

GROUNDWATER CONTAMINATION INVESTIGATION

Observe • Test • Compare • Investigate • Decide

Name: _____ Class Period: _____ Date: _____

THE CHALLENGE A town gets drinking water from Municipal Well W4. A contaminant has entered the groundwater. Follow the evidence, identify the likely source, and recommend a way to protect the water supply.

No equations are required. Read the model displays, record observations, and explain what the evidence means.

1 Learn the Five Key Ideas

Use these terms while you investigate the groundwater system.

Term	What it means
Groundwater	Water found below the ground.
Aquifer	A layer underground that can store and move water.
Plume	The area where contaminated groundwater has spread.
MCU	Model concentration unit. A higher number means more contamination.
Shallow / deep well	Wells that collect water from different underground depths.

BEFORE EVERY TEST Click Reset run. Change only the setting named in the directions. Keep the other settings the same.

1. In your own words, what is an aquifer?
- _____
2. What does a higher MCU number mean?
- _____

2 Look at the Model

Begin with Source visible so you can see how the system is arranged.

STARTING SETTINGS Groundwater flow mode | Source visible | Coarse sand | Uniform aquifer | Gradient 0.006 | Normal recharge | Pumping 25% | Thick clay | Tracer | Source load 5

3. Which direction do most groundwater arrows point? Circle one: East West North South
4. Which well supplies water to the community?
- _____
5. Which well do you predict will detect contamination first? Explain in one sentence.
- _____
- _____

3

Quick Test A: Does the Ground Material Matter?
Compare two very different materials. Do not calculate anything.

DIRECTIONS Use the starting settings from Page 1. At Day 0, select each material and copy the two readouts shown by the model. Reset before switching materials.

Material	Groundwater speed (m/day)	Travel time to W3
Well-sorted gravel		
Silt and clay-rich sediment		

1. Which material moved groundwater faster?
2. Why would faster groundwater movement matter after a spill?

4

Quick Test B: Can Pumping Change the Risk?
Compare no pumping with strong pumping.

DIRECTIONS Use coarse sand and the starting settings. Set pumping to 0%, run to Day 365, and record W4. Reset. Set pumping to 100%, run to Day 365, and record W4.

Pumping	W4 concentration at Day 365	What happened to the plume?
0%		
100%		

3. Did strong pumping make W4 safer or put W4 at greater risk in this run? Use one piece of data.
4. Complete the sentence: Pumping can change risk because it can pull groundwater and contamination toward _____.

5

Mystery Source

Use well samples to determine where the contamination probably began.

SET UP

Choose Investigation mode > Mystery source > Generate new mystery. Run to Day 180. Sample W1, W2, W3, and W4. Then run to Day 365 and choose two more samples. You do not need to use all 12 samples.

Day	Well	MCU	What does this suggest?

1. Which well had the strongest contamination?
2. Which source is most likely? Check one: ☐ Residential septic ☐ Agricultural storage ☐ Fuel storage
3. Evidence: Write two results from your sample table that support your choice.
4. Reasoning: Explain how the well locations and groundwater flow support your source choice.

6

Protect the Water Supply

Use your evidence to choose a practical response.

Plan	What the town would do	Benefit	Possible problem
A	Sample only W4 every month.	Simple and low cost.	May discover the problem only after it reaches the drinking-water well.
B	Sample W3 and deep well W6 every three months. Sample W4 twice each year.	Provides earlier warning and checks whether contamination is moving deeper.	Requires more sampling.
C	Increase W4 pumping to 100% and sample W4 every month.	Provides more water and may capture nearby groundwater.	Could pull the plume toward W4.

1. Which plan do you recommend: A, B, or C?

2. Explain why your plan is the best choice. Use evidence from one of your model tests.

3. Name one action that could stop or reduce contamination at the source.

4. Why should the town collect real water samples before making a final decision?

FINAL CLAIM The likely source was _____. The strongest evidence was _____. The town should choose Plan _____ because _____.