Unit 1: “Introduction to seismic refraction geophysical imaging” Student exercise

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# 1.1 Introduction

Unit 1 of the Shallow Seismic Refraction module of IGUaNA is designed to introduce geophysical concepts and surrounding earth science principles including why geophysics is important to geoscience and how these concepts are related to future careers and day-to-day life.

Part 1 introduces the broad concept of geophysics and more specifically refraction seismology. Context is given for how seismic refraction may be used in science and industry with focus on examples from the built environment. The importance of seismic refraction is explained, and relevance to daily life is presented.

Part 2 describes the parts of a wave related to the speed of sound. The concept of bedrock is explained, along with examples of how bedrock is important for science and engineering applications, and how these are related to seismic geophysical imaging.

This unit is an important foundation, particularly for students who have not previously encountered geophysical concepts in their coursework. This unit makes several key connections between the fundamental scientific principles and relevance to society and daily life. It also presents examples of careers in geophysics linked to the relevant refraction seismology examples.

The Shallow Seismic Refraction module of IGUaNA is designed to fill the need to exposure students to geophysical concepts and surrounding earth science principles so that students begin to know why geophysics is important to geoscience and how these concepts are related to future careers and day-to-day life.

# 1.2 Introduction to geophysics, refraction seismics, bedrock, and waves

Answer the following questions as you go through the lecture materials:

1. A geophysicist may use \_\_\_\_\_\_\_\_\_\_\_\_ measurements to create \_\_\_\_\_\_\_\_\_\_\_\_ of the

Earth’s subsurface properties.

1. Sesmic refraction concerns the observation of how waves \_\_\_\_\_\_\_\_\_\_ in the subsurface in order to create images of the earth.
2. Geophysical measurements may be used before or with excavation and drilling because the geophysical measurements are less \_\_\_\_\_\_\_\_\_\_\_\_ and can be used to measure data about large \_\_\_\_\_\_\_\_\_\_\_ of the subsurface.
3. Examples of applications where geophysics may be used in urban settings include:
4. When a geophysicist is making evaluations of a problem using geophysics, one example of something they may judge is:
5. Sound travels as \_\_\_\_\_\_\_\_\_\_ through the air or the ground. In this type of energy transport, the individual particles of material \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ permanently moved.
6. Waves in the air might be recorded using a \_\_\_\_\_\_\_\_\_ while waves in the Earth are likely to be recorded using a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. Bedrock may be related to hydrology because it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and bedrock may be related to engineering because building foundations \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

# 1.3 Discussing societal relevance and importance of geophysics

**Exercise 1:** Think of some examples where you have observed geoscience or environmental concepts/activities in your neighborhood, city, or region. Next, in groups of 3-4 students, discuss these observations and write down what the geoscience or environmental relevance was, why the activity was important to society, and list some questions you might have about the activity. Finally, can you think of a way that geophysical measurements might be used related to one of the concepts/activities you observed? Why or why not?