

## Lab: Fruitvale

(modified from University of California Regents)

### 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.

First you check the pond. It does smell funny – but it always smelled funny to you. Next you ask your friends' neighbors, the Andrews, whether they've noticed anything wrong with the water. Your friends and the Andrews are the only people in Fruitvale who still get their water from their own wells; everyone else uses city water. Mrs. Andrews tells you she hasn't noticed anything unusual but mentions that their dog has been sick. She wonders whether the dog drank some contaminated water.

You begin to make a map to record what you find out. Much of the neighborhood has changed since you lived there years ago. There are many more houses and fewer farms. The old country school has been replaced by a large school and playing fields. The dry creek bed has been cleaned up since you and your friends used to make forts out of scraps of metal and wood you found there. Now the part of the creek below the highway is a park. Finally your map is complete, and you stop at Randy's Filling Station to have a cold drink.

As you are finishing your map, Randy 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 pp, 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.

### Procedure:

1. Use the information in the story to identify six wells that you would like to test and record the well number along with the reasons behind your choice in the data table.
2. To test a well:
  - a. place a small piece of magical pesticide testing paper (pH paper) on a clean paper towel.
  - b. obtain one well sample at a time from Mr. Rush/Ms. Magee
  - c. place one drop of the well sample on pH paper
  - d. note the color and corresponding pesticide concentration in the data table
3. After the six initial wells have been tested, follow the evidence to select another six wells (you do not need to provide reasons for this second group of six). Record the results in the data table.
4. Use the following range chart for determining well sample concentration:

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

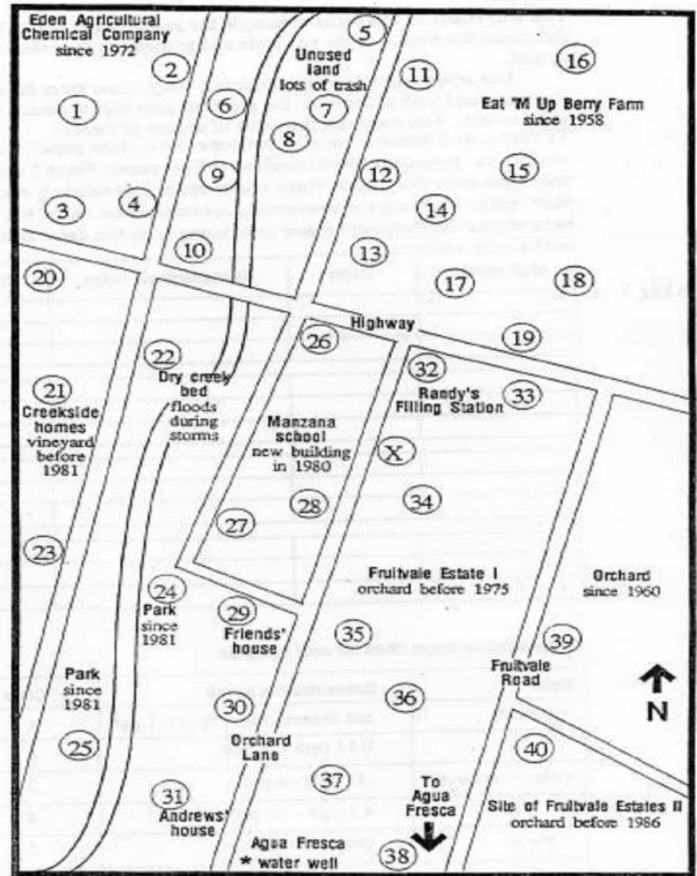
(continued on back)

Data:

Well #	Reason Tested

Well #	Color	ppb

Fruitvale Map



**Analysis:**

1. Which of the wells you chose tested positive for pesticide contamination?
2. List the potential sources of contamination based on your results.
3. Based on your results, what do you think is the one ultimate source of contamination?
4. A plume of pollution is a cone expanding outward from the source. In what direction did the plume expand outward from the one ultimate source you identified in question #3?
5. If you had funding for additional well testing, what additional wells would you like to test?
6. In what ways is this lab similar to how sources of well contamination are determined in the real world?
7. In what ways is this lab different from how sources of well contamination are determined in the real world?
8. List three types of pollution, other than pesticides, that could contaminate groundwater? (hint: water soluble)
9. Why is groundwater contamination more of a concern than surface water contamination?
10. How do you think Fruitvale would deal with this groundwater contamination?