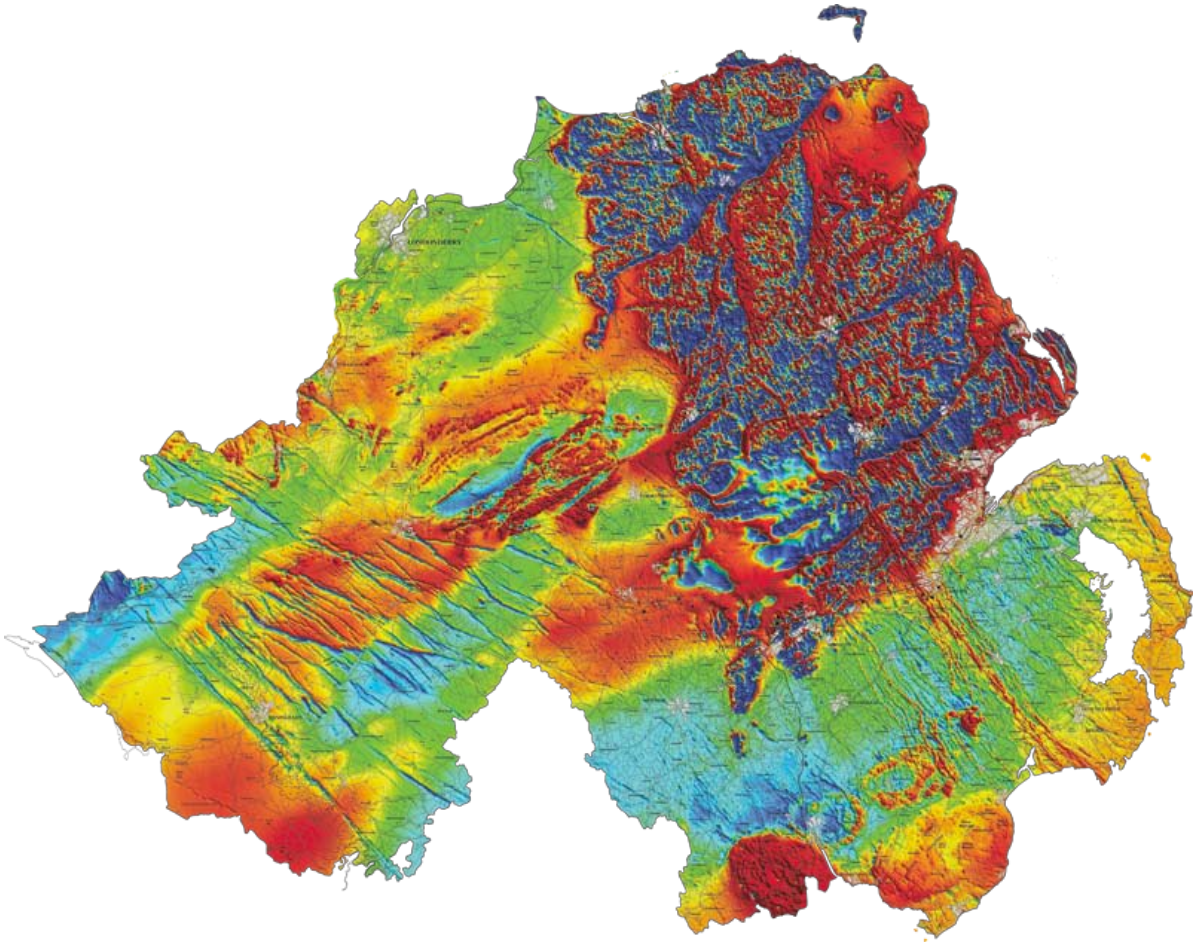
TELLUS

Licensing the Tellus Data

July 2007



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Contents

Licensing the Tellus Project Data 5
Geophysical Data (Digital) 7
Geochemical Data (Digital) 9
Digital Data Formats 11
Digital Data Charges 13
1:250,000 Series Maps 15

Appendix 1 - Geophysical Specifications 19
Appendix 2 - Geochemical Soil Analytes 21
Appendix 3 - Geochemical Sediment Analytes 22
Appendix 4 - Geochemical Water Analytes 23

Before applying, you are invited to visit GSNI to view the data available and discuss its applications with our specialists.

Licensing the Tellus Project Data

The Geological Survey of Northern Ireland (GSNI) will release geophysical and geochemical data from the Tellus Project on Monday 2nd July 2007.

The Tellus Project is the most concentrated geological mapping project ever undertaken in Northern Ireland. The project, managed by GSNI, has produced new geochemical and geophysical maps and digital data sets that will extend and deepen our knowledge of the geology, soils, surface water, natural resources and environment of Northern Ireland.

These results will interest everyone concerned with the strategic management of the environment and natural resources in Northern Ireland:

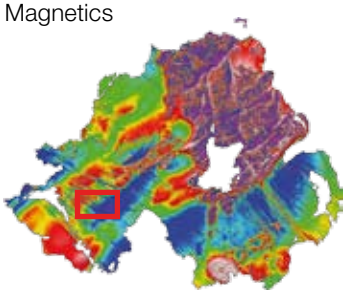
- Planners, regulators and policy makers
- Central and local government officers
- Earth and environmental scientists and managers
- Environmental health officers
- Agricultural industry
- Extractive and energy industries

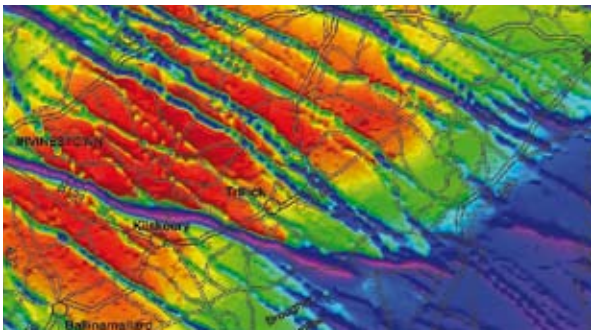
These data were collected over the whole land surface of Northern Ireland between 2004 and 2006. The data sets now available also include geochemical data from streams in western Northern Ireland collected between 1994 and 1996.

Data will be released under a simple licensing scheme. Annual licence fees, which are a small fraction of the cost of data acquisition and processing, will apply. Licensing fees may be waived for research organizations and universities presenting a proposal for research that serves the aims of the project.

Before applying, you are invited to visit GSNI to view the data available and discuss their application with our specialists.

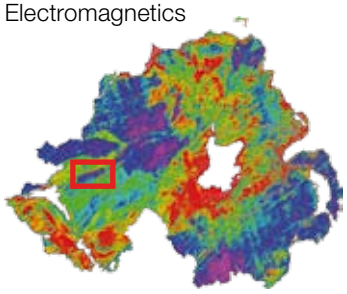
Magnetics

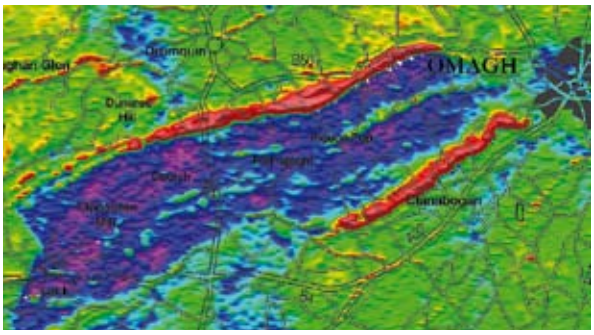




1:250,000 extract

Electromagnetics





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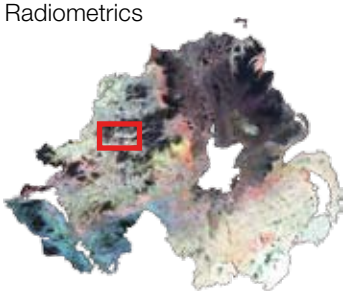
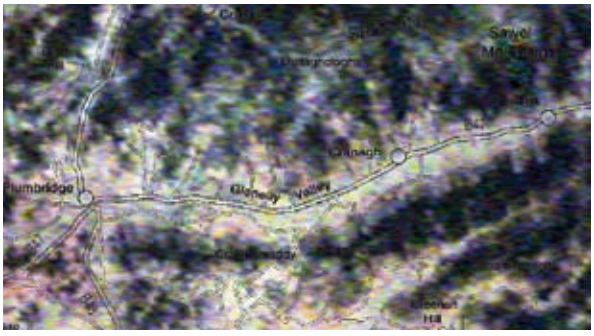
Radiometrics





1:250,000 extract

Geophysical Data (Digital)

Acquisition and Processing

Geophysical data were collected in 2005 and 2006 by the Joint Airborne-geoscience Capability (JAC), a joint venture between the Finnish Geological Survey (GTK) and the British Geological Survey (BGS). Magnetic, electromagnetic and terrestrial gamma-radiation (radiometric) data were recorded.

Data were acquired for 80,458 line km of survey. Flight lines were spaced 200 m apart in the direction 165-345 degrees. The survey was flown with a nominal ground clearance of 56 m in rural areas and 240 m in urban areas, with sample intervals of 7 m (magnetics), 17.5 m (electromagnetics) and 70 m (gamma radiation).

Full survey specifications are given in Appendix 1.

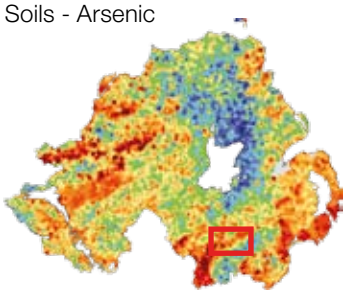
Corrected digital data are available in along-line or gridded (40x40 m) formats. Digital data of commonly used derived products are also available.

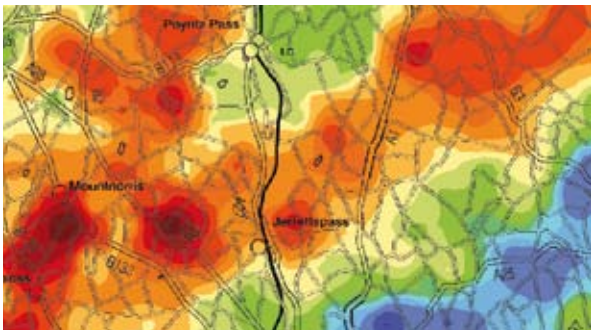
1. Total magnetic intensity
2. Gamma radiation (total count and potassium (K), equivalent uranium (eU), and equivalent thorium (eTh))
3. Electromagnetics (including in-phase, out-of phase, apparent conductivity and depth inversions for two frequencies)
4. Transformations (filters): various common magnetic field transformations; radiometric ratios or ternary grids

Information on data formats can be found on page 11; data licensing charges can be found on page 13.

These products are also available as 1:250,000 maps - see page 15.

Soils - Arsenic





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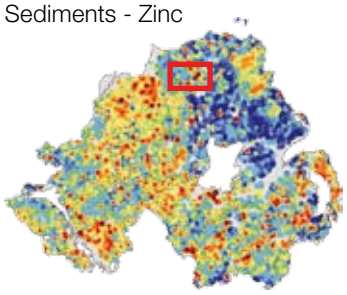
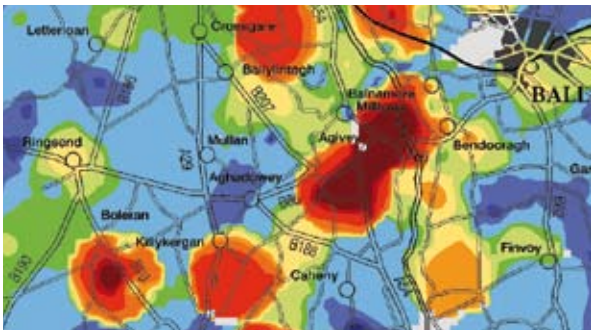
Sediments - Zinc





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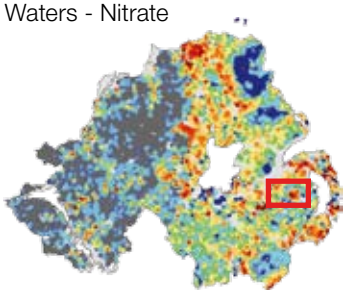
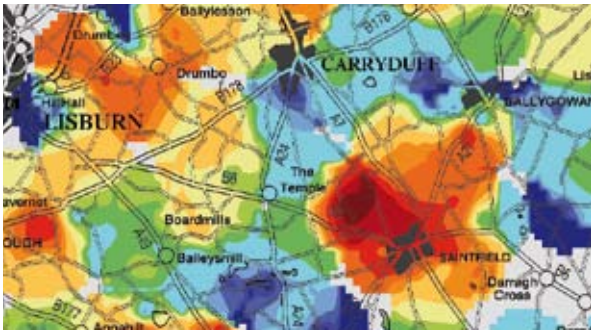
Waters - Nitrate





1:250,000 extract

Geochemical Data (Digital)

The Tellus project collected samples of soils, stream sediments and stream waters across Northern Ireland.

Rural soil survey

1. Samples collected at 5-20 cm depth, sampling density of 1 sample per 2 km^2:
   These samples were analysed for 52 inorganic elements and compounds by XRF. Soil pH and Loss-on-Ignition (LOI) were also measured. See Appendix 2.1 for a complete list of analytes.

2. Samples collected at 35-50 cm depth, sample density of 1 per 2 km^2.
   These samples were analysed by fire assay for Au, PGE (Pt, Pd) and for sulphate by ICP (aqua regia digest).

Stream surveys

The Tellus Project collected stream sediment and stream waters samples from 1st and 2nd order streams over eastern Northern Ireland at an average density of 1 sample per 2.15 km^2.

These samples were analysed for 58 elements and compounds as follows:

1. Sediments by XRF and fire-assay
2. Waters by ion chromatography and ICP

The data available include stream sediment (39 analytes) and waters (41 analytes) data from a previous (1994-1996) survey of western Northern Ireland.

See Appendix 3 for a list of analytes of the stream sediments and Appendix 4 for the stream waters.

These products are also available as 1:250,000 maps - see page 16.

Data are supplied in ASCII format for use in all major software packages. Geosoft Oasis montaj grids are available for the geophysical data.

Digital Data Formats

Geochemical Data
Data are supplied in the following format.
1. ASCII or .TXT file

Geophysical Data
Data are available in along-line data supplied in the following formats.
1. ASCII .XYZ
2. Geosoft Geodatabase .GDB

Grids can be supplied in Geosoft Oasis montaj format. Grids are produced using bi-directional gridding at 40 x 40 m cell size.

Standard magnetic data transformations and radiometric ratios can also be supplied in 40 x 40 m grid format using Gesoft Oasis montaj™ MAGMAP software. The range of magnetic filters can be seen on: http://www.geosoft.com/pinfo/oasismontaj/extensions/magmap.asp

GeoTIFF files of the 1:250,000 Geophysical Series maps are supplied at 300dpi. A list of these maps is available on page 15.

Projection
Where grids are supplied, the data are projected in Irish National Grid.

Licensing fees may be waived for research organizations and universities presenting a proposal for research that serves the aims of the project.

Digital Data Charges

Geophysical Data

Geophysical data are available in two formats:

1. The corrected original data along the flight lines. This format is charged per line-km.
2. Gridded onto a 40 x 40 m mesh. This format is charged per km^2. (At 200 m line spacing, 1 km^2 of gridded data is equivalent to 5 line-km of line data).

Both data sets include positional data (X,Y cordinates and altimeter data).

Dataset	Line data/km*	Grid data/km^2*
Total magnetic intensity (levelled, IGRF removed)	15p	75p
Radiometrics (total count and K, eU, eTh windows)	15p	75p
Electromagnetics (including IP, OP, and apparent conductivity and depth inversions for two frequencies)	15p	75p
Magnetic transformations (filters); radiometric ratios or ternary grids (40 x 40 m grid), each	na	15p

* Discounts apply to the above rates over 10,000 line-km (2,000 sq km):

10,000 - 20,000 (2,000-4,000 sq km)	10%
20,000 - 30,000 (4,000-6,000 sq km)	20%
30,000 - 40,000 (6,000-8,000 sq km)	30%
40,000 - 50,000 (8,000-10,000 sq km)	40%
>50,000 (>10,000 sq km)	50%

Charges are for the first user. Up to nine additional users may be licensed by the payment of one additional Annual Licence Fee. VAT is charged at standard rate if applicable.

Preparation and Delivery Charge

All data supply is subject to a preparation and delivery charge of £200 in the first year.

Administration Charge

An annual administration charge of £200 is applied to all data.

Geochemical Data

Data supplied; X, Y coordinates

Dataset	Rate/sample*
Soils, inorganic (5-20 cm depth, one sample per 2 km^2)	
XRF (Appendix 2.1.1)	100p
pH and LOI	25p
Soils, inorganic (35-50 cm depth, one sample per 2 km^2)	
Au, Pt and Pd by fire assay	25p
Sulphate by aqua regia	15p
Stream sediments (one sample per 2.15 km^2 average)	
XRF; Au, Pt and Pd by fire assay; and Boron	100p
Stream waters (one sample per 2.15 km^2 average)	
ICP-MS; anions; pH; electrical conductivity, alkalinity	100p

* Discounts apply to the above sample numbers over 1,000

1,000 - 2,000	10%
2,000 - 3,000	20%
3,000 - 4,000	30%
4,000 - 5,000	40%
>5,000	50%

Charges are for the first user. Up to nine additional users may be licensed by the payment of one additional Annual Licence Fee.

VAT is charged at standard rate if applicable.

Preparation and Delivery Charge

All data supply is subject to a preparation and delivery charge of £200 in the first year.

Administration Charge

An annual administration charge of £200 is applied to all data.

1:250,000 Series Paper Maps

A range of maps of the full data for Northern Ireland are available in paper format with an Ordnance Survey of Northern Ireland topographic underlay. These are available also in GeoTIFF format without the underlay. The prices are £40 and £200 respectively.

1:250,000 Series Geophysical Maps

Magnetic field images and derivatives
Total field magnetic anomaly, sun-shaded: inclination 35°, declination 345°
Total field magnetic anomaly, sun-shaded: inclination 35°, declination 75°
Reduced to pole, sun-shaded: inclination 35°, declination 345°
Residual of reduction to pole, after 50 m upward continuation
Upward continuation of total field magnetic anomaly, by 3000 m
Residual of total field magnetic anomaly, after subtracting 3000 m upward continuation
1st vertical derivative of total field magnetic anomaly
Analytical signal of total field magnetic anomaly
Pseudogravity of total field magnetic anomaly, sun-shaded: inclination 35°, declination 075°
Tilt derivative of total field magnetic anomaly

Electromagnetic data derivatives
Apparent conductivity, low frequency, sun shaded: inclination 35°, declination 345°
Apparent conductivity, high frequency, sun shaded: inclination 35°, declination 345°
Apparent depth, low frequency
Apparent depth, high frequency

Gamma radiation data and derivatives
Total activity in ppm, sun shaded: inclination 35°, declination 345°
Dose rate in nano Gray (nGy) per hour
Potassium distribution, concentration as %
Uranium equivalent, concentration in ppm
Thorium equivalent, concentration in ppm
Ternary (K, U, Th) distribution

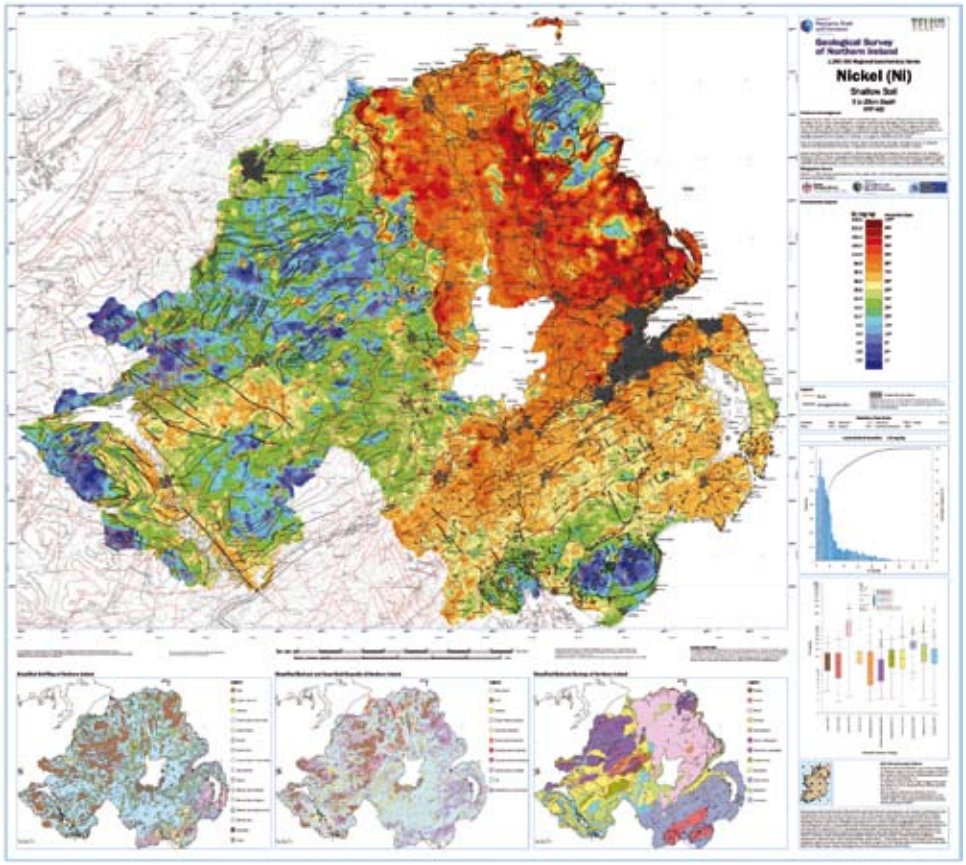
Other maps and images
Digital Terrain Model (from the airborne geophysical survey positioning data)
Bouguer gravity anomaly (from pre-Tellus surveys)
Bouguer gravity anomaly – sun-shaded: inclination 35°, declination 345°

1:250,000 Series Geochemical Maps

Analyte	Soils	Sediments	Waters
Al			•
Alkalinity			•
As	•	•	•
Au*	•	•	
B		•	
Ba		•	
Ca	•	•	•
Cd	•	•	
Ce		•	
Conductivity			•
Cr	•	•	•
Cu	•	•	•
DOC			•
Fe	•	•	•
HCO_3			•
K	•	•	•
LOI	•		
Mg	•	•	•
Mn	•	•	•
Mo	•	•	
Na			•
Ni	•	•	•
NO_3			•
P_2O_5	•	•	
Pb	•	•	•
Pd*	•	•	
pH	•		•
Pt*	•	•	
Sb	•	•	
Se	•	•	
Sn	•	•	
SO_4			•
U	•	•	
Zn	•	•	•

Soil maps are produced from the 5-20 cm XRF analysis except *, which are produced from the 35-50 cm fire-assay dataset.

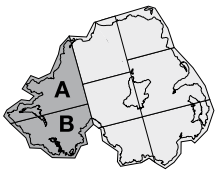
1:250,000
Geochemical Series
Map - Nickel



Geophysical survey specifications and geochemical element and compound analytical methods.

Appendix 1 - Geophysical Specifications

Operator:	Joint Airborne-geoscience Capability (JAC), a joint venture between the British Geological Survey (BGS) and the Geological Survey of Finland (GTK)
Aircraft:	deHavilland DHC-6 Twin Otter Series 300, registration OH-KOG
Magnetometers:	2 x Scintrex Caesium Vapour Model CS2
Location:	In 2005: on the wing tips. In 2006: on the nose stinger and left wing
Horizontal gradient length:	21.36 m (2005), 10.7 m (2006)
Base station:	2 x Scintrex Cesium Vapour Model CS2
Sensitivity:	0.001 nT
Sampling interval:	0.1 sec (~7 m)
Compensation:	RMS AADCII
Gamma-ray spectrometer:	2 x Exploranium GR-820/3 (32 l downward looking, 8 l upward looking, 256 channels)
Sampling interval:	1.0 sec (~70 m)
Electromagnetic system:	Vertical-coplanar, 3.125 and 14.368 kHz (2005) 0.912, 3.005, 11.962, 24.510 kHz (2006)
Magnetic dipole moment:	In 2005: 115 and 55 Am^2; In 2006: 190, 127, 49 and 27 Am^2
Tx-Rx Coil separation:	21.36 m (2005), 21.35-21.38 (2006) located in pods on wing tips
Measuring range:	0-40,000 ppm
Sampling interval:	0.25 sec (~17 m)
Navigation:	Ashtec GG-24, GPS with Glonass real time GPS, differential post processed
Altimeter:	Collins
Sampling interval:	1.0 sec (~70 m)
Data acquisition system:	GTK proprietary



Survey Pattern:

Flight line spacing:	200 m
Flight line direction:	165 - 345˚
Tie line spacing:	2000 m (blocks A and B only)
Tie line direction:	075 - 245˚
Ground clearance:	Nominal 56 m (rural), 244 m (urban)
Total line length:	80,458 km (flight lines only)

Data Processing:

Software:	GTK proprietary, Geosoft Oasis montaj™
Magnetics:	Diurnal correction
	Lag and heading correction
	Aircraft noise edit
	Virtual tie-line levelling
	Conversion to single and gradient channel
	Micro levelling (JAC proprietary)
	IGRF 8th generation 2005 revision applied
Radiometrics:	Dead time correction
	Background correction (aircraft and cosmic)
	Radon correction
	Barometric correction
	Elemental stripping and equivalent concentration calculation
	Greens (1987) levelling of TC and eU channel

Energy windows:

Window	Energy range (MeV)
Thorium	2.41 - 2.81
Uranium	1.66 - 1.86
Potassium	1.37 - 1.57
Total	0.41 - 2.81

Electromagnetics:	System calibration coefficients applied
(In-phase and quadrature)	Pre-levelling: linear and non-linear drift corrections applied interactively
	Zero level adjustment; interactively
	Microlevelling (FMD method)
	Apparent resistivity and depth calculated

Projection:

Data transformation:	WGS84 based GPS coordinates were transformed to Irish Grid 1975 National Datum (Transverse Mercator Projection)

Appendix 2 - Geochemical Soil Analytes

2.1 Rural soil survey, inorganic 5-20 cm soils

2.1.1 XRF Analysis

Ag, Al_2O_3, As, Ba, Bi, Br, CaO, Cd, Ce, Cl, Co, Cr, Cs, Cu, Fe_2O_3, Ga, Ge, Hf, I, In, K_2O, La, MgO, MnO, Mo, Na_2O, Nb, Nd, Ni, P_2O_5, Pb, Rb, SO_3, Sb, Sc, Se, SiO_2, Sm, Sn, Sr, Ta, Te, Th, Tl, TiO_2, U, V, W, Y, Yb, Zn, Zr

2.1.2 Additional Parameters

pH and Loss on Ignition

2.2 Rural soil survey inorganic 35-50 cm soils

2.2.1 Gold and PGE (10g Fire Assay)

Au, Pt, Pd

2.2.2 Additional Parameter

SO_4 by Aqua Regia ICP-MS

Appendix 3 - Geochemical Sediment Analytes

3.1 Tellus Survey 2005-2006

3.1.1 XRF Analysis

Al_2O_3, Ag, As, Ba, Bi, Br, CaO, Cd, Ce, Cl, Co, Cr, Cs, Cu, Fe_2O_3, Ga, Ge, Hf, I, In, K_2O, La, MgO, MnO, Mo, Na_2O, Nb, Nd, Ni, P_2O_5, Pb, Rb, S, Sb, Sc, Se, SiO_2, Sm, Sn, SO_3, Sr, Ta, Te, Th, TiO_2, Tl, U, V, W, Y, Yb, Zn, Zr

3.1.2 Gold and PGE (10g Fire Assay)

Au, Pt, Pd

3.1.3 Additional Parameter

B

3.2 G-Base Survey 1994-1996

3.2.1 XRF Analysis

Ag, As, Ba, Bi, CaO, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, K_2O, La, MnO, Mo, Nb, Ni, P_2O_5, Pb, Rb, Sb, Se, Sn, Sr, Th, TiO_2, U, V, W, Y, Zn, Zr

3.2.2 Gold and PGE (10g Fire Assay)

Au, Pt, Pd

3.2.3 Additional Parameter

B

Appendix 4 - Geochemical Water Analytes

4.1 Tellus Survey 2005-2006

4.1.1 Anions and fluid parameters

Bicarbonate, Bromide, Chloride, Fluoride, Nitrate, Nitrite, Orthophosphate, Sulphate, Dissolved Organic Carbon, Alkalinity, Conductivity, pH,

4.1.2 Trace Elements in waters

Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Hg, Ho, K, La, Li, Mg, Mo, Mn, Na, Ni, P, Pb, Pd, Pt, Rb, Rh, Sb, Se, Si, Sn, Sr, Th, Tl, U, V, Y, Zn, Zr

4.2 G-Base Survey 1994-1996

4.2.1 Anions and fluid parameters

Bicarbonate, Chloride, Fluoride, Nitrate, Sulphate, Dissolved Organic Carbon, Conductivity, pH

4.2.2 Trace Elements in waters

Ag, Al, Al, As, B, Ba, Be, Ca, Cd, Ce, Co, Cr, Cu, Fe, K, La, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Rb, Sb, Se, Si, Sr, Tl, U V, Y, Zn, Zn, Zr,

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