MINFO

minerals ireland EXPLORATION & MINING DIVISION

Format and Content

of

Airborne Geophysical Survey data Submissions

To Exploration and Mining Division

October 2013

Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment

Exploration and Mining Division, Department of Communications, Climate Action and Environment
29-31 Adelaide Road, Dublin, D02 X285, Ireland. Tel: + 353-1-6782000 Email: EMD.info@dccae.gov.ie
www.mineralsireland.ie
www.dccae.gov.ie

General

This document is designed to complement the MINFO leaflet entitled '*Guidelines for regional airborne geophysical surveying for minerals*'. The purpose of this document is to provide the **required** format and content for all data lodged with the Exploration and Mining Division (EMD) that relates to an airborne geophysical survey.

Content is, to a degree, dependent on the system used and the individual survey. However, the EMD approach is that all relevant raw and processed data must be lodged and archived, so that the data may be reprocessed using new or different technology at some future date. The survey contractor preparing data archives should review survey data content and format with these Guidelines prior to submission.

Table of Contents

Digital and Hardcopy Data

Airborne survey data submitted to EMD should contain the following digital and hard copy datasets, for each technique flown.

Magnetics

- **Digital databases:** Ascii and Geosoft database format.
  The channel listing for magnetic data, which should be included in the database, is given in Table 1 (pg.5)

- **Digital grids** Ascii or Geosoft format (gxf, grd)
  The grid archives should include at least three grids:
  a) final processed digital elevation model (metres above sea level);
  b) final processed total magnetic intensity (nanoteslas); and
  c) first vertical derivative of the total magnetic intensity, derived from grid b)

- **Digital maps:**
  - Maps of the grids listed above in geo-referenced Geosoft compatible format.
  - Geosoft MAP format.
  - Tiff with tiff world file (tfw).
  - Geotiff
  - Autocad DXF

- **Hard copy maps:** Plotted maps of the grids listed above (A0 size or smaller)

- **Reports:** Hardcopy and MSWord or Acrobat pdf format
  a) Survey Report: Final logistic and processing report outlining full processing sequence (see Table 5 (pg.10) for listing of typical contents)
  b) Survey Interpretation report

- **Readme file:** Full explanation of database channels, maps and grids.

Radiometrics

- **Digital databases:** Ascii and Geosoft database format.
  The channel listing for radiometric data, which should be included in the database, is given in Table 2 (pg.6).

- **Digital grids** Ascii or Geosoft format (gxf, grd)
  The grid archives should include the following grids:
  a) total air-absorbed dose rate (nanograys per hour)
  b) caesium (percent)
  c) potassium (percent)
  d) equivalent uranium (parts per million)
  e) equivalent thorium (parts per million);
  f) ratio of thorium over potassium.
  g) ratio of uranium over potassium.
  h) ratio of uranium over thorium.
  i) ternary image (potassium, thorium & uranium

- **Digital maps:** • Maps of the grids listed above in geo-referenced Geosoft compatible format.
  • Geosoft MAP format.
  • Tiff with tiff world file (tfw).
  • Geotiff
  • Autocad DXF

- **Hard copy maps:** Plotted maps of the grids listed above (A0 size or smaller)

- **Reports:** Hardcopy and MSWord or Acrobat pdf format
  a) Survey Report: Final logistic and processing report outlining full processing sequence (see Table 5 (pg.10) for listing of typical contents)
  b) Survey Interpretation report

- **Readme file:** Full explanation of database channels, maps and grids.

Time Domain and Frequency Domain Electromagnetics

- **Digital databases:** Ascii and Geosoft database format.
  The channel listing for electromagnetic data, which should be included in the database, is given in Tables 3 and 4 (pg.7-9)

- **Digital grids** Ascii or Geosoft format (gxf, grd)
  The grid archives should include the following grids:
  a) TDEM decay constant (tau), one each for the X and Z receiver components (microseconds).
  b) TDEM de-herringboned decay constant (tau), derived from grid a) (in the case of asymmetric systems only), one each for the X and Z receiver components (microseconds);
  c) TDEM apparent conductivity or conductance (siemens per metre or siemens).
  d) TDEM de-herringboned apparent conductivity or conductance, derived from grid c) (in the case of asymmetric systems only) (siemens per metre or siemens).
  e) FEM apparent resistivity, one each for the coplanar coil pairs (at each frequency) (ohm-metres), and similarly for the coaxial coil pairs if prepared.

- **Digital maps:** • Maps of the grids listed above in geo-referenced Geosoft compatible format.
  • Geosoft MAP format.
  • Tiff with tiff world file (tfw).
  • Geotiff
  • Autocad DXF

- **Hard copy maps:** Plotted maps of the grids listed above (A0 size or smaller)

- **Reports:** Hardcopy and MSWord or Acrobat pdf format
  a) Survey Report: Final logistic and processing report outlining full processing sequence (see Table 5 (pg.10) for listing of typical contents)
  b) Survey Interpretation report

- **Readme file:** Full explanation of database channels, maps and grids.

- **Digital Anomaly Listing** Location and classification of selected EM anomalies, including cultural sources and anomaly model parameters.

ADDITIONAL NOTES

1. Digital data should be submitted on CD-R or CD-RW only.
2. The digital datasets, grids and maps should be delivered in Geosoft compatible formats.
3. All digital files delivered should be clearly documented and all naming conventions explained.
4. All survey calibration parameters and test flight data before, during or after the acquisition period, that pertain to the survey data, should be delivered in digital format. Eg. TDEM reference waveforms.
5. All datasets should be delivered with a survey logistics and processing report.
6. Interpretation overlays should be delivered in digital format.
7. Grids should be derived directly from the corresponding profile archive channels, unless otherwise noted.
8. The gridding algorithms used must be documented.
9. Any micro-levelling corrections must be applied to the profile data prior to generation of corresponding grids and included in the database.
10. If trend-enhancement is applied in the preparation of any grid, then a corresponding grid without trend enhancement is also required.
11. Any method used to classify anomalies must be documented and explained.
12. The models used to calculate apparent conductivity or conductance must be described.

All digital and hardcopy products must be supplied in the Irish National Grid (ING) coordinate system:

Datum:	TM65 (Airy Modified 1849)
Reference Ellipsoid:	Airy Modified 1849
	Major axis: 6377340.189
	Eccentricity: 0.081673374
	1/f: 299.3249646
Projection	Transverse Mercator
Central Meridian	-8.00.00.000
Latitude of origin	53.30.00.000
False Northing:	250,000 m
False Easting:	200,000 m
Scale factor:	1.000035
WGS84 to Local Conversion:	Molodensky
Datum Shifts:	DX: -506, DY: +122, DZ: -611

(1) Magnetic Data Archive Listing (ASCII and/or Geosoft database Format)

The archive will include a comment file describing channel contents, naming conventions, units and formats.

Channel Name	Description	Units
gps_x_final	differential GPS X (filtered, WGS84 datum, UTM 29N)	degrees
gps_y_final	differential GPS Y (filtered, WGS84 datum, UTM 29N)	degrees
gps_z_final	differential GPS Z (filtered, WGS84 datum, UTM 29N)	metres (asl)
x_ING	easting in ING co-ordinates using Airy Mod 1849 datum	metres
y_ING	northing in ING co-ordinates using Airy Mod 1849 datum	metres
z_ING	GPS height (Airy Mod 1849 datum)	metres
long	longitude (Airy Mod 1849 datum)	decimal-degrees
lat	latitude (Airy Mod 1849 datum)	decimal-degrees
radar_raw	measured radar altimeter	metres above terrain
baro_raw	measured barometric altimeter	metres above sea level
radar_final	corrected radar altimeter	metres above terrain
baro_final	corrected barometric altimeter	metres above sea level
dem	levelled digital elevation model	metres above sea level
fiducial	fiducial	
flight	flight number (eg. 48)	
line_number	line number, L=survey, T=Tie (e.g., L1310.0)	
time_local	local time (GMT)	decimal hours
date	local date (year month day)	YYYYMMDD
mag_base_raw	measured magnetic base station data (diurnal)	nanoteslas
mag_base_final	corrected magnetic base station data (diurnal)	nanoteslas
mag_raw1	raw magnetic field (uncompensated)	nanoteslas
mag_raw2	raw magnetic field (compensated)	nanoteslas
mag_edit	edited magnetic field	nanoteslas
mag_diurn	diurnally-corrected magnetic field	nanoteslas
igrf	local IGRF field	nanoteslas
mag_igrf	IGRF-corrected magnetic field	nanoteslas
mag_lev	levelled magnetic field	nanoteslas
mag_final	micro-levelled magnetic field	nanoteslas
mag_1vd	first (second) vertical derivative of mag_final	nanoteslas/m or nanoteslas/m^2
mag_as	analytic signal of mag_final	nanoteslas
mag_rtp	reduced to pole of mag_final	nanoteslas
mag_decult	decultured mag_final	nanoteslas

(2) Radiometric Data Archive Listing (ASCII and/or Geosoft database Format)

The archive will include a comment file describing channel contents, naming conventions, units and formats.

Channel Name	Description	Units
gps_x_final	differential GPS X (filtered, WGS84 datum, UTM 29N)	degrees
gps_y_final	differential GPS Y (filtered, WGS84 datum, UTM 29N)	degrees
gps_z_final	differential GPS Z (filtered, WGS84 datum, UTM 29N)	metres (asl)
x_ING	easting in ING co-ordinates using Airy Mod 1849 datum	metres
y_ING	northing in ING co-ordinates using Airy Mod 1849 datum	metres
z_ING	GPS height (Airy Mod 1849 datum)	metres
long	longitude (Airy Mod 1849 datum)	decimal-degrees
lat	latitude (Airy Mod 1849 datum)	decimal-degrees
radar_raw	measured radar altimeter	metres above terrain
baro_raw	measured barometric altimeter	metres above sea level
radar_final	corrected radar altimeter	metres above terrain
baro_final	corrected barometric altimeter	metres above sea level
dem	levelled digital elevation model	metres above sea level
fiducial	fiducial	
flight	flight number (eg. 48)	
line_number	line number, L=survey, T=Tie (e.g., L1310.0)	
time_local	local time (GMT)	decimal hours
date	local date (year month day)	YYYYMMDD
air_temp	air temperature outside aircraft	decimal degrees celsius
baro_pressure	barometric pressure	kilopascals
height_rad	gamma-ray spectrometer height	metres above terrain
height_effect	effective height	metres
spectrum_corr	corrected gamma-ray spectrum (array channel)	counts per second
live_time	gamma-ray spectrometer live time	milliseconds
cosmic_raw	raw cosmic count	counts per second
radon_raw	raw upward-looking uranium window	counts per second
radon_final	radon background in downward-looking uranium window	counts per second
total_count	windowed total count	counts per second
caesium_win	windowed caesium	counts per second
potassium_win	windowed potassium	counts per second
uranium_win	windowed uranium	counts per second
thorium_win	windowed thorium	counts per second
dose_rate	total absorbed dose rate	nanograys/hour
dose_rate_nat	natural air-absorbed dose rate	nanograys/hour
caesium_final	caesium	percent
potassium_final	potassium	percent
euranium_final	equivalent uranium	parts per million
ethorium_final	equivalent thorium	parts per million

(3) TDEM Data Archive Listing (ASCII and/or Geosoft database Format)

The archive will include a comment file describing channel contents, naming conventions, units and formats.

Channel Name	Description	Units
gps_x_final	differential GPS X (filtered, WGS84 datum, UTM 29N)	degrees
gps_y_final	differential GPS Y (filtered, WGS84 datum, UTM 29N)	degrees
gps_z_final	differential GPS Z (filtered, WGS84 datum, UTM 29N)	metres (asl)
x_ING	easting in ING co-ordinates using Airy Mod 1849 datum	metres
y_ING	northing in ING co-ordinates using Airy Mod 1849 datum	metres
z_ING	GPS height (Airy Mod 1849 datum)	metres
long	longitude (Airy Mod 1849 datum)	decimal-degrees
lat	latitude (Airy Mod 1849 datum)	decimal-degrees
radar_raw	measured radar altimeter	metres above terrain
baro_raw	measured barometric altimeter	metres above sea level
radar_final	corrected radar altimeter	metres above terrain
baro_final	corrected barometric altimeter	metres above sea level
dem	levelled digital elevation model	metres above sea level
fiducial	fiducial	
flight	flight number (eg. 48)	
line_number	line number, L=survey, T=Tie (e.g., L1310.0)	
time_local	local time (GMT)	decimal hours
date	local date (year month day)	YYYYMMDD
height_em	electromagnetic receiver height	metres above terrain
em_x_raw_on	measured dB/dT, X-component, on-time	picoteslas per second
em_x_raw_off	measured dB/dT, X-component, off-time	picoteslas per second
em_y_raw_on	measured dB/dT, Y-component, on-time	picoteslas per second
em_y_raw_off	measured dB/dT, Y-component, off-time	picoteslas per second
em_z_raw_on	measured dB/dT, Z-component, on-time	picoteslas per second
em_z_raw_off	measured dB/dT, Z-component, off-time	picoteslas per second
em_bx_raw_on	measured B-field, X-component, on-time	femtoteslas
em_bx_raw_off	measured B-field, X-component, off-time	femtoteslas
em_by_raw_on	measured B-field, Y-component, on-time	femtoteslas
em_by_raw_off	measured B-field, Y-component, off-time	femtoteslas
em_bz_raw_on	measured B-field, Z-component, on-time	femtoteslas
em_bz_raw_off	measured B-field, Z-component, off-time	femtoteslas
etau_x	early decay constant (x-coil)	us
etau_y	early decay constant (y-coil)	us
etau_z	early decay constant (z-coil)	us
ltau_x	late decay constant (x-coil)	us
ltau_y	late decay constant (y-coil)	us
ltau_z	late decay constant (z-coil)	us
em_x_drift_on	drift-corrected dB/dT, X-component, on-time	picoteslas per second

em_x_drift_off	drift-corrected dB/dT, X-component, off-time	picoteslas per second
em_y_drift_on	drift-corrected dB/dT, Y-component, on-time	picoteslas per second
em_y_drift_off	drift-corrected dB/dT, Y-component, off-time	picoteslas per second
em_z_drift_on	drift-corrected dB/dT, Z-component, on-time	picoteslas per second
em_z_drift_off	drift-corrected dB/dT, Z-component, off-time	picoteslas per second
em_x_final_on	filtered dB/dT, X-component, on-time	picoteslas per second
em_x_final_off	filtered dB/dT, X-component, off-time	picoteslas per second
em_y_final_on	filtered dB/dT, Y-component, on-time	picoteslas per second
em_y_final_off	filtered dB/dT, Y-component, off-time	picoteslas per second
em_z_final_on	filtered dB/dT, Z-component, on-time	picoteslas per second
em_z_final_off	filtered dB/dT, Z-component, off-time	picoteslas per second
em_bx_drift_on	drift-corrected B-field, X-component, on-time	femtoteslas
em_bx_drift_off	drift-corrected B-field, X-component, off-time	femtoteslas
em_by_drift_on	drift-corrected B-field, Y-component, on-time	femtoteslas
em_by_drift_off	drift-corrected B-field, Y-component, off-time	femtoteslas
em_bz_drift_on	drift-corrected B-field, Z-component, on-time	femtoteslas
em_bz_drift_off	drift-corrected B-field, Z-component, off-time	femtoteslas
em_bx_final_on	filtered B-field, X-component, on-time	femtoteslas
em_bx_final_off	filtered B-field, X-component, off-time	femtoteslas
em_by_final_on	filtered B-field, Y-component, on-time	femtoteslas
em_by_final_off	filtered B-field, Y-component, off-time	femtoteslas
em_bz_final_on	filtered B-field, Z-component, on-time	femtoteslas
em_bz_final_off	filtered B-field, Z-component, off-time	femtoteslas
conductivity	apparent conductivity	siemens per metre
conductance	apparent conductance	siemens
power	50 Hz power line monitor	microvolts
primary	electromagnetic primary field	microvolts
Tx_pk	Tx peak current	a

(4) FEM Data Archive Listing (ASCII and/or Geosoft database Format)

The archive will include a comment file describing channel contents, naming conventions, units and formats.

Channel Name	Description	Units
gps_x_final	differential GPS X (filtered, WGS84 datum, UTM 29N)	degrees
gps_y_final	differential GPS Y (filtered, WGS84 datum, UTM 29N)	degrees
gps_z_final	differential GPS Z (filtered, WGS84 datum, UTM 29N)	metres (asl)
x_ING	easting in ING co-ordinates using Airy Mod 1849 datum	metres
y_ING	northing in ING co-ordinates using Airy Mod 1849 datum	metres
z_ING	GPS height (Airy Mod 1849 datum)	metres
long	longitude (Airy Mod 1849 datum)	decimal-degrees
lat	latitude (Airy Mod 1849 datum)	decimal-degrees
radar_raw	measured radar altimeter	metres above terrain
baro_raw	measured barometric altimeter	metres above sea level
radar_final	corrected radar altimeter	metres above terrain
baro_final	corrected barometric altimeter	metres above sea level
dem	levelled digital elevation model	metres above sea level
fiducial	fiducial	
flight	flight number (eg. 48)	
line_number	line number, L=survey, T=Tie (e.g., L1310.0)	
time_local	local time (GMT)	decimal hours
date	local date (year month day)	YYYYMMDD
height_em	electromagnetic receiver height	metres above terrain
power	50 Hz frequency power line monitor	millivolts
The following channels should be included for each transmitter frequency (coaxial or coplanar as applicable)		
cxi_freq_raw	measured coaxial in-phase	parts per million
cxq_freq_raw	measured coaxial quadrature	parts per million
cpi_freq_raw	measured coplanar in-phase	parts per million
cpq_freq_raw	measured coplanar quadrature	parts per million
cxi_freq_filt	filtered coaxial in-phase	parts per million
cxq_freq_filt	filtered coaxial quadrature	parts per million
cpi_freq_filt	filtered coplanar in-phase	parts per million
cpq_freq_filt	filtered coplanar quadrature	parts per million
cxi_freq_final	levelled coaxial in-phase	parts per million
cxq_freq_final	levelled coaxial quadrature	parts per million
cpi_freq_final	levelled coplanar in-phase	parts per million
cpq_freq_final	levelled coplanar quadrature	parts per million
cp_ares_freq	apparent resistivity for coplanar coil pair	ohm-metres
cp_ares_freq_dep	apparent depth calculated from coplanar coil pair	metres
cx_ares_freq	apparent resistivity for coaxial coil pair	ohm-metres
cx_ares_freq_dep	apparent depth calculated from coaxial coil pair	metres

(5) Example of a Survey Report Table of Contents