Lab Homework Assignment 1

Topographic Maps

Due Friday January 30, 2009
Group Project


Study the map shown in Figure 9.20, pp. 188.

a) The contour lines on this map are labeled in meters. What is the contour interval of this map?

b) What is the total relief of the land represented in this map?

c) How could you find the areas of this map that have a gradient of 20 meters per kilometer or greater?

d) Imagine that you need to drive a truck from point A to point B in this map, and that your truck cannot travel up any slopes having a gradient over 20 meters per kilometer (gradient of 2%). Trace the route that you would drive to get from point A to point B.

Exercise 2

Consider the SW corner of the 7 ½-minute Golden quadrangle distributed during the lab. The horizontal scale of the map is 1:24,000 (1 in. for 2,000 ft).

a) Construct the topographic cross-section from A to A' to A" by the method described during the lab. The crooked path AA'A" can be represented as a straight line on your cross-section.

b) A water tunnel is to be excavated along the AA'A" alignment. The tunnel intersects the ground (SW portal) at point P (Elev. 5850 ft). Starting from P, the tunnel is excavated with an upward gradient of 1% from P to A' and an upward gradient of 1.5% from A' to A". Draw the trace of the tunnel on your cross-section and note where the tunnel intersects the ground on the NE side of North Table Mountain? Give the location and elevation of that intersection.

c) Using a different graph, show the variation of the height, $h$, of overburden above the tunnel versus the tunnel length. The rock has a unit weight, $\gamma$, of 25 kN/m$^3$. Knowing that $\sigma = \gamma h$ can be taken as a measure of the rock pressure acting on the lining of the tunnel, what is the maximum value of $\sigma$ along the tunnel length?