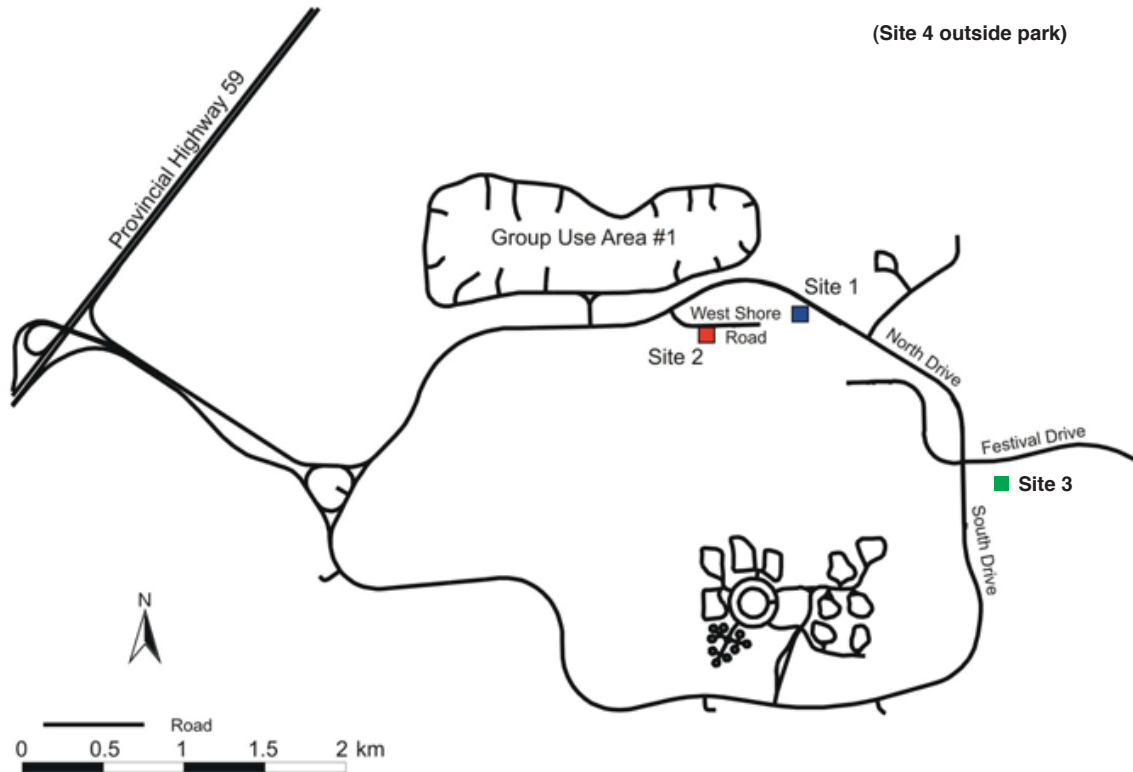


University of Manitoba
2015 Geophysics Field School

Birds Hill Project: Day 1 or 2 (April 28 or 29)
Ground-Penetrating Radar & TEM Survey



Schedule: Group 3 (Site 3), 28th, morning; group 1 (Site 1), 28th, afternoon; group 2 (Site 2), 29th, morning. Allow about 2.5 hours for data collection.

Goals: Birds Hill is an esker complex, with a sandy composition very different from the rest of the Red River valley. You will use GPR to examine its shallow layering in detail. You will also perform a sounding using the time-domain electromagnetic (TEM) system, which is an electromagnetic system capable of measuring conductive layering to significantly greater depth than our other instruments.

A. FIELD INSTRUCTIONS

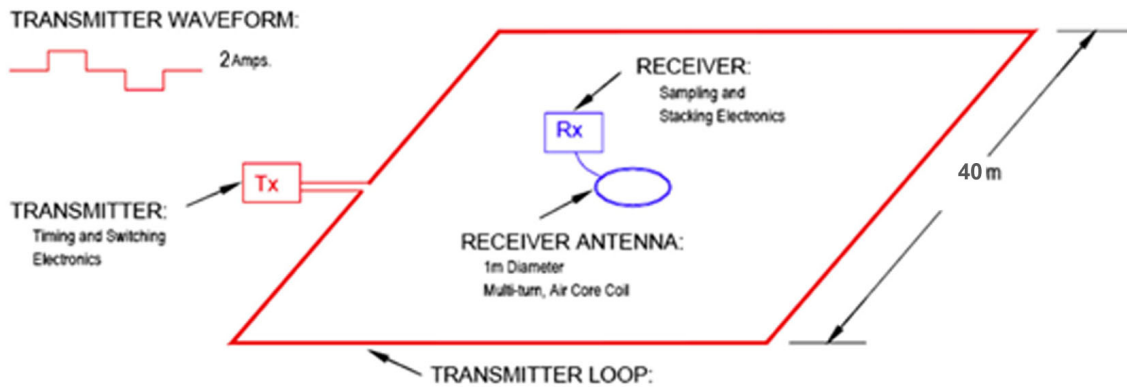
The aim of our TEM measurements is to perform a sounding using a 30 m by 30 m transmitter loop and receiver positions for a central loop sounding and offset soundings of 40 m and, if time permits, a 60 m offset. For the GPR

measurements you will collect a lower resolution GPR profile using the 200 MHz antenna (200 to 400 m long) and a higher resolution GPR profile using the 400 MHz antenna (50 to 100 m long).

| Table 1. Equipment required for Birds Hill TEM & GPR surveys | | |
|--|------------|---|
| No. | Item | Specific components |
| 1 | GPR system | SIR System 3000 and peripherals: |
| | | Digital control unit |
| | | Console sunshade |
| | | Batteries (10.8 V Li-ion) |
| | | Antenna control cable |
| | | 400 MHz antenna & cart |
| | | 200 MHz antenna & wheel |
| | | Flash card or USB stick to save recorded data |
| | | Manuals (Operation & antenna) |
| | | 2 |
| Transmitter | | |
| Transmitter cable (connects transmitter to loop) | | |
| Transmitter loop (wire) | | |
| Receiver coil and three legs | | |
| Receiver cable (connects receiver to console) | | |
| Reference cable (for synchronization) | | |
| PROTEM Field Manual | | |
| 3 | Surveying | 1 x 100 m tape and 4 x 50 m tapes |
| | | 8 wooden stakes |
| | | GPS |

TEM SURVEY

1. Lay out the equipment for a TM sounding using a 30 m x 30 m transmitter loop and a central receiver loop (see sketch below). Record the configuration and the exact location (using GPS and compass methods).
2. The pre-survey set-up required for TEM measurements will be explained to you. You should record the results of all of the tests.



3. Make the TEM central loop recordings by taking three separate readings at each site in UH mode and if it is useful in VH mode. Each recording is stored as a separate record in the PROTEM memory. During measurements you should record what each record corresponds to, and also write down several sets of actual responses (in both mV and apparent resistivity values). Use a format similar to shown in Table 1.

4. Reconfigure the system for a 40 m offset sounding. Check the signal levels and make the soundings. If time permits make a sounding using a 60 m offset.

GPR SURVEY

5. The GPR recordings will be made along the main north-south profile at each site (for BH₁ centred on 651350 E and for BH₂ centred on 651920E). Record the start and end points and the position of all cultural features on the profile. Conduct the low resolution survey.

6. Choose an interesting part of the profile and conduct the high resolution survey.

POST-SURVEY INSTRUCTIONS

1. At the university return the equipment to Room 315 or 316 and inform the instructors of any problems with the equipment or of a need to add another set of batteries.

2. Put the TEM transmitter, receiver, and console batteries on charge. Put the GPR batteries on charge.