Two Monash students teamed up with archaeologists last year to use geophysical sensing technology in the search for ‘lost sites’ important to 19th century Melbourne. The students were part of the Science Talented Students Program (available within BSc advanced degrees and double degrees), which provides opportunities to place students in industry for a project offering challenge beyond the standard curriculum. Alpha Archaeology provided two positions and projects, Professor Michael Asten in the School of Geosciences provided the specialist supervision and Fugro Instruments provided the equipment rent free.

1803 Lt Collins Settlement – Jesse Savage

One project involved the search for Melbourne’s oldest non-indigenous gravesites, believed to be on the coastal hill-slopes east of Sorrento (Port Phillip Bay) dating from the earliest white settlement of 1803 led by Lt Collins. The settlement was brief; the ground is hugely sought after today for summer holiday retreats, but two centuries ago the immediate requirements of producing food suffered from the poor sandy soil. Less than two years later the settlement was moved to Tasmania leaving behind 19 graves. The site has previously been surveyed by Professor Jim Cull using ground-probing radar, but the method suffered from dual limitations of rough vegetated terrain making a GPR grid difficult, and conductive soils associated with salt sea-spray adjacent to the coast reducing radar penetration. Student Jesse Savage was keen to try electrical resistivity profiling (electrical resistivity tomography) and set up a grid to follow up on a few weak features identified in GPR images.

Eight resistivity profiles with line spacing 1 m were conducted with 25 m strings of electrodes at 0.5 m spacing. The conceptual target is a conductive feature of order 0.5 to 1 m wide, 2 m long and 1 or 2 m deep (we don’t know whether the recorded graves of convicts and freemen were all individual or a mix of individual and common graves). A grave is expected to be indicated by a resistivity low due to disturbance of sediments, but any signature is likely to be subtle since such a settlement would probably not have used coffins (certainly not metal lined coffins), and decomposition of a corpse is likely to be complete over the span of two centuries.

Figure 1 shows a 2-D resistivity inversion on Line 4. There are two or three prominent resistivity lows of target size that extend onto adjacent lines and are considered to be targets for excavation as possible graves. A resistivity depth slice at depth 0.9 m (Figure 2) shows the spatial regularity of these features and adds to their interest as targets. Jodie Mitchell, Director of Alpha Archaeology, plans excavations in February 2013 and said, ‘If the graves are found it will be one of the most important archaeological finds in recent years in Victoria.’

1839 Viewbank Homestead – Lachlan Grose

Student Lachlan Grose chose a project to survey the surrounds of the heritage site of the former Viewbank Homestead, overlooking the confluence of the Yarra and Plenty rivers in Melbourne’s north-eastern suburbs. The homestead, constructed in 1839, was a bluestone manor (now demolished) and home of a 19th century character by the name of Doctor Martin. The object of the survey was to locate the rubbish dump for the home, such sites being potentially rich sources of artefacts from days of yore. Lachlan chose a Geonics EM31 ground conductivity meter, which is effective in finding excavated filled areas where digging plus refill with introduction of organic waste is expected to produce high conductivity values. The EM31 instrument also measures the frequency-domain in-phase response, which provides a measure of variations in magnetic susceptibility, thus detecting zones of repeated burning such as an open incinerator, and metallic rubbish – such as tin cans, old machinery or blacksmith’s discards. After surveying an area 50 by 30 m containing the site of a previous archaeological dig, Lachlan found surprisingly little variation in conductivity
response, but imaged a clear magnetic signal in the vicinity of the previous excavation that was centred some 6 m south-east of the dig. Jodie Mitchell is now organising a second community archaeological excavation in conjunction with the Archaeological and Anthropological Society of Victoria.

Lessons learnt

How much have we learnt so far? It’s a great success for the pilot program being run by Monash; Jesse describes the exercise as ‘challenging, but gave a good insight into working as a geophysicist and learning the practical side of such field work’. Lachlan adds, ‘The project was an excellent way to apply the skills which I was shown in the lab class to a real world application and it highlighted that geophysics is not looking for a specific detail but looking for a significant difference’.

None of this would be possible without industry support for rent-free use of appropriate instrumentation. But as John Peacock of Fugro Instruments remarks, ‘I believe it is in the industry’s best interest to expose students to the most modern instrumentation possible’.

Gerry Rayner, co-leader of Monash Science Student Industry Placement Program, describes the projects as excellent examples of the industry placements we hoped our talented students would engage in.

‘The projects provide hands-on opportunities for our students to apply their learning, showcase their skills and capabilities, and provide a capstone experience in their final undergraduate years. The placement program has also built bridges between the University and a range of industry partners, which will form the basis for ongoing partnerships in teaching and research.’

Now the students have opportunity to learn another great geophysical experience; waiting for a hole in the ground to prove their model right.