

Is the water safe in P.S.52?

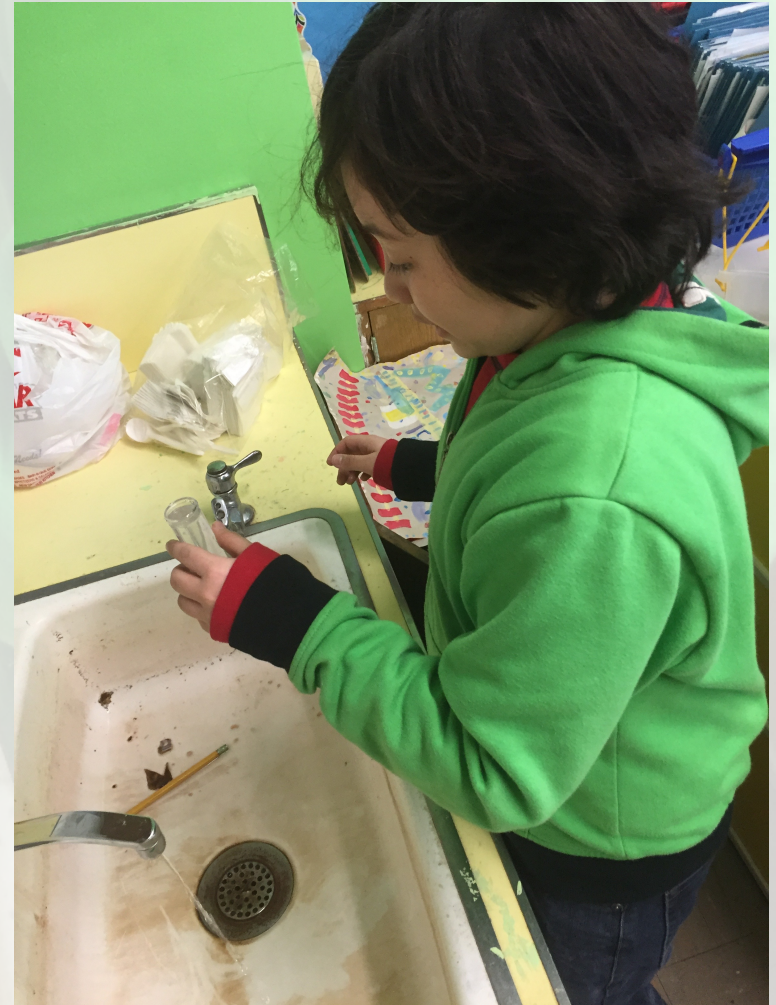


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Hypothesis

If we test every school sink with electronic testing we can get a general idea of how safe or unsafe our water is in every room.

If we use chemical tests on one poor classroom sink on each floor, we can accurately determine if there is any risk of contamination in P.S. 52's water supply.



Materials

1. TDS meter
2. PH meter
3. Distilled water
4. Salt packets 1gram
5. Disposable plastic cups
6. Water testing strips and chart (H2O OK brand)
7. White vinegar acetic acid
8. Test Tube



Electronic Testing Methodology

1. Allow water to run for 30 seconds.
2. Test for 60 seconds, remove tester, test again.
3. Discard testing cups after every sink.
4. Re-calibrate meters after every floor.
5. Compare results with national standards.



Calibrating Electronic Testers

1. Calibrate pH meter to a reading of 2.4 pH using common white vinegar
2. Mix 1 Liter of distilled water with one gram of salt to create 1,000 ppm solution
3. Add 1 quarter cup of salt solution with a 3 quarter cup of distilled water to create 250 ppm solution
4. Calibrate ppm meters to 250 ppm using diluted salt solution



Chemical Testing Methodology

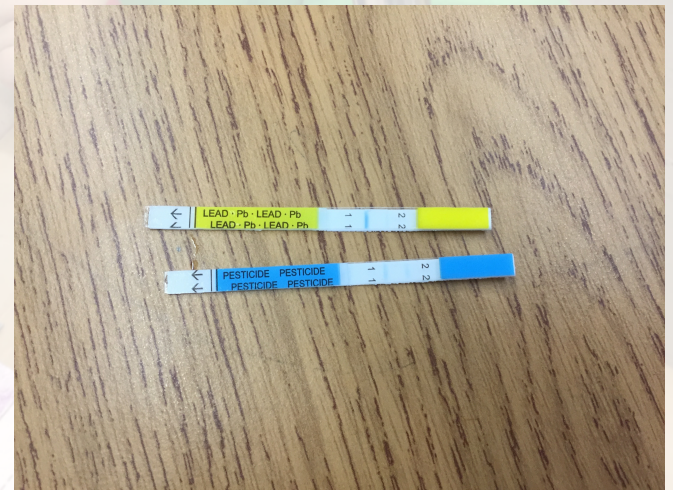
Sinks were allowed to run for 30 seconds before all tests.

For Chlorine, Alkalinity, pH, Nitrite, Nitrate, Copper, and Iron we dipped the test strips in a test tube of water for 10-60 seconds depending on test, and matched the color of the tip to the color on the chart.

For Hydrogen Sulfide, we used the “sniff test” to find any odor of rotten eggs. We checked hot and cold water.

For bacteria, we allowed water to settle in a magnifying container. Any cloudy sediment would be considered a clear sign of bacteria contamination.

For Lead and Pesticides, we put the pass/fail indicator strips in a small amount of water in a test tube and waited 10 minutes for the result to read positive or negative on the indicator bar. We only had enough lead and pesticide test strips for one floor, so we chose the floor farthest from the incoming water source, the third floor.



What is pH?

The pH value of a water source is a measure of its acidity or alkalinity. The pH meter is used to measure the activity of the hydrogen atoms. Hydrogen activity is a good showing of the acidity or alkalinity of the water. A pH level of 7 is neutral. Drinking water should always be 6.5 to 8.5 pH.

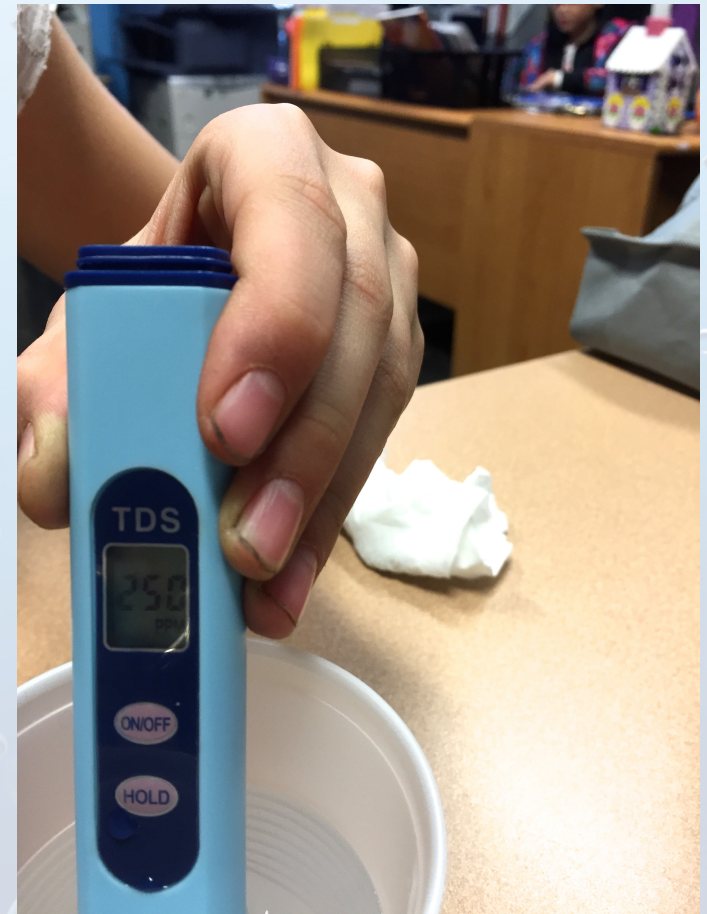
Water that is too acetic tastes sour while alkaline water tastes far too bitter. We use pH as a leading indicator of water safety because water that is too far from good pH levels is not drinkable. Bad pH levels are often caused by bacteria, salts, or other contaminants. Testing for pH levels is a good first test of water safety.



What is TDS?

TDS stands for total dissolved solids, and represents the total concentration of dissolved substances in water. It is measured in milligrams per unit volume of drinking water and also referred to as parts per million (ppm). For drinking water the maximum concentration level set by the EPA is 500 mg/L.

TDS is made up of inorganic salts, as well as a small amount of organic matter. Common inorganic salts that can be found in water include calcium, magnesium, potassium and sodium, which are all cations, and carbonates, nitrates, bicarbonates, chlorides and sulfates, which are all anions. Cations are positively charged ions and anions are negatively charged ions.



Flint Michigan, What Went Wrong?

In Flint Michigan, there is a water crisis going on today.

Here's how it happened:

1. The water pipes were over 100 years old.
2. Water systems changed from a safe source to an unsafe source to save money.
3. Unsafe water in old pipes caused lead levels to rise above toxic.
4. It will now cost about \$1.5 billion to replace the pipes in Flint Michigan.
5. They had planned to save \$5 million per year using bad water.
6. Residents of Flint Michigan started protests saying that when they drank their water it had turned colors and had terrible odors.



NYC Why is Our Water so Good?

NYC's water comes from the Catskill aqueduct, Delaware aqueduct, New Croton aqueduct, and occasionally from the Hudson River.

Even though NYC's water is very clean we want to keep it that way so we have to check it regularly. Chemicals are sometimes added to the water. Water samplers are constantly analyzing the quality levels. New York City has 965 water sampling stations and tests 1,200+ samples of water yearly.

A new water tunnel, #3 is planned to be completed in 2021. The people who work in the water tunnels are called sand hogs. Eventually it will span 60 miles. This new pipe will allow shut down and maintenance of the other water sources in New York City.



Electronic Testing Raw Results

CLASS	PH	TDS
100	6.6	39
101	6.9	36
102	6.7	38
103	7.1	36
106	6.8	37
112	7.1	35
113	7.1	37
114	7.1	35
116	7	38
117	7	35
117	7.2	35
118	7	38
128	7.3	38
131	7.2	38
132	7.3	38
137	7.1	37
139	7.3	39
141	7.2	38
Sink 143	7.1	36

CLASS	PH	TDS
Fountain 143	7.1	41
147	7.2	38
204	7.1	35
206	7	37
210	7.1	35
212	7.1	37
213	7.1	38
216	7.1	40
217	7.3	38
228	7.1	37
234	6.9	38
236	8.5	35
237	7.1	35
238	7.4	35
240	6.9	35
241	7	35
242	7.1	35
243	7	36
244	7	35

CLASS	PH	TDS
246	6.9	38
301	6.3	41
303	7	40
304	6.5	37
306 B	7	40
307	7	40
310	7	35
312	7	40
313	7.1	38
316	6.9	37
317	8.5	35
318	7.4	40
336	7.3	30
340	7	35
341	7.1	40
342	7.1	40
343	7.2	40
346	7	37

Chemical Testing Raw Results

Class	139	241	341	acceptable
Hardness (ppm)	0	0	0	< 50 (ppm)
Chlorine (ppm)	0	0.5	0.25	< 3 (ppm)
Alkalinity (ppm)	60	80	60	< 180 (ppm)
PH	6.5	6	6.5	6.5-8.5
Nitrite	0	0	0	< 1 (ppm)
Nitrate	0	0	0	< 10 (ppm)
Copper (ppm)	0.2	0.1	0.2	< 1.3 (ppm)
Iron Bacteria	Clear	Clear	Clear	< .3 (ppm)
Iron (ppm)	0.3	0	0	0
Lead	None	None	Negative	Negative
Pesticide	None	None	Negative	Negative
Hydrogen Sulfide	Passed	Passed	Passed	Passed

Illustrated Results

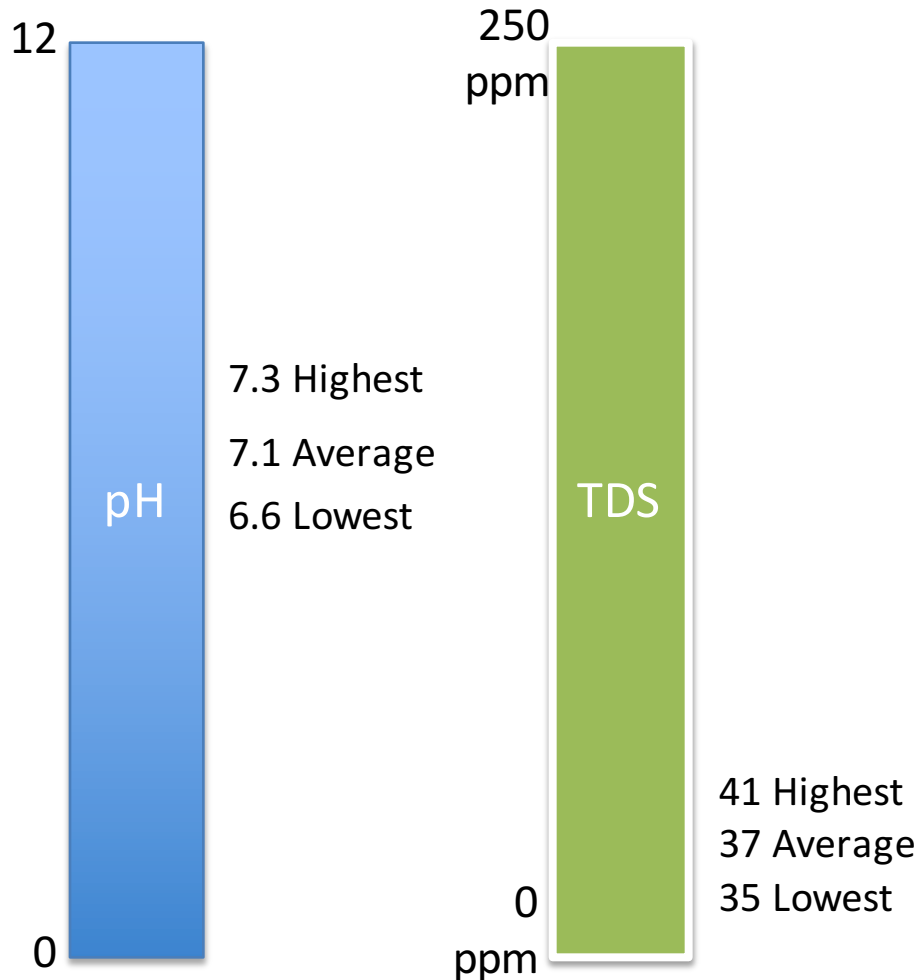
1st Floor

Best Room : 117

Ph: 7 TDS: 35

Worst Room : 139

Ph: 7.3 TDS: 39



Iron:	0.3 ppm
Chlorine	0 ppm
Hydrogen Sulfide	pass
Copper	0.2 ppm
Nitrites	0 ppm
Nitrates	0 ppm
Bacteria	pass
Hardness	0 ppm

Illustrated Results

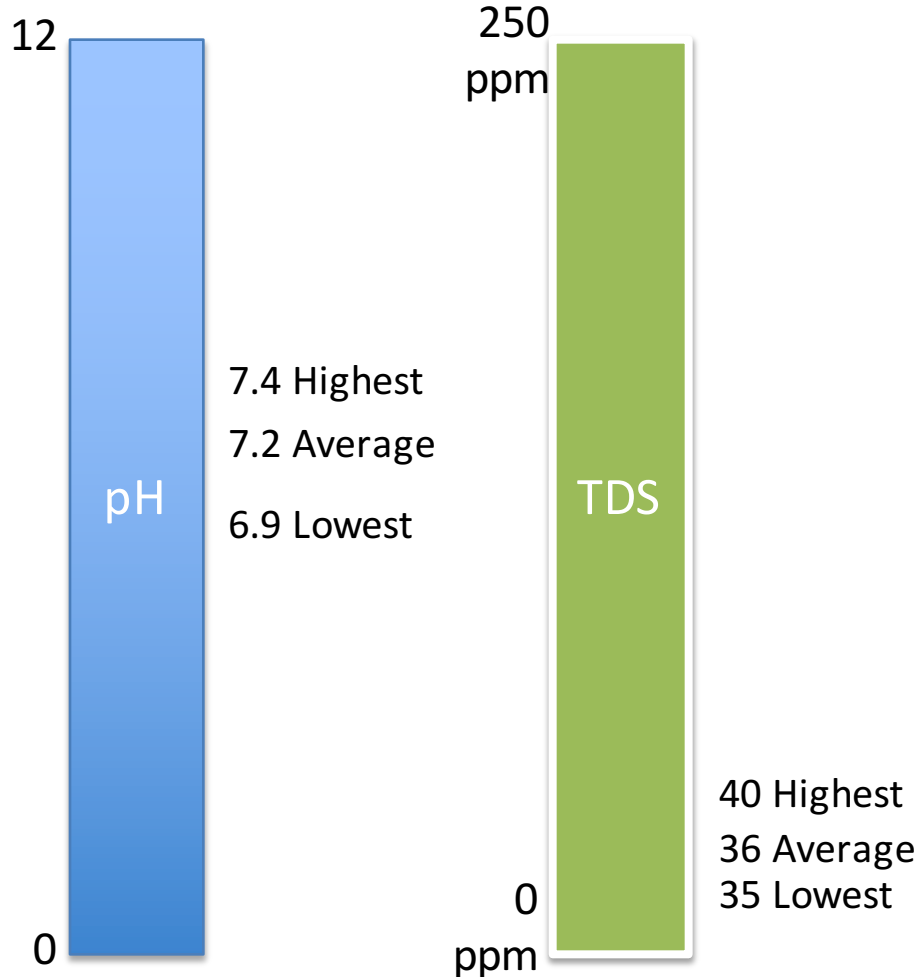
2nd Floor

Best Room : 244

Ph: 7 TDS: 35

Worst Room : 236

Ph: 8.5 TDS: 35



Iron:	0 ppm
Chlorine	0.25 ppm
Hydrogen Sulfide	pass
Copper	0.2 ppm
Nitrites	0 ppm
Nitrates	0 ppm
Bacteria	pass
Hardness	0

* Tested room 2-341 – worst room was custodian closet, only classrooms were chemically tested.

Illustrated Results

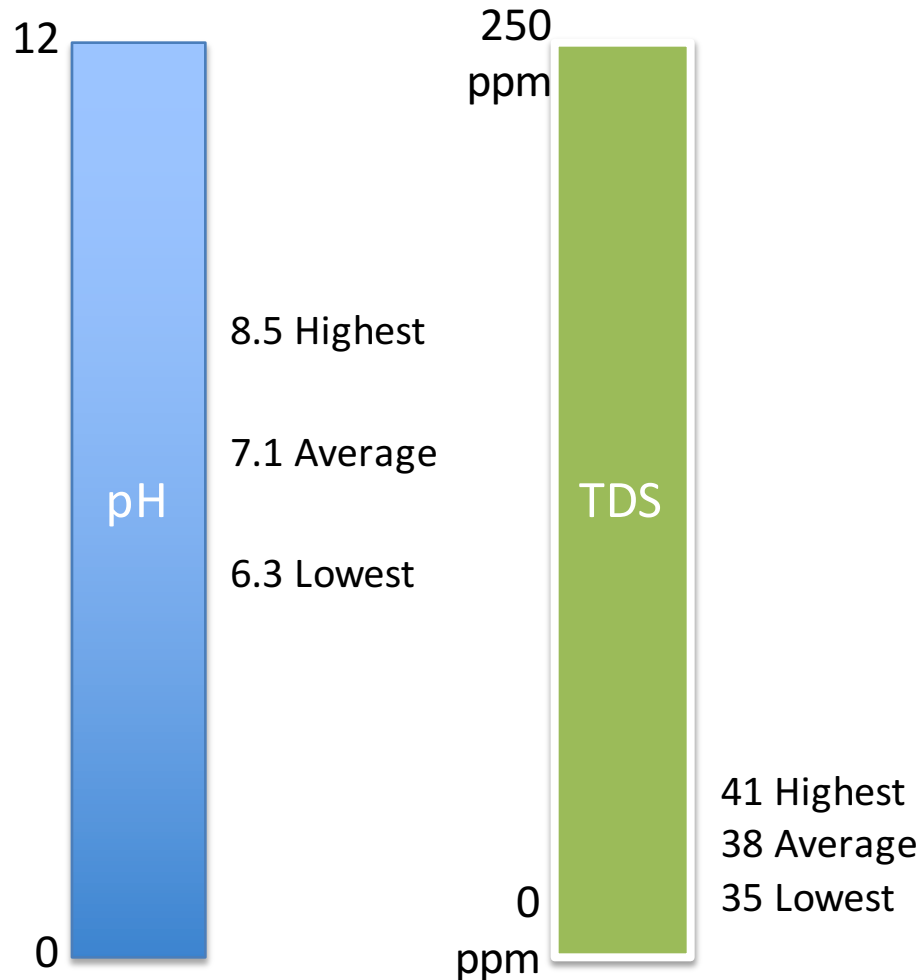
3rd Floor

Best Room : 340 & 310

Ph: 7 TDS: 35

Worst Room : 341

Ph: 7.1 TDS: 40



Iron:	0 ppm
Chlorine	0.25 ppm
Hydrogen Sulfide	pass
Copper	0.2 ppm
Nitrites	0 ppm
Nitrates	0 ppm
Bacteria	pass
Hardness	0
Lead	negative
Pesticide	negative

Conclusion

Our school has better than acceptable quality water.

2nd floor has the best water

3rd floor has the worst water

