

## Structural Map Exercise 2

Three-point problems in areas of topographic relief.  
The Stony Brook-Millstone Research Well Field, Mercer County, NJ

In the Heron Glen Golf Course 3-point problem, we assumed that depths to a stratigraphic marker horizon were referenced to the same elevation. In actuality, there is only small differences in the elevation of the three well heads, so that the assumption did not effect the outcome. However, in areas of noticeable topographic relief, depth reference to stratigraphic elevations must be made to a common datum, such as sea level, in order to make calculations that take spatial variations in surface elevation (or topographic variations) into account.

Source: Maps and figures adapted from Rider/PDFs/NJGS\_Bulletin\_77\_Appendixes\_1-4.pdf

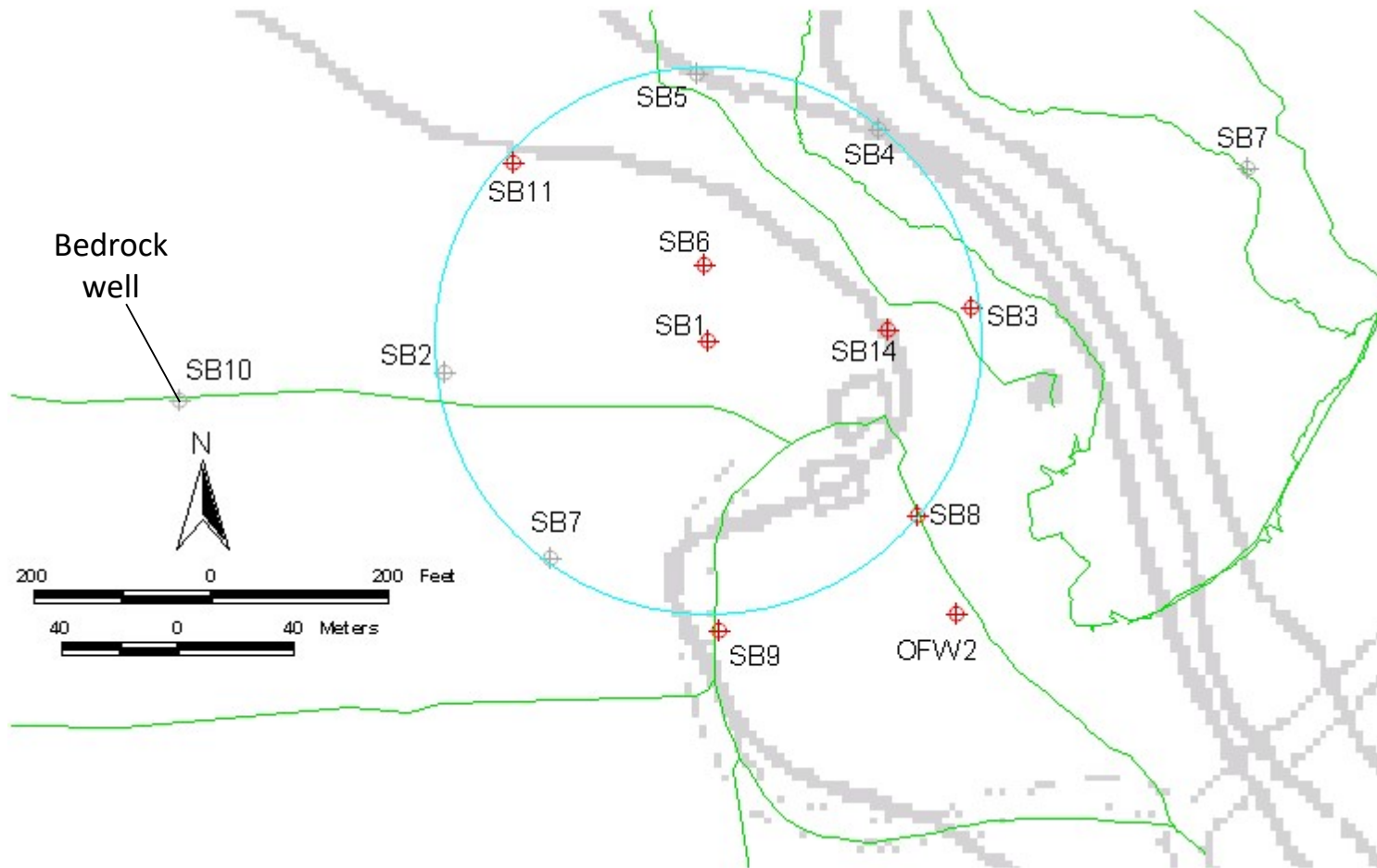
## **Stony Brook-Millstone Research Well Field 3-point problem**

The NJGS conducted a hydrogeological framework study of the the Brunswick aquifer at the hydrogeological research site (well field) located in the nature preserve at the Stony Brook - Millstone Watershed Association, Hopewell Twp., Mercer County, NJ. A circular array of wells were drilled in 1966 as test wells for a field project designed to demonstrate the uneven (anisotropic) groundwater flow directions in fractured shale. As part of the NJGS study, borehole images were collected for some of the wells during 2001-2008. The aquifer is red and gray mudstone and dark gray shale of the Passaic Formation.

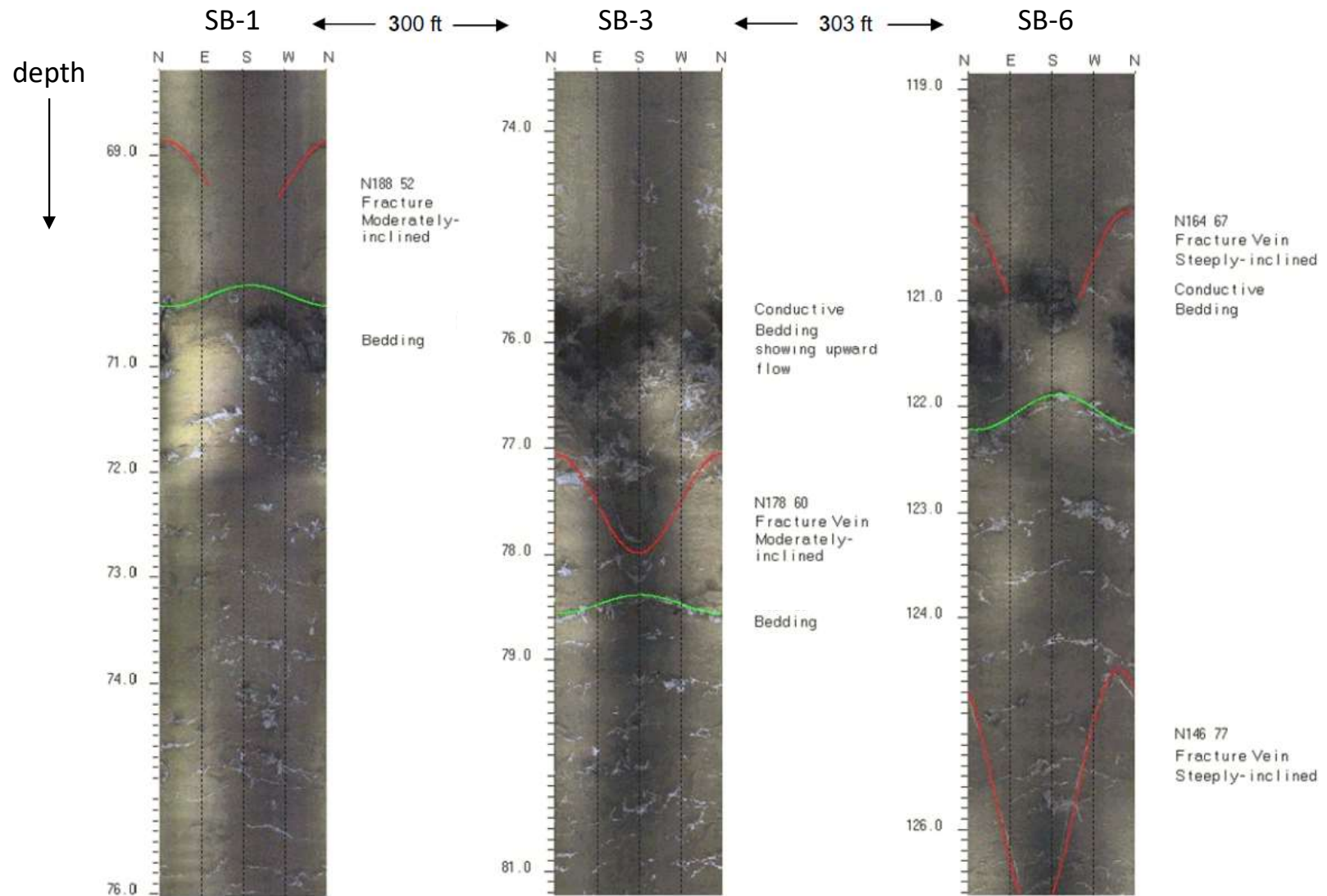
Complete the problem(s) on the following pages and hand them in at the start of next lab.

Grading of the results will depend on the accuracy of your results, and the manner in which you present them.

# Stony Brook-Millstone Research Well Field



Bedrock monitoring wells were drilled in a circular arrangement about 300' around a central pumping well (SB-1). The level of water within the monitoring wells varies during a pump test as a result of groundwater flowing unevenly through the rock to the pumping well. Over time, the water levels in wells aligned along bed strike drop faster than those aligned up- or down-dip. *The NJGS collected borehole images in the wells with red symbols.* The green lines are GPS tracks on foot trails.



**FIGURE 3M7.** Stratigraphic correlation of wells at the Stony Brook-Millstone Watershed Association well field based on OPTV records showing a major water-bearing zone in a gypsum-soil horizon and other geologic structures. Depth values are in feet below land surface.

## Well and Marker Bed Elevations (MSL-ft)

Well ID	Ground Elevation	Marker bed depth	Marker bed elevation
SB-1	167	71	$167 - 71 = 96$
SB-3	155	76	$155 - 76 = 79$
SB-6	168	121	$168 - 121 = 53$

Using the Heron Glen example and method, determine the strike and dip of the bedrock strata from the elevation values for the marker bed.

Use the 3-point problem to solve for bedding strike and dip.

Put a strike and dip symbol on the map in the correct orientation with a dip label. Show all of your work and calculations in the margins. Attach (staple) an extra page if you prefer. There is bonus work on the last page.

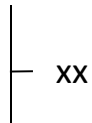
HINT: Use your engineer rule and the map scale to determine distance increments and distances between two wells and follow the procedure for the Heron Glen example.

Name:

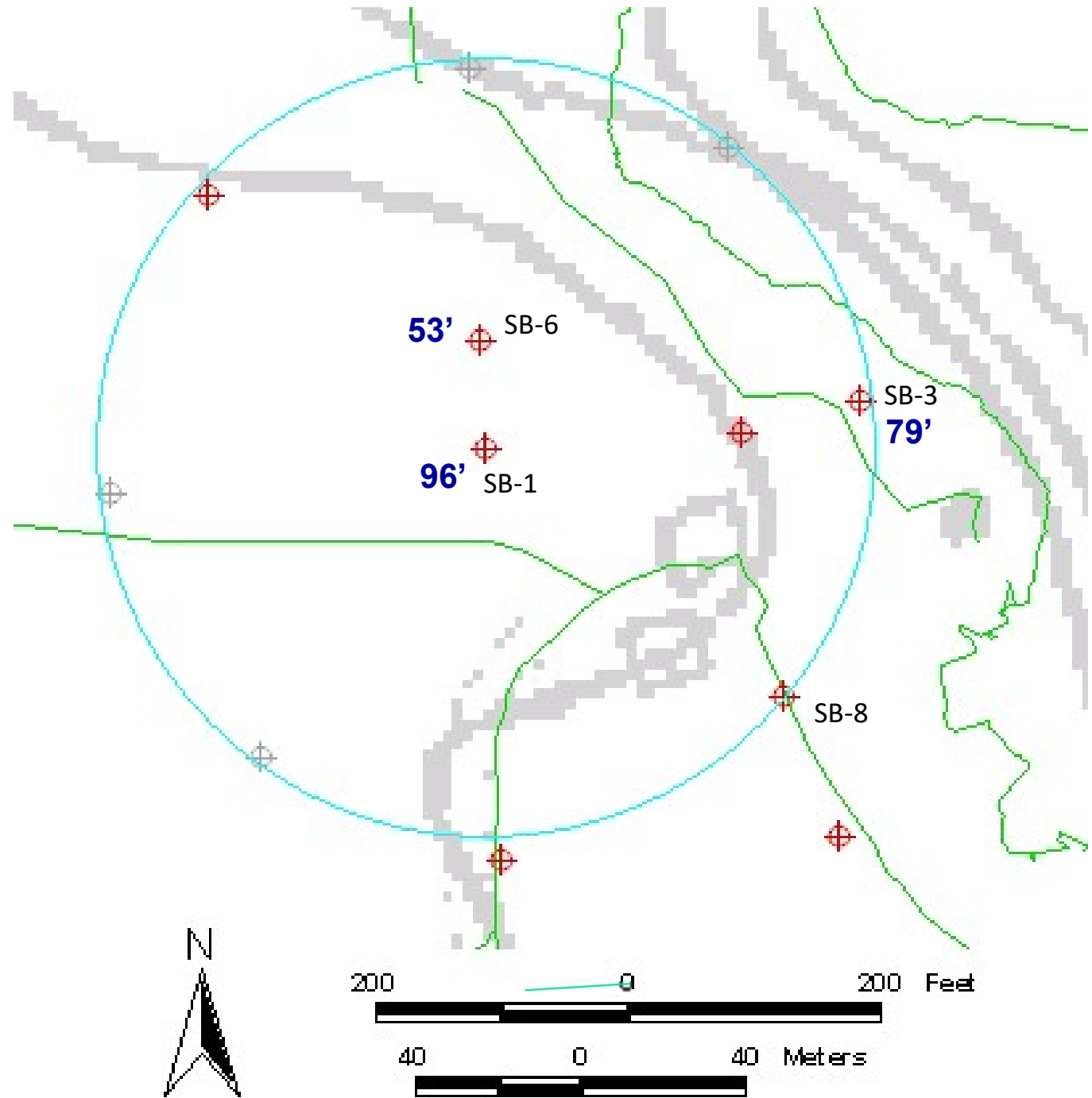
Date:

Use the 3-point problem to solve for bedding strike and dip. **Show your work on this sheet.** Use a No. 2 pencil.

Place and rotate the strike and dip symbol below on the map near SB-1 and SB-6 in the correct orientation with the correct dip value. Use this grouped symbol below:

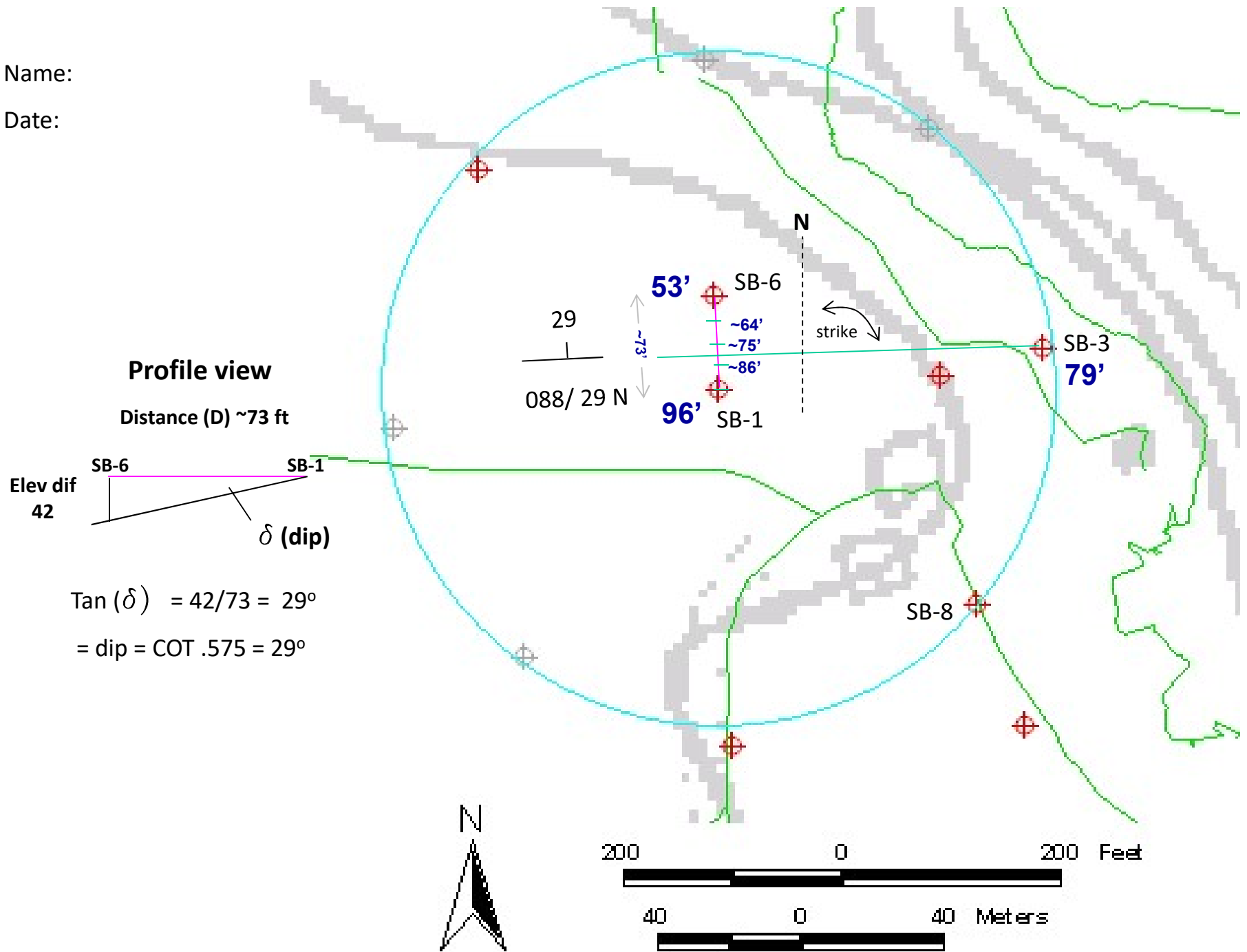


Print out the results and bring it to LAB 3.



Name:

Date:



Name:

Date:

## Bonus Questions

**You must answer the first correctly and attempt the second in order to get credit.**

- 1) What is the apparent dip of bedding along a line connecting well SB-1 and SB-8?
  
- 2) Knowing what you know about the strike and dip of bedding, and taking into consideration that groundwater levels in wells aligned along bed strike with the pumping well drop the fastest, speculate on why wells SB-6 and SB-10 were drilled?



Name:

Date:

