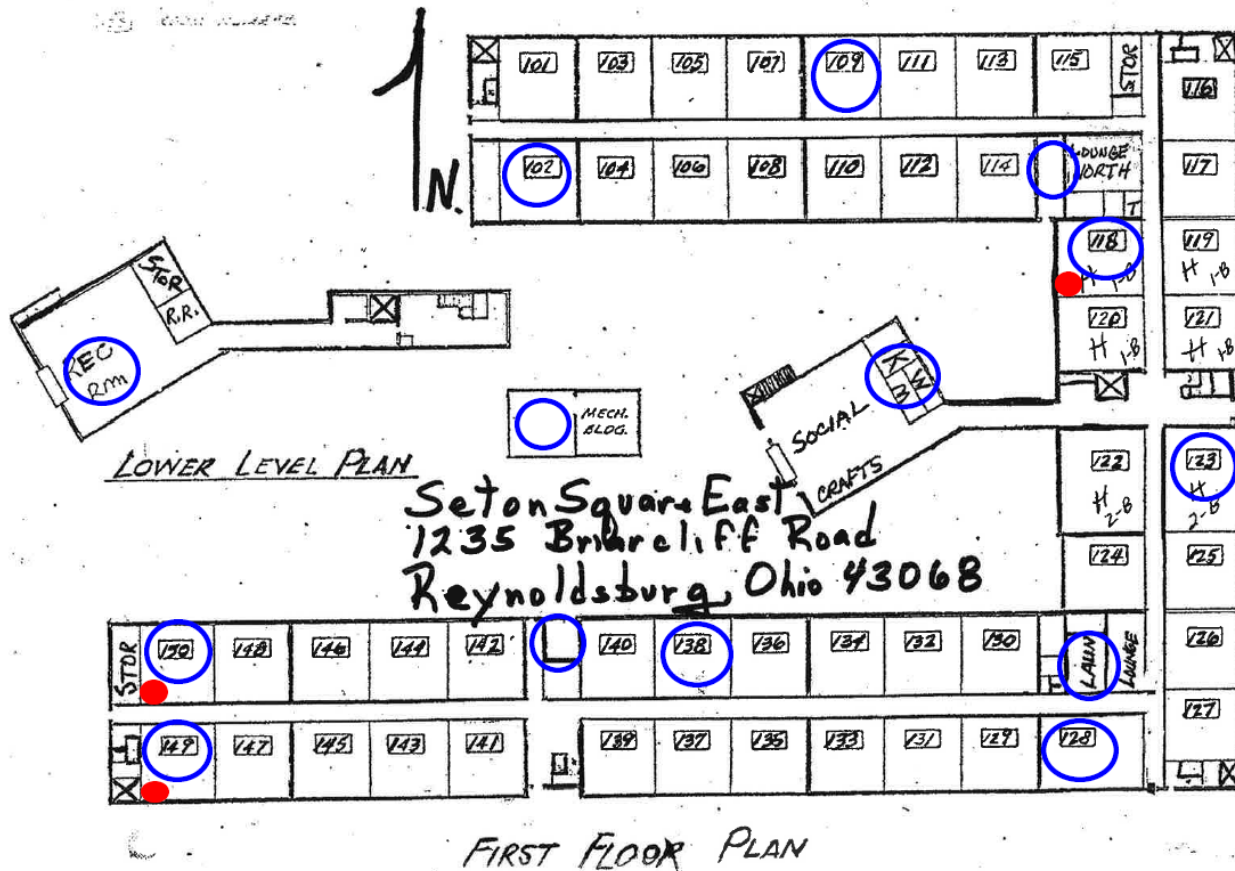
- Work with the consultant to decide on sites
 - Use only a CDC ELITE Program Lab
 - Environmental Legionella Isolation Technique Evaluation
 - Detects Legionella and isolate serogroups
 - Consider both water and swab samples
 - Consider HPC test (Heterotrophic Plate Count)
 - Organisms that feed on organic carbon/matter
- 

Water Sampling

- After the assessment
- Decide where to sample
 - Rooms/apartments
 - Showers, sinks etc.
 - Cooling towers
 - Water fountains
 - Water heaters
 - Incoming water line(s)



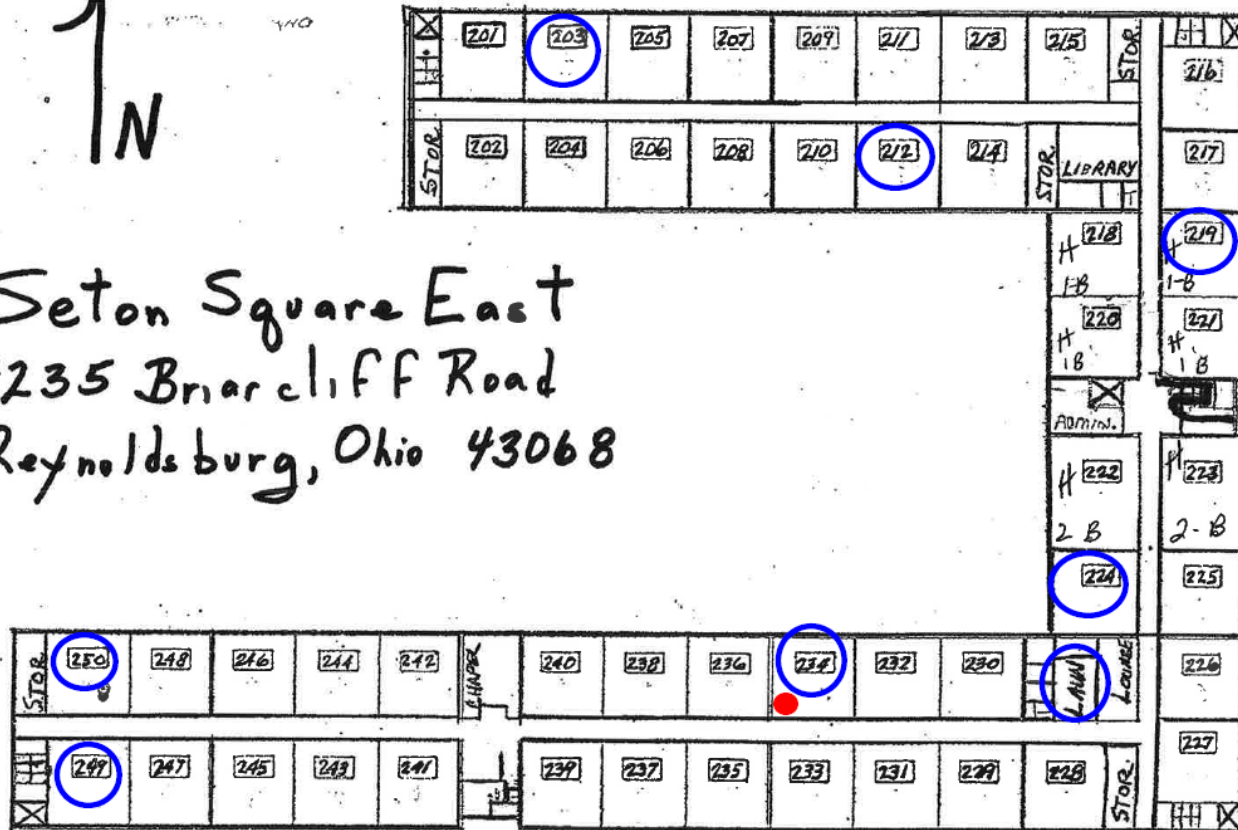
What Rooms/Apts?



What Rooms/Apts?

1
N

Seton Square East
1235 Briarcliff Road
Reynoldsburg, Ohio 43068



SECOND FLOOR PLAN

Test Results

Environmental Culture Test–Legionella

Location	Result	Concentration	Species
1. HW Return North	Not Detected		
2. HW Return South	Positive	580 CFU/mL	L. pneumophila, serogroup 1 L. pneumophila, serogroup 5
3. Apt 114 Hot	Not Detected		
4. Apt 118 Hot	Not Detected		
5. Apt 122 Hot Shower	Positive	5 CFU/mL	L. pneumophila, serogroup 5
6. Apt 135 Hot Shower	Not Detected		
7. Apt 140 Hot	Not Detected		
8. Apt 149 Hot	Positive	33 CFU/mL	L. pneumophila, serogroup 1 L. pneumophila, serogroup 5
9. Apt 201 Hot	Not Detected		
10. Apt 223 Hot	Positive	1 CFU/mL	L. pneumophila, serogroup 5
11. Apt 226 Hot	Positive	30 CFU/mL	L. pneumophila, serogroup 1 L. pneumophila, serogroup 5

Test Results

Heterotrophic Plate Count (HPC)


Location	Result	Concentration
4. Apt 118 Hot	Complete	850000 CFU/mL
5. Apt 122 Hot Shower	Complete	1800000 CFU/mL
6. Apt 135 Hot Shower	Complete	220000 CFU/mL
7. Apt 140 Hot	Complete	1200000 CFU/mL
8. Apt 149 Hot	Complete	810000 CFU/mL
9. Apt 201 Hot	Complete	330000 CFU/mL
10. Apt 223 Hot	Complete	320000 CFU/mL
11. Apt 226 Hot	Complete	250000 CFU/mL
12. Apt 235 Hot	Complete	420000 CFU/mL
13. Apt 240 Hot	Complete	300000 CFU/mL
14. Apt 250 Hot	Complete	970000 CFU/mL



Remediation

- Chlorination (20-50 ppm)
- Heat (140+° F)

Limitations and Challenges

- Can be difficult to maintain levels
 - Can cause damage to plumbing
 - Difficult to penetrate mineral deposits and biofilm
 - May take several attempts
 - Rebound effect
- 


The Cycle and Diligence

- Testing, remediation and corrective action...Testing, remediation and corrective action...
- You want progress not setbacks
- Keep looking for things that may be contributing






The End Game

- Stop disease transmission
 - Eliminate or reduce Legionella to a very low risk
 - Water Management is in place – and working!
 - Plumbing systems are optimal
 - Temperatures, circulation and monitoring in place
- 



Seton Square Action Items

- Many rounds of disinfection and testing
 - Installation of Legionella filters on showers
 - Eliminated dead legs and corrected plumbing oddities
 - Installed backflow prevention devices
 - Increased water temperatures in water heaters
 - Replaced one water heater and recirculation pumps
 - Installed digital mixing valves to increase and regulate recirculation temperatures
 - Installed timed flushing of HW recirculation systems
 - Implemented manual flushing of showers and sinks
 - Implemented evaporator tower startup cleaning and automated disinfection during operation
- 




Seton Square East – Solved?

- It all started in January 2017
- As of January 2019
 - Implemented nearly every tool in the toolbox, except continuous disinfection or copper-silver ionization
 - Reduced now to quarterly testing
 - 3 quarters in a row with no Legionella detected or at very low levels
 - No more human cases at this point





Parting Thoughts

- I don't think Legionella is going away anytime soon
 - We need to consider being proactive with high risk facilities and populations
 - Perhaps develop regional LHD support for outbreaks and investigations
 - Evaluate and propose changes to the plumbing code
 - Propose changes to EPA's requirements regarding disinfection and water treatment
 - Be thoughtful, diligent and intentional in handling these investigations
- 



Thanks and Acknowledgements

- Niki Lemin, FCPH EH Director and AHC
- FCPH Team
 - EPIs
 - Radhika Iyer, Scott Brewer, Kara Cover, Brooke Hughes, Nate Raidel
 - Communications
 - Mitzi Kline and Michelle Day
 - Ken Farmwald, Plumbing Program Supervisor
- Tim Keane, Legionella Risk Management





Questions?

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