



**ASEG-PESA 2015**

**Geophysics and Geology together for Discovery**

24th International Geophysical Conference and Exhibition  
15–18 February 2015 Perth, Western Australia

## Developing Urban and Mining Geophysical Instruments and Methods: Pushing the Boundaries

### Near surface keynote paper

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#### **SUMMARY**

It is becoming increasingly evident that our understanding of the geological conditions in the shallow subsurface is limited. This is especially apparent in large cities and areas covered by lakes where underground infrastructure such as tunnels, subways and train stations have to be constantly developed or expanded to facilitate the daily life and transportation. The degree to which we can understand geological conditions such as these also has great economical and environmental effects for mine planning. What makes these environments similar and challenging targets for geophysical investigations are the various sources of noise and restriction (both in time and space), which require the equipment to be versatile and to produce minimal disruption as well as fast to set up and pack. Direct observations of the subsurface are cumbersome, expensive and sometimes impossible. However, if properly designed and implemented, geophysical methods are capable of imaging detailed subsurface structures and can successfully be used to provide crucial information for site characterizations, infrastructure planning, brown- and near-field exploration and mine planning. To illustrate the potential of geophysical methods in these environments, I will show prototype seismic and EM instrumentation and their applications that are especially geared for noisy environments and areas where high-resolution images of the subsurface are needed. The presentation will be supported by several examples from these two areas.