Objectives: 1) To learn about possible sources of contamination of drinking water, and how to find out whether your local drinking water is safe to drink; 2) to appreciate the importance of water conservation, and to practice it.

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Suggested Sequence</th>
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<tbody>
<tr>
<td>10-20</td>
<td>READ &amp; TALK STORY: handout copies of “Sewage Spill” reading (2 pages, plus bonus “Ala Wai Update”). Discuss this or similar flooding &amp;/or water pollution issues and solutions people in your school community are involved in now. Explain where drinking water comes from (pumping stations, aquifer, rainwater &amp; catchment sources vary on all islands). Discuss if students think Hawaii’s drinking water is safe. Brainstorm possible threats (e.g., pesticides, landfills, gas stations, run off, etc.).</td>
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<tr>
<td>10</td>
<td>RESEARCH: IS OUR SCHOOL’S DRINKING WATER SAFE? Find out by going to the Board of Water Supply website at <a href="http://www.hbws.org">www.hbws.org</a>; click on water quality report; then “Click to download the Water Quality Report for your specific area (PDF)”. Type in your school’s street address. Distribute copies to students (printed in advance). Have them note which contaminants are present and assess whether levels are safe. Discuss what is being tested (see: <a href="http://www.boardofwatersupply.com/files/2007%20WQR.02.pdf">www.boardofwatersupply.com/files/2007%20WQR.02.pdf</a> for regulated &amp; unregulated contaminants). See optional homework in Extensions below.</td>
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<td>10-?</td>
<td>OPTIONAL: FIELD TRIP &amp;/OR GUEST SPEAKER: Have students help prepare a trip or find a guest speaker. All islands employ staff to monitor &amp; report drinking water safety, as well as waste-water management. Go to this website for O’ahu tours &amp; speakers: <a href="http://www.boardofwatersupply.com/cssweb/display.cfm?sid=1084">www.boardofwatersupply.com/cssweb/display.cfm?sid=1084</a> This site has outer islands’ resources: <a href="http://www.wrrc.hawaii.edu/links.html">www.wrrc.hawaii.edu/links.html</a></td>
</tr>
<tr>
<td>3-5</td>
<td>BRAINSTORM: Water is a precious. Brainstorm ways to conserve (e.g., limit showers, put filled water bottle in toilet tank, turn off faucet water when not in use.) Examine household water bills (which students bring in) &amp; try to figure out why some households use more water (e.g., more people, water used to wash cars or water lawns). Can graph data (e.g., bar graphs – see example).</td>
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<td>5-10</td>
<td>POST-TEST: see below</td>
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<td>2</td>
<td>SUMMARIZE KEY POINTS. End with individual and shared community responsibility to monitor drinking water quality and to conserve water.</td>
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LESSON: IS HAWAII’S DRINKING WATER SAFE?
UNIT 4: Kilohonua & Kalawai (Geology & Hydrology)
### Materials:
- **For teacher:** computer access &/or the school Water Quality Report (give as handout); “Sewage Spill” handout
- **For students:** Water Quality report for their school, their household water bill
- **Safety:** Warn students of dangers mixing some of these materials & precautions to take.

### Assessment/Performance Indicators:
- **Informal assessment:** Students participated in reading, brainstorming & shared mana’o (thoughts) in class activities & optional homework and construction &/or use of conductivity testers (see Appendix)
- **Formal assessment:** Post-Test answers are accurate

<table>
<thead>
<tr>
<th>Suggested Points: 10pts</th>
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<tbody>
<tr>
<td>9=A</td>
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<tr>
<td>8=B</td>
</tr>
<tr>
<td>7.5=C</td>
</tr>
<tr>
<td>6=D</td>
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### Exceeds Expectations:
- Test answers were 90% accurate or better
- Participated fully in class activities (attentive, contributed to activities appropriately)
- Wrote additional notes on water quality info, conservation ideas, etc.

### Meets Expectations:
- Test answers were 75-89% accurate
- Participated (attentive) in 2/3rds of the time in class activities or more

### Needs Improvement:
- Test answers were less than 74% accurate
- Participated 1/3rd of the lesson or less (was mostly inattentive to lesson &/or distracting to others)

### Learning Styles:
- ✓ Left Brain    Right Brain    ✓ Auditory, ✓ Visual ✓ Kinesthetic/Tactile, ✓ Spatial

### Enrichment/Extension:
**HOMEWORK OR IN CLASS:** Have students determine whether their drinking water is safe at home by repeating step 2 for their home address
**FIELD TRIP &/OR GUEST SPEAKER (O’AHU):** Contact Arthur Aiu (748-5312) at the Board of Water Supply to arrange a tour of the Halawa Underground Pumping Station, garden or Waihe’e tunnel. OUTER ISLANDS can contact their water suppliers (public or private). See websites at: www.wrrc.hawaii.edu/links.html
**READ:** KUNIA CASE STUDY of contaminated water. Discuss problem & solutions(s). Example: Kunia spill: [www.mgf-hawaii.com](http://www.mgf-hawaii.com); click on “ohia project curriculum”, “ohia project water lessons” then “water lessons”. Under grades 6-8, click on “hold it”; see pp.9-10.

### Keywords:
aquifer, Board of Water Supply, contaminants, conductivity, conservation, drinking water, EPA, environmental protection agency, groundwater, ‘opala, pesticide, sewage spill, water quality
Who is Responsible for Safe Drinking Water in Hawai‘i?
Several government agencies address the problems of the contaminated wells:

- Department of Health (DOH): this state agency oversees the health of the people of Hawai‘i.
- Department of Agriculture (DOA): this state agency oversees agriculture in Hawai‘i. One of its responsibilities is to regulate the distribution and use of pesticides.
- Honolulu Board of Water Supply (HBWS): this semi-autonomous agency under the City and County of Honolulu is charged with providing municipal water supply to meet domestic needs and fire protection for the island of O‘ahu. HBWS provided water wagons to areas that were affected by contaminated groundwater wells. It has constructed treatment facilities using granular activated carbon (GAC) filters to remove the pesticides.
- Environmental Protection Agency (EPA): this federal agency is charged with protecting human health and safeguarding the natural environment. The EPA enforces the Safe Drinking Water Act, which sets requirements for the level of contaminants in drinking water, and standards by which water supply system operators must comply to meet these levels.
- Governor: branch of government that enforces state laws and oversees the general welfare of the State of Hawai‘i.
- Legislature: branch of government responsible for making laws in the state of Hawai‘i.

Note: 1 gallon of chlorine is added to Hawaii's water for every 55,000 gallons. Hawaii's water is held in aquifers which naturally filter the water through the lava.
Post-Test: Kilohonua & Kalawai (Geology & Hydrology)

Write Answers in 1-2 Sentences:

1. How were Hawaii’s islands formed?

2. Which type of volcanoes explode violently?

3. Draw a contour map & explain what it shows.

4. Name 3 ways a kitchen sponge is like Hawaii’s soil.

5. Why do water supply workers do conductivity testing?

BONUS: Write a paragraph or more.

What was the most interesting activity of this unit for you? What did you learn that may be useful to you? Does this interest you in a career in geology or hydrology? Explain.

ANSWERS: 1 point each for a total of 5
1. From a hotspot on the ocean floor
2. Tuff cones
3. Contour maps are line drawings that show the elevation of geological features when viewed from above.
4. Multiple answers may include: “dryness”, infiltration, saturation, holding capacity, percolation, drainage & load bearing
5. Conductivity tests are done to make sure drinking water is not contaminated.