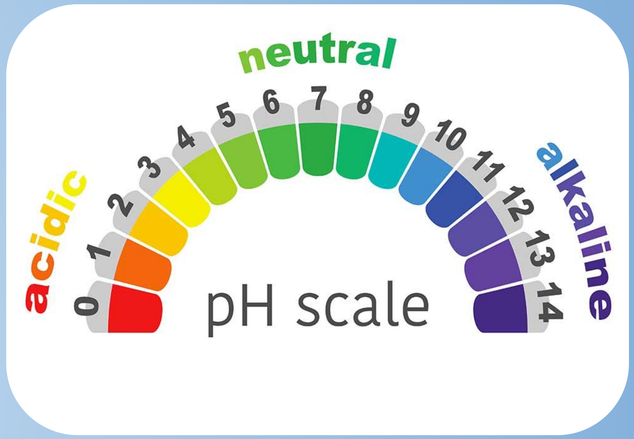
Rethink your Drink!

Grace Tuglavina Grade 11

Lake Melville School
North West River,Labrador

Purpose~To determine if the pH levels in North West River vary

Question~ do the pH levels in my area vary?



Hypothesis~ There will be differences in the pH levels in drinking water in different locations in North West River, Labrador

Independent variable~The location where the water sample was taken

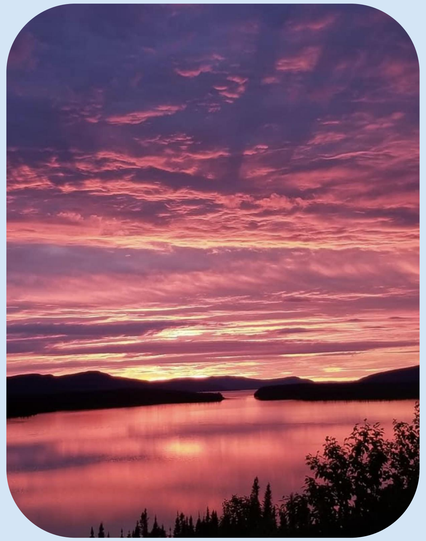
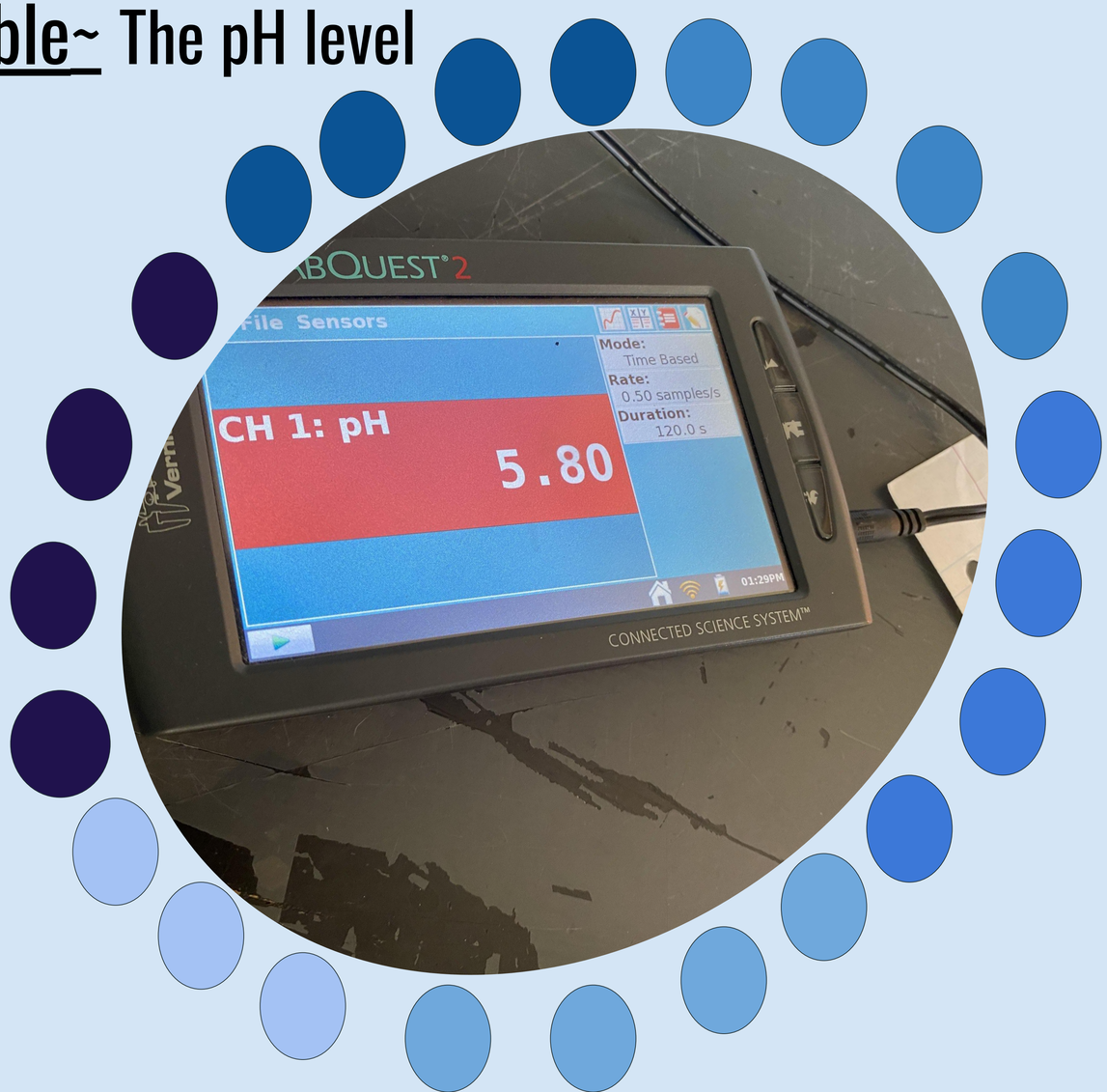


Image 1: Taken by Sheila Blake behind sample site 1

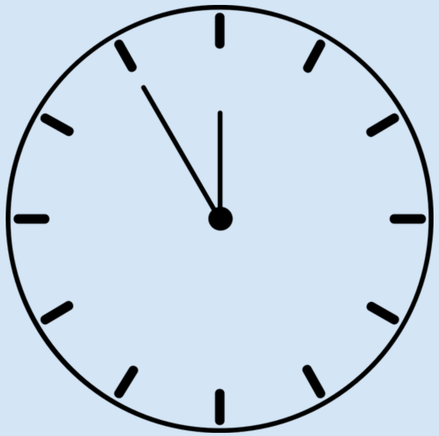
Image 2: Taken by Helena Riche at Sample site 2

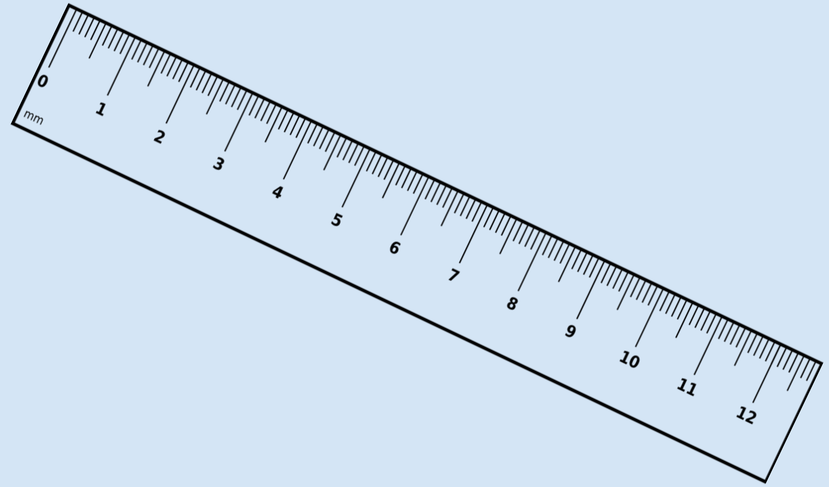
Image 3: Taken by Ashley Jarvis Next to sample site 3

Dependent variable~ The pH level



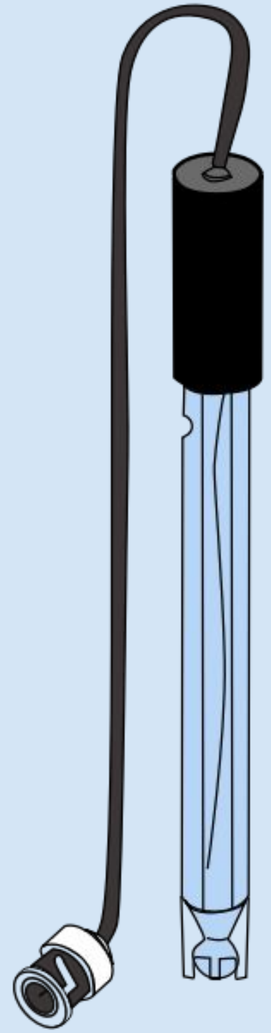
Controlled variables~ The amount of water, time(before testing),the depth the pH probe was placed into the sample and the number of samples in each location





Materials:

- logbook
- Labels or tape
- Source of tap water from 3 different areas of a town
- 9 glass jars (500mL) for water sample collection
- A pH sensor by Vernier
- Vernier interface
- Distilled water
- Electrode storage bottle
- Paper towel or tissue
- 2 buffer solutions with a known pH



Procedure

Note that during the initial experiment the pH electrode storage bottle that was used appeared contaminated and that pH probe did not give steady readings but instead the values kept increasing the longer the probe washeld in the drinking water samples. Therefore a new probe and storage bottle was purchased and used

1.Calibrate the pH probe
2.Label each glass jar (Top,Middle and Bottom)
3.Collect 3 water samples in each of the 3 different areas of town (Top,middle and bottom) with 500 ml of tap water in each jar
4.Plug the pH probe into the interface (Labquest mini,Labquest 2)
5.Rinse the lower section of the probe thoroughly with distilled water
6.Submerge the pH probe approximately 5 cm into the water sample
7.Record the pH reading in the logbook
8. Repeat steps 5 to 7 for each water sample

Results

Table 1: pH values of drinking water for 3 areas in North West River, their means and standard deviations

uptown	midtown	downtown
4.67	5.22	5.51
4.86	5.27	5.65
5.13	5.4	5.76
Mean 4.88	Mean 5.29	Mean 5.64
SD 0.2311	SD 0.0929	SD 0.1252

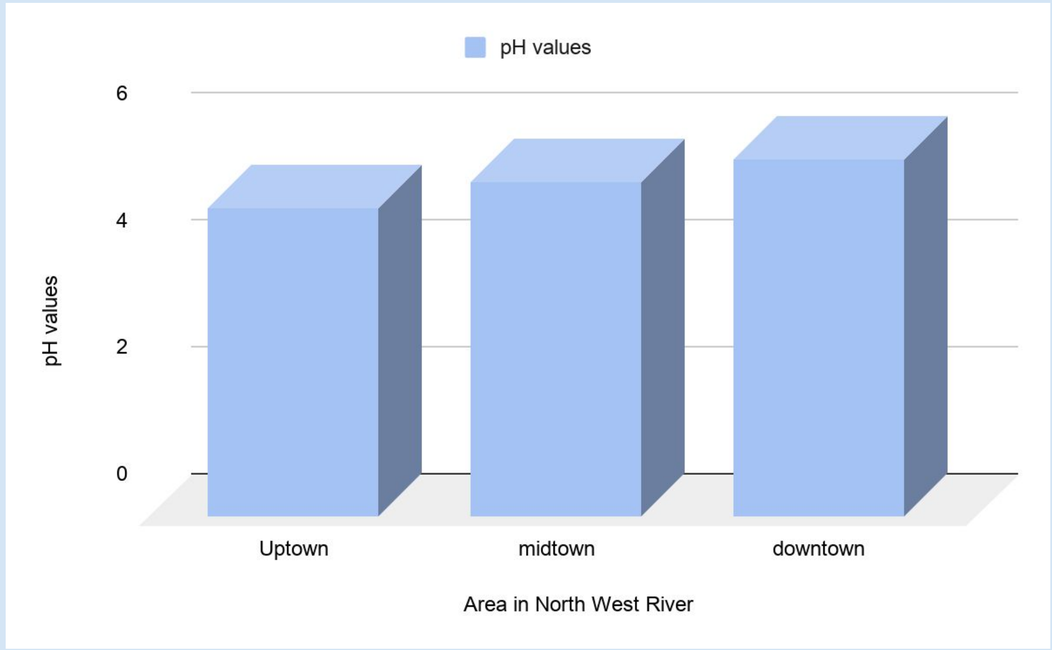


Figure 1: Mean pH values of drinking water for 3 areas in North West River

As Table 1 and Figure 1 show, the drinking water in all 3 areas of North West River is acidic but the acidity decreases (alkalinity increases) from uptown to middletown and to downtown, which is furthest from the water source in North West River

Results

~Using a t-test it was determined that the difference in pH values for uptown Vs downtown and midtown Vs downtown were both significant, but those for uptown Vs midtown were not significant.

uptown vs downtown t(2)= -4.96254, P= .003846
midtown vs downtown t(2)= -3.8122, P= .009452

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{(s^2(\frac{1}{n_1} + \frac{1}{n_2}))}}$$

Image 1: The T-Test formula

Results

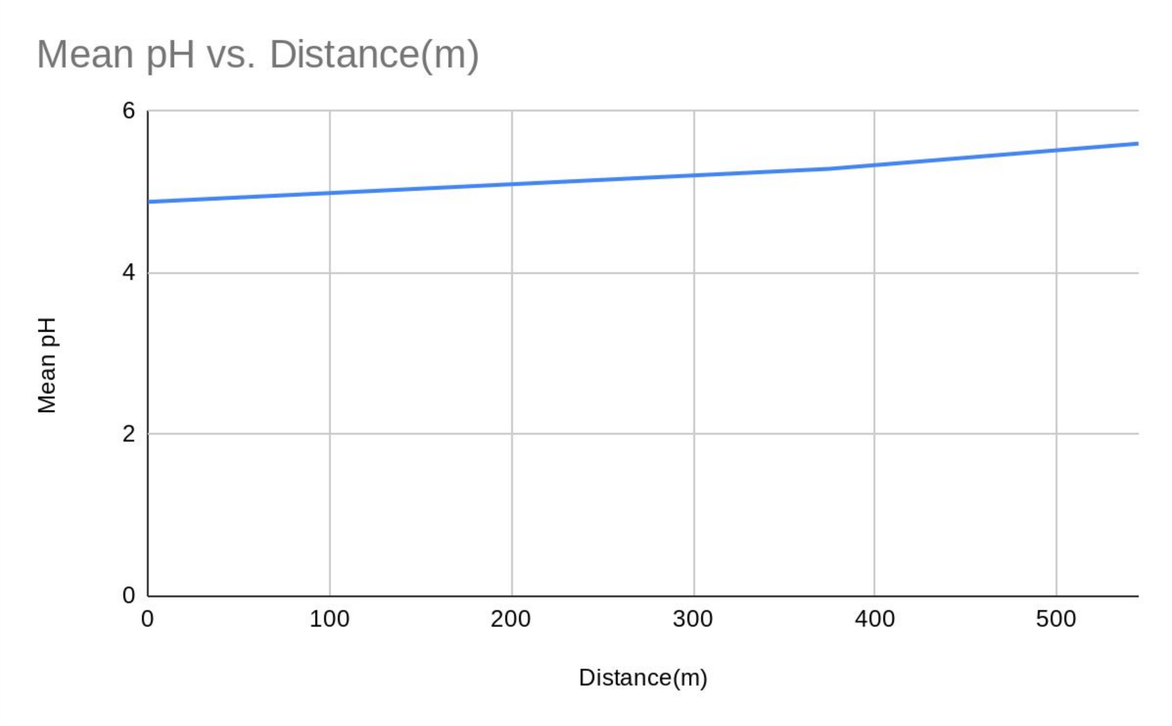


Figure 2: Mean pH values difference with distance(m)

The further away you go from the water source the more Basic the water gets

Discussion

~The results from this project indicate that the drinking water in North West River would be considered acidic and that the pH increases as you go further away from the water source in North West River

~It was desired to determine possible reasons for the increase in pH with distance from where the treated water originates. North West River uses Lavo 12 to purify the water. This is a combination of sodium hypochlorite and sodium hydroxide, both of which are bases. These compounds produce a pH of greater than 12.5 but when Lavo 12 is added to water hypochlorous acid is produced. The hydrogen ions of this acid lower the pH of the water but the acid gets diluted further downstream from the point of origin which then results in a higher pH. So the water is less acidic at the middletown and even less so at downtown sites.

~North West Rivers water pH levels are below the standard values of drinking water which is 6.5-8.5

Sources of error

~a possible random error was that not every water sample was exactly 500 mL

~another possible source of error that might affect the results is the fact that there are different types of water pipes at each of the sample locations (uptown, midtown, downtown)

~a third possible source of error was the fact that the temperature of the water was not measured

Conclusion

~The results of this project supports the hypothesis that there will be differences in the pH levels in drinking water in different locations in North West River,Labrador

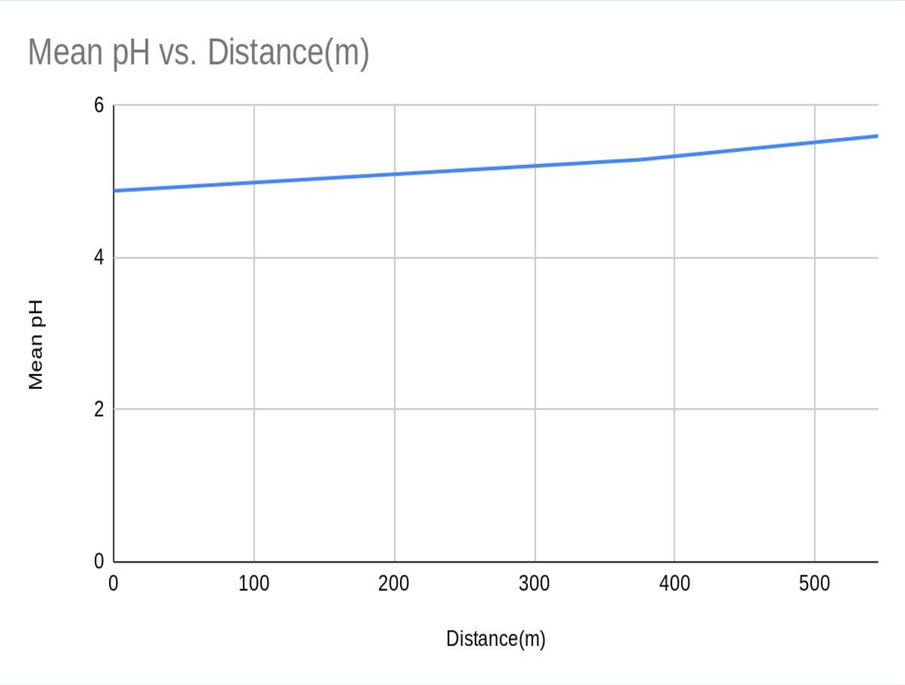


Figure 1: Mean pH vs Distance(m) graph

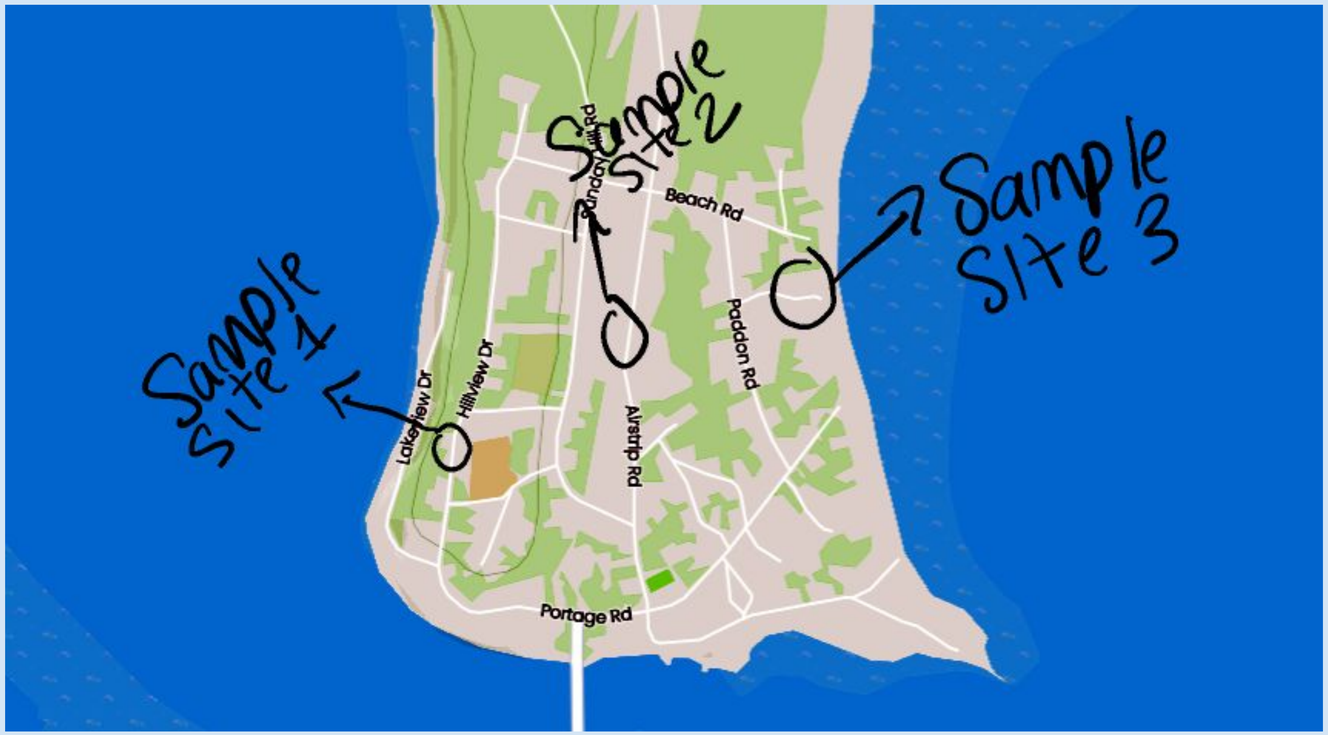


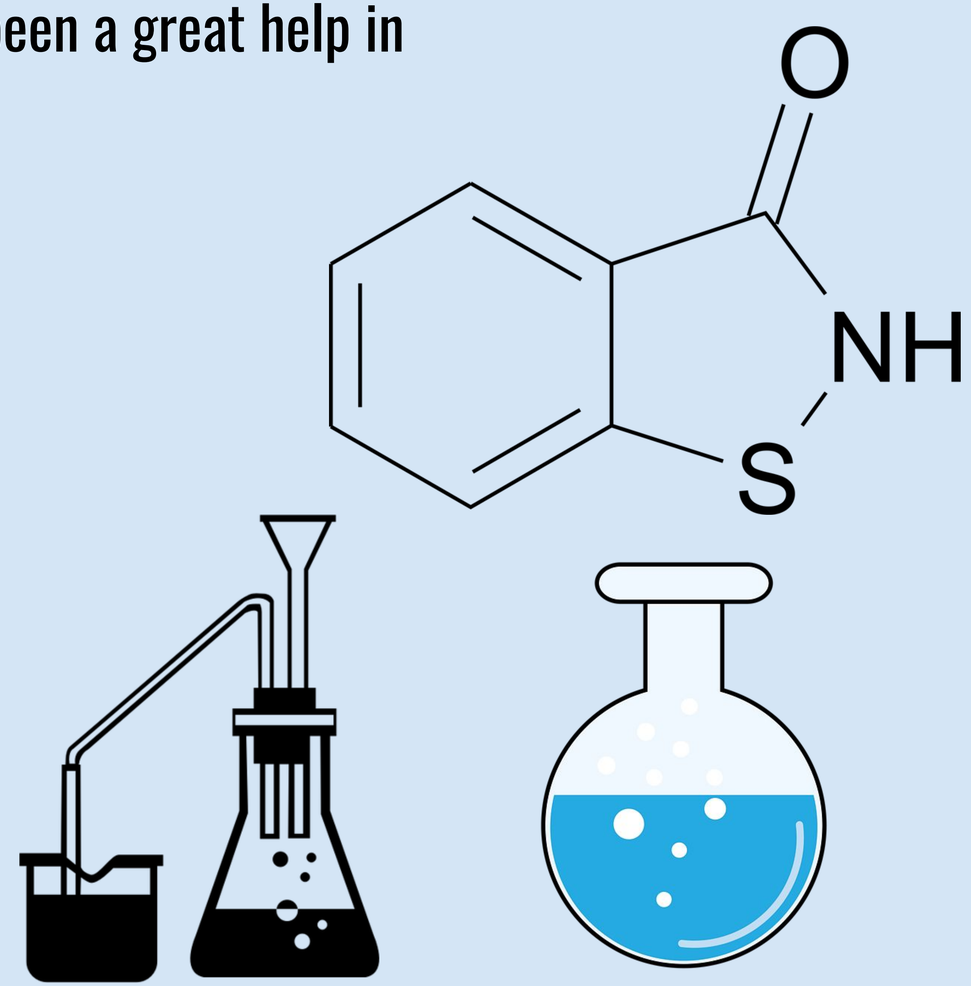
Image 1: A Map displaying the sample sites in North West River

Acknowledgements

~I would like to offer my special thanks to my teachers Chad Carroll my science teacher and Shane Morgan my principle/grym teacher. I would not have been able to do this project without their help; I greatly appreciate it!

Acknowledgements

~Advice given by Yvonne Dawe my CDLI chemistry teacher has been a great help in the journey of the completion of this project



Acknowledgements

~ I would like to thank Donna Mcgrath, Helena Riche and Mina Campbell for allowing me to collect tap water samples from their homes

Image 1: Donna Mcgrath

Image 2: Helena Riche

Image 3: Minna Campbell

Acknowledgements

~Thanks to Desmond Montague for teaching me techniques for analyzing my data

~I would also like to thank my mother Joyce Tuglavina for her assistance in the Collection of my data

References:

Tribe,C (April 25,2017) retrieved from:
https://sciencing.com/variables-affect-ph-levels-8551579.html

Foo, R. (n.d.) retrieved from:
https://endlead.weebly.com/factors-that-affect-ph.html

Appendix: Log Book

Sample 1(uptown)

Jar 1= 4.67

Jar 2= 4.86

Jar 3= 5.13

Sample 2(middle town)

Jar 1= 5.22

Jar 2= 5.27

Jar 3= 5.40

Sample 3(downtown)

Jar 1= 5.51

Jar 2= 5.65

Jar 3= 5.76