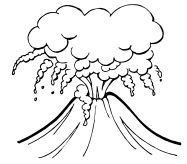


## Volcano Alert Student Worksheet (Lesson 8 of 10)



### *Lesson 8: Hazard Analysis*

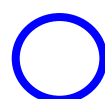
The major questions facing your team are: (1) Which of the towns are in danger of a lahar flow, a pyroclastic flow or ash fallout? (2) How severe might each of these 'hazards' be for each town? (3) How much time would each town have between the eruption and the arrival of the hazard? To answer these questions, your engineering team needs to perform a **hazard analysis**.

First, take a look at the **Mt. Gunnarupt Volcanic Hazards Map**. A team of geologists and geological engineers went to the site and examined all of the rock and soil types in the region. They created this map based on what they found. Study this map carefully and read the notes on the map. This map shows that there have been past eruptions of Mt. Gunnarupt! This information from past eruptions will help you predict what might happen if Mt. Gunnarupt erupts again.

1. Using this map, list the potential hazards for each town in the table below.
2. Indicate if the people of each town need to be evacuated.
3. Using the velocity data from Lesson 6, any other data you may have collected, and your volcano model, estimate the warning time for each town. Use the space below the table to explain how you determined the warning times.

	<b>Hazards Faced</b>	<b>Evacuate? (Yes or No)</b>	<b>Warning Time (min)</b>
<b>Town A</b>			
<b>Town B</b>			
<b>Town C</b>			

Explanation for warning times:



## Volcano Alert Student Worksheet (Lesson 8 of 10)

### *Lesson 8 Continued* *Lahar Threat - Further Analysis*

Because the surrounding towns are in danger, further analysis is required to better estimate the warning time and determine how deep the lahar deposit might be at each town. Study the **Hazard Analysis for Town B** report and answer the following questions. Read carefully, the answers are all in the report!

1. Will the lahar travel at a constant velocity from the summit to town B? Explain why or why not?

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2. Comparing the elevation vs. distance graph with the contour lines on the Geologic Map, how can you tell from the contour lines where the steepest part is?

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3. If Town B was notified right when the eruption occurred, how much warning time would the people have before the lahar arrived?

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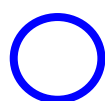
4. Compare this detailed estimation of warning time with the value that you estimated on the previous page. Were you close? List some reasons why your estimate was different:

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How thick will the lahar deposit be at town B?

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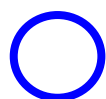
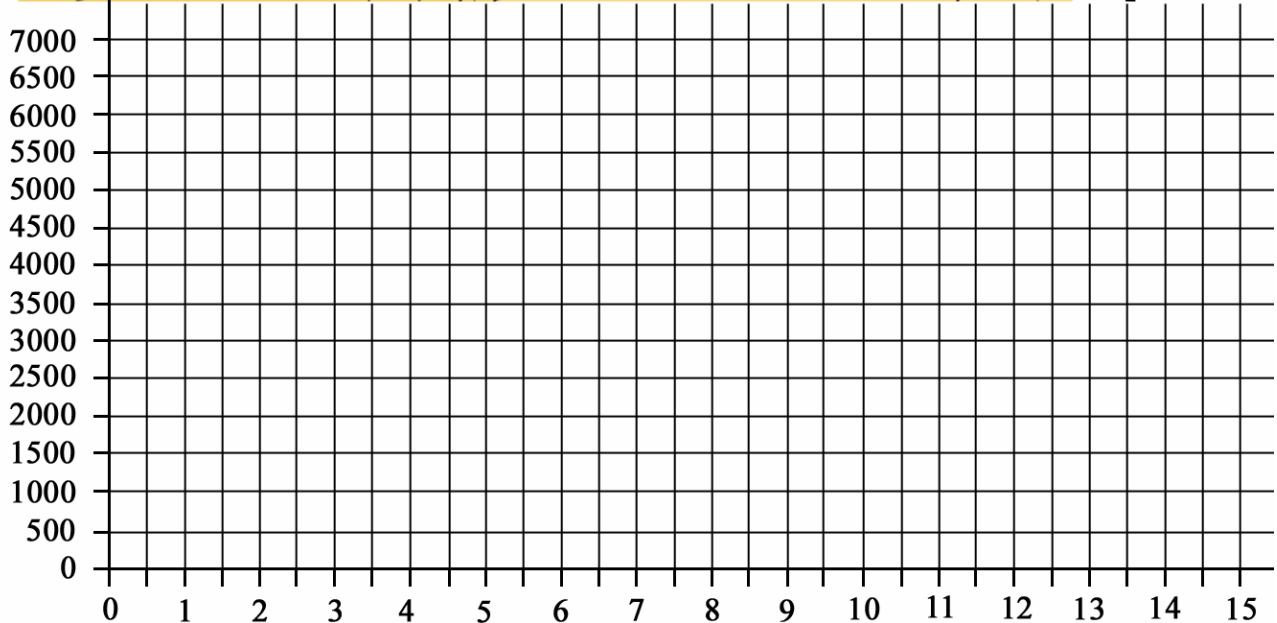
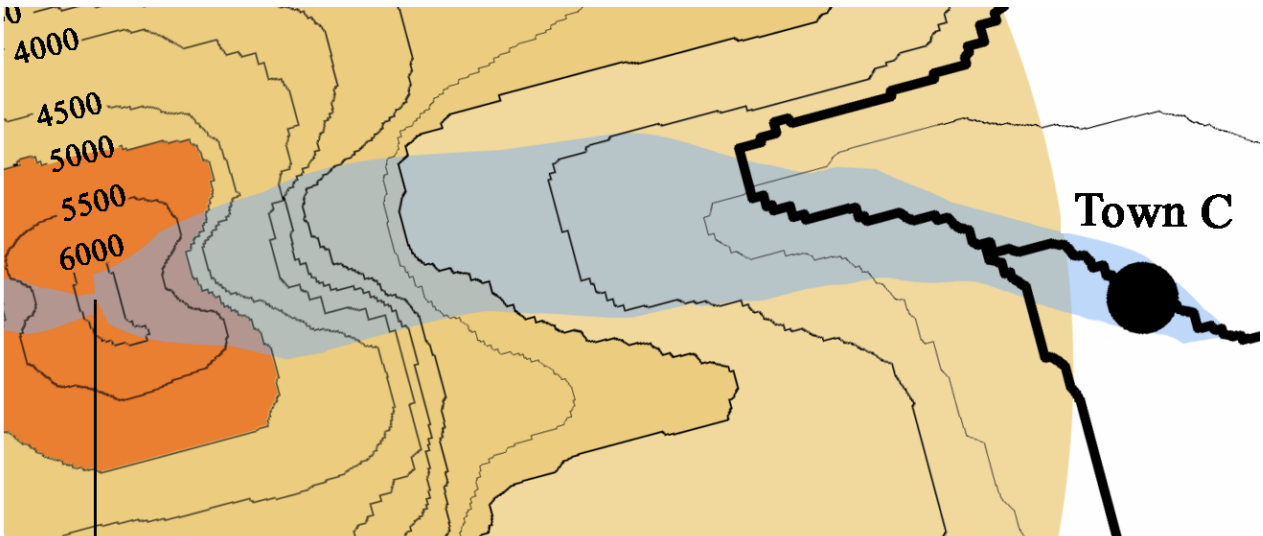


## Volcano Alert Student Worksheet (Lesson 8 of 10)

### *Lahar Threat: Advanced Analysis*

Now that you've learned how it's done, your team will perform a detailed hazard analysis for Town C. Using **Hazard Analysis for Town B** as a guide:

- (1) Create an elevation vs. distance from summit graph for Town C.
- (2) Determine the segments where the slope is constant and determine the slopes
- (3) Complete the table for the different segments
- (4) Answer the questions on the following page



## Volcano Alert Student Worksheet (Lesson 8 of 10)

Horizontal distance (m)						
Vertical distance (m)						
Slope (m/m)						
Straightline distance (m)						
Velocity (m/sec)						
Travel time (sec)						
Travel time (min)						

1. How long will it take the lahar to travel from the summit to Town C?

\_\_\_\_\_

2. How thick will the lahar deposit be at town C?

\_\_\_\_\_

3. Is Town C in greater danger than Town B? Explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. What factors might cause the lahar to arrive at Town C faster than you have estimated?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Based on your evaluation, the knowledge that your estimation may be slightly off, and assuming that the early warning system detects a lahar flow at the summit, what would you recommend as evacuation time for towns B and C.

Town B: \_\_\_\_\_

Town C: \_\_\_\_\_

