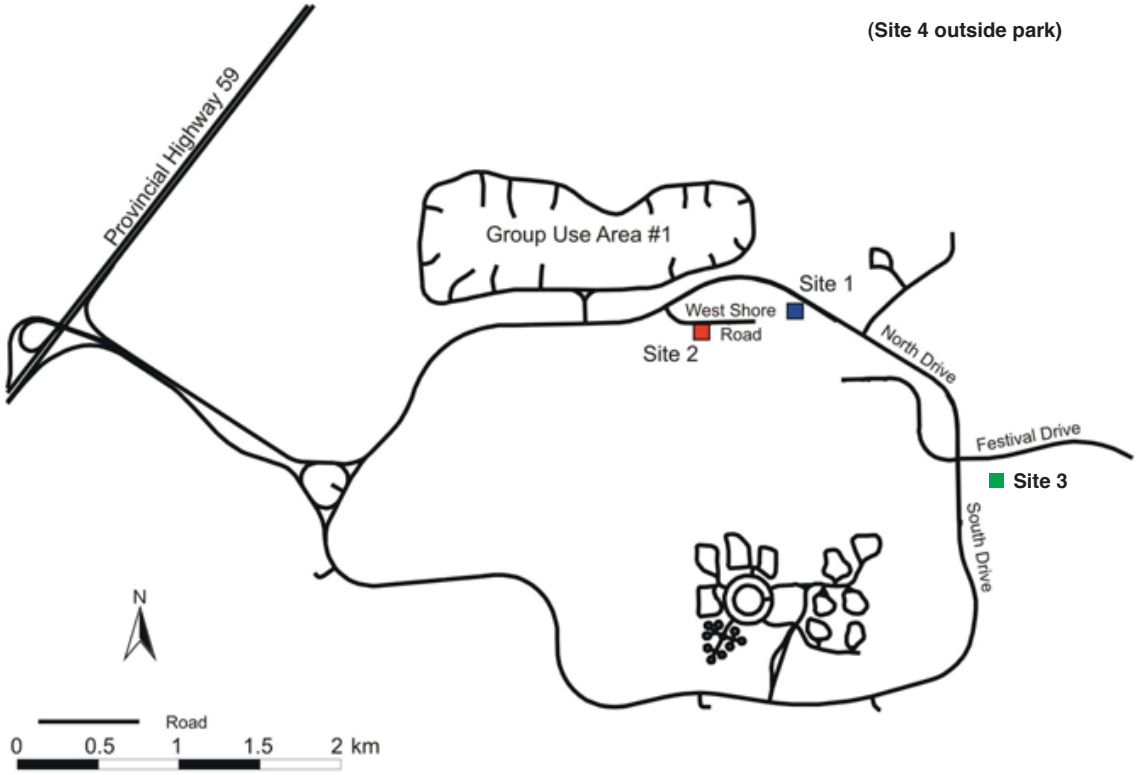
University of Manitoba
2015 Geophysics Field School

Birds Hill Project: Day 2 or 3 (April 29 or 30)
Gravity/elevation survey



Schedule: Group 1, April 29th, afternoon; group 2, April 30th, morning; group 3, April 30th, afternoon. Allow about 2.5 hours for data collection. The site for groups 1 and 2 will be the slope leading downhill from the overlook (between Sites 1 and 2, above); for group 3, the site will be Site 3, along a line chosen to be as steeply sloping as possible.

Goals: You will carry out an elevation and gravity survey, in order to examine the relationship between elevation and gravity this will ultimately allow you to calculate the approximate density of near-surface material at Birds Hill.

Table 1. Equipment required for Birds Hill gravity survey		
No.	Item	Specific components
1	Worden gravimeter	Gravimeter in carrying case with clip
		Manual
		Spare battery
		Spare bulb
		Two measurement plates and one set of legs
		Ruler or tape for measuring instrument height
2	Surveying	1 x 100 m and 2 x 50 m tapes
		1 Brunton compass
		2 wooden stakes and 20 pin flags
		GPS unit
		Tripod, pole, and level (in yellow case)

A. PRE-SURVEY INSTRUCTIONS

1. Read these instructions in full prior to the survey.
2. Briefly familiarize yourself with the operation of the gravimeter and with the procedures for elevation surveying (see separate sheet).
3. Synchronize watches for consistent drift correction
4. Pack all equipment into one vehicle. Ensure that the gravimeter is kept vertical and stable during travel (e.g. held upright between two seats).
5. Be sure to *only* transport the gravimeter and level in their respective cases. Be sure the clip on the gravimeter case is in place; never transport the level attached to the tripod.

B. FIELD SURVEY INSTRUCTIONS

Gravity survey:

1. Establish a base station for the survey – it must be in a spot that can be occupied *exactly* at the beginning and end of the survey. Ideally, the base station should be sheltered from wind. *The accuracy of the base station measurement limits the accuracy of the entire survey.*

2. Select a starting point for the line (if convenient, it can even be the base station itself), and use the compass to run a line due south (or at another azimuth that is more steeply down-slope). Take first base-station measurement (and time it!) – at least three readings should be taken at the base station. Take GPS coordinates of the base station.

3. Select a reasonable measurement spacing based on the slope of the hill you want your measurements to sample a range of elevations. At each point, take gravity measurements (at least two readings), describe and measure distances to any interesting features, and measure the instrument height above the ground (with a ruler or tape measure).

4. At the end, *return to the base station and measure again.* If this step is missed, you will be unable to correct for drift. If the survey takes more than 1.5 hours or so, it would be advisable to take a base station measurement in the middle as well.

Elevation survey

1. You will be measuring the elevation of every point where gravity measurements are taken the goal is to measure the elevation relative to the base station.

2. Remember that sighting from the tripod to the pole measures the difference between the (unknown) height of the level and the height of the measurement point. Thus, *two points* must be surveyed from a *fixed* tripod location: a "back shot" and a "forward shot". Every point on the line, except for the first and last, will be sighted twice: once as a forward shot and once as a back shot.

3. Take GPS readings at each measurement point.

C. POST-SURVEY INSTRUCTIONS

1. Pack the vehicle carefully for the return trip, paying particular attention to the (fragile!) gravimeter.

2. At the university, return all equipment to room 315 or 316 and report any problems (e.g. new batteries required).