

Characterization of a highly prospective fault system with airborne geophysics data, west-central Newfoundland

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This is a joint publication by the Geological Survey of Canada (GSC) and the Geological Survey of Newfoundland and Labrador (GSNL). Final products of the compilation are eight merged data grids and eight corresponding open file series maps at 1:250 000 scale. Coordinates are projected in NAD83/UTM Zone 21N.

1. Residual Total Magnetic Field.
GSC Open File 8776
GSNL Open File; NFLD/3393, Map 2021-01
2. First Vertical Derivative of the Magnetic Field.
GSC Open File 8777
GSNL Open File; NFLD/3393, Map 2021-02
3. Tilt Angle of the Magnetic Field.
GSC Open File 8778
GSNL Open File; NFLD/3393, Map 2021-03
4. Analytic Signal of the Magnetic Field.
GSC Open File 8779
GSNL Open File; NFLD/3393, Map 2021-04
5. Potassium.
GSC Open File 8780
GSNL Open File; NFLD/3393, Map 2021-05
6. Equivalent Uranium.
GSC Open File 8781
GSNL Open File; NFLD/3393, Map 2021-06
7. Equivalent Thorium.
GSC Open File 8782
GSNL Open File; NFLD/3393, Map 2021-07
8. Total Count.
GSC Open File 8783
GSNL Open File; NFLD/3393, Map 2021-08

Descriptive Notes

Regional aeromagnetic data used in this compilation were acquired from the Geological Survey of Canada Geophysical Data Repository. Digital data from high-resolution surveys flown by mineral exploration companies and the Geological Survey of Newfoundland and Labrador were made available through the Geoscience Atlas, Newfoundland and Labrador Department of Industry, Energy and Technology and the Geological Survey of Canada Geophysical Data Repository.

Results from all high-resolution surveys were levelled to the regional data and to each other using Geosoft GridKnit software. The “suture” method was used, and a static shift was applied to most of the grids to facilitate optimal data merging. In a very few incidences, a slope correction was applied. A target resolution for the final data was a 25 m grid cell size; all data were gridded from the magnetic profile data, and, if required, re-interpolated to this resolution before merging. Lower resolution data were knitted into the regional data first and the higher resolution data last, so that all areas on the maps and digital datasets show the highest resolution data currently available. Apparent mismatches between survey blocks are a result of differing line spacing, flight altitudes and equipment platforms. The grids are available with the regional data and with the regional data removed (HiRes_Only).

Magnetic field measurements reflect magnetic properties of the underlying bedrock and radiometric measurements reflect radiological properties of the surficial geology and bedrock. They both provide qualitative and quantitative information used in geological mapping. An improved understanding of the geology assists in mineral exploration activities and provides a valuable reference to communities, aboriginal associations, and government in making informed land-use decisions.

Magnetic Data and Derivative Maps

The International Geomagnetic Reference Field (IGRF) was removed from the magnetic profile data before gridding. The **first vertical derivative** of the magnetic field enhances higher frequency magnetic anomalies compared to the residual total magnetic field. This tends to accentuate contacts between bedrock lithologies, but can also highlight mismatches at the boundaries between lower and higher resolution datasets. The **tilt angle** (Miller and Singh, 1994) is useful for mapping shallow basement structures and mineral exploration targets. The tilt equalizes the anomalous effects of magnetic sources at different depths. It is defined as $\arctan(\text{first vertical derivative}/\text{total horizontal derivative})$ of the magnetic field. The **analytic signal** (Roest et al., 1992) is useful in locating the edges of magnetic source bodies in the subsurface and is defined as the square root of the sum of the squares of the derivatives in the x, y, and z directions.

Radiometric data

The geochemical information provided by variations in potassium, uranium and thorium concentrations depict radioactivity originating from the upper 30 cm of the Earth's surface. Radiometric surveys are used to support mapping of bedrock and surficial geology, mineral exploration, environmental-radiation monitoring and land-use planning at regional and local scales (Shives et al., 1995). A more detailed interpretation of the high resolution data is encouraged through the use of the original line data, available for download through GSNL's online Geoscience Atlas.

In areas with thin or discontinuous overburden, the radio-element patterns provide assistance to bedrock geological mapping, depicting both lithological variations and compositional variations (Shives et al., 1995). In areas covered by thicker overburden, the radio-element patterns may help delineate the distribution of surficial materials but will reflect local bedrock compositions to a lesser degree, or not at all. Shives et al. (1995, 1997) have shown that radio-element patterns offer valuable direct and indirect exploration guides for a variety of mineral commodities. Direct applications include

the search for radioactive mineral deposits where uranium and thorium are the primary targets, or where one or more of the radioactive elements are present as an associated trace element. Gamma-ray spectrometry can also provide valuable indirect applications for mineral exploration where one or more of the radioactive elements is either enriched or depleted as a result of alteration associated with mineralization.

The characteristic energy of gamma-ray emissions from the potassium 40 isotope allows direct measurement of the concentrations of potassium. Concentrations of uranium and thorium, however, are inferred indirectly by detection of gamma-ray photons emitted by their long-lived daughter products, Bismuth 214 and Thallium 208, respectively. For this reason, gamma-ray spectrometric measurements of uranium and thorium concentrations are referred to as equivalent uranium (eU) and equivalent thorium (eTh). Several corrections were applied to the raw window counts prior to conversion to standard concentration units, including: system dead time; background activity from cosmic radiation, the aircraft and atmospheric radon decay products; spectral scattering in the ground, air and detectors; deviations of altitude from the planned terrain clearance; and temperature and pressure variations.

More detailed information about individual surveys can be found within individual contractor survey reports, available through GSNL's online Geoscience Atlas.

Acknowledgements

The authors would like to thank Ian Honsberger for initiating this project and his encouragement and support throughout its progression, and Mark Pilkington (GSC) for his helpful comments and suggestions to improve the maps.

References

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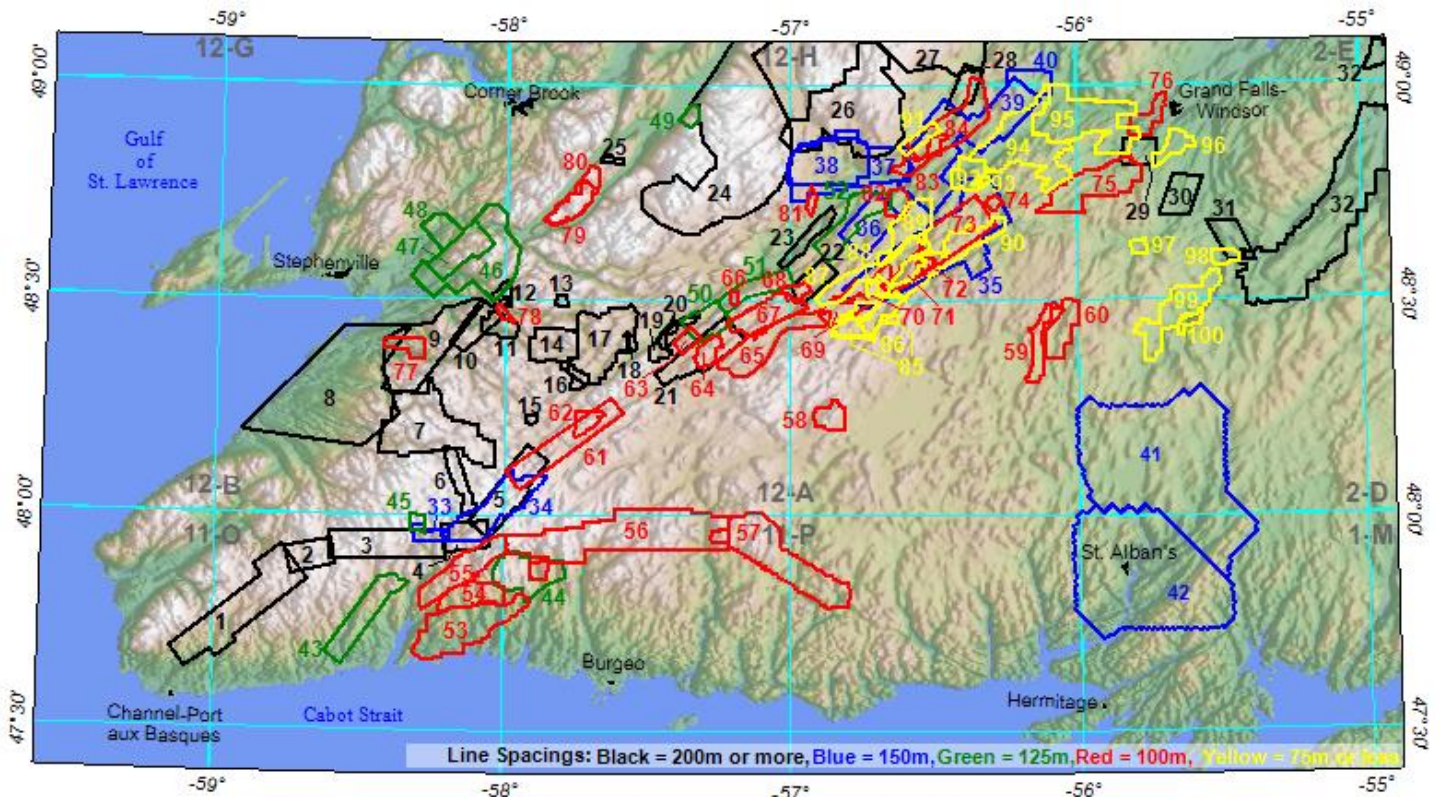
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The detection of potassic alteration by gamma-ray spectrometry – Recognition of alteration related to mineralization, in *Proceedings of Exploration 97: Fourth Decennial International Conference on Mineral Exploration*, (ed.) A.G. Gubins, pp. 741-752. <http://dx.doi.org/10.1190/1.1444884>

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The following index map and table provide locational and source information for the industry surveys that were merged in this project. Shaded lines in the table indicate surveys for which radiometric data were collected. Individual surveys can be identified as colour polygons on the index map and by corresponding numbers in the table below.



SURVEY INDEX AND NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

Index Number	Survey ID	Survey Area	Contractor	Client	Year	Line Spacing (m)	Mag Sensor Height (m)	Survey Type	Platform
1	DN09268	Cape Ray Blocks 1,2,3	Fugro	Cornerstone Capital Resources Inc.	2003	200	100	M	F
2	DN09269	Cape Ray Block 4	Fugro	Cornerstone Capital Resources Inc.	2003	200	100	M	F
3	DN09270	Cape Ray Block 5	Fugro	Cornerstone Capital Resources Inc.	2003	200	100	M	F
4	DN09272	Cape Ray Block 6	Fugro	Cornerstone Capital Resources Inc.	2003	200	100	M	F
5	DN09273	Cape Ray Blocks 7,8,9	Fugro	Cornerstone Capital Resources Inc.	2003	200	100	M	F
6	DN04730	Prospectors Pond	Aero Surveys	New Island Resources Inc.	1997	220	30	E-M	H
7	DN04729	Robinsons River	Aero Surveys	New Island Resources Inc.	1997	220	30	E-M	H
8	DN08003	Stephenville / Flat Bay	AeroQuest	Vulcan Minerals Inc.	2006	200	30	M	H
9	DN13780	Stephenville / Steel Mountain	AeroQuest	Marathon PGM Corp.	2008	250	51	E-M	H
10	DN11185	Nita's Brook Property	AeroQuest	Benton Resources Corp.	2005	200	47	E-M	H
11	DN16756	Puddle Pond - Barachois Brook Block E	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
12	DN16755	Puddle Pond - Barachois Brook Block G	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
13	DN16753	Puddle Pond - Barachois Brook Block F	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
14	DN16751	Puddle Pond - Barachois Brook Block C	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
15	DN16757	Puddle Pond - Barachois Brook Block D	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
16	DN16519	Puddle Pond - Barachois Brook Block B	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
17	DN14324	Puddle Pond / Long Range	Geotech	Royal Roads Corp.; Benton Resources Corp.	2008	200	62	E-M	H
18	DN16752	Puddle Pond - Barachois Brook Block A	Fugro	Buchans Minerals Corp.; Benton Resources Corp.; Buchans River Ltd.; Quest Inc.; R. Quinlan	2009	200	35	E-M	H
19	DN17484	Lloyds Lake / MolyPeak & Horn-Mesh	Geotech	Puddle Pond Resources Inc.; North Range Resources Ltd.	2011	200	69	E-M	H
20	DN01003	Lloyds River	Aerodat	Noranda Mining & Exploration Inc.	1995	200	45	E-M-V	H
21	DN01001	Stanley Waters	Aerodat	Noranda Mining & Exploration Inc.	1995	200	45	E-M-V	H
22	DN01002	Harmsworth Steady	Aerodat	Noranda Mining & Exploration Inc.	1995	200	45	E-M-V	H
23	DN13692	Red Indian Lake / Healy Bay	AeroQuest	Messina Minerals Inc.	2007	200	51	E-M	H
24	DN14044	Topsails Block 2	UTS Geophysics	Altius Resources Inc.; JNR Resources Inc.	2008	200	50	M-R	F
25	DN07590	Block B, Glover Island	Fugro	New Island Minerals Ltd.	2000	200	40	E-M	H
26	DN15609	Topsails Block 3	UTS Geophysics	Altius Resources Inc.; JNR Resources Inc.	2008	200	50	M-R	F
27	DN15629	Topsails Block 1	UTS Geophysics	Altius Resources Inc.; JNR Resources Inc.	2008	200	50	M-R	F
28	DN11109	LJG Property	AeroQuest	Benton Resources Corp.	2005	200	47	E-M	H
29	DN08867	Twilight	Goldak	Altius Resources Inc.	2002	200	80	M-V	F
30	DN08250	Paradise Lake	Goldak	Altius Resources Inc.	2002	200	80	M-V	F
31	DN07724	Rolling Pond	Goldak	Altius Resources Inc.	2002	200	80	M-V	F
32	DN24569	Gander Lake South	CGG / Fugro	Palisade Resources; Krinor Resources; New Found Gold Corp.	2017	200	35	E-M	H
33	DN17878	Finger Pond West	Geotech	Marathon Gold Corp.	2012	150	50	E-M	H
34	DN17860	Finger Pond East	Geotech	Marathon Gold Corp.	2012	150	50	E-M	H
35	DN02032	Tally Pond & Duck Pond	Aerodat	Noranda Mining & Exploration Inc.	1988	150	45	E-M-V	H
36	DN08012	Buchans Block C	CGG Geotrex-Dighem	Billiton Exploration Canada Ltd.	1998	150	73	E-M	F
37	DN08011	Buchans Block B	CGG Geotrex-Dighem	Billiton Exploration Canada Ltd.	1998	150	73	E-M	F
38	GSC	Red Indian Line II – L	CGG Geotrex-Dighem	BHP Billiton	1998	150	73	E-M	H
39	DN08013	Buchans Block D	CGG Geotrex-Dighem	Billiton Exploration Canada Ltd.	1998	150	73	E-M	F
40	GSC	Red Indian Line II – I	CGG Geotrex-Dighem	Billiton	1998	150	73	E-M	H
41	DN09913	Twillick Brook	Sander Geophysics Ltd.	Geological Survey of Newfoundland and Labrador	2019	150	90	M-R-V	F
42	DN09911	St. Alban's	Goldak Airborne Surveys	Geological Survey of Newfoundland and Labrador	2015	150	125	M-R	F
43	DN12507	La Poile	AeroQuest	UCore Uranium Inc.	2007	125	30	E-M-R	H
44	DN12421	Peter Snout	AeroQuest	UCore Uranium Inc.	2007	125	30	E-M-R	H
45	DN12513	Deep Brook	AeroQuest	UCore Uranium Inc.	2007	125	30	E-M-R	H
46	DN12145	Lost Pond Ext. 1	AeroQuest	UCore Uranium Inc.	2006	125	30	E-M-R	H
47	DN12128	Lost Pond	AeroQuest	Hot Rock Uranium Corp.; UCore Uranium Inc.	2006	125	30	E-M-R	H
48	DN12510	Lost Pond Ext. 2	AeroQuest	UCore Uranium Inc.	2006	125	30	E-M-R	H
49	DN12512	Grommit Lake	AeroQuest	UCore Uranium Inc.	2007	125	30	E-M-R	H
50	N00192	Glitter Pond	Dighem	BP Resources Canada Ltd.; Noranda Exploration	1990	125	48	E-M-V	H
51	N00197,8	Tulks Hill	Aerodat	BP Resources Canada Ltd.; Noranda Exploration	1990	125	48	E-M-V	H
52	N00195,6	Bobby's Pond West	Aerodat	BP Resources Canada Ltd.; Noranda Exploration	1990	125	48	E-M-V	H
53	DN14551	Hope Brook	AeroQuest	Quest Inc.; Quinlan Prospecting; Stares Prospecting; Benton Resources Corp.	2008	100	40	M	F
54	DN12359	Strickland	AeroQuest	Commander Resources Ltd.	2006	100	30	E-M-R	H
55	DN11417	Hermitage West	AeroQuest	Pathfinder Resources Ltd.; Commander Resources Ltd.	2006	100	30	E-M-R	H
56	DN11414	Hermitage Central	AeroQuest	Commander Resources Ltd.	2006	100	30	E-M-R	H
57	DN11423	Hermitage East	AeroQuest	Pathfinder Resources Ltd.; Commander Resources Ltd.	2006	100	30	E-M-R	H
58	DN11296	Granite Lake Project	AeroQuest	Playfair Mining Ltd.	2006	100	30	E-M-R	H
59	DN06682,3	Great Burnt Lake Block B & A	AeroQuest	Celtic Minerals Ltd.	2007	100	30	E-M	H
60	DN08783	Pipestone Pond	Sial	Celtic Minerals Ltd.	1996	100	45	E-M-V	H
61	DN14441	Staghorn Lake	AeroQuest	Metals Creek Resources Corp.	2009	100	50	M	F
62	DN24339	Victoria Lake / Victoria River	Scott Hogg & Associates	Antler Gold Inc.; Altius Resources Inc	2017	100	35	M	H
63	DN11925	Boomerang	AeroQuest	Messina Minerals Inc.	2006	100	30	E-M-R	H
64	DN18453	Victoria Lake	AeroQuest	Crosshair Exploration and Mining Corp.; Paragon Minerals Corp.	2011	100	59	E-M	H
65	DN10943	Valentine Lake	Geophysics GPR International	Richmont Mines Inc.; Mountain Lake Resources Inc.	2007	100	30	M-R-V	H
66	DN10212	Tulks Hill	AeroQuest	Prominex Resources Corp.	2006	100	51	M-E	H
67	DN11802	Long Lake	AeroQuest	Messina Minerals Inc.	2006	100	47	E-M	H
68	DN12569	Costigan Lake	AeroQuest	Messina Minerals Inc.	2007	100	51	E-M	H
69	DN14158	South Tally Pond Block 1	AeroQuest	Paragon Minerals Corp.	2011	100	59	E-M	H
70	DN08183	South Tally Pond	McPhar	Altius Resources Inc.; Thundermin Ltd.	2004	100	65	E-M	H
71	DN13583	South Tally Pond Block 2	AeroQuest	Paragon Minerals Corp.	2011	100	59	E-M	H
72	DN10541	Tally Pond	Geotech	Buchans River Ltd.; Royal Roads Corp.	2008	100	63	M-E	H
73	DN10044	Duck Pond	Geotech	Teck Limited	2008	100	62	M-E	H
74	DN11681	Burnt Pond	Geotech	Buchans River Ltd.; Royal Roads Corp.	2008	100	63	E-M	H
75	DN24281	Grand Falls / Crystal Lake	Scott Hogg & Associates	Antler Gold Inc.; Altius Resources Inc.	2017	100	35	M	H
76	DN05015	Grand Falls – Windsor	Aero Surveys	Copper Hill Resources Inc.; Pearl Resources Inc.	1997	100	30	E-M	H
77	DN13780	Stephenville / Steel Mountain	AeroQuest	Marathon PGM Corp.	2008	100	51	E-M	H
78	DN17369	Southwest Brook / Four Corners	Fugro	Four Corners Mining Corp.; Triple Nine Resources Ltd.	2010	100	35	E-M	H
79	DN12245	Glover Island	Geotech	Crew Gold Corp.	2008	100	68	E-M	H
80	DN07584	Block A, Glover Island	Fugro	New Island Minerals Ltd.	2000	100	40	E-M	H
81	DN12697	Red Indian Lake / Skidder Brook	AeroQuest	Messina Minerals Inc.	2007	100	51	E-M	H
82	DN08787	Hungry Hill	Sial	Celtic Minerals Ltd.	1996	100	45	E-M-V	H
83	DN20398	Buchans Junction	CGG / Fugro	Xstrata Zinc Canada; Canstar Resources Inc.	2012	100	35	E-M	H
84	DN09904	Little Joe Glodes	Fugro	Geological Survey of Canada; Geological Survey of Newfoundland & Labrador	2007	100	40	M	H
85	DN24310	Wilding Lake East and West	Scott Hogg & Associates	Antler Gold Inc.; Altius Resources Inc.	2017	75	35	M	H
86	DN09336	Lake Douglas	AeroQuest	Paragon Minerals Corp.	2007	75	51	E-M	H
87	DN10465	Harpoon Lake & Barren Lake	AeroQuest	Paragon Minerals Corp.	2007	75	51	M-E	H
88	DN18888	South Tally Pond / Lemarchant	AeroQuest	Paragon Minerals Corp.	2011	75	59	E-M	H
89	DN03088	South Golden Promise 2	Fugro	Rubicon Minerals Corp.	2003	75	30	E-M	H
90	DN24154	Noel Paul's Brook	Scott Hogg & Associates	Antler Gold Inc.; Altius Resources Inc.	2017	75	35	M	H
91	DN17364	Buchans Junction	Geotech	Eagleridge International Ltd.; Vinland Resources	2012	50	49	E-M	H
92	DN03087	South Golden Promise 1	Fugro	Rubicon Minerals Corp.	2003	75	30	E-M	H
93	DN08947	Licence 8947M	Fugro	Rubicon Minerals Corp.	2003	75	30	E-M	H
94	DN03080	Golden Promise West	Fugro	Rubicon Minerals Corp.	2003	75	30	E-M	H
95	DN03079	Golden Promise East	Fugro	Rubicon Minerals Corp.	2003	75	30	E-M	H
96	DN09215	Golden Star	Fugro	Linear Gold Corp.	2003	75	30	E-M	H
97	DN08291	SW Rattling Brook	Fugro	Rubicon Minerals Corp.	2002	50	30	M	H
98	DN08292	Beaver – Miguels	Fugro	Rubicon Minerals Corp.	2003	50	30	M	H
99	DN09216	Reid	Fugro	Linear Gold Corp.	2003	75	30	E-M	H
100	DN11926	Huxter Lane	AeroQuest	Paragon Minerals Corp.	2006	75	30	E-M	H

E=Electromagnetic M=Magnetic R=Radiometric V=VLF F=Fixed Wing H=Helicopter

The maps for this publication are available for free download through GEOSCAN (<https://geoscan.nrcan.gc.ca>). Corresponding digital profile and gridded data for GSC surveys can be downloaded, at no charge, from Natural Resources Canada's Geoscience Data Repository for Aeromagnetic Data at <http://gdr.agg.nrcan.gc.ca>. Corresponding digital profile and gridded data and further information regarding detailed Newfoundland surveys can be accessed or downloaded through GSNL's Geoscience Atlas, at <https://gis.geosurv.gov.nl.ca/>.

These Open Files are a contribution to the Targeted Geoscience Initiative (TGI) program of the Lands and Minerals Sector, Natural Resources Canada.

Recommended Citation for gridded data

Characterization of a highly prospective fault system with airborne geophysics data, west-central Newfoundland, parts of NTS 1-M, 2-D, 11-O, P and 12-A, B, Newfoundland and Labrador;
Geoscience Data Repository for Geophysical Data,
<http://gdr.agg.nrcan.gc.ca>.
Airborne Geophysics Section,
GSC - Central Canada Division,
Geological Survey of Canada,
Natural Resources Canada