



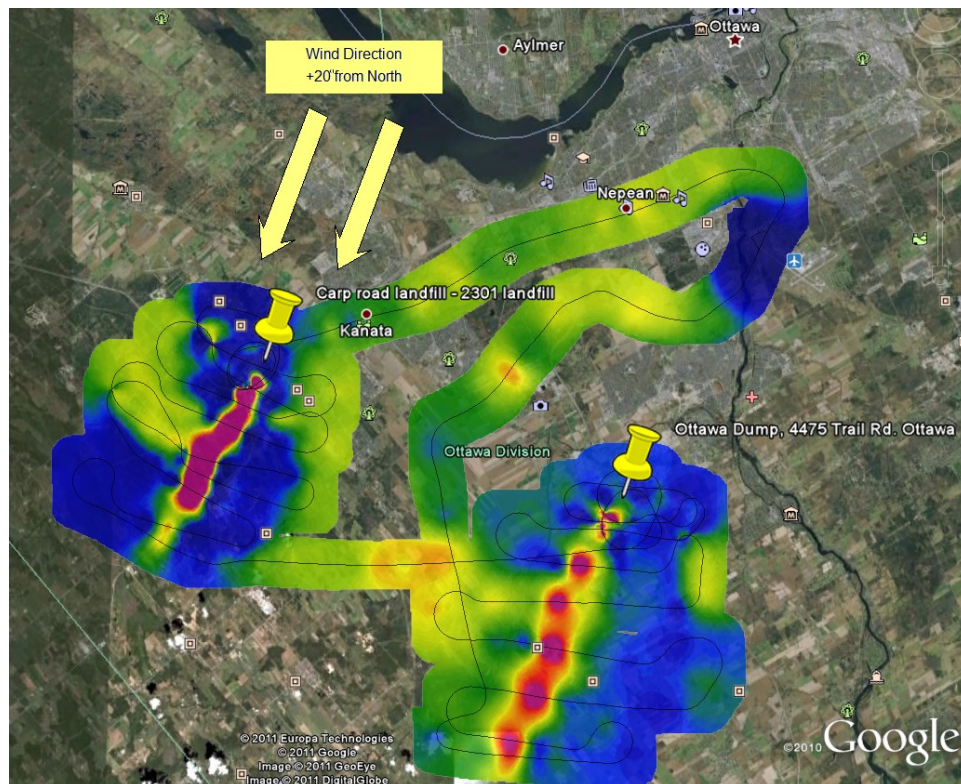
AIRBORNE METHANE SENSING

Sander Geophysics Limited (SGL) offers direct detection of hydrocarbon gases that naturally seep into the air. These gases can be related to active hydrocarbon systems, industrial activity, biogenic processes and landfills. Methane surveys conducted by SGL have shown that methane concentrations related to hydrocarbon systems are well above background levels, even in jungle environments. SGL uses ultra sensitive high resolution sensors mounted in a survey aircraft to record methane gas concentrations in the air. These airborne data can then be used to map ground level gas flux rates, matching measured data to known methane sources and potential hydrocarbon seeps.

SGL conducts methane surveys for petroleum exploration and environmental mapping. Intake air is collected by an inlet port mounted externally on the survey aircraft and is pumped through a particle separator filter to an off-axis integrated cavity output spectroscopy (OA-ICOS) analyzer recording at up to 20 Hz. Other geophysical information, such as gravity or magnetic data, can be collected simultaneously using SGL's fixed-wing and helicopter platforms, thereby increasing the survey benefits.

The position recovery uses NovAtel multi-frequency GNS (GPS) receivers in the aircraft and on the ground, processed using SGL's proprietary GPSoft navigation processing system, resulting in a horizontal position accuracy of better than 0.2 m and a vertical position accuracy of better than 0.3 m.

Proprietary processing is used to calculate the equivalent ground flux rate from the measured airborne data. Working with Shell Global Solution B.V., SGL has successfully measured methane gas flux over varied terrain including arid regions and jungle.



Measured hydrocarbon concentration above known methane sources

AIRBORNE INSTRUMENTS

SGMethane Detection System	Resolution (ppb)	Calibrated to		Range
	1	<0.03% of concentration		10 ppb to 25 ppm
Data Acquisition System	Sander Geophysics – SGDAS airborne computer Capable of recording unlimited number of channels at variable intervals, and digital scrolling chart display of the data. Data are recorded on a vibration tolerant removable drive. The system clock is a quartz time standard automatically synchronized to UTC by the GPS signal to an accuracy of 1 millisecond.			
Video Imaging System	Sander Geophysics – SGDIS digital video			
		Resolution (m)	Calibrated to	Range (m)
Laser Altimeter	Riegl LD90–31K–HiP	0.05	<1%	0 to 1,000 (3,300 ft)
Radar Altimeter	King KRA–10	0.05	5%	0 to 760 (2,500 ft)
Barometric Altimeter	Honeywell TJE	2.0	+/- 4 m	0 to 10,000 (30,000 ft)
AVAILABLE INSTRUMENTS FOR SIMULTANEOUS MULTIDISCIPLINARY SURVEYS				
MAGNETICS				
Sensor	Geometrics Strap-down, optically pumped, cesium split beam Sensitivity: 0.005 nT Sensor noise level: <0.02 nT Sampling rate: 10 Hz			
Compensator	Sander Geophysics – AIRComp real-time digital compensation Range: 20,000 to 200,000 nT Resolution: 0.001 nT Sampling rate: 160 Hz			
RADIOMETRICS				
Spectrometer	SGSpec or Radiation Solutions RS–500			
Detector Volume	16.8 to 50.4 litres of downward-looking crystals 4.2 to 12.6 litres of upward-looking crystals			
GRAVITY				
Gravimeter	Sander Geophysics – AIRGrav, Airborne Inertially Referenced Gravimeter			

v3.0