EARTH SCIENCE AND TECHNOLOGY

MAPPING DISASTER ZONES

On August 29, 2005, Hurricane Katrina hit the New Orleans area, causing $81.2 billion in damage and resulting in the deaths of nearly 2000 people. With such widespread devastation, how did relief workers reach the damaged areas? Mapping technologies helped workers to identify priority areas and create a plan to aid those affected.

GPS and disaster relief Global Positioning System (GPS) satellites send signals back to Earth telling the receiver the exact location of the user. The satellites travel at approximately 14,000 km/h, and are powered by solar energy. During Katrina, GPS signals provided up-to-the-minute information regarding destruction detail and locations of survivors and aid workers.

Using GIS Another important mapping tool used during disasters is the Geographic Information System Technology (GIS). This technology captures, stores, records, and analyzes data dependent on geography and location. As a result, many important decisions about environmental issues or relief efforts can be made using GIS data. After Katrina, GIS data provided relief workers with images of area hospitals within a small geographic area. This enabled emergency workers to get injured individuals to medical facilities quickly.

Other imaging systems Other mapping software packages provide actual pictorial images of Earth. These images show the damaged areas as well as buildings that can be appropriate for setting up relief sites.

Synethetic Aperture Radar (SAR) polarimetry is an imaging technology that is able to rapidly detect disaster zones.

This aerial image shows some of the flooding and destruction caused by Hurricane Katrina. Images like this help workers navigate through the altered landscape.

With other satellite images, views of the affected landscape can be blocked by clouds, darkness, smoke, or dust. By using radar, SAR mapping is not affected by these things, thus making the images readily available to relief workers.

Mapping areas affected by natural disasters with satellite and aerial images makes these areas accessible by relief workers. They are better able to prepare for the changes in local geography, destruction of buildings, and other physical challenges in the disaster zone. Continued improvements in mapping technologies and increased accessibility are important for continued improvement of disaster relief programs.

WRITING in Earth Science

Mapping Applications Research a recent natural disaster by visiting glencoe.com. Write a news article that describes the disaster based on the images of the disaster you find. Include several images in your news article.

GEOLAB

MAPPING: USE A TOPOGRAPHIC MAP

Background: **Topographic maps show two-dimensional representations of Earth's surface. With these maps, you can determine the slope of a hill, what direction streams flow, and where mines and other features are located. In this lab, you will use the topographic map on the following page to determine elevation for several routes and to create a profile showing elevation.**

Question: *How can you use a topographic map to interpret information about an area?*

Materials

ruler
string
piece of paper

Procedure

1. Read and complete the lab safety form.
2. Take a piece of paper and lay it on the map so that it intersects Point A and Point B.
3. On this piece of paper, draw a small line at each place where a contour line intersects the line from Point A to Point B. Also note the elevation at each hash mark and any rivers crossed.
4. Copy the table shown on this page into your science journal.
5. Now take your paper where you marked your lines and place it along the base of the table.
6. Mark a corresponding dot on the table for each elevation.
7. Connect the dots to create a topographic profile.
8. Use the map to answer the following questions. Be sure to check the map's scale.
9. Use the string to measure distances between two points that are not in a straight line. Lay the string along curves, and then measure the distance by laying the string along the ruler. Remember that elevations on United States Geological Survey (USGS) maps are given in feet.

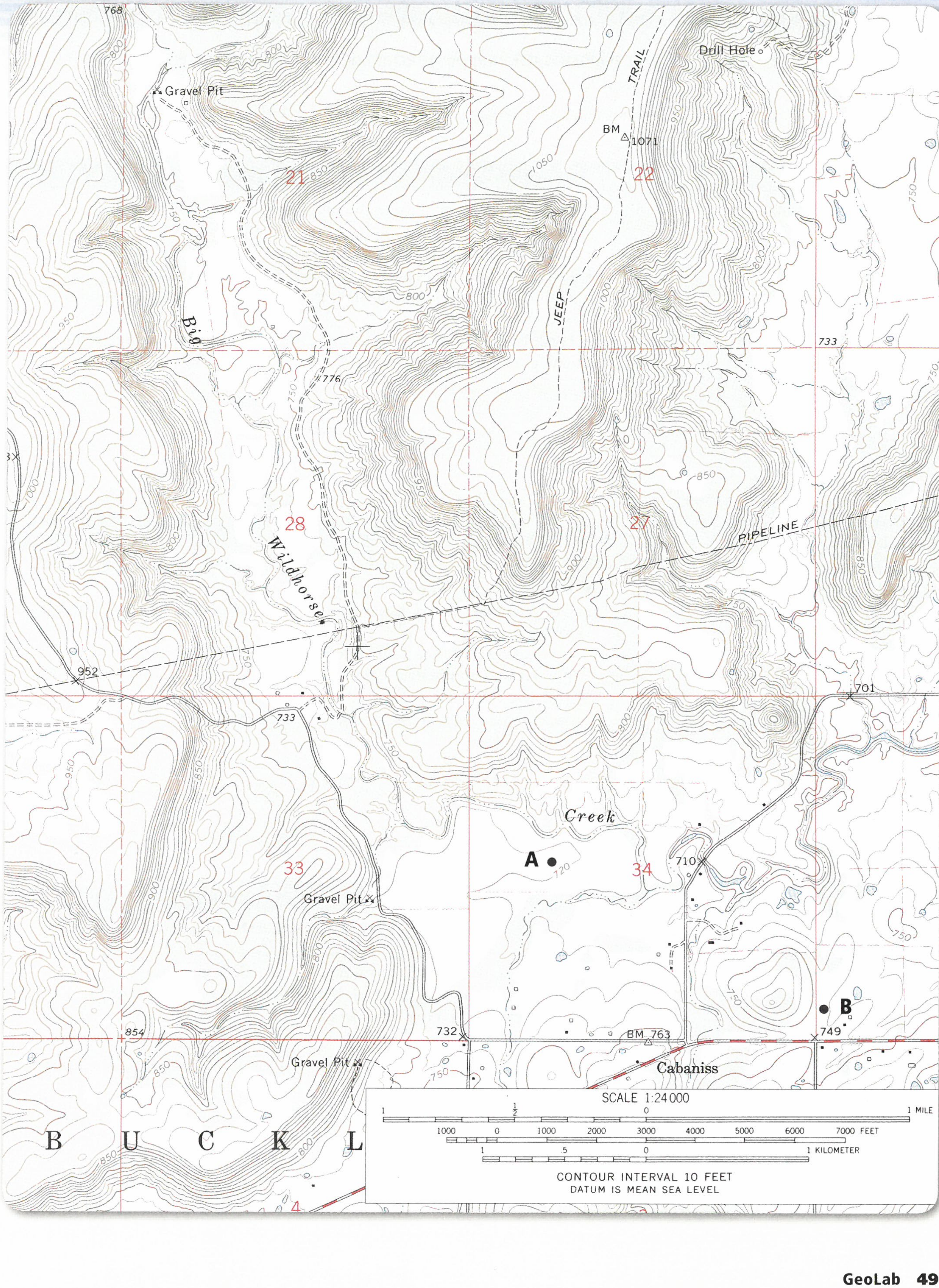
Analyze and Conclude

1. **Determine** What is the contour interval?
2. **Identify** what type of map scale the map utilizes.
3. **Calculate** the stream gradient of Big Wildhorse Creek from the Gravel Pit in Section 21 to where the creek crosses the road in Section 34.
4. **Calculate** What is the highest elevation of the jeep trail? If you followed the jeep trail from the highest point to where it intersects an unimproved road, what would be your change in elevation?
5. **Apply** If you started at the bench mark (BM) on the jeep trail and hiked along the trail and the road to the Gravel Pit in section 21, how far would you hike?
6. **Analyze** What is the straight line distance between the two points in Question 4? What is the change in elevation?
7. **Predict** Does Big Wildhorse Creek flow throughout the year? Explain your answer.
8. **Calculate** What is the shortest distance along roads from the Gravel Pit in Section 21 to the secondary highway?

	820
	810
	800
	790
	780
	770
	760
	750
	740
	730
	720
	710
	700

INQUIRY EXTENSION

Make a Map Using what you have learned in this lab, create a topographic map of your hometown. For more information on topographic maps, visit glencoe.com.


Gravel Pit
Drill Hole
JEEP TRAIL
BM 1071
21
22
Big Wildhorse Creek
28
27
PIPELINE
952
733
701
776
A
33
34
710
Gravel Pit
854
732
BM 763
749
B
Cabaniss
Gravel Pit
B U C K L
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

CHAPTER 2

Study Guide

STUDY TO GO — Download quizzes, key terms, and flash cards from glencoe.com.

BIG Idea Earth scientists use mapping technologies to investigate and describe the world.

Vocabulary	Key Concepts
Section 2.1 Latitude and Longitude	
• cartography (p. 30) • equator (p. 30) • International Date Line (p. 33) • latitude (p. 30) • longitude (p. 31) • prime meridian (p. 31)	**MAIN Idea** Lines of latitude and longitude are used to locate places on Earth. • Latitude lines run parallel to the equator. • Longitude lines run east and west of the prime meridian. • Both latitude and longitude lines are necessary to locate exact places on Earth. • Earth is divided into 24 time zones, each 15° wide, that help regulate daylight hours across the world.
Section 2.2 Types of Maps	
• conic projection (p. 35) • contour interval (p. 36) • contour line (p. 36) • geologic map (p. 38) • gnomonic projection (p. 35) • map legend (p. 39) • map scale (p. 39) • Mercator projection (p. 34) • topographic map (p. 36)	**MAIN Idea** Maps are flat projections that come in many different forms. • Different types of projections are used for different purposes. • Geologic maps help Earth scientists study patterns in subsurface geologic formations. • Maps often contain a map legend that allows the user to determine what the symbols on the map signify. • The map scale allows the user to determine the ratio between distances on a map and actual distances on the surface of Earth.
Section 2.3 Remote Sensing	
• Geographic Information System (p. 44) • Global Positioning System (p. 44) • Landsat satellite (p. 41) • remote sensing (p. 41) • sonar (p. 43) • *TOPEX/Poseidon* satellite (p. 42)	**MAIN Idea** New technologies have changed the appearance and use of maps. • Remote sensing is an important part of modern cartography. • Satellites are used to gather data about features of Earth's surface. • Sonar is also used to gather data about features of Earth's surface. • GPS is a navigational tool that is now used in many everyday items.