

# Electromagnetic Resistivity Lineaments, NW Midlands Ireland (ROI/NI) ITM

**Type** File Geodatabase Feature Class



**Tags** Ireland, Geology, IE/GSI, Tellus, Minerals, Exploration, MPM, Geophysics, Lineaments, Electromagnetic

## Summary

This survey measures, from an airplane, how electrical currents flow through different types of rocks and soils. Measuring how well or poorly electrical currents flow in the ground allows us to map different types of rocks and soils. The findings tell us about the rocks in the ground. This helps if you want to drill for water or to help find minerals (materials taken from the ground used for things we need from mobile phones to the stones used to build roads and houses). The data can also be used by farmers to tell them about the soil.

Maps that show how well or poorly electrical currents flow in the ground are called 'resistivity' maps. When resistivity maps are looked at in detail, clear lines in the maps can be seen. These show where the rocks have been broken or fractured. These lines in the maps are called lineaments. Finding and mapping lineaments can help work out how the rocks have changed over time and can help in searching for minerals.

## Description

Structural lineaments (linear features) have been identified and mapped from 3 kHz and 12 kHz electrical resistivity maps of the Northwest (NW) Midlands of Ireland. The study area includes the south western part Northern Ireland. These resistivity maps show how rocks resist the flow of electrical currents. This allows us to observe and map different types of rock beneath the soil. Linear features (lineaments) can also be mapped. These may be sharp margins (faults) between rock types, or fractures (breaks) in the rocks. The resistivity data in the NW Midlands of Ireland were collected between 2005 – 2017. They consist of a merge of data collected during a number of Tellus survey phases: Northern Ireland (NI), Tellus Border (TB), Cavan (CAV), North Midlands (TNM), A1, A2 and A3 survey blocks. The NW Midlands study area covers a total area of approximately 21,500 km<sup>2</sup>.

The resistivity data were collected using an airplane. The airplane flies at 60 m flight height along lines that are 200 m apart. Electromagnetic (resistivity) data are recorded at around 6 m intervals along the flight lines. The electromagnetic system transmitter mounted on the airplane sends an electromagnetic signal (at four different frequencies) into the ground and records the response of the ground returning to the system receiver. The recorded response changes depending on the type of rock or soil that the electromagnetic signal meets. For example, graphite has a high response value (meaning it is a low resistivity rock) while limestone has a low response value (it is a high resistivity rock).

The data are collected as points in XYZ format. X and Y are the airplane coordinates. Z is the different recorded data, which include electromagnetic responses at each of the four transmitter frequencies and airplane flight height. The XYZ data for each line contains thousands of points. The data from separate lines are merged to create a resistivity grid (map) for each survey block for each transmitter frequency. Individual survey blocks are then merged to create a final resistivity grid for Ireland for each transmitter frequency. The resistivity grids were cut to provide a window of data corresponding with the extents of the Northwest (NW) Midlands project area.

A number of different image enhancement filters are then used to improve the resolution of the resistivity grids and to help in identifying and mapping structural lineaments in the grids. This is a vector dataset. Mapping of lineaments in the resistivity grids was done using ArcGIS Pro software. The lineament datasets are made available in a file geodatabase and shapefile format.

The Tellus project is a national survey which collects geochemical and geophysical data across Ireland. It allows us to study the chemical and physical properties of our soil, rocks and water. It is managed by the Geological Survey Ireland.

## Credits

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## Extent

West -9.753187 East -7.228783  
North 54.438461 South 53.252741

## Scale Range

Maximum (zoomed in) 1:5,000  
Minimum (zoomed out) 1:150,000,000

## Topics and Keywords ►

Themes or categories of the resource Environment, Geoscientific, Location  
Content type ⇌ Downloadable Data  
Export to FGDC CSDGM XML format as Resource Description No

Theme keywords Soil

## Thesaurus ►

Title GEMET - INSPIRE themes, version 1.0  
Alternate titles GEMET INSPIRE  
Publication date 2008-06-01 00:00:00  
Resource location online  
Online location (URL) <https://inspire.ec.europa.eu/theme/so>  
Connection protocol text/html  
Name INSPIRE theme register  
Function performed information  
Application profile INSPIRE theme register

Place keywords Ireland

## Thesaurus ►

Title Metadata Registry of the Publications Office of the EU Named Authority Lists - Country  
Alternate titles MDR-COUNTRIES  
Publication date 2015-03-18 00:00:00  
Edition 20200624-0  
Resource location online  
Online location (URL) <https://op.europa.eu/en/web/eu-vocabularies/concept/-/resource?uri=http://publications.europa.eu/resource/authority/country/IRL>  
Connection protocol text/html  
Name Name authority list  
Description Name authority list  
Function performed information

Other keywords IE/GSI

## Thesaurus ►

Title Global Change Master Directory (GCMD) Data Center Keywords 9.1.5  
Alternate titles GCMD Data Center Keywords  
Publication date 2016-08-04 00:00:00  
Edition 9.1.5  
Resource location online  
Online location (URL) <https://vocabs.ardc.edu.au/repository/api/lda/ardc-curated/gcmd-providers/9-1-5-2020-02-06/resource?uri=https://gcmdservices.gsfc.nasa.gov/kms/concept/4bdbb012-4aed-485b-8ee8-16519985681e>  
Connection protocol text/html  
Name GCMD Data Center Keywords  
Description GCMD Data Center Keywords  
Function performed information

## Citation ►

Title Electromagnetic Resistivity Lineaments, NW Midlands Ireland (ROI/NI) ITM  
Creation date 2022-06-24 00:00:00  
Publication date 2022-06-28 00:00:00  
Revision date 2022-06-24 00:00:00  
Presentation formats ⇔ digital map  
FGDC geospatial presentation format vector digital data  
Resource identifier  
Value  
GE\_AirborneGeophysicalSurvey\_IE\_GeologicalSurveyIreland\_Electromagnetic\_Lineaments\_NW\_Midlands\_IE32\_ITM  
Reference that defines the value ►

Title GSI  
Creation date 2022-06-24 00:00:00  
Publication date 2022-06-28 00:00:00  
Revision date 2022-06-24 00:00:00

## Citation Contacts ►

Responsible party - point of contact  
Individual's name Tellus Project  
Organization's name Geological Survey Ireland  
Contact's position Tellus Project Manager  
Contact information ►  
  
Phone  
Voice +353-1-6782896

#### Address

Type both

Delivery point Block 1, Booterstown Hall, Booterstown Avenue, Booterstown, Blackrock

City Dublin

Postal code A94 N2R6

Country IE

e-mail address [support@geodata.gov.ie](mailto:support@geodata.gov.ie)

#### Online resource

Online location (URL) <https://www.gsi.ie>

Connection protocol text/html

Name GSI Website

Description GSI Website

Function performed information

### Resource Details ►

Dataset languages ⇔ English (IRELAND)

Dataset character set utf8 - 8 bit UCS Transfer Format

Status on-going

Spatial representation type vector

Spatial resolution

Dataset's scale

Scale denominator 50000

Ground sample distance

Precision of spatial data 500 m (meter)

Processing environment ⇔ Version 6.2 (Build 9200) ; Esri ArcGIS 10.7.1.11595

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#### ArcGIS item properties

Name ⇔ NW\_MPM\_EM\_Lineaments\_ITM

Size ⇔ 0.000

### Extents ►

#### Extent

Geographic extent

Bounding rectangle

Extent type Extent used for searching

West longitude ⇔ -9.753187

East longitude ⇔ -7.228783

North latitude ⇔ 54.438461

South latitude ⇔ 53.252741

Extent contains the resource ⇔ Yes

#### Temporal extent

Beginning date 2021-03-19 00:00:00

Ending date 2021-06-14 00:00:00

#### Extent in the item's coordinate system

westBL ⇔ 486235.882100

eastBL ⇔ 650033.741600

southBL ⇔ 723843.055300

northBL ⇔ 854436.094500

exTypeCode ⇔ Yes

### Resource Points of Contact ►

Point of contact - point of contact

Individual's name Tellus Project Manager

Organization's name Geological Survey Ireland

Contact's position Tellus Project Manager

Contact information ►

Phone

Voice +353-1-6782896

Address

Type both

Delivery point Block 1, Booterstown Hall, Booterstown Avenue, Booterstown, Blackrock

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Online resource

Online location (URL) <https://www.gsi.ie>

Connection protocol text/html

Name GSI Website

Description GSI Website

Function performed information

## Resource Maintenance ►

Resource maintenance

Update frequency irregular

## Resource Constraints ►

Legal constraints

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Access constraints license

Use constraints license

Security constraints

Classification unclassified

Additional restrictions

no limitations to public access

## Constraints

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## Spatial Reference ►

### ArcGIS coordinate system

Type ⇔ Projected

Geographic coordinate reference ⇔ GCS\_IRENET95

Projection ⇔ IRENET95\_Irish\_Transverse\_Mercator

Coordinate reference details ⇔

ProjectedCoordinateSystem

WKID 2157

XOrigin -5022200

YOrigin -15179500

XYScale 10000

ZOrigin -100000

ZScale 10000

MOrigin -100000

MScale 10000

XYTolerance 0.001

ZTolerance 0.001

MTolerance 0.001

HighPrecision true

LatestWKID 2157

WKT PROJCS["IRENET95\_Irish\_Transverse\_Mercator",GEOGCS["GCS\_IRENET95",DATUM  
["D\_IRENET95",SPHEROID["GRS\_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT  
["Degree",0.0174532925199433]],PROJECTION["Transverse\_Mercator"],PARAMETER  
["False\_Easting",600000.0],PARAMETER["False\_Northing",750000.0],PARAMETER["Central\_Meridian",-  
8.0],PARAMETER["Scale\_Factor",0.99982],PARAMETER["Latitude\_Of\_Origin",53.5],UNIT["Meter",1.0],AUTHORITY  
["EPSG",2157]]

### Reference system identifier

Value 2157  
Version ⇔ 6.5.1(8.1.2)  
Codespace ⇔ EPSG  
Reference that defines the value ►

Title European Petroleum Survey Group (EPSG) Geodetic Parameter Dataset  
Alternate titles EPSG  
Publication date 2004-04-07 00:00:00  
Edition 9.8.12  
Resource location online  
Online location (URL) <http://www.opengis.net/def/crs/EPSG/0/2157>  
Connection protocol text/html  
Name EPSG  
Description EPSG  
Function performed information

## Spatial Data Properties ►

### Vector ►

Level of topology for this dataset ⇔ geometry only  
Geometric objects  
Feature class name NW\_MPM\_EM\_Lineaments\_ITM  
Object type ⇔ composite  
Object count ⇔ 4671

### ArcGIS Feature Class Properties ►

Feature class name NW\_MPM\_EM\_Lineaments\_ITM  
Feature type ⇔ Simple  
Geometry type ⇔ Polyline  
Has topology ⇔ FALSE  
Feature count ⇔ 4671  
Spatial index ⇔ TRUE  
Linear referencing ⇔ FALSE

## Data Quality ►

### Scope of quality information ►

Resource level dataset  
Data quality report - Domain consistency ►

Conformance test results  
Test passed No  
Result explanation  
The INSPIRE Directive or INSPIRE lays down a general framework for a Spatial Data Infrastructure (SDI) for the purposes of European Community environmental policies and policies or activities which may have an impact on the environment.

### Product specification ►

Title D2.8.III.3 Data Specification on Soil – Technical Guidelines  
Alternate titles INSPIRE Data Specifications v3.0  
Publication date 2013-12-10 00:00:00  
Data quality report - Domain consistency ►

Conformance test results  
Test passed Yes

Result explanation

See the reference specification

Product specification ►

Title COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

Publication date 2008-12-04 00:00:00

Data quality report - Domain consistency ►

Conformance test results

Test passed No

Result explanation

See the reference specification

Product specification ►

Title Regulation 1089/2010 COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services

Publication date 2010-12-08 00:00:00

## Lineage ►

Lineage statement

Electromagnetic Data Quality\Lineage:

Airborne electromagnetic data were recorded and processed by Sander Geophysics Ltd. and delivered to Geological Survey Ireland, where they were further processed and gridded prior to data release. Airborne survey specifications and the data processing routines applied to the data are described below.

Airborne Survey Specifications (Tellus airborne survey):

- 1) Electromagnetics (four-frequency (0.9 kHz, 3 kHz, 12 kHz and 25 kHz), wing-tip mounted transmitter-receiver system).
- 2) Flight-line spacing: 200 m.
- 3) Flight altitude (ground clearance): nominal 60 m, increasing to 214 m over sensitive areas (e.g., livestock farms) and 305 m over larger population centres.

Electromagnetic Data Processing:

The following corrections and calculations were performed on the recorded electromagnetic data by Sander Geophysics Ltd. using purpose-developed, proprietary software. More detail on each data processing step may be found in, for example, Sander Geophysics Limited's document "Technical Report – Fixed-Wing High-Resolution Aeromagnetic, Gamma-ray Spectrometric and Frequency-Domain Electromagnetic Survey – Tellus A1 Block, Republic of Ireland 2015 – For Geological Survey Ireland".

- 1) Conversion of the recorded EM responses from volts to parts per million (ppm) for four frequencies and two data components (in-phase and quadrature), providing eight data components in total.
- 2) Non-linear drift corrections – to correct for drift effects, largely due to temperature variation during flight, on the zero level of the recorded data.
- 3) De-rotation of the data – to correct for data phase errors and ensure orthogonality between in-phase and quadrature data components.
- 4) Hanning low-pass filter application (10 samples, 1 second) – to reduce noise levels in the data, leaving the geological response signal in place.
- 5) Levelling - line-to-line data levelling of each of the eight data components to bring each flight line to a matching amplitude level with neighbouring lines, using DC shifts and differential polynomial levelling (following the method of Beiki et al., 2010, Geophysics, Vol. 75, No. 1, L13-L23).

Electromagnetic data conversion to ground resistivity values, gridding and merging:

The following corrections and calculations were performed on the final eight-component electromagnetic response data by GSI using Geosoft Oasis Montaj software.

- 1) Data conversion to resistivity. Conversion of in-phase and quadrature data (jointly) for each frequency to apparent resistivity using Geosoft HEM software.
- 2) Micro-levelling of four apparent resistivity data sets (at each frequency: 0.9 kHz, 3 kHz, 12 kHz and 25 kHz) – to remove residual linear line-to-line artefacts in the data.
- 3) Gridding of apparent resistivity data for each frequency using inverse distance weighted method with a grid



cell size of 50 x 50 m.

4) Merging of all completed survey block grids into one all-island grid for each data frequency. The 3 and 12 kHz frequency data provide coverage of both Ireland (Republic) and Northern Ireland, while the 0.9 and 25 kHz frequencies are only available in the Republic.

5) Resampling of the merged apparent resistivity grids for each frequency back to a final master database.

Preparation of the data for structural lineament picking:

The following steps were carried out by GSI using Geosoft software to prepare the 3 and 12 kHz apparent resistivity data for lineament picking.

1) The 3 and 12 kHz resistivity data from GSI's two-frequency "2F\_MERGE\_2019B" dataset were gridded using inverse distance weighted method with a grid cell size of 50 x 50 m.

2) The resistivity grids were cut to provide a window of data corresponding with the extents of the Northwest (NW) Midlands project area.

3) Computation of fractional vertical derivatives of the apparent resistivity grids, for each frequency, to sharpen and enhance features in the grids. Fractional derivatives of order = 0.25 and order = 0.75 were applied. In the case of the 0.75 order vertical derivative, a Butterworth low-pass filter (rejecting wavelengths less than 250 m) was applied to the resistivity grids beforehand, to attenuate cultural noise present in the grids

4) Output of geotiff map images of the resistivity and vertical derivative grids for both 3 and 12 kHz. Geotiff pixel resolution: 23.911 x 23.911 m in ground units.

Lineament picking:

The following steps were carried out by GSI using ArcGIS Pro software.

1) Import of geotiff images.

2) Lineaments visible in the map images were digitised as "polylines". The objective was to pick structural/tectonic lineaments exclusively and to avoid linear features associated with stratigraphic layering (where possible and using geological knowledge provided by the GSI 1:100,000 bedrock geology map). A number of different "types" of lineaments were picked (but not explicitly classified): (i) lineaments associated with disruption of a series of resistivity anomalies along the length of a fault/fracture, (ii) lineaments associated with sharp and distinct, straight or curved edges to anomalies, (iii) lineaments in an otherwise uniform resistivity host "background" and (iv) lineaments where the geometry of juxtaposed resistivity anomalies, with different orientations, suggest the presence of a fault between the anomalies.

3) Vector data was saved in a file geodatabase. The polyline lineament feature class was exported as a shapefile, with the following attributes:

Field	Data Type	Description
OBJECTID	Number	Object ID
Shape	Text	Polyline
GUID	GlobalID	Unique Global ID
Shape_length	Number	Length of polyline

Final Dataset: NW\_MPM\_Geophysical\_Lineaments\_Vector\_Data.gdb

Shapefile: NW\_MPM\_em\_lineaments.shp

Projection: IRENET95 / Irish Transverse Mercator (ITM); EPSG:2157

## Distribution ►

### Distributor ►

Contact information - publisher

Individual's name Information Management

Organization's name Geological Survey Ireland

Contact's position Head of Information Management

Contact information ►

Phone

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Address

Type both

Delivery point Block 1, Booterstown Hall, Booterstown Avenue, Booterstown, Blackrock

City Dublin

Postal code A94 N2R6

Country IE

e-mail address [support@geodata.gov.ie](mailto:support@geodata.gov.ie)  
Online resource  
Online location (URL) <https://www.gsi.ie>  
Connection protocol text/html  
Name GSI Website  
Description GSI Website  
Function performed information

#### Distribution format

Version 10.7

Name ⇔ File Geodatabase Feature Class

#### Transfer options

##### Online source

Online location (URL) <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b8576fe6efca43058953573dbbd71f25>  
Connection protocol text/html  
Name Webmapping Viewer  
Description Webmapping Viewer  
Function performed information

##### Online source

Online location (URL) <https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx>  
Connection protocol application/vnd.shp  
Name Data Download  
Description Data Download  
Function performed download

##### Online source

Online location (URL) <https://gsi.geodata.gov.ie/server/rest/services/Geochemistry>  
Connection protocol text/html  
Name REST Service  
Description REST Service  
Function performed information

## Fields ►

### Details for object NW\_MPM\_EM\_Lineaments\_ITM ►

Type ⇔ Feature Class  
Row count ⇔ 4671  
Definition  
Electromagnetic Resistivity Lineaments

Definition source  
MPM Project

### Field OBJECTID ►

Alias ⇔ OBJECTID  
Data type ⇔ OID  
Width ⇔ 4  
Precision ⇔ 0  
Scale ⇔ 0  
Field description ⇔  
Internal feature number.

Description source ⇔  
Esri

Description of values ⇔

Sequential unique whole numbers that are automatically generated.

#### Field Shape ►

Alias ⇔ Shape  
Data type ⇔ Geometry  
Width ⇔ 0  
Precision ⇔ 0  
Scale ⇔ 0  
Field description ⇔  
Feature geometry.  
  
Description source ⇔  
Esri  
  
Description of values ⇔  
Coordinates defining the features.

#### Field GUID ►

Alias ⇔ GUID  
Data type ⇔ GlobalID  
Width ⇔ 38  
Precision ⇔ 0  
Scale ⇔ 0  
Field description  
Unique Global ID  
  
Description source  
MPM Project

#### Field Shape\_Length ►

Alias ⇔ Shape\_Length  
Data type ⇔ Double  
Width ⇔ 8  
Precision ⇔ 0  
Scale ⇔ 0  
Field description ⇔  
Length of feature in internal units.  
  
Description source ⇔  
Esri  
  
Description of values ⇔  
Positive real numbers that are automatically generated.

#### Metadata Details ►

Metadata language ⇔ English (IRELAND)  
Metadata character set utf8 - 8 bit UCS Transfer Format  
Metadata identifier  
MD\_GE\_AirborneGeophysicalSurvey\_IE\_GeologicalSurveyIreland\_Electromagnetic\_Lineaments\_NW\_Midlands\_IE32\_ITM  
Scope of the data described by the metadata ⇔ dataset  
Scope name ⇔ dataset  
Last update ⇔ 2022-06-24  
ArcGIS metadata properties  
Metadata format ArcGIS 1.0  
Created in ArcGIS for the item 2020-07-29 09:23:20

Last modified in ArcGIS for the item 2022-06-24 15:54:28

Automatic updates

Have been performed Yes

Last update 2022-06-24 15:54:28

## Metadata Contacts ►

Metadata contact - point of contact

Individual's name Information Management

Organization's name Geological Survey Ireland

Contact's position Head of Information Management

Contact information ►

Phone

Voice +353-1-6782896

Address

Type both

Delivery point Block 1, Booterstown Hall, Booterstown Avenue, Booterstown, Blackrock

City Dublin

Postal code A94 N2R6

Country IE

e-mail address [support@geodata.gov.ie](mailto:support@geodata.gov.ie)

Online resource

Online location (URL) <https://www.gsi.ie>

Connection protocol text/html

Name GSI Website

Description GSI Website

Function performed information

## Metadata Maintenance ►

Maintenance

Update frequency as needed

## Metadata Constraints ►

Legal constraints

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Access constraints    license  
Use constraints    license  
Security constraints  
    Classification    unclassified  
Additional restrictions  
    no limitations to public access

#### Constraints

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## Thumbnail and Enclosures ►

#### Thumbnail

Thumbnail type    Image file

