STUDENT GUIDE
AQUIFER LAB MODELING APPLICATION

The Aquifer Lab's Modeling Application is a learning tool that will introduce you to basic groundwater modeling concepts. It uses simple calculations and assumptions to present groundwater flow in an easy to understand manner. Use this guide to get you started with the application. You'll be an expert in no time!

Supplies Needed

- computer with internet access
- calculator (basic)

Modeling Activity Abbreviations & Definitions

G - Ground Elevation

S - Water Table Elevation in static conditions

P - Water Table Elevation in pumping conditions

i - Gradient

n - Porosity

K - Hydraulic Conductivity

ft - feet

Elevation X - the water table elevation of Well X

ΔElev X to Y - the difference between the water table elevation of Well X and the water table elevation of Well Y

Dist X to Y - the distance between Well X and Well Y

X-xy Dist - The distance between Well X and the point (Xy) between Well X and Y that has a water table elevation equal to the water table elevation of the middle well (Well Z)

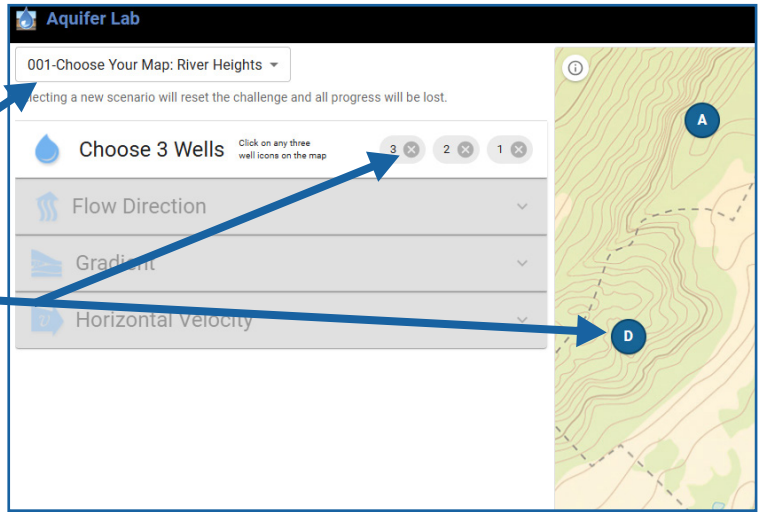
Getting Started

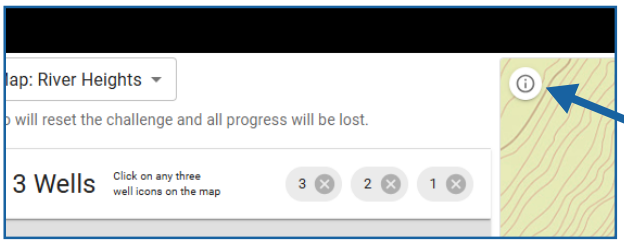
Go to AquiferLab.com using any up-to-date browser to access the practice version of the Aquifer Lab modeling application.

Helpful Features

Select a scenario from the drop-down menu. Each scenario has unique well placement, topography, and geology.

To choose three wells, click the wells on the map. You can unselect wells by clicking them again or by clicking the 'x' button next to them in the list.

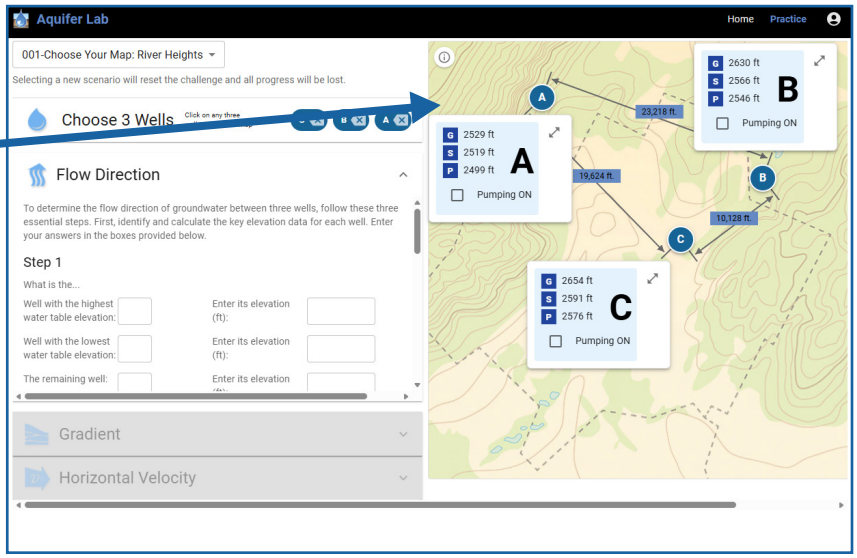




Click the information icon to open a pop-up with helpful details about using certain features.

Use **S-value** (*water table elevation in static conditions*) for **wells not pumping.**

Use **P-value** (*water table under pumping conditions*) for wells that **are pumping**.



As you complete each section, the next section will light up and will become available.

You may move the well information pop-up boxes by clicking and dragging.

Select this check box to turn pumping ON for a well. Select it again to turn pumping OFF.

Flow Direction

Now you are ready to calculate the flow direction. To determine the flow direction of groundwater between three wells you will need to work through the three basic steps.

Step 1: Fill in the blank boxes with the necessary information. When filling in information about water table elevation, make sure to use the 'water table elevation in static conditions (S)' for wells that are not pumping and use the 'Water table elevation in pumping conditions (P)' for wells that are pumping. You must fill in all of the boxes for Step 1 before you may move on to Step 2.

Step 2: Fill in the blank boxes with the necessary information. Make sure to round your answers to the stated amount of decimal places. The distance between wells is shown on the map. You may use a calculator to help you answer the math questions. Upon completion of step 2, you will notice a grey line appears on your map. This is your water table contour line.

Step 3: Select the direction of groundwater flow by clicking and dragging the blue dot around the compass. Alternatively, tab-select the dial and use Alt+ right arrow / Alt+ left arrow to nudge 5°. Remember, groundwater flows from regions of higher elevation to regions of lower elevation.

To check your answers select the "Check Step" button. Correct answers are highlighted in green, incorrect answers are highlighted in red. To view the correct answers, select the 'Show Solution' button.

Gradient

Step 1: Click on "Reveal Distance Y". Distance Y is the flow distance perpendicular to the water table contour (grey line) that you determined in Flow Direction. Distance Y will appear on your map.

Step 2: Complete the formula to determine the gradient (i). Once again, make sure to round your answers to stated amount of decimal places. A visual of the gradient will appear as a yellow arrow under the Step 2 equation. You are now ready to proceed to the final portion: Horizontal Velocity.

Horizontal Velocity

Horizontal Velocity is calculated using Darcy's Law. Darcy's Law requires the hydraulic conductivity (K) and porosity (n) of the soil through which the groundwater is moving. To find these values, open the Geology Table of the well with the highest water table elevation (this is the well the groundwater will be flowing from). The Geology Table shows the lithology (soil type) where the well is located. The depth is listed as feet below the surface. To select your K and n values, choose the layer of soil with the highest conductivity (K) in the saturated zone (area below the water table).

Step 1: Determine your hydraulic conductivity (K) and porosity (n). Fill in the blank boxes with the necessary information. You may back track to Gradient if you forgot your gradient value. Remember, porosity is entered in as a decimal, so a porosity of 45% would be entered as 0.45.

Step 2: Complete the equation (Darcy's Law) to calculate Horizontal velocity.

Congratulations!

Congratulations! You have successfully calculated the speed and direction of groundwater flow. You may now click the "Submit Answers" button to see your score. After reviewing your score, you can either:

- Select "Reset Challenge" to erase all currently input answers.
- Select "Return Home" to go to the main start page.
- Click anywhere on the previous scenario to close the results pop-up and revisit your work.