Who Contaminated the Aquifer?
(aka: _____)

Name: _____

The Scenario:

You are a physician in a small community, where your family has lived for generations. Your great-great-great grandfather was a famous officer in the Civil War and is buried in the local cemetery.

Recently, a few members of the community have described puzzling symptoms and just yesterday, a new patient came with similar but more serious complaints: weakness, tingling and numbness in his hands & feet, as well as dark warts on the palms of his hands and on the soles of his feet.

You listen carefully and learn that he works in the small, local factory (located near Private Well #6 on the map) that produces wood preservatives. He has lived in the area for about 10 years. He & his wife have a private well at their home, but his wife is not having any symptoms. He takes no medications.

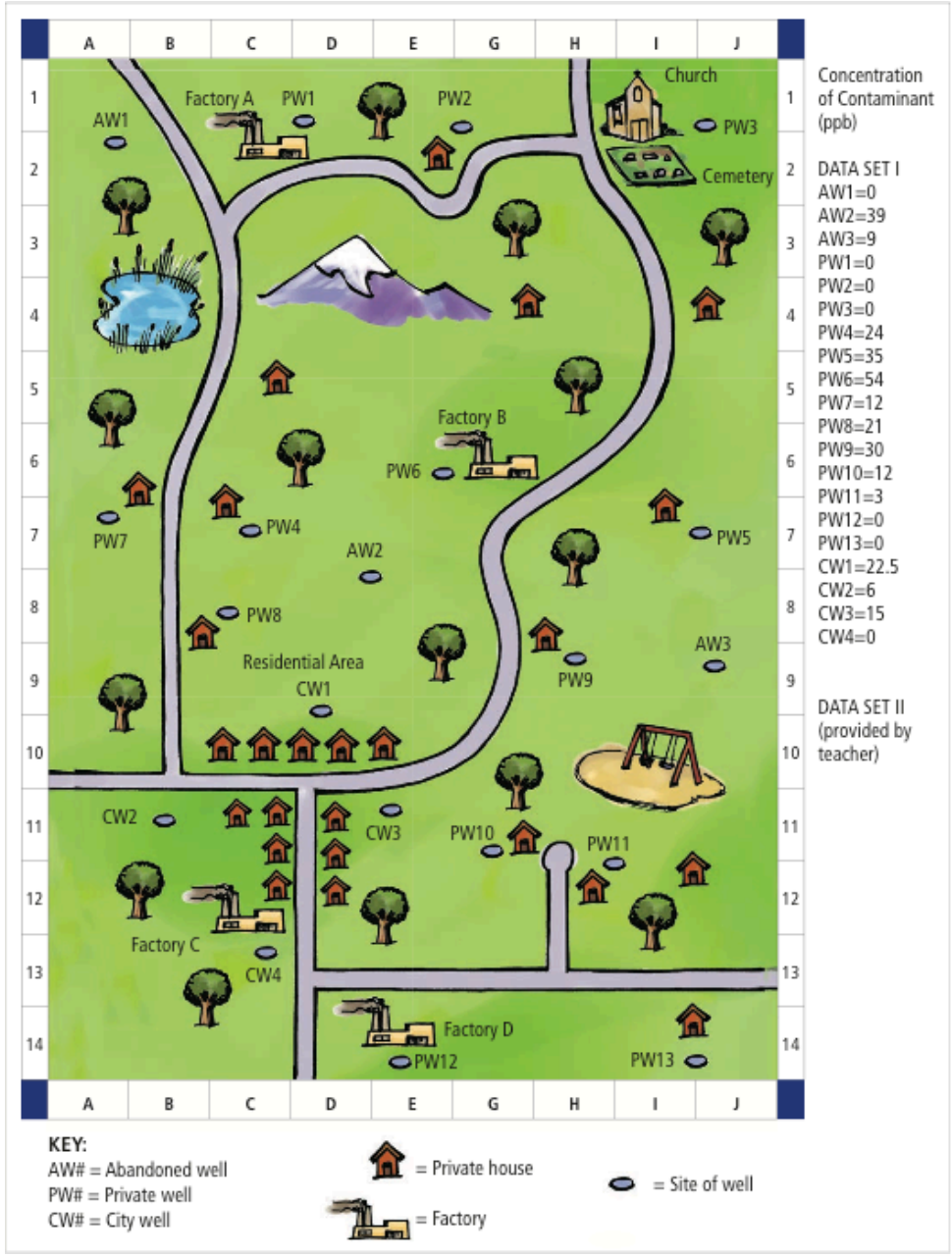
You meet with members of the Town Council and express your suspicions – you feel that these symptoms are related to chronic arsenic poisoning from contaminated drinking water. You inform them that the EPA (Environmental Protection Agency) has set the acceptable limit for arsenic in drinking water at 10 parts per billion (ppb). You strongly advise testing the groundwater for arsenic contamination. The Town Council agrees, but due to budget constraints can only afford to test the water in existing wells.

Procedure:

1. Read the scenario above.
2. Plot the arsenic levels for each well.
   (listed on the right side of the community map)
3. Define the term **point-source contamination**.

4. Analyze the data you have just plotted and come to a conclusion about the source of contamination.
   - Most contaminated well is _____.
   - The most likely **source** of contamination is _____
   - WHY?

5. What should the Town Council do with this information?



The Scenario, Part 2:

The factory owner was contacted by the Town Council and she provided water quality data that proves that her operation is **not** responsible for the arsenic contamination. All arsenic coming into and leaving the factory has been accounted for.

The Town Council now has knowledge of a serious arsenic contamination in several of the town's wells. Legally, they must act in the best interests of the town and find the funds necessary to conduct a full investigation.

A water quality testing agency has now been hired to locate the source of the arsenic contamination. The agency has drilled test wells throughout the community and this data is located below. The new data chart shows the location of each well (plotted on a grid shown on the community map) and the concentration of arsenic found in that well.

Procedure, Part 2:

6. Pick up a copy of the new test data from your teacher. Plot these new arsenic levels for each test well, using the grid on the community map.
7. Analyze the data you have just plotted and come to a conclusion about the source of contamination.
   - Most contaminated well is _____.
   - The most likely **source** of contamination is _____
   - WHY?

The Final Scenario:

Arsenic, a naturally occurring chemical element, is used primarily to produce pesticides and wood preservatives. In the past, however, arsenic compounds were used more extensively – even to treat certain diseases. This practice has been discontinued because of an awareness of arsenic's negative effects and development of safer drugs.

Less well known is that cemeteries represent another potential source of groundwater contamination by arsenic. From 1880 – 1910, arsenic was widely used in embalming fluid. During the American Civil War, this was used as a preservative so that the bodies of thousands of dead soldiers could make the long journey to their homes for burial. During this period, people were buried in wooden coffins that have degraded over time. Arsenic does not degrade and as water moved downward through the soils of cemeteries, it can carry arsenic downward to the aquifer. Therefore, the potential exists for groundwater contamination by arsenic in areas near cemeteries where burials were conducted from 1880-1910.

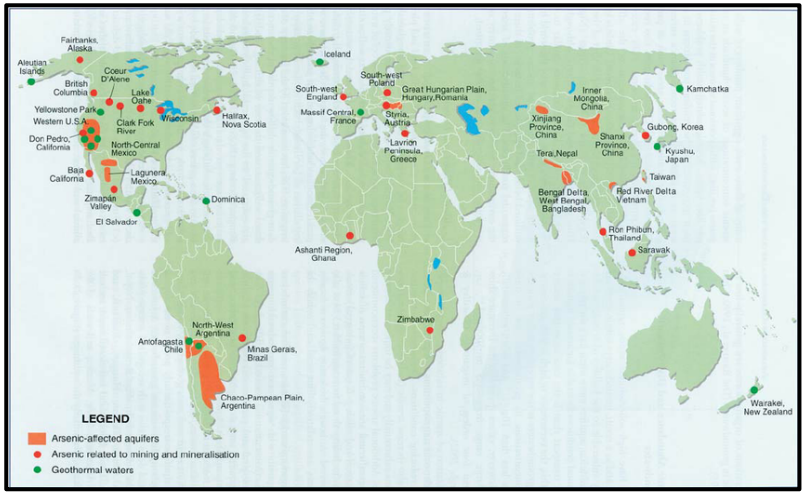
Conclusion Questions:

1. What specific facts from the last reading confirm your latest source of arsenic? (this requires more than one fact)

2. What specific steps should the Town Council take now that the source of contamination has been identified? (again – more than one is required)

3. How does the following comment apply to this situation?
   "Past solutions sometimes become present problems."

Research global arsenic groundwater contamination.



4. What are some potential sources of arsenic contamination? (list at least two natural AND two man-made sources)

5. What are the health effects of arsenic poisoning?