

Ministry of Energy, Mines & Petroleum Resources  
Mining & Minerals Division  
BC Geological Survey

Assessment Report  
Title Page and Summary

TYPE OF REPORT [type of survey(s)]: **Integration of Geophysical and Geological Data in the** **Re** TOTAL COST: \$11,700.00

AUTHOR(S): Frederick A. Cook

SIGNATURE(S): Frederick Cook

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DN: cn=Frederick Cook, o=BC  
Geological Survey, c=CA  
Date: 2012.07.25 13:04:00-0700

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): \_\_\_\_\_ YEAR OF WORK: 2016-

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S): Event 5632089: Dates July 25, 2016; Aug 10,11

Jan 29, 30, Feb 7, 8, Mar 5, 6, 7, 2016

PROPERTY NAME: RD01-16, RD 02-16

CLAIM NAME(S) (on which the work was done): RD 01-16 (1040142); RD 02-16 (1041044)

COMMODITIES SOUGHT: Massive sulphides

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: \_\_\_\_\_

MINING DIVISION: Ft. Steele

NTS/BCGS: 082F

LATITUDE: 49 ° 39 ' 3 " LONGITUDE: 116 ° 23 ' 50 " (at centre of work)  
49 38 46.7 116 21 56

OWNER(S):

1) D. E. Lavoie

2) \_\_\_\_\_

MAILING ADDRESS:

2290 DeWolfe Ave.

Kimberley, BC V1A1P5

OPERATOR(S) [who paid for the work]:

1) D. E. LaVoie

2) \_\_\_\_\_

MAILING ADDRESS:

2290 DeWolfe Ave.

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PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):

Metasedimentary rock; Proterozoic; Aldridge Formation, sedex deposits

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS: Kennedy, AR34591; Lavoie et al, AR14197A;

Ransom, AR14197B; Rodgers, AR25590; Peters, AR32893

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
<b>GEOLOGICAL</b> (scale, area)			
Ground, mapping			
Photo interpretation			
<b>GEOPHYSICAL</b> (line-kilometres)			
Ground			
Magnetic			
Electromagnetic VLF-EM		1041042	\$ 2,600.00
Induced Polarization			
Radiometric			
Seismic <u>Seismic reprocessing</u>		1041042, 1041044	\$ 5,600.00
<b>Other</b>			
<b>Airborne</b>			
<b>GEOCHEMICAL</b> (number of samples analysed for...)			
<b>Soil</b>			
Silt			
Rock			
Other			
<b>DRILLING</b> (total metres; number of holes, size)			
<b>Core</b>			
Non-core			
<b>RELATED TECHNICAL</b>			
<b>Sampling/assaying</b>			
Petrographic			
Mineralographic			
Metallurgic			
<b>PROSPECTING</b> (scale, area)			
<b>PREPARATORY / PHYSICAL</b>			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other <u>Report</u>			\$3,500.00
<b>TOTAL COST:</b>			<b>\$11,700.00</b>

Assessment Report:

**Integration of Geophysical and Geological Data in the  
Redding Creek Area: RD 01-16 and RD 02-16 Claims**

**MTO event 5632089**

**Approximate centres of claims:**

**North 49° 39' 3.5"; West 116° 23' 50.6"**

**UTM Zone 11 543500E, 5500000N**

**and**

**North 49° 38' 46.7"; West 116° 21' 56"**

**UTM Zone 11 545800E, 5499500N**

**NTS map sheet 082F**

**Fort Steele Mining Division**

**by**

**F. A. Cook, Ph.D., P.Geo.  
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*Property Owner:*

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**March, 2017**

**BC Geological Survey  
Assessment Report  
36667**

**Table of Contents**

1.0 Summary .....3  
 2.0 Introduction and Terms of Reference.....3  
     2.1 Terms of Reference .....3  
 3.0 Mineral Tenure Description and Location.....6  
 4.0 Accessibility and Physiography.....6  
 5.0 Exploration History .....6  
 6.0 Geological Setting.....7  
 7.0 Work Accomplished in 2016 .....8  
     7.1 Seismic reflection data ..... 8  
         7.11 Data processing .....8  
         7.12 Interpretation ..... 10  
     7.2 VLF-EM survey ..... 12  
         7.21 Data acquisition and processing ..... 12  
         7.22 Inversion results..... 14  
 8.0 Summary and Conclusions ..... 19  
 9.0 References..... 20  
 10.0 Statement of costs..... 21  
 11.0 Statement of qualifications ..... 22

**Table**

Table 1 Description of the MB01-16 mineral titles .....6

**Figures**

Figure 1 Satellite image, St. Mary lake area .....4  
 Figure 2 Geological map of the St. Mary Lake area.....5  
 Figure 3a Seismic reflection data Line 5.2.....9  
 Figure 3b Reprocessed Seismic reflection data.....9  
 Figure 4 Stratigraphic section/synthetic seismic trace ..... 10  
 Figure 5a Line 5.2 interpretation – contacts and faults ..... 11  
 Figure 5b Line 5.2 interpretation – formations..... 11  
 Figure 6 Map of VLF-EM survey..... 13  
 Figure 7 Recorded data for VLF survey..... 14  
 Figure 8 VLF inversions calculated responses ..... 15  
 Figure 9 VLF inversions ..... 16  
 Figure 10 VLF inversions with drill holes projected ..... 17  
 Figure 11 Interpreted line seismic line 5.2 with VLF ..... 18

**Appendices**

Appendix 1 Seismic line 5.2 ..... 23  
 Appendix 2 Recorded VLF data..... 25  
 Appendix 3 VLF inversions ..... 27

## 1.0 Summary

Integration of geological and geophysical data in the Redding Creek area of southeastern British Columbia has led to the delineation of a suite of geophysical anomalies that are spatially associated with surface showings of polymetallic veins and shear zones. These include: 1) stratigraphic and structural features delineated on seismic reflection data that lead to the conclusion that the Lower Aldridge – Middle Aldridge contact ('Sullivan horizon') rises to within a few hundred meters of the surface near strong soil anomalies and extensive rock geochemical anomalies, and, 2) a series of near-surface conductors delineated on a reconnaissance VLF-EM profile.

## 2.0 Introduction and Terms of Reference

The purpose of this report is to describe results of integrating geophysical and geological data in the region of the Redding Creek drainage west of St. Mary Lake (Figure 1). A central feature of the analysis is the inclusion of a regional seismic reflection profile (line 5.2) that was recorded in the mid-1980's in an effort to delineate the stratigraphy and structures of the Purcell anticlinorium in the hangingwall of the St. Mary fault. Seismic images have been enhanced to facilitate correlations to surface structures and stratigraphy that are visible in outcrop and in exploration drill holes.

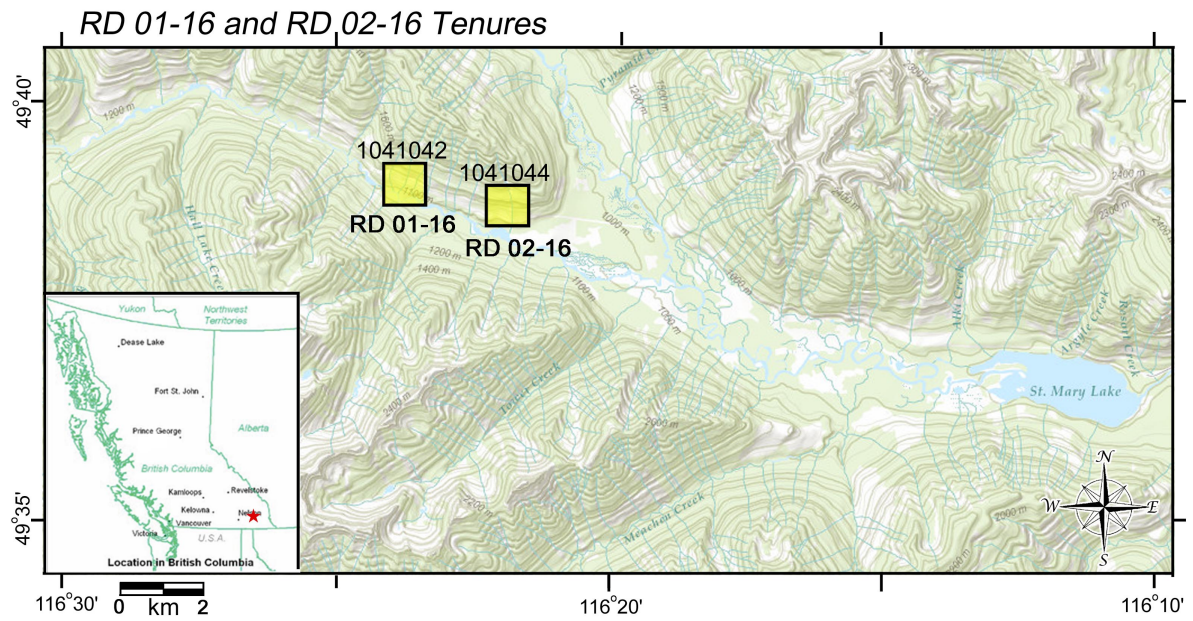
The area has been a focus of exploration activities for many decades, largely because it is near the Sullivan mine (about 25 km to the east of the claims), because the area has similar rocks to those of the Sullivan deposit, including exposed (meta-) sedimentary and igneous rocks of the Mesoproterozoic Middle and Lower Aldridge Formations, and because a number of strong showings with elevated Pb, and Zn have been found in veins, shear zones and soil geochemistry at and near the surface. Primary access is available from the Redding Creek road that diverges from the St. Mary Lake road about 15 km west of St. Mary Lake (Figures 1 and 2). This report is a description of geological and geophysical analyses undertaken in 2016.

### 2.1 Terms of Reference

Included in this report are a description of the general geological setting of the claims, a description and analysis of geophysical data and results, an interpretation and reinterpretation of geological and geophysical relationships, and an evaluation of the merits of the relevant parts of the claims. Reports reviewed by the author are listed in the reference section at the end of this report.

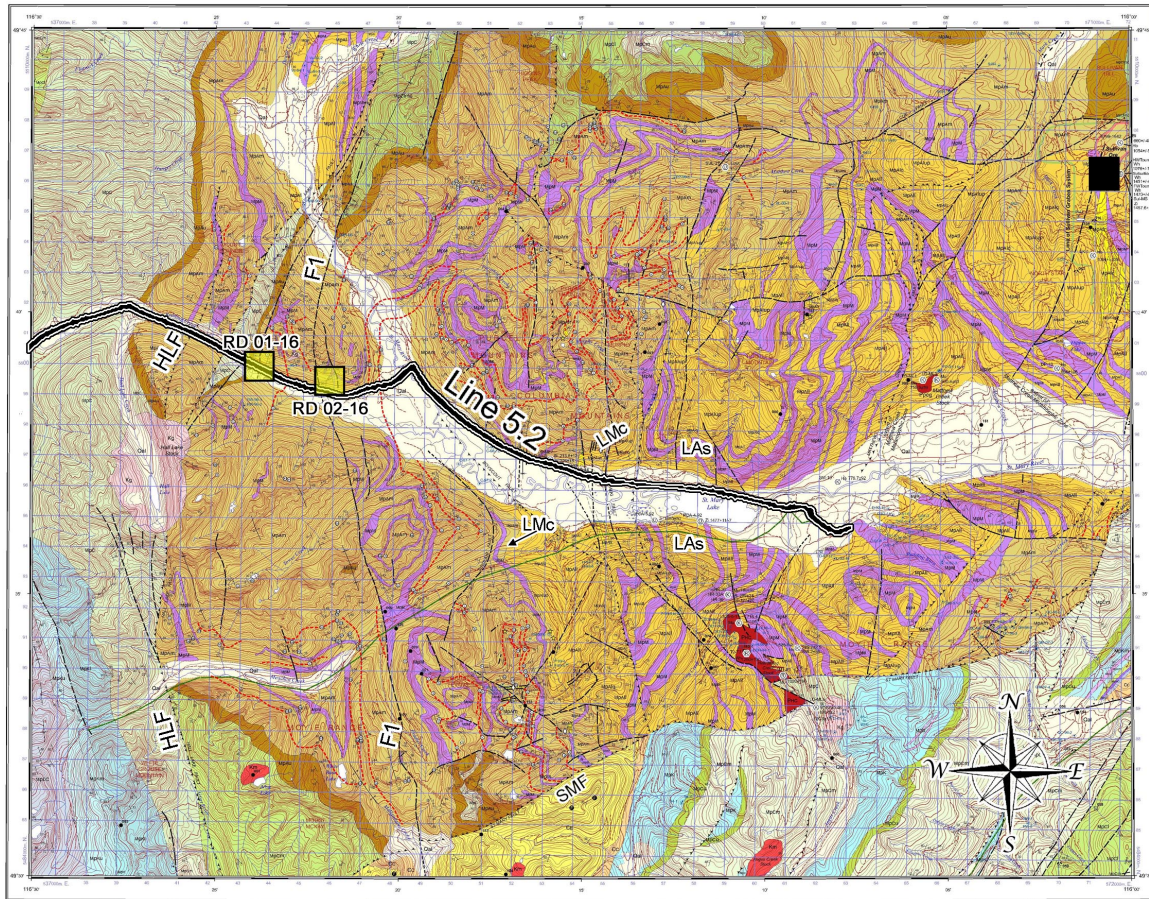
The author is familiar with the geology and geophysics of the region, having been responsible for acquiring geophysical data in British Columbia since 1983 and as the transect leader for the Lithoprobe Southern Canadian Cordillera transect from 1985-1995 and Transect co-leader for the Lithoprobe Slave-Northern Cordillera transect from 1995-2005.

All measurement units used in this report are metric. The coordinate system in use on the Property and on all maps is UTM zone 11 (NAD83).

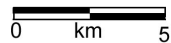


**Figure 1.** Topographic image of St. Mary Lake area with the RD 01-16 and RD 02-16 claims indicated in yellow.

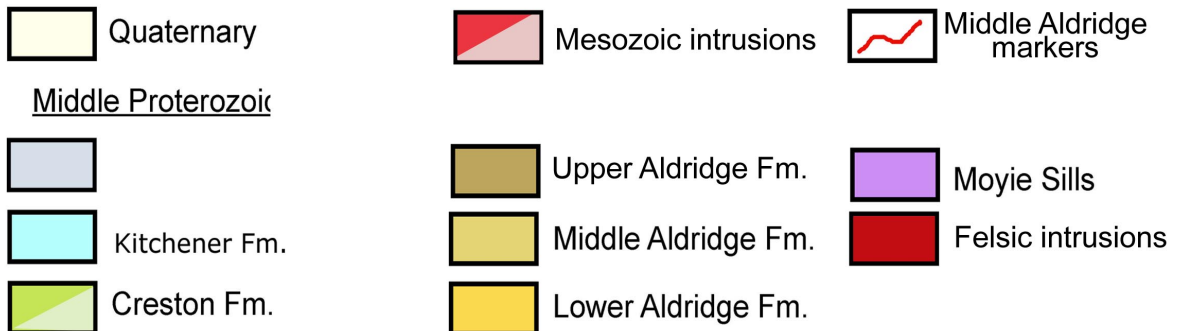
## Geology



*modified from Brown et al. 2011*



### Legend



**Figure 2.** Geological map of the St. Mary Lake area (modified from Brown et al. 2011). The location of seismic line 5.2 is shown as are a number of faults and formations. Abbreviations used are: SMF, St. Mary fault; HLF, Hall Lake fault, F1, Fiddler Creek fault and extension; LMC, Lower-Middle Aldridge contact; LAs, Lower Aldridge sills. The black rectangle in the northeast is the location of the Sullivan mine. Note the sharp bend in the seismic line approximately 2 km east of RD 02-16 where the Redding Creek road diverges southward from the St. Mary lake road.

### 3.0 Mineral Tenure Description and Location

The RD 01-16 and RD 02-16 claims are located in southeastern British Columbia approximately 25 km southwest of Kimberley, BC (Figures 1 and 2). The claims consist of two mineral tenures containing approximately 167.31 hectares in eight cells (Table I). The mineral cell titles were acquired online and as such there are no posts or lines marking the location of the property on the ground. The claims are owned by D. Lavoie of Kimberley, BC.

Table 1: Description of the MB 01-16 mineral title.

Title Number	Claim Name/Property	Issue Date	Good To Date	New Good To Date	# of Days Forward	Area in Ha	Applied Work Value	Submission Fee
1041042	RD 01-16	2016/JAN/06	2017/JAN/06	2023/JUL/05	2371	83.65	\$ 5844.35	\$ 0.00
1041044	RD 02-16	2016/JAN/06	2017/JAN/06	2023/JUL/05	2371	83.66	\$ 5844.78	\$ 0.00

### 4.0 Accessibility and Physiography

The RD 01-16 and RD 02-16 claims are small, rectangular blocks of cells that are located along Redding creek west of St. Mary Lake (Figures 1 and 2). The claims are located approximately 25 km southwest of Kimberley, B. C. (Figures 1 and 2). Access to the property is along the St. Mary lake road from Maryville and then southwest along the Redding Creek road about 10 km west of St. Mary Lake.

In this area, the terrain is mountainous with elevation differences of as much as 1000m from the Redding Creek valley to the higher elevations.

### 5.0 Exploration History

The area in the vicinity of the property has been prospected since the Sullivan deposit was found and subsequently exploited. In the mid-1980's regional geophysical work was done to investigate the possibility of hydrocarbons in the area (Cook and van der Velden, 1995) and some of the data from this work is reprocessed and analysed in this report. Work by Cominco in 1985 included ground geophysics (HLEM and magnetics; LaJoie et al. 1985) as well as soil geochemistry (Ransom, 1985). Strong anomalies were observed on both the geophysical data and the soil geochemistry (Pb/Zn) so that the area has been under claim and the focus of additional prospecting almost continuously until today. In 1997, Abitibi Mining oversaw the drilling of two holes in the vicinity of the RD 01-16 claim that were designed to test the EM anomalies as well as the Sullivan horizon.

Rock geochemistry has found elevated Pb, Zn and Cu in shear zones and fragmental deposits on or near the claims (Kennedy, 2007), and additional soil geochemistry has extended the surface soil anomaly. In 2011, Fjordland drilled four holes near the strongest soil anomalies and intersected shear zones, parts of which had combined Pb + Zn as high as 7.00% (Peters, 2012).

## 6.0 Geological Setting

The area of this study is in the central part of the Purcell anticlinorium in Canada southwest of Kimberley, B. C. (Figure 2). The Purcell anticlinorium in this area can be subdivided into three major blocks that are separated from one another by transverse contractional faults. The lowest structural panel is the Moyie block that is dominated by the Moyie anticline. In Canada, its western and northern boundary is the Moyie fault, an east/southeast verging transverse contractional structure with at least 8-10 km of displacement. The St. Mary block is delineated on the southeast by the Moyie fault and on the northwest by the St. Mary fault. The northern most block in this area is the Hall Lake block, which is located in the hangingwall of the St. Mary's fault and the footwall of the Hall Lake fault. The RD 01-16 and RD 02-16 claims are in the hangingwall of the St. Mary fault and are thus wholly within the Hall Lake block (Figure 2).

The study area is included in Geological Survey of Canada open file 6308 (Brown et al. 2011) which is reproduced in Figure 2. The map area contains three distinct regions that are separated by major faults: 1) a triangular area in the southeast that is delimited in the northwest by the St. Mary fault, 2) a large area that dominates the map north of the St. Mary fault (SMF) and east of the Hall Lake fault (HLF) and in which the RD 01-16 and RD 02-16 claims are located, and 3) the area west of the Hall Lake fault. The St. Mary fault emplaces metasedimentary and igneous rocks of the Lower and Middle Aldridge formations and younger formations onto the rocks as young as Devonian and thus represents a major structural break. All of the rocks of interest here are in the hangingwall of the St. Mary fault, with the stratigraphic level generally rising to the west-northwest. Thus, the oldest rocks in the panel are the Lower Aldridge strata in a panel adjacent to the St. Mary fault and extending to the vicinity of the Sullivan mine. Faults confined to the hangingwall block of the St. Mary fault include the north-striking F1 fault that is located along Fiddler Creek and then projects northward across Redding Creek in the vicinity of the RD 02-16 claim (Figure 2). Exploration efforts have been focused on finding:

- 1) Stratabound deposits similar to the Sullivan deposit, primarily in the same stratigraphic interval (Lower-Middle Aldridge contact, or LM; Figure 2), or in fragmental black smoker type deposits at other stratigraphic positions (e.g., Middle Aldridge), and
- 2) Polymetallic vein deposits associated with joints, fractures or faults.

Although numerous metalliferous quartz-carbonate veins and shear zones have been found at the surface, stratabound deposits similar to the Sullivan are elusive.

## 7.0 Work Accomplished in 2016

There are two types of geophysical data that were analysed in this study: seismic reflection, and VLF-EM. Airborne geophysical (magnetics and EM) were acquired in 1996 in the area (McConnell, 1996), but have not been analysed for this project. When combined with a newly reprocessed seismic reflection profile, the data provide new perspectives on the subsurface stratigraphy, structure and possibly the exploration potential of this area. We begin with a description of the results from seismic reflection data.

### 7.1 Seismic Reflection Data

More than 1000 km of seismic reflection data were recorded in the Purcell anticlinorium in Canada in the early and middle 1980's by Duncan Energy Corporation during exploration activities for hydrocarbons. Recording was accomplished with typical industry-standard parameters for that time period and are listed in Cook and van der Velden (1995). The data have been processed and interpreted for regional studies (e. g., Cook and Van der Velden, 1995); here we focus on one of the lines that traverses part of the area, and that crosses both the RD 01-16 and RD 02-16 claims (Line 5.2 in Figure 2).

#### *7.11 Data Processing*

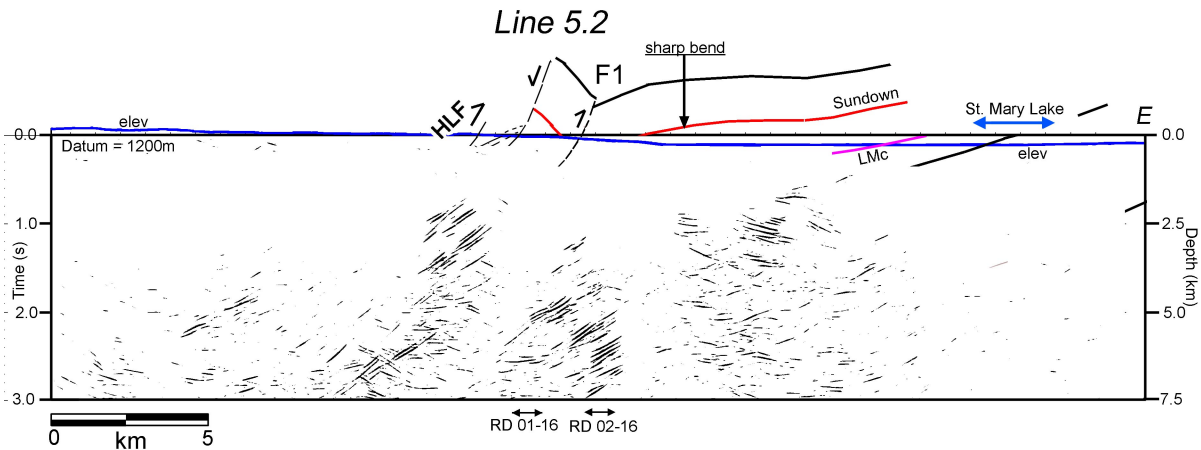
Although the data were processed initially in the mid-1990's (Figure 3a), examination of the results of that processing indicate that the structures are poorly imaged along this line. As is apparent in Figure 3a, there are numerous crossing reflections that indicate the structures are narrow, complex and not well imaged such that additional effort is warranted in order to enhance the image. A major factor in the complex image is that the original processing included only a single velocity (5000 m/s) for the migrations.

Reprocessing has consisted of filter tests, post-stack migration with variable velocities, and coherency filtering tests. The results are shown in Figure 3b. For this result, the reprocessing efforts were concentrated in the western half of the profile, between the Sinclair fault on the east and the Hall Lake fault on the west. There are two reasons for this focus: 1) the MB01-16 property is located in the western part of the line (Figures 3a and 3b), and, 2) the Lower Aldridge – Middle Aldridge contact (LMc) is located at the surface near the Sinclair fault and dips westward.

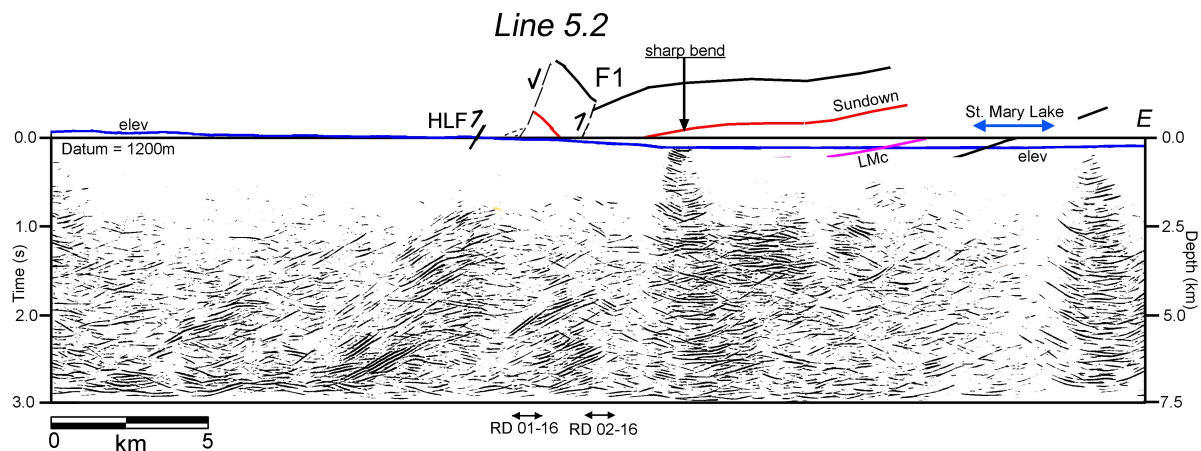
In both Figures 3a and 3b, the locations and attitudes of a number of key structures, contacts and markers at the surface are shown to facilitate interpretations. These include: 1) the Hall lake fault and F1 (Fiddler Creek) fault, 2) the surface position of the Lower Aldridge – Middle Aldridge contact (LMc) near St. Mary Lake, and 3) a narrow apparently associated with the F1 fault, along with the location and attitude of the Sundown marker in the Middle Aldridge.

The position of the elevation profile is also shown. The data were processed with a datum of 1200m (1.2 km) so that elevations that are above 1200m on the western end of the line are above the datum, whereas those to the east are below 1200m.

The migrations and filtering produce a significantly different image (Figure 3b). The new version allows for better correlations to known stratigraphy and structures so that the geological and other geophysical results can be projected into the subsurface.



**Figure 3a.** Original processed version of the line 5.2. Note the generally weak signal throughout. Following are abbreviations used: LMc, Lower-Middle Aldridge contact; F1, Fiddler Creek fault; HLF, Hall Lake fault. ‘Sundown’ is the position of the Middle Aldridge Sundown marker and sill and ‘RD 01-16’ and ‘RD 02-16’ are locations of the claims. Reprocessing has concentrated on the region east of HLF and west of the ‘sharp bend’.

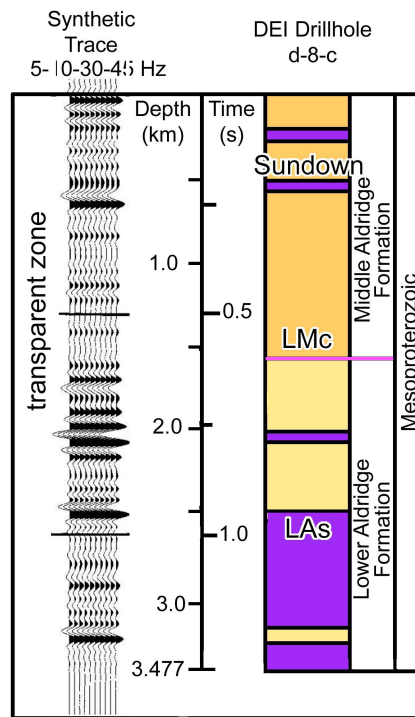


**Figure 3b.** Reprocessed version of line 5.2. This result includes variable velocities for the migration as well as additional filtering, gain and coherency filtering. Abbreviations are the same as used in Figure 3a. For this plot, an average velocity of 5.5 km/s is assumed to calculate depth.

### 7.12 Interpretation

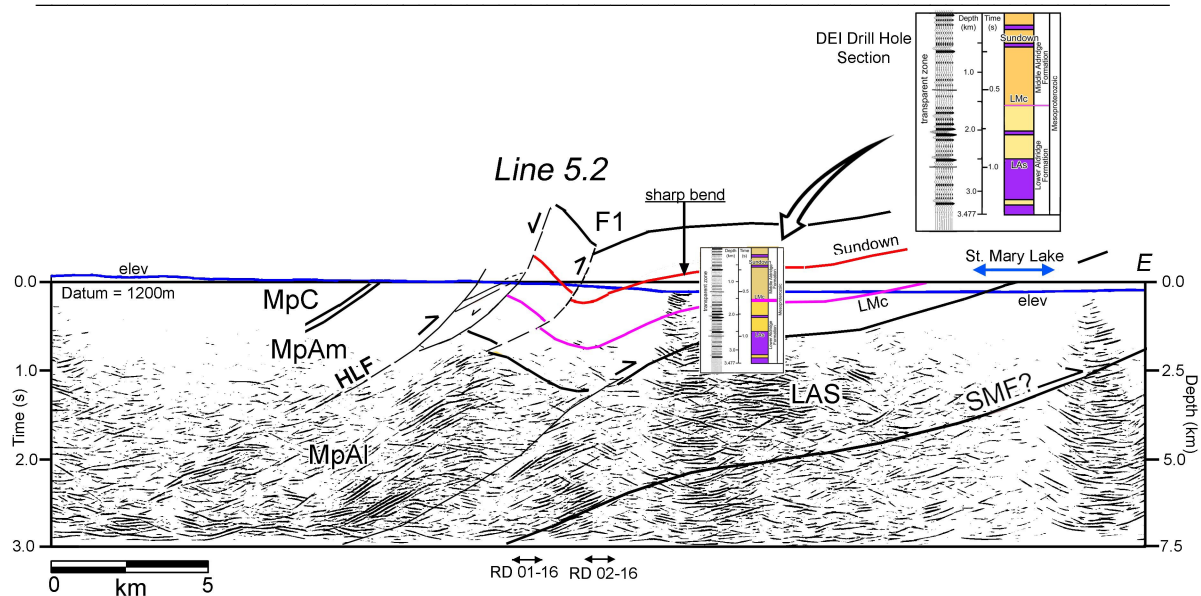
Interpretation of the enhanced version of line 5.2 is facilitated by two important constraints: 1) the positions and attitudes of contacts and faults at the surface, and 2) the consistent seismic character of the Sundown (Middle Aldridge) to Lower Aldridge/Middle Aldridge contact to Lower Aldridge sills. Specifically, as described in Cook and van der Velden (1995), the Sundown sill is a prominent and regionally extensive seismic marker, and sills in the Lower Aldridge (LAs; probably equivalent in part to the Bootleg sills near the Sullivan deposit), also produce a zone of regionally extensive and prominent seismic reflections approximately 1300-1400m (approximately 0.4-0.5 s two-way travel time) below the Sundown reflection (Figure 4). The zone between the Sundown sill and the Lower Aldridge sills is largely seismically transparent (i.e., non-reflective). The LMc, or Lower Aldridge – Middle Aldridge contact, is located within this seismically transparent zone a few hundred meters above LAs (Figure 4), but its exact location is uncertain.

This seismic-stratigraphic information is valuable for projecting the surface contacts to depth, and thus delineating the structure in the subsurface; results are shown in Figure 5.

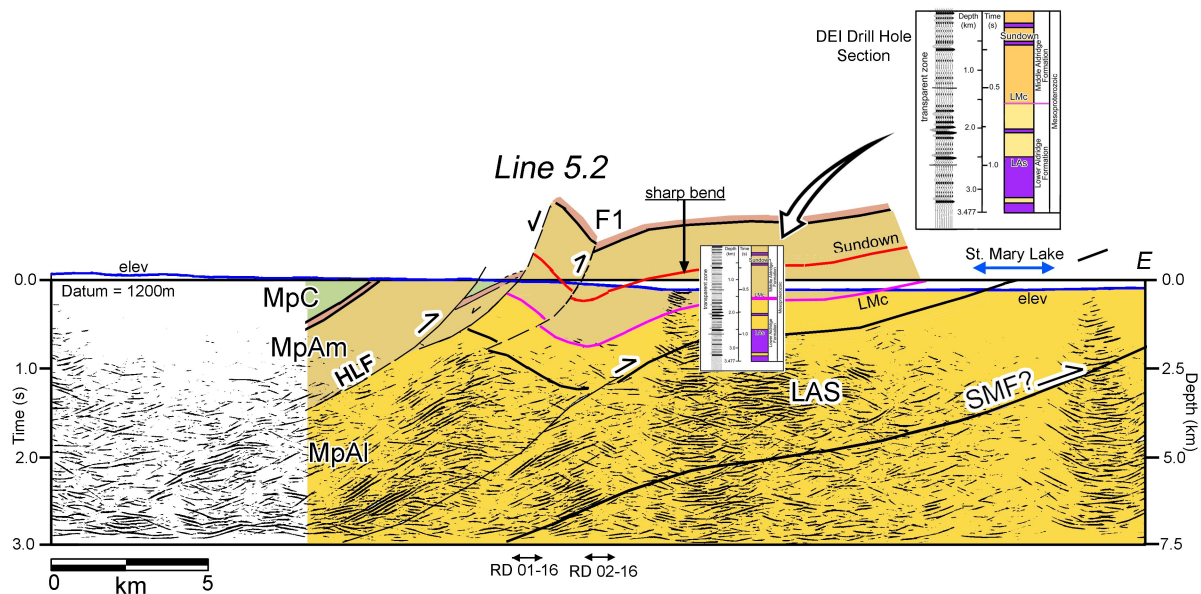


**Figure 4.** Stratigraphic section (right) and synthetic seismic trace (left) calculated for the DEI drill hole near Moyie (Cook and van der Velden, 1995). Note that the zone between the Lower Aldridge sills (LAs) and the Middle Aldridge Sundown sill is comparatively seismically transparent. The Lower Aldridge – Middle Aldridge contact (LMc) is located within the transparent zone about 900m-1000m below the Sundown sill.

The newly migrated version of the data provides a clarified view of the subsurface structure and stratigraphy and allows the faults, contacts and overall geometry to be correlated from the surface into the subsurface. Some specific features include: 1) the presence of a syncline associated with the F1 fault; 2) the faulted anticline between the Hall Lake fault and the F1 fault, and 3) the position of the LMc at the surface west of the sharp bend that can be followed into the subsurface.



**Figure 5a.** Reprocessed seismic line 5.2 with contacts and faults. The stratigraphic column and seismic trace are spliced into the line to show likely correlations to seismic reflections.



**Figure 5b.** Coloured interpretation of line 5.2. Colours are the same as used in Figure 2, sills have not been coloured individually. Additional abbreviations are: MpC, M. Proterozoic Creston; MpAl, M. Proterozoic Lower Aldridge; MpAm, M. Proterozoic Middle Aldridge.

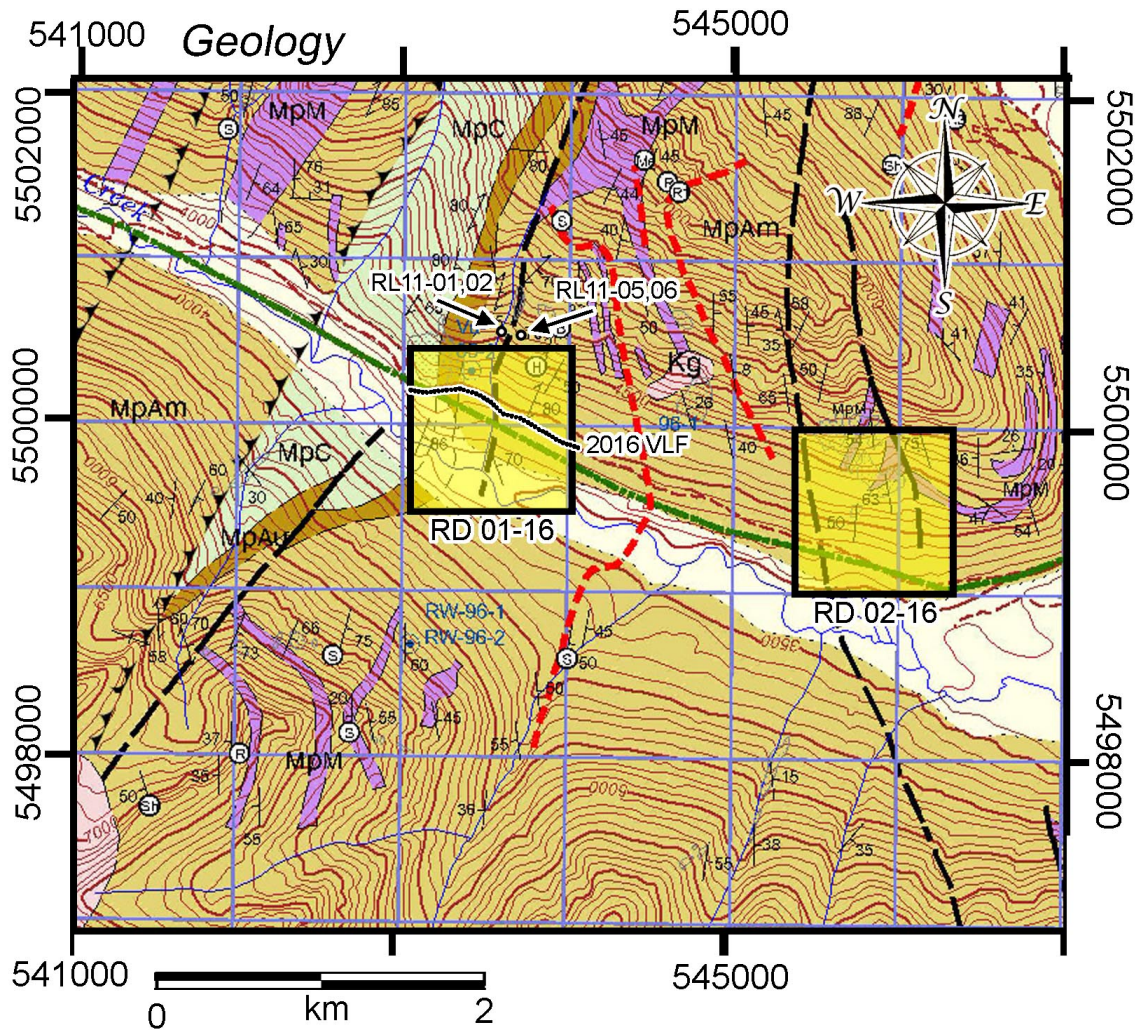
Figure 5b displays the new interpreted version of the profile that utilizes surface structural and stratigraphic information as well as the correlation with the stratigraphic column from the DEI drill hole. Two key points that derive from the interpretation are these: 1) from St. Mary Lake westward the strata generally dip gently westward to F1 fault, and, 2) The position of the LAs at depth provides a lower boundary the stratigraphic zone that contains the LMc. In other words, the west of the outcrop of LMc near St. Mary lake, the LMc flattens to approximately the sharp bend, at which point, it steepens and reverses to an eastern dip to outline the syncline near F1. One important consequence of this geometry is the LMc is probably within 300-400m of the surface on the west flank of the F1 syncline. The LMc has not been drill-tested at this location.

## **7.2 VLF-EM Survey**

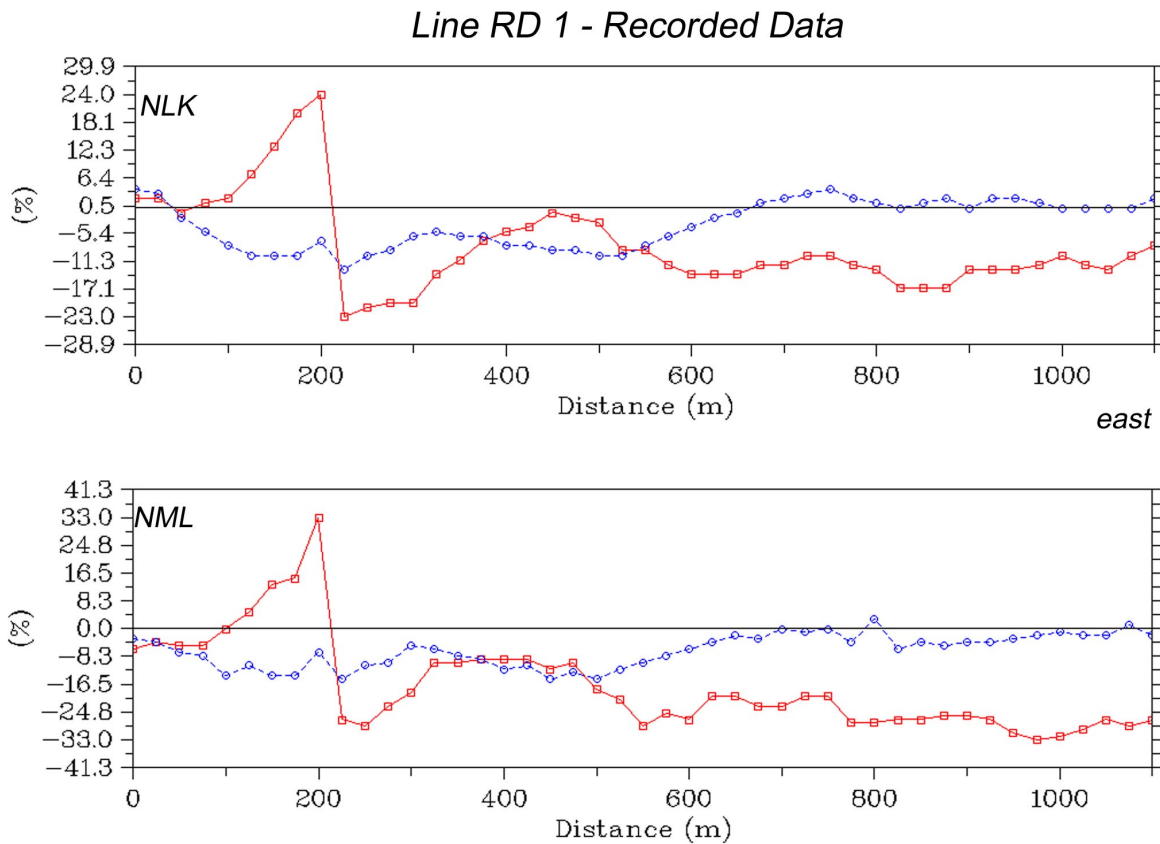
### *7.21 Data Acquisition and Processing*

In July, 2016, a reconnaissance VLF-EM profile was acquired across the RD 01-16 claim (Figure 6). The data were recorded with a Geonics EM-16 instrument that measured signals from two distant transmitters: Seattle Washington (NLK, 24800 Hz) and LaMoure, North Dakota (NML, 25200 Hz). Readings were taken at 25 m station intervals and GPS measurements were made for elevation and horizontal control at 100m intervals. The GPS results were then interpolated to the station locations. The recorded data for the two transmitters are shown in Figure 7.

A key characteristic of the responses for the two transmitters is that, although the curves are similar, they appear to be reversed in polarity relative to one another. This is caused by the orientation of the transmitter relative to the instrument. Accordingly, prior to applying inversion, it is necessary to reverse the signal for the data recorded for the LaMoure, North Dakota (NML) transmitter.



**Figure 6.** Map of the geology near the RD 01-16 property extracted from the map in Figure 2 showing the location of the 2016 VLF line. Note that it does not coincide exactly with the seismic line 5.2. The reason for that is that the seismic line is delineated by the locations of depth points, which can be positions slightly off of the road due to road curvature.



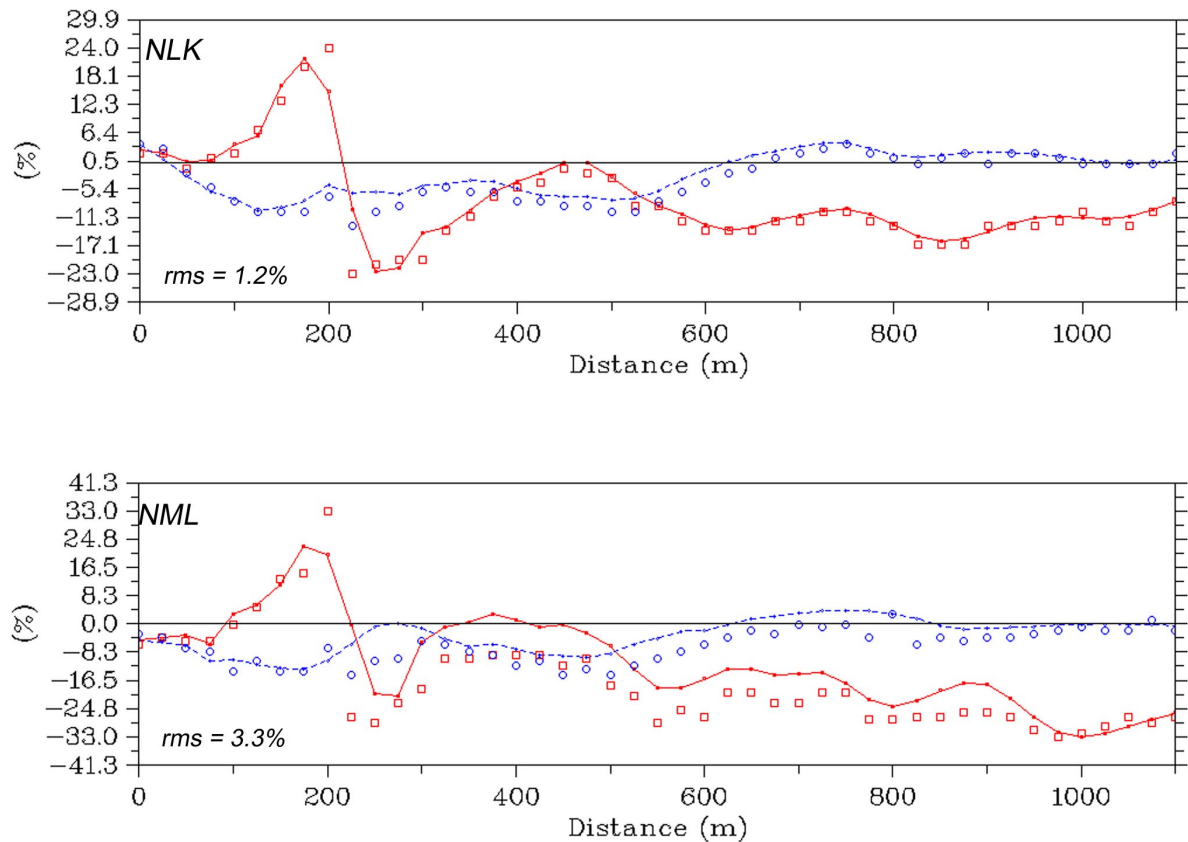
**Figure 7.** Recorded data for VLF line MB-1; (upper) data from the Seattle transmitter (NLK); (lower) data from the LaMoure, North Dakota transmitter (NML). Red lines are the in-phase components and the blue lines are the quadrature. The polarity of the NLK data has been reversed.

### 7.22 Inversion Results

Filtering of the data was tested, but the data quality is sufficiently high that inversions on the filtered data were little different than those done without any filtering. Hence, the additional processing (e.g., inversions) described here were applied to the unfiltered data. Inversions were accomplished with the EMTOMO software, the principles of which were described in Monteiro-Santos et al. (2006).

The inversion procedure was applied to the data and the responses for each of the models derived from the inversion are shown in Figure 8. In most cases it is preferable that the RMS misfit be near 2% or less and. In these results, the inversion of the NLK data produced and RMS misfit of 1.2%, whereas inversion of the NML data produced a slightly higher RMS value (3.3%).

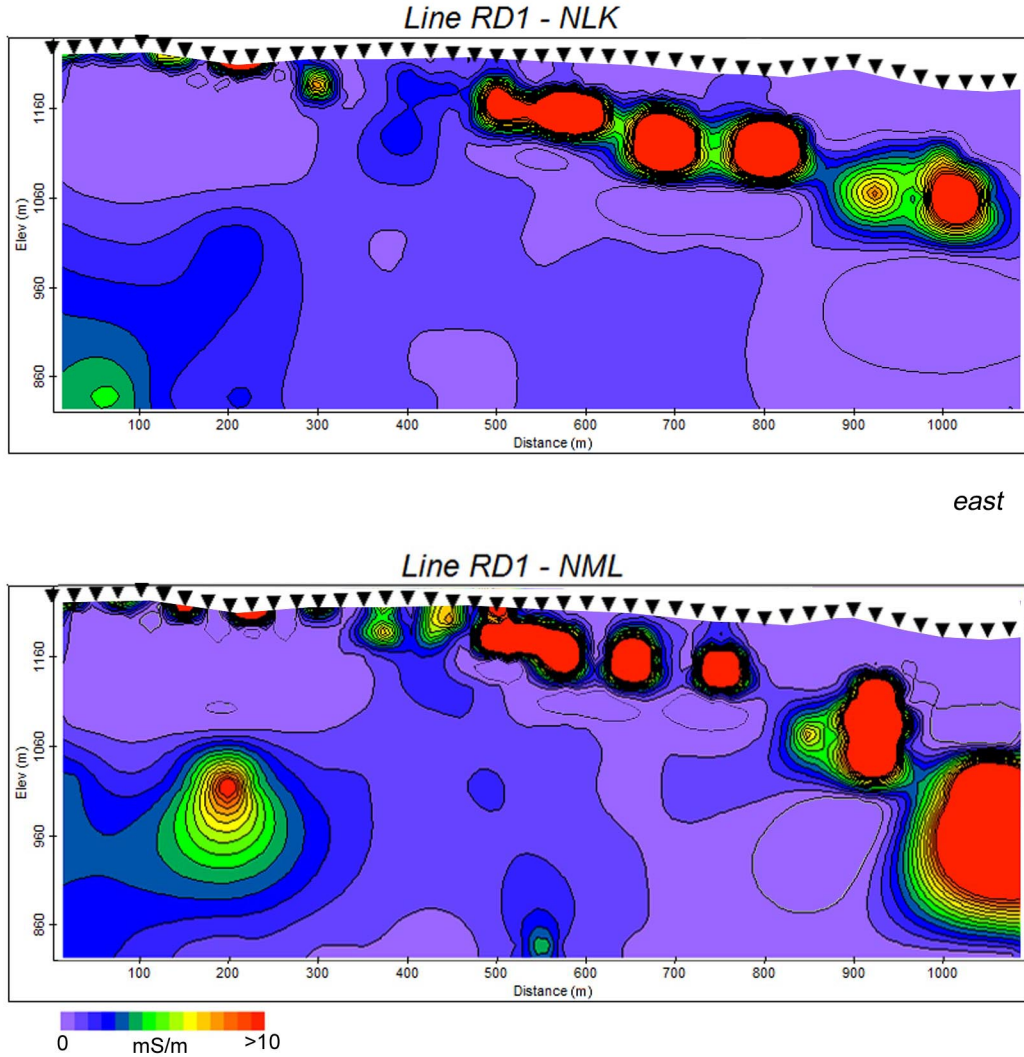
### Line RD 1 - Inversion Responses



**Figure 8.** (upper) recorded data from the Seattle (NLK) transmitter (dots) with the calculated response from the inversion (lines) to the filtered data (lines); (lower) recorded data from the NML transmitter (dots) with the calculated response from the inversion (lines) to the filtered data (lines).

The inversion models for each transmitter are shown in Figure 9. For these results, the inversions were attempted to about 400m depth. This is unusually deep to investigate VLF signals. The depth of signal penetration is usually described by a quantity known as the ‘skin depth’. The skin depth is the depth at which the signal drops to a value of  $1/e$  of the signal at the surface. It is dependent on the signal frequency and electrical conductivity of the near-surface rocks. In this area, the near-surface conductivity is typically 1000 Ohm-m or more (Gupta and Jones, 1995), so that for these frequencies (about 25 kHz), the skin depth is about 100m. For the inversions presented here, background resistivity is set at 1000 Ohm-m. The results of the inversion are contoured in values of conductivity (in milli-Siemens per meter, or mS/m).

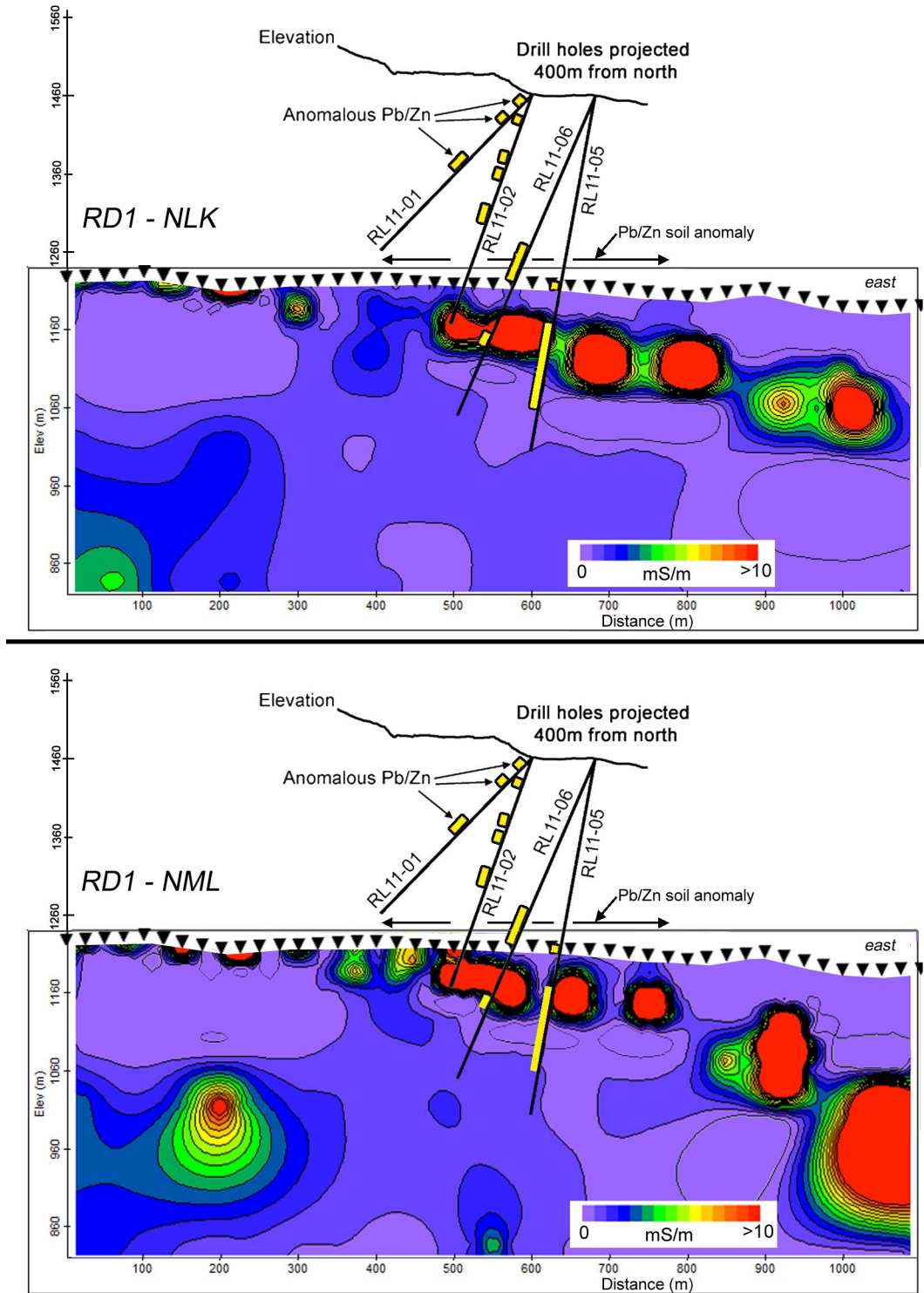
The inversions show similar geometry and conductors on each of the transmitter versions. The most obvious feature is a series of discrete apparent high conductivity zones that collectively dip eastward from the surface at about 200-300m distance to approximately 900-1000m elevation (150-200m depth) on the east end of the line. In the vicinity of 200-300m distance at the surface are shear zones that exhibit elevated Pb, Zn and Ag.



east

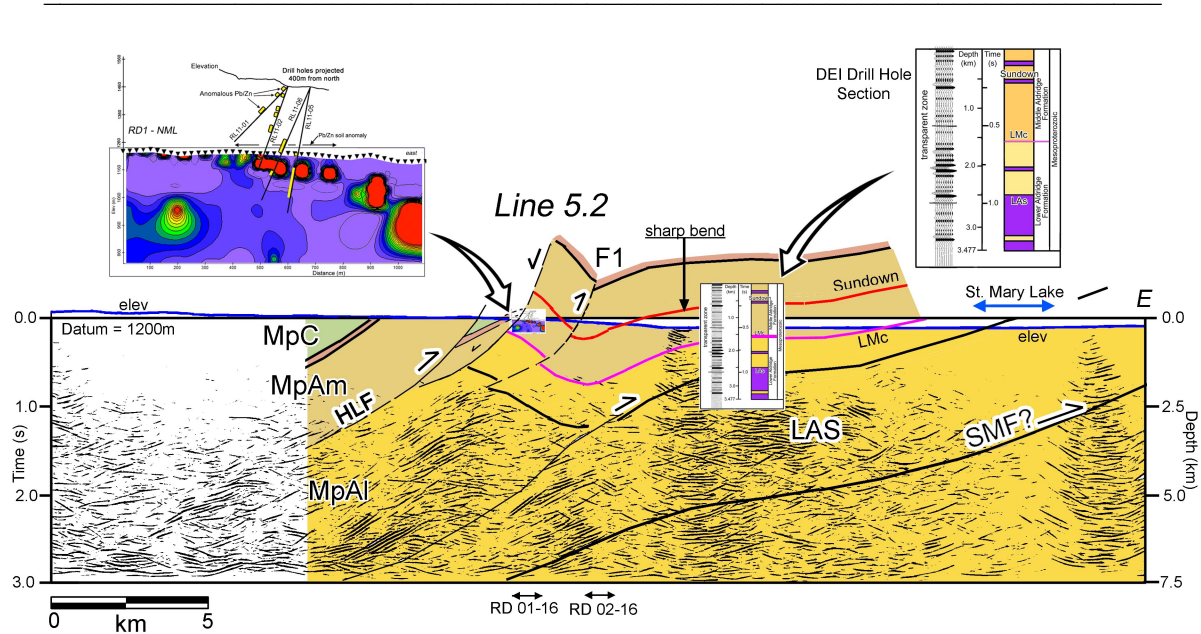
**Figure 9.** Inversions of the Redding Creek, RD1, VLF-EM profile for the Seattle, Washington (NLK) transmitter (upper) and the LaMoure, North Dakota (NML) transmitter (lower).

Additional information on the nature of the conductors is provided by projecting four of the drill holes that were completed by Fjordland approximately 400m north of the VLF line (Peters, 2012). Figure 10 shows the correlation after projection.



**Figure 10.** (upper) Inversion result for the NLK transmitter and (lower) for the NML transmitter with drill holes projected from 400m to the north. The yellow zones in the drill holes are shear zones where the elevated values of Pb and Zn are observed (Peters, 2012).

Finally, the VLF inversions can be correlated with the seismic geometry as shown in Figure 11. Two observations are significant: 1) the east-dipping zone of (apparent) conductors coincides with the east-dipping west flank of the syncline described previously, and 2) the deep conductor at about 1000m elevation beneath the western part of the cross section is located at, or slightly above, the interpreted location of the LMc.



**Figure 11.** Correlation of the VLF-AM profile (NML transmitter version) with the interpreted seismic reflection profile.

## 8.0 Summary and Conclusions

Integration of geophysical (seismic reflection and VLF-EM) with geological data (mapping, rock samples, and soil anomalies) in the Redding Creek area southwest of Kimberley has led to a number of findings that are relevant to the potential for the area. They are:

1. Reprocessing of the seismic reflection profile has improved definition of the subsurface structure and stratigraphy in greater detail than was previously possible;
2. A reconnaissance VLF-EM profile indicates that there are strong conductors that line up in an east-dipping zone to about 150m depth on the east end of the profile.
3. Correlation of the VLF-EM inversions with drill holes indicates that the east-dipping conductors may be associated with shear zones that were intersected in the drill holes and that appear to be consistent with east-dipping strata, including the LMc.

## 9.0 References

- Brown, D. A., MacLeod, R. F., and Wagner, C. L. (compilers) 2011. Geology, St. Mary Lake, British Columbia, Geological Survey of Canada Open File 6308, scale 1:50000.
- Cook, F., and Van der Velden, A. 1995, Three-dimensional crustal structure of the Purcell anticlinorium in the Cordillera of southwestern Canada, Geological Society of America Bulletin, v. 107, 642-644.
- Gupta, J. and Jones, A. G. 1995. Electrical conductivity structure of the Purcell anticlinorium in southeast British Columbia and northwest Montana, Canadian Journal of Earth Sciences, v. 32, p. 1564-1583.
- Kennedy, S. 2014. Prospecting and rock geochemistry program, BC Geological Survey Branch Assessment Report 34591, 20pp.
- LaJoie, J. J., Jackish, I and Ohara, I. P. 1985, Horizontal loop electromagnetic and magnetic surveys on Redd claims 4, 5, 6, and 7, BC Geological Survey Branch Assessment Report 14197A, 12pp.
- McConnell, D. L. 1996. Dighem survey for British Columbia Geological Survey and the Geological Survey of Canada, St. Mary River, Findlay Creek and Yahk areas, 77pp.
- Monteiro Santos, F.A., Mateus, A. Figueiras, J., and Gonçalves, M. A. 2006. Mapping groundwater contamination around a landfill facility using the VLF-EM method – a case study. Journal of Applied Geophysics, 60, 115-125.
- Peters, L. J. 2012. Assessment report on the St. Mary property, BC Geological Survey Branch Assessment Report 32893, 318pp.
- Ransom, P. W. 1997. Report on soil grid geochemistry, Vulcan property, Redd 4, 5, 6, and 7 claims, BC Geological Survey Branch Assessment Report 14197B, 45pp.
- Rodgers, G. 1998. Assessment report on geophysical (gravity) surveys and drilling, Clair west claims, St. Mary river area, BC Geological Survey Branch Assessment Report 25590, 77pp.

**10.0 Statement of Costs**

Property:	RD 01-16, RD02-16	
Event #	5632089	
Start - End Date:	Jan 29 – Aug 11, 2016	
Tenure work done on:	1041042, 1041044	
Type of work done:	Geophysical – Seismic, VLF	
Craig Kennedy	Fieldwork-VLF July 25 1 man day @ 500/day 1 truck day @ 100/day	500.00 100.00
Fred Cook – seismic, VLF	Jan 29, 30, Feb 7, 8, Mar 5, 6, 7, Jul 25, Aug 10, 11, 2016 9.5 Man days @ 800/day	7,600.00
	Report & Maps	<u>3,500.00</u>
Total		<u><b>\$ 11,700.00</b></u>

Note: The claims are partially located on the seismic line; the VLF profile is on RD 01-16. As noted in the text, the seismic processing concentrated on the part of the seismic line between the Hall Lake fault and the St. Mary River, and the claims about 2 km (about 1/4) of that distance. Thus the data processing for the seismic (January 29, 30, February 7, 8, Mar 5, 6, 7) does not include an additional 8-9 days that were used for processing and interpretation.

Because the claims are not adjoining, we contacted BC Mines and were told that because the work (particularly the seismic) covers both that a single report is sufficient.

## 11.0 Statement of Qualifications

I, **Frederick A. Cook** do hereby certify that:

I attained the degree of Doctor of Philosophy (Ph.D.) in geophysics from Cornell University in Ithaca, New York in 1981.

I have a B.Sc. in geology (1973) and an MSc. in Geophysics (1975) from the University of Wyoming in Laramie, Wyoming.

I am a registered member of the Association of Professional Engineers and Geoscientists of British Columbia (P. Geo. 2009). Previously, from 1984-2009, I was registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta as both a P. Geol. and a P. Goph.

I am a member of the American Geophysical Union and the Geological Society of America.

I have worked as a geophysicist/geologist for a total of 40 years since my graduation from university.

I have worked for the Continental Oil Company (1975-1977) and the University of Calgary (1982-2010).

I was the Director of the Lithoprobe Seismic Processing Facility at the University of Calgary from 1987-2003.

I have recently (2011) been appointed an International Consultant for the Chinese SinoProbe project.

I have a thorough knowledge of the geology and geophysics of southern British Columbia based on extensive geological and geophysical fieldwork.

I have authored more than 125 scholarly publications in peer-reviewed journals and books.

I am the author of this report.

I am not aware of any material fact or material change with respect to the subject matter of this report, which is not reflected in this report.

“signed and sealed” at Salt Spring Island, B.C.

**Frederick A. Cook**, P. Geo.

Salt Spring Imaging, Ltd

128 Trincomali Heights

Salt Spring Island, B.C. V8K1M8

Dated at Salt Spring Island, B.C. this 21st day of March, 2017

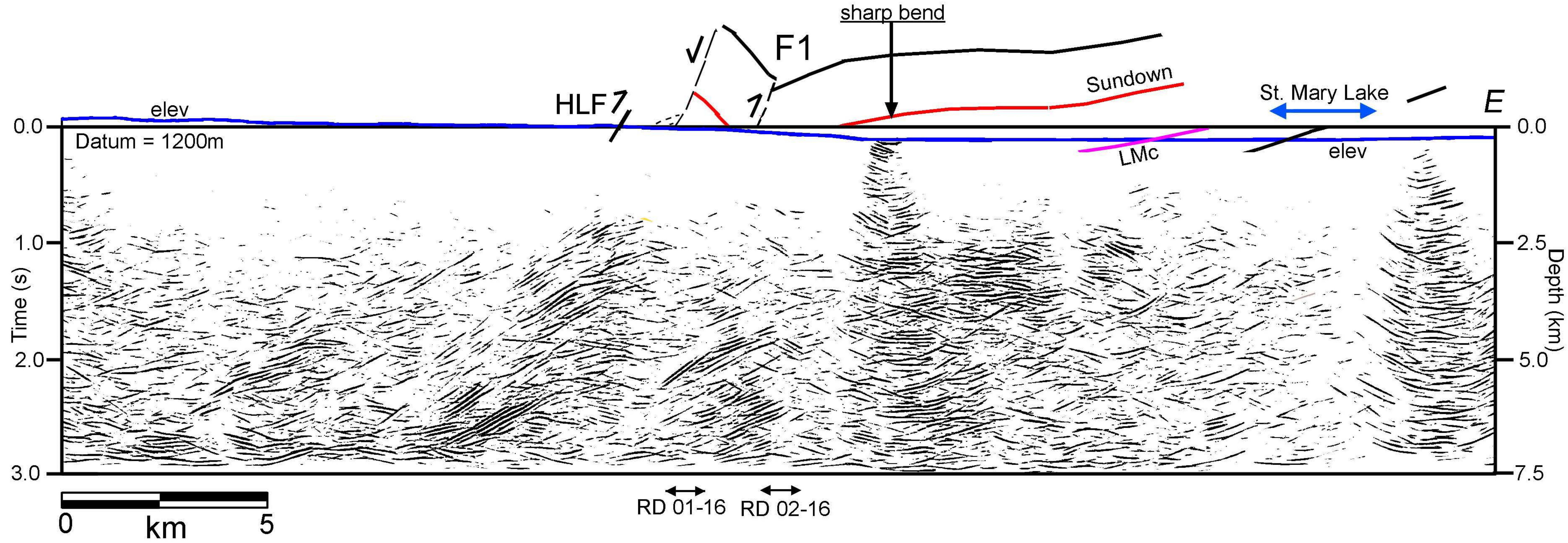
Registration License No. 34585

**Association of Professional Engineers and Geoscientists of British Columbia**

**Appendix 1. Seismic Line 5.2**

**Scale 1:50000**

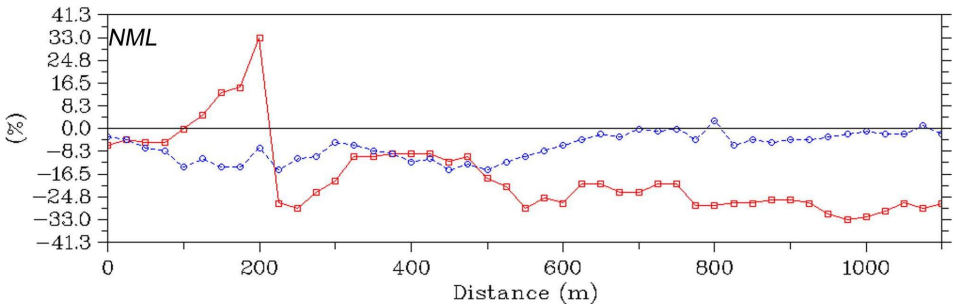
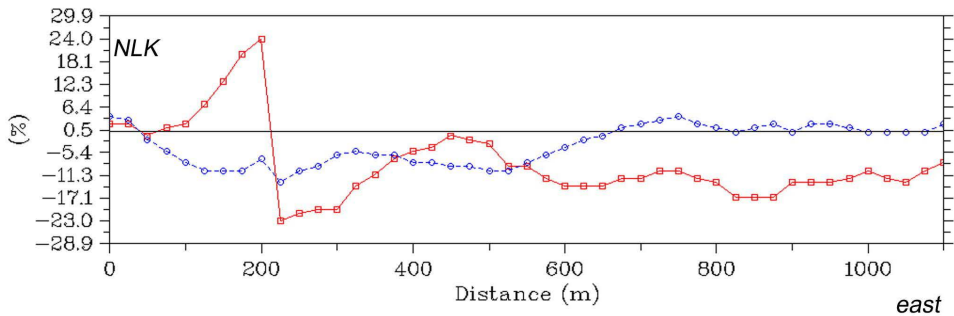
# Line 5.2



**Appendix 2. Recorded VLF Data**

**Scale 1:10000**

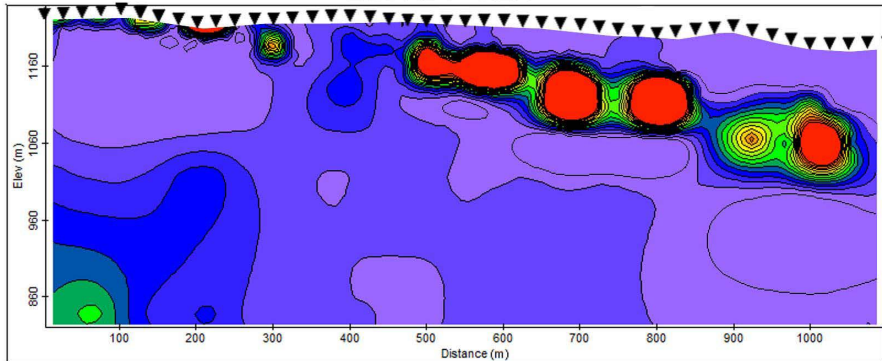
# Line RD 1 - Recorded Data



### **Appendix 3. VLF Inversions**

**Scale 1:10000**

Line RD1 - NLK



east

Line RD1 - NML

