Lab: Fruitvale MAKEUP ASSIGNMENT

Background:

You are visiting friends in your home town of Fruitvale. They have a small house but a very big yard – one big enough for chickens, a vegetable garden, a pond, and two horses! When you arrive, you find they are drinking bottled water instead of water from their well. They tell you that the water in the pond, which comes from an underground aquifer, smells funny lately. They don't know whether it's safe to drink the water from their wells and are afraid that the garden may be contaminated. You're not happy about this! You've been studying about groundwater and water contamination so you decide to investigate.

Randy, from the local filling station, mentions that water from a well drilled in Fruitvale Estates is contaminated with a pesticide. As you are talking with Randy, city water department workers pull into the station. Randy tells them about your investigations and they ask to see your map. Impressed with your careful investigations, they ask for your help.

A pesticide has been found in the Fruitvale Estates well at 5 ppb, five times its safe level. The manufacturers of this pesticide originally thought that it would be safe if used properly because the chemicals would break down in the soil. Later tests showed the pesticide did not decompose as expected, and it was banned in the United States eight years ago. City officials are worried that the pesticide may have reached the main city wells, located near the bottom of your map. Your help is needed to decide where test wells should be drilled to determine the source of the pesticide and the extent of its spread.

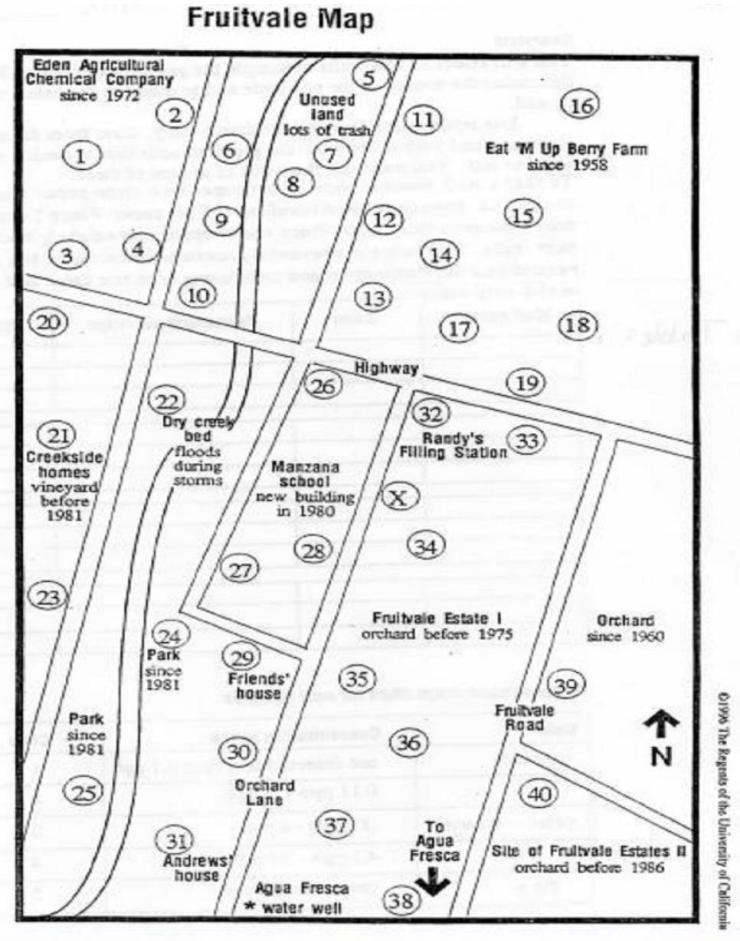
What We Did in Class:

Students used "magical pesticide testing paper" (pH paper) to test only 12 water samples taken from 40 wells in an effort to identify the source of contamination. They determined which wells to test based on what was in the area and the way in which they thought the groundwater might flow. Once they identified the source, they drew the contamination plume on the map to show all affected wells.

Color	Concentration (ppb)
green	less than 0.1
green-yellow	0.11 – 0.8
yellow-orange	0.81 – 4.0
orange-red	4.1 – 32
red	greater than 32

Well #	Color	ppb
15	Green	
8	Green	
2	Green	
13	Green	
10	Dark Orange	
34	Orange	
28	Orange	
36	Yellow	
4	Red	
22	Orange	
19	Green	
39	Yellow	

Based on the data provided, complete the chart and draw the contamination plume on the map below.



Analysis Questions: Watch this video (https://www.youtube.com/watch?v=pdPAqMpRtsw) and answer the following questions

1. Where in the United States does this story take place?

2. What organization was responsible for the contamination?

3. What is the source of water for the community discussed?

4. Identify the major pollutant(s) involved at the site.

5. Describe how a contamination plume moves through the area.

6. Describe the "standard playbook" that polluting companies generally use in these situations.

7. Describe the history of the land discussed.

8. How were the people in the area affected?

9. Who should be responsible for protecting water resources in the area?

10. What is the status of the project at the time of this video (2021)?

Watch this video (https://youtu.be/hi5DfRy01vE?si=m5HEwlxGg_j31oSi) and answer the following questions

11. What percentage of wells in New England have levels of arsenic that is deemed unsafe?

12. How many people are affected?

13. What are the health risks of a low dose arsenic exposure?

14. The level of arsenic deemed safe was 50 ppb at one time. What is today's accepted level?

15. What is the source of this arsenic contamination?

16. Arsenic is now thought to be an endocrine disruptor. What does this mean?

17. How many wells in New Hampshire are estimated to be above the allowable limit?

18. What is the best way for affected citizens to mitigate this problem?

19. What have you learned from this makeup lab?