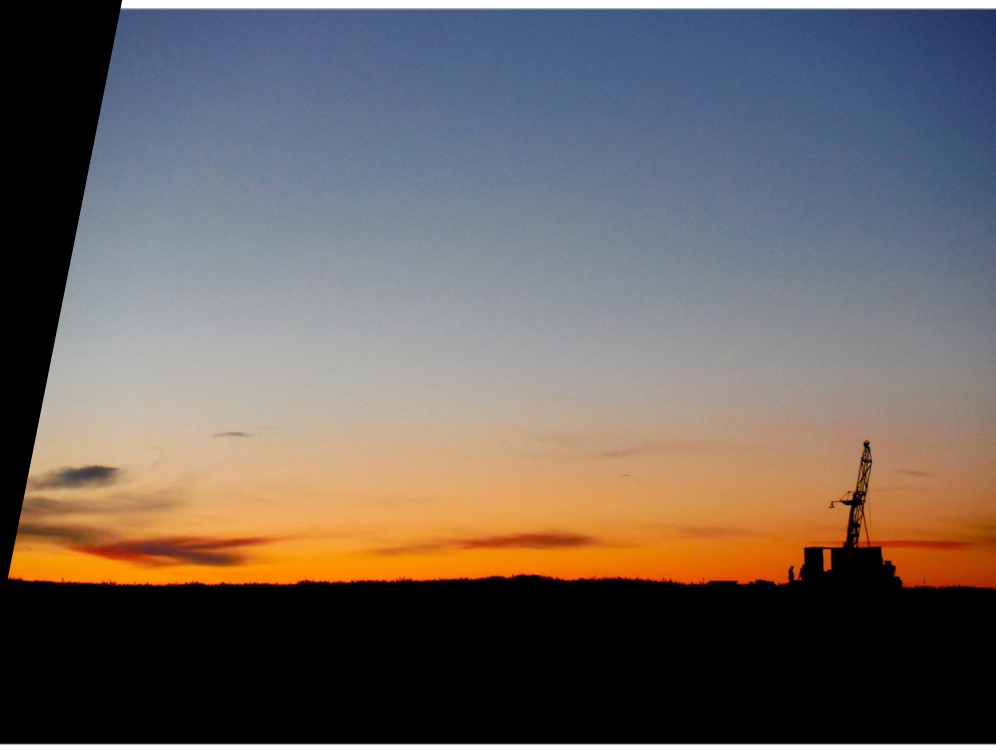
Exploration Assessment Data Digital Formats Proposal

Version 1.0



PDAC

PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA

The Prospectors & Developers Association of Canada (PDAC) would like to acknowledge the central role of Charles Beaudry, chair of the geoscience committee, in developing this guide. The PDAC would also like to thank the working group consisting of Ken Wright, Jeremy Brett (MPH Consulting Limited), Blair Hrabi, Ana Fonseca (SRK Consulting Ltd.), Michael Kociumbas (Watts, Griffis and McOuat Limited) and Pim van Geffen (REFLEX Geosciences).

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Executive Summary

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Without exploration there can be no discoveries of the mineral deposits that may eventually become mines. Attracting exploration investment, and improving the effectiveness of that investment, is thus a priority for all mineral-rich jurisdictions. On both counts, however, analytics provided by MinEx Consulting suggest that Canada is falling behind (see Schodde 2014 PDAC Presentation at **www.MinExConsulting.com**).

In terms of attracting exploration investment, Canada's share of global non-ferrous exploration budgets has fallen from over 20% in 2007 to around 14% in 2015. If iron ore exploration budgets are included, Canada has also fallen behind Australia for the first time in 15 years and is no longer able to claim it is the top destination for exploration investment globally.

With respect to exploration effectiveness, Canada also ranks below Australia. From 2001 to 2011 Canada's exploration spending increased tenfold, while the discovery rate only increased by about five times. In addition, Canada's return on exploration investment was only 0.77 for every dollar spent between 2005 and 2014, while Australia's was 0.97.

There are a number of variables affecting the discovery performance of companies exploring in Canada, including the greater costs of exploration arising from exploring at greater depths and in remote areas. However, one key variable affecting discovery performance is the availability of geoscience information to assist with land acquisition and targeting decisions.

The PDAC believes that discovery rates can increase if we improve the type, quality, quantity and accessibility of geoscience data available to all companies and stakeholders within the mineral exploration industry. Accordingly, PDAC has successfully advocated for increased public investments in geoscience to improve discovery rates at depth (through the federally funded Targeted Geosciences Initiative) and in remote areas (Geo-mapping for Energy and Minerals program).

In addition, PDAC is advocating for jurisdictions in Canada to require explorationists to submit their assessment data in a consistent digital format. The following document is a proposal for a national standard for submission of mineral exploration assessment data in digital format and is meant to open a discussion on what such a standard should look like.

Currently, Canadian jurisdictions have a wide range of requirements for prospectors, mineral exploration and mining companies to submit digital data in exchange for assessment credits. At one end of the spectrum, some jurisdictions have no requirements at all or, more frequently, only require submission of a PDF version of the assessment report in addition to the paper document. At the other end of the spectrum, some jurisdictions require that all data be submitted in digital format, including the PDF report, and may list the type of files that are acceptable and in one case includes some metadata requirements. However none of the jurisdictions actually specify any minimal standards for data submission such as what table and field names should be included and how the metadata should be organized. For subsequent users of the assessment data, integrating data embedded in PDF files with existing exploration databases is difficult and time consuming. The guidelines presented here, if adopted, would facilitate the submission of assessment data in digital form with hopes of improving data sharing, exploration efficiency and discovery rates.

For these standards to be effective we have attempted to make them:

- Simple enough for explorers with limited resources to satisfy
- Enduring, so that formats can be read several decades hence
- Extendable, so that newer versions will be compatible with older formats.

Users of assessment data and, in particular, personnel of mines ministries should acknowledge that this format proposal is not meant to replace a conventional assessment report or its PDF equivalent but is meant to supplement the report by providing a simple yet standardized approach to organizing and formatting assessment data. In our view the PDF report remains an important component of any submission of assessment data and will contain some unique information that may be very important but too unstructured to be recorded in digital data tables. Examples of such data include geological descriptions or interpretations and laboratory method codes descriptions.

The standards we present here are modelled on Australia's requirements for digital data submission that were originally published in 1999 and have since seen four major revisions and have been adopted by all state governments and the Australian industry as a whole. The main difference in the Canadian approach is that data headers have been simplified to include only the metadata necessary to assess the quality of the data submitted.

The PDAC's ultimate goal with respect to this proposal is to encourage jurisdictions to adopt a common set of guidelines (and ultimately regulations) to facilitate the submission of exploration assessment data in a digital format and in a consistent manner. This is the first "official" version of this EADDF proposal created by a a working group of subject matter experts. Moreover it has benefited from consultative feedback from all provincial, territorial and federal mining jurisdictions as well as all of PDAC's sister organizations across Canada. It is the Geoscience Committee's intent to establish a Digital Data working group once version 1.0 has been published in order to provide a forum for discussion on the topic of digital assessment data formats and to promote the adoption of a common standard across the country.

The EADDF working group recognizes that we may be overly optimistic when considering the issue of digital assessment data as it pertains to individual prospectors and their capacity to produce digital data. After much discussion however, we conclude that prospectors should be excepted from submitting digital assessment data until such time as the system is well enough established and the prospectors familiar enough to make the change to digital assessment data. We therefore suggest that mining jurisdictions should provide exceptions to the small prospector in the submission of work reports and sampling and assaying data.

Table of Contents

List of Tables

Introduction

To maintain mineral properties in good standing, prospectors, mineral exploration companies and mining companies submit exploration results to provincial and territorial governments in return for assessment credits. Each jurisdiction has specific requirements for submitting assessment reports, but few require data in digital format with the exception of PDF versions of the reports. Currently, there is little to no national or cross-jurisdictional guidelines for submitting raw data which inhibits explorers' abilities to collate the digital information.

In 2014, the PDAC formed an Exploration Assessment Digital Data Formats (EADDF) working group to create a proposal for a set of standards for digital data submission. The ultimate goal is to produce a best practices guide that will help improve exploration efficiency and increase the discovery rate of mineral exploration in Canada by being adopted in all jurisdictions across the country.

Four principles guided the working group while creating these standards:

- **Simplicity:** Junior companies and prospectors may lack the resources to satisfy complex assessment requirements
- **Durability:** The formats should be readable 30 years from now
- **Extensibility:** Programs and standards evolve but must remain compatible with older formats
- **Originality:** Data collection is forward looking. Historical data will not be considered

The standards are modelled on Australia's *Requirements for the Submission of Digital Exploration Data* that was first published in April 1999 and currently (as of July 2016) in **version 4.3**. The Australian proposal suggested six templates to cover surface sampling data and results and drill hole data descriptions and results. The EADDF working group proposes adding templates for geophysical data and geological mapping data. A further important difference in the Canadian approach is that headers include only the metadata required to:

- Locate the observation in a world coordinate system (UTM NAD83)
- Identify the owners of the property on which the work was done
- Record when the work was done
- Identify the laboratory and method codes used for geochemical work
- Identify the drilling company and record the orientation, length and geological data for drill holes
- Allow geophysical data to be re-processed.

The working group proposes three tiers of data:

1. Mandatory (e.g. UTM coordinates and original drill hole names)
2. Recommended (e.g. cut grid coordinates)
3. Data that can be included in the mandatory PDF report (e.g. QAQC data or upper/lower detection limits, laboratory method code descriptions)

The three-tier system is meant to emphasize that some data may be very important but also too unstructured to be recorded in the digital data tables such as geological descriptions or interpretations or laboratory method codes descriptions. These data are best left in the assessment report itself and should be included in the PDF file of the assessment report and will be included with the assessment work submission. Other data can appear in the data files but may not be captured in all projects. Finally there are data that we consider fundamentally

important to any work submission. The various templates clearly identify and distinguish those data that are optional from those that should be mandatory.

Producers of assessment data can also include additional data fields at the end of the tables, as long as the titles respect the title formatting norms and any codes are referenced in corresponding dictionary files in the H0300 and H0301 series of records.

Background and History of Initiative

Mining companies and prospectors produce a considerable amount of valuable geoscience data throughout Canada each year. Results are submitted to various jurisdictions as assessment reports to maintain mineral tenure on their mineral properties. Much of this data is produced in digital format but typically submitted as PDF equivalents of paper documents. Although all jurisdictions have specific formatting requirements for reports, there are few if any requirements for data submitted in digital form.

At the PDAC we recognize the opportunity for value creation within the mineral industry if basic survey information and metadata were included with digital results. This practice is expected to improve discovery rates for mineral exploration in Canada.

Summary of Current Regulations in Various Jurisdictions Across Canada

A review of the current state of affairs regarding requirements by the various mining jurisdictions across Canada was undertaken in 2012 through a web search and interviews with mining recorders. Results, which were summarized in a table, were updated in 2017 through a request for comment to all mining jurisdictions. Results of the original results and updates are summarized in Appendix 1.

There is a wide range of requirements across Canada from none, or more commonly a simple PDF version of the assessment report along with one or two copies of the paper report, to the requirement that all data be submitted in digital format. However, even when data is mandated the nature of the data, namely the data fields that should be submitted, is not described. In one jurisdiction some metadata is prescribed but how that metadata should be formatted is not. The review of current “best-practices” has convinced the EADDF working group that there is a need in Canada for a simple way to submit digital assessment data. We also think that this proposal will fill a need for more comprehensive digital assessment data by proposing a detailed but simple format and provide a framework that will allow easy compilation and integration of assessment data across multiple projects and even at the province-scale and between provinces across the country.

PDAC

The Prospectors & Developers Association of Canada (PDAC) is the leading voice of the mineral exploration and development community. With over 8,000 members around the world, the PDAC's mission is to promote a globally-responsible, vibrant and sustainable minerals

industry. As the trusted representative of the sector, PDAC encourages best practices in technical, social, operational, environmental and safety performance.

PDAC Policy Priorities

The PDAC has several policy priorities designed to enhance mineral exploration in Canada. The purpose of the EADDF initiative is to address the association's first priority: to improve discovery rates.

Geoscience Committee

The PDAC's Geoscience Committee's mandate is to encourage and support mineral exploration in Canada. The committee serves as a forum for discussion and development of policies, positions and initiatives to be submitted to the PDAC Board for approval.

History of EADDF Initiative

The PDAC's Geoscience Committee formed a working group of experienced industry geoscientists to draft a proposal to submit to the other parties for comment and suggestions. The Exploration Assessment Data Digital Formats working group met several times during 2015 to develop the proposal.

EADDF Working Group

The Exploration Assessment Data Digital Formats (EADDF) working group includes four sub-groups consisting of geology, drilling, geophysics and geochemistry, each led by a geoscientist with extensive industry experience. The group members are:

Charles Beaudry, Chair of Geoscience Committee	**Chair**
Ken Wright, MPH Consulting Limited	**Special Advisor**
Blair Hrabi, Ana Fonseca, SRK Consulting Ltd.	**Geology**
Michael Kociumbas, Vice-President, Watts, Griffis and McOuat Limited	**Drilling**
Pim van Geffen, REFLEX Geosciences	**Geochemistry**
Jeremy Brett, Senior Geophysical Consultant, MPH Consulting Limited	**Geophysics**
Nadim Kara, PDAC, Senior Program Manager	**PDAC**
Anne Belanger, PDAC, Analyst, Geoscience and Innovation	**PDAC**

We would like to acknowledge the key role played by Richard Moore, the previous Chair of the Geoscience Committee, who recognized the importance of a common National standard for the submission of digital assessment data and who lead the early efforts of the committee with this initiative.

Data Standard Specification

General

To preserve the quality of the database, the working group recommends consistent file name conventions, language and data types. There are additional specifications for each of the four specialties including drilling, geology, geochemistry and geophysics.

Acceptable File Name Convention

File names should include the following:

- Project name (e.g. BlueLagoon)
- Year (e.g. 2014)
- A consecutive file number (01, 02, 03....etc.) Note that the shapefile, which has multiple and distinct extensions, will be referenced as one shapefile with the extension shp. All the files referenced as a shapefile will have the same file number.
- Data type (e.g. DrillLithology, GeochemicalSurvey)
- Template format (e.g. DL1, SG1)
- File extension (e.g. csv, jpg, tif, shp)

Examples:

BlueLagoon_2014_20_GeochemicalSurvey_SG1.csv	Surface sampling data
BlueLagoon_2014_23_DrillLithology_DL1.csv	Downhole lithology data

Additional File Naming Convention

Header data file

Header data will normally be found at the top of data files or, when presented separately from the data files, use the same name as data files, but with the suffix _hdr before the extension name:

e.g. BlueLagoon_2014_23_DrillLithology_hdr.csv

Dictionaries

Dictionary files use the same name as data files, but with the suffix _dict before the variable or field that is the object of the dictionary:

e.g. BlueLagoon_2014_23_DrillLithology_dict_Lithology.csv

Other Acceptable Conventions

Language English or French. Ensure that number conventions (i.e. use of commas and periods) are consistent to avoid errors.

Measurement system	Metric
Location	UTM coordinates (NAD83); some jurisdictions currently allow use of NAD27 datum but in our view this is a less accurate datum and increases the possibilities of errors and we do not recommend its usage. A local grid coordinate system is allowed but only in addition to, and not in lieu of, UTM. Latitude and longitude coordinates (using NAD83 datum) are acceptable for airborne geophysical

	surveys. At present we are not proposing to require a vertical datum but this is an issue that should be considered for later versions of the format.
File names	Title case (upper case for first letter followed by lower case letters)

Acceptable Media

Online data submission is preferable. Other acceptable media include:

- CD or DVDs, read only
- USB Drives (non-returnable)
- Hard drives (non-returnable)

Hard copy or paper reports are unacceptable. All documents should be submitted in digital format, including PDFs of reports and maps. Ideally, PDF documents are generated directly by the word processing software, not scanned, to allow for searchable text.

Maximum File Size

How big is too big? When it comes to digital data files the answer depends on the year the question was asked. We think this number is a moving target and depends on a number of factors including server sizes and communication bandwidth, each of which may vary between jurisdictions and will increase over time. As such we make no recommendation as to what the acceptable maximum file size should be but recommend that each jurisdiction determine that number based on its own situation and actively revise the number at regular intervals.

Data Types

A number of data formats are acceptable (Table 1). The majority of exploration information (i.e. metadata and point & downhole data) can be captured in a simple open source text format by using a series of templates in csv or tab delimited format. Other open source or widely used binary formats include: shapefiles for line and polygon data; Geosoft (CSV, GDB and GRD) files for geophysical data; GeoTIFF files for images and maps; PDF files for reports and print-ready maps; and JPG files for photographs.

Table 1: Acceptable formats for digital data

Data Type	Description	Format	Parameter	File Extension
Tabular data[1]	Geochemistry, drill log and surveying data	Delimited ASCII (prefer csv delimited)	Standard as described below	.txt .csv
Geo-referenced polygons and lines[2]	Geology, geochemistry, geophysics, geography, etc GIS datasets	Shapefile and delimited csv file for header data	Each shapefile is composed of several files of same name but different extensions.	.shp .csv
Digital elevation models	DEM's from Lidar or other sources.	Geosoft format (GRD) or GeoTIFF		.grd .tif
Geophysics	Raw and processed located data, gridded data, magnetics, radiometrics, and gravity data	Delimited ASCII (prefer csv delimited) Geosoft format (GDB, GRD, GXF)		.csv .gdb .gxf
Geophysical images	Images derived from magnetics or gravity, e.g. TMI, Bouguer	GeoTIFF/TIFF (colour) TIFF (Greyscale) JPEG PDF	300 dpi, 24 bit 300 dpi, 8 bit 300 dpi, Q=95	.tif .tif .jpg .pdf
Petrophysical and geophysical log data	Raw and processed wireline and MWD data	DLIS LIS LAS ASCII	As defined by latest Industry Standard	.lis .lis .las .asc
Text[3]	Log plots up to E or A0 in physical length at full scale	PDF		.pdf
	Includes documents, figures etc. normally provided in hard copy	PDF		.pdf
Maps, plans and figures (not included in text)	Files of maps up to E or A0 format in physical length at full scale	PDF		.pdf
Photographs (not included in text)	Core and aerial photographs, etc.	JPG		.jpg

A digital data submission will comprise a sequentially numbered series of files with various file extensions along with a Manifest file as shown in Appendix 2 that will list all the files in the submission. The manifest file name will contain the project name and the year of the report followed by the word Manifest and a file extension (eg: BlueLagoon_2014_Manifest.csv). The files in the Manifest will be numbered consecutively to prevent loss of files and the total number of files in the submission will be recorded in the Manifest file. Note that a GIS-type Shape coverage counts as one file even though the file may contain several files with different extensions.

1 Where several related database files cover one theme (e.g. surveying data, drill logs, look-up tables etc.) tabular data files should use the same sequential number.

2 Shapefiles will be in UTM NAD83 and the appropriate zone for project and datum will be recorded in the header file for additional safety.

3 PDF files should be created from the original plot file where possible to allow text to be searchable.

Tabular data

All point data should be submitted as csv (preferred) format or tab delimited flat files with either XYZ coordinates or downhole intervals. The csv and tab delimited formats are recommended because they can be read by any spreadsheet software and most word processing software packages. Lower Level geophysical data can also be submitted in Geosoft database format (gdb; not to be confused with Gemcom's GDB database format).

GIS data

Shapefiles, which are an open GIS data standard, are prescribed for lines and polygons. All lines should appear in one shp file with the suffix _lin before the file extension and all polygons should appear in one shp file with the suffix _pol before the file extension (e.g. BlueLagoon_2014_Geology_pol.shp). Shapefiles do not allow the combination of polygons with lines or points in the same coverage.

Although shapefiles are in a binary format that cannot easily be read by non-GIS software, the shapefile itself is typically composed of three separate files with the same name but different extensions, including shp, shx and dbf. The dbf file can be read by Excel and other spreadsheet or database software.

Shapefiles are a trademark of ESRI and are the standard data exchange format of ArcGIS. However the format itself is open in the sense that the format specification is published and freely available (see **https://www.esri.com/library/whitepapers/pdfs/shapefile.pdf** and **https://en.wikipedia.org/wiki/Shapefile**).

In view of their open definition and widespread use, shapefiles are expected to be readable in the future. Currently, the format can be read by several GIS software packages, including Quantum GIS (QGIS), a powerful, free and open source GIS software popular in academic circles and supported by an active development community.

Appendix 3 includes a QGIS primer that allows the user to download and install QGIS. The primer explains how to:

- Create shapefiles or layers with the appropriate projection and tabular structure
- Digitize or import lines and polygons into the layers
- Combine similar layers together
- Export layers to the shapefile format.

Although no map or cartographic characteristics need to be stored with the lines or polygons, three key fields should be included:

1. **Feature_code** (Feat_code in shapefile) identifies the type of line or polygon feature and is accompanied by a dictionary file describing the nature of each code in the dataset.
2. **Feature_value_code** (Feat_value) stores any value attached to the line or polygon such as a lithological code or fault code and is accompanied by a dictionary file describing each code in the layer.
3. **Interpretation_level** (Int_lvl) indicates the level of confidence in the feature, namely whether the feature is an observation or an interpretation or is presumed based on scant evidence.

The **Feature_code and Interpretation_level** fields are required. The **Feature_value_code** field is optional. Note that shapefile field names cannot contain more than 10 characters.

Drilling Tables and Fields

All drilling data should be submitted in csv or tab delimited format in up to six separate tables linked to the drillhole ID in the header table, including:

1. **Collar**: contains location and type of holes
2. **Survey**: distance or depth downhole, measurement of azimuth and dip in degrees; type of surveying instrument
3. **Geology**: downhole interval (from-to), coded lithology
4. **Textures, Alteration & Mineralization**: downhole intervals with coded texture type, alteration type, and mineralization type
5. **Structure**: downhole interval, coded structure type, measurement convention and measurements
6. **Assays**: downhole interval, sample number, assay results, % recovery, specific gravity, density, coded lithology, texture, alteration, mineralization and other petrophysical measurements.

Dictionaries are required for all fields that have coded categories. The dictionary is referenced in the header of the table and listed in the Manifest file.

The drilling header table should include:

- Drillhole identifier expressed as Company_Project_Hole Number (e.g. SureGold_BlueLagoon_001)
- Collar location expressed as XYZ in UTM83 coordinates
- Dip & azimuth of hole (dips below horizontal are negative)
- Length of hole (metres)
- Project-specific grid coordinates
- Type of drilling (DDH, RC, other)
- Start & end dates
- Drilling company

Downhole drilling depth From_m and To_m should be measured to 2 decimal places (eg. 153.52).

See **Metadata** section for more details and examples.

Analytical Data

Analytical data is associated with the Geochemistry and Drilling Categories.

Analytical results are in alphanumeric format and include any special characters for lower or upper detection limits and other codes as supplied by the laboratory. All codes are referred to and described in the laboratory certificate PDF report.

It is assumed that all analytical results have been validated (i.e. QAQC'd) by the author of the report and can be used with confidence. Moreover the method codes referred to in the analytical tables (i.e. DG1, SG1) are described in detail in the PDF report or at least readily available on the Internet at the laboratory's website. It is recommended that the laboratory method code descriptions be included in an appendix in the PDF report since method codes can change over time and there is no guarantee that old and unused method code descriptions will be maintained by laboratories.

Dictionaries

The dictionary file contains a list of all the codes used in a particular field (e.g. lithology, structure, texture, alteration, mineralization) along with a description of the codes. If multiple fields within a table contain codes, each field requires a separate dictionary file.

Dictionary files use the same name as the data files, but with a dictionary suffix before the extension name that includes _dict followed by the variable or field that is the object of the dictionary:

e.g. BlueLagoon_2014_23_DrillLithology_**dict_Lithology**.csv

Dictionary files must be referenced in the header of the appropriate template or the accompanying header file and listed in the manifest file.

Geophysical data and images

This category includes magnetic, electromagnetic, induced polarization, radiometric, and gravity data. In all cases, data should be submitted as ASCII format csv files and, optionally, in standard Geosoft format gdb files. The first format ensures the data are readable and the second is more convenient for geophysicists. Gridded data can be submitted in Geosoft (grd or gxf) or GeoTIFF (tif) formatted files and images in PDF or GeoTIFF format. However it should be emphasized that a GeoTiff is not a grid and should not be encouraged. Avoid JPG format, which results in the loss of information.

A format specification is proposed only for ASCII format csv files. All other data types, including gdb files, are optional and left to the discretion of whoever produces the data.

Geophysical survey data is typically processed in stages, and as such needs to be qualified so that the user knows what amount of processing has been applied to any given dataset. Geophysical data can be classified into one of the following categories:

Raw (Level 0): Separate field datasets with field specific parameters, collected by the first party and usually not useful to anyone but the first party. **This type of data type should not be submitted and no jurisdictions should accept it but is included here to provide a reference for the preparation of geophysical datasets.**

Measured (Level 1): Compiled and sorted raw data that can now be processed. This type of data is useful to the first party for producing processed products, and to second parties for quality control and reprocessing. Level 1 data is required for reprocessing and is the most important type of data from an archiving perspective. However, Level 1 data can rarely be used directly and must be subjected to further processing before the data can be useful.

Processed (Level 2): Compiled data that has been processed to clean up the data so that it is suitable for presentation, filtering, modeling or inversion. Level 2 data is more informative and easier to interpret but cannot be reprocessed and often cannot be used to produce Level 3 data.

Interpreted (Level 3): Processed data that have been manipulated to enhance specific aspects of the data. Examples include: filtering, time-constant calculations, target selection files, modeling, and inversions. Level 3 data is highly interpreted and cannot be reprocessed but is often the easiest to use and the most informative about the underlying geology. This is

also the Level of data that is most sought by explorationists and the one that adds the most value to the data.

Categorizing geophysical data into Levels 1 to 3 makes the degree of data processing more explicit and unequivocal. Although the question of which Level of data processing corresponds to which data Level can be difficult to answer, requiring this information should at least help to establish the hierarchy for each geophysical survey. Since variables from all Levels of processing will appear in the same data file, the Level of processing should be recorded in the data column's description file accompanying all geophysical data files. Refer to the PS1 and PA1 templates metadata sections of this report.

We recommend Level 1 data be required but that submission of Level 2 and 3 data be incentivized by giving higher credits for these types of data. As a suggestion, if a geophysical submission is worth 100%, then Level 1 data could represent 25% of the value of submitted assessment credits for the survey, Level 2 another 25% and Level 3 maybe 50%. We encourage submission of all three Levels to satisfy the ability to perform quality control on the results, to allow the reprocessing of the data and provide data with greater immediate usability for geoscientists and explorationists. How each jurisdiction perceives the relative value of the different levels of geophysical data is another matter and certainly open to debate.

There are two fundamental types of geophysical surveys and these produce two distinct types of data files: **Single Variable** and **Array Variable surveys**.

Single Variable files include: magnetic data, gravity data, radiometric data and frequency domain electromagnetic data. Single variable systems may have more than one variable but will have a single measurement of each variable such as the value of the in-phase and out-of-phase measurements in frequency-domain EM systems.

Array Variable files include: modern time domain EM systems, IP surveys or radiometric surveys when arrays of spectral information are stored. Array Variable systems contain multiple channels representing time windows in the case of EM or IP systems, or energy windows in the case of radiometrics.

Physical rock properties and well-log data

Physical rock property measurements on hand specimens should be stored in flat files either as stand alone files (see SG1 template) or as downhole intervals from drill core (see DG1 template).

Raw well log data should be in text format and optionally in Geosoft GDB format. Well log plots should be in PDF format.

Text or reports

Documents, including tables and figures, must be submitted in PDF format. Most word processing and spreadsheet programs allow files to be saved directly to PDF format.

Oversized maps, plans, sections and figures

Documents too big for a regular printer should be printed in PDF format at scale for sizes up to E or A0. Larger maps should be split to fit into E or A0 format or smaller.

All maps and plans must include the following:

- A scale bar
- UTM coordinates (NAD83); local grid coordinates can be used in addition to, but not in lieu of, UTM
- Location coordinates on the axes of the map
- A north arrow
- A legend if any symbolic information is present

Photographs

Photographs of drill core, geological or environmental features that are not part of the report text are submitted in JPG format.

Metadata

Metadata is data that describes other data such as sample coordinates, the type of medium sampled, and the sampling date. Metadata is necessary to assess the quality and pertinence of the data for a particular application.

Every project should include a universal metadata header that encompasses all the surveys in addition to headers for each specific survey. In cases where a survey uses multiple instruments (e.g. airborne geophysics), the survey header is followed by headers for each instrument.

Include metadata as csv or tab delimited format in a header file at the top of the file of related tabular data (recommended) or in a separate file that is linked to the tabular data.

Header files use the same name as data files, but with the suffix _hdr before the extension name:

e.g. BlueLagoon_2014_23_DrillLithology_hdr.csv

There are three separate tiers for submitting metadata:

1. Mandatory fields (e.g. UTM coordinates, type of survey)
2. Recommended fields (e.g. local grid coordinates, elevation)
3. Data included in the mandatory PDF report (e.g. QAQC data or upper/lower detection limits)

Mandatory fields include:

- Location of the data (or a pointer to a file providing this information)
- Date the data was produced
- Parameters controlling the data's acquisition
- Property owner
- Property name
- Activity which produced the data, e.g. drilling program
- Name of contractor
- Equipment used to generate the data
- Original format of the data

File header format

The file header consists of a number of fields, each occupying one or more rows at the top of a data file or in a separate header file. Each line of the header starts with a Field Number followed by a description in the first and second columns, respectively, of a csv delimited ASCII file (table 2). Numbering within a category is consecutive.

Table 2: Metadata file header codes

Field Number Series	Description
H0001	Version of Format (eg. 1.0)
H0101	Property owner
H0102	Property name
H0103	Map sheet numbers covered by data (100K and 250K)
H0200	Start date of data acquisition
H0201	End date of data acquisition
H0203	Number of data rows in file
H0204	Geophysical results Level (1, 2 or 3)
H0300	Identification of linked file or dictionary, one column for each file.
H0301	File names as pointers to other relevant files, one column for each file.
H0400	Drilling code, one column for each code.
H0401	Drilling Contractor, one column for each drilling code.
H0402	Description of drilling type, one column for each drilling type.
H0500	Surveyed feature located
H0501	Geodetic datum (e.g. NAD83)
H0503	Projection (e.g. UTM)
H0504	Projection zone (e.g. 14)
H0505	Surveying equipment used (e.g. WGPS, DGPS)
H0506	Downhole survey instrument code, one column for each code. At least one code required.
H0507	Downhole survey instrument description, one column for each type of survey. Values for H0506 fields; at least one instrument type should be present
H0600	Codes for type of sample, one column for each code.
H0601	Description of sample types, one column for each sample type.
H0800	Assay information; the first row is a list of field names for the H0801 row to follow
H0801 onwards	Values for H0800 fields
H0900	Remarks and other comments
H0910 to H0999	Used for additional metadata that are not required by format
H1000	Data field descriptions (includes unit of measure as suffix; e.g. _ppm)
H1002	Analytical method (geochemistry) per field
D	Data row in alpha-numeric format

Header categories not used in a file need not be included in the header.

List of Templates

The following section describes the principal features of the various templates for the submission of point, line, polygon and downhole data. Table 3 lists all the templates, types of data stored, and links between the different template tables.

Table 3: List of template tables for submission of digital assessment data.

Table Name Suffix	Content of Table	Links to Other Tables
SL1	Drill Hole collars	DS1
DS1	Downhole Survey	SL1
DG1	Sample Downhole Location and Description	SL1, DS1 and various dictionaries
DL1	Drill Hole Log	SL1, DS1 and various dictionaries
SG1	Geochemical Sample Location and Results	SL1, DG1 and GM1
GO1	Geology Outcrop Description	Various dictionaries
GS1	Geology Structural Description	GO1 and Structure dictionary
GM1	Geology Mineral Occurrence	Various dictionaries
GL1	Geology Line Data	Shapefile and various dictionaries
GP1	Geology Polygon Data	Shapefile and various dictionaries
PS1	Geophysics, Single Variable Results	Data columns description file,SL1, DS1
PA1	Geophysics, Array Variable Results	Data columns description file,SL1, DS1

Examples of each template are presented below. All the tables have the following fonts legend:

- Orange: data required to be entered by user
- Yellow: special instruction
- Bold: required field or comment
- Italic: optional field

Template SL1 - Drill hole collars locations

Template SL1 (Table 4) records the collar location of drill holes as well as:

- Drilling type
- Drilling contractor
- Datum and projection information and coordinates
- Azimuth, dip of collar, and length from the collar to the end of the hole.

Grid coordinates are optional.

Additional fields can be included in the table but these should be placed to the right of the table and field names should not conflict with mandatory fields.

Table 4: Template SL1 – Drill hole collar locations

H0001	**Version_of_ Format**	**1.0**								
H0100	**Table_name**	**SL1-Drill Hole collars**								
H0101	**Property_ owner**	Great Plains Mining Inc.								
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program								
H0200	**Start_date_ of_data_ aquisition**	23/09/2016								
H0201	**End_date_ of_data_ aquisition**	29/09/2016								
H0203	**Number_of_ data_records**	2								
H0300	**Downhole_ survey_data_ file**									
H0301	RP2016_02_ DS1.csv									
H0400	**Drilling_code**	RC	DD							
H0401	**Drilling_ contractor**	Better Drilling Inc.	Faster Drilling Inc.							
H0402	**Drilling_ description**	Reverse Circulation	HQ, NQ Diamond drilling							
H0500	**Surveyed_ feature**	Hole collar								
H0501	**Geodetic_ datum**	NAD83								
H0503	**Projection**	UTM								
H0504	**Projection_ zone**	17								
H0505	**Survey_ instrument_ code**	WGPS								
H0506	**Survey_ instrument_ description**	WAAS-enabled Garmin eTrex-30 GPS								
H0900	*Comment*									
H1000	**Hole_ID**	**UTM_E**	**UTM_N**	*Grid_East*	*Grid_ North*	*Elevation*	**TD**	**Azimuth**	**Dip**	**Drill_code**
D	TRC001	348928.1	7719052	*-2015.5*	*504.6*	*325.6*	50	178	-74	DD
D	TRC002	348947.6	7719037.2	*1007.8*	*-238.6*	*334.9*	56	0	-90	RC

Template DS1 - Downhole survey

Template DS1 (Table 5) always accompanies the drill hole collar file (SL1) since the latter does not contain any downhole orientation data. If multiple surveying instruments were used they should all be listed. Magnetic azimuth is optional but should be in degrees from 0 to 360. Dip below horizontal should be negative.

Table 5: Template DS1 - Downhole survey

H0001	**Version_of_Format**	**1.0**				
H0100	**Table_name**	**DS1-Downhole Survey**				
H0101	**Property_owner**	Great Plains Mining Inc.				
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program				
H0200	**Start_date_of_data_aquisition**	23/09/2016				
H0201	**End_date_of_data_aquisition**	29/09/2016				
H0203	**Number_of_data_records**	3				
H0300	**Location_data_file**					
H0301	RP2016_02_SL1.csv					
H0506	**Survey_instrument_code**	SPS	*TRP*			
H0507	**Survey_instrument_description**	Sperysun Multishot Camera	*Tropari*			
H0900	*Comment*					
H1000	**Hole_ID**	**Depth_m**	**Surveying_instrument_code**	**Dip_deg**	*Azimuth_deg_mag*	**Azimuth_deg**
D	TRC001	0	SPS	-74	*178*	192
D	TRC001	20	SPS	-75.1	*180*	192
D	TRC002	30	TRP	-75.3	*180*	192

Template DG1 - Downhole geochemical sample location and results

Template DG1 (Table 6) contains sampling data, analytical results and any optional sample-level descriptions that may be available. Analytical results include the type of sample analyzed, the analytical code for the analysis and the name of the laboratory.

Template DL1 - Drill hole log

Template DL1 (Table 7) captures the major lithological units observed in the drill holes. Each hole must be referenced in the accompanying collar (SL1) and downhole survey (DS1) tables and will contain a drilling code and lithology dictionary code, as well as optional codes for texture, alteration and mineralization with accompanying dictionaries.

Table 6: Template DG1 - Sample downhole location and description

H0001	Version_of_ Format	1.0											
H0100	Table_name	DG1-Downhole Geochemistry Sample Location and Description											
H0101	Property_ owner	Great Plains Mining Inc.											
H0102	Project_name	Polkadot Lake Project/2016 Drilling Program											
H0200	Start_date_of_ data_aquisition	23/09/2016											
H0201	End_date_of_ data_aquisition	29/09/2016											
H0203	Number_of_ data_records	4											
H0300	Location_ data_file	Downhole_survey_ data_file	Assay_data_file	*Lithology _dictionary*	*Texture_ dictionary*	*Alteration_ dictionary*	*Mineralization _dictionary*						
H0301	RP2016_02 _SL1.csv	RP2016_03_DS1. csv	RP2016_04 _SG2.csv	*RP2016_05_ DG1_dict_ Lithology.csv*	*RP2016_06_ DG1_dict_ Texture.csv*	*RP2016_07_ DG1_dict_ Alteration.csv*	*RP2016_08_ DG1_dict_ Mineralization.csv*						
H0600	Sample_code	RC	DD										
H0601	Sample_type	Reverse Circulation	NQ diamond core										
H0700	Laboratory_ Certificate_ID	A328749.98C											
H0800	Assay_code	Assay_description	Assay_laboratory										
H0801	FA50	Fire assay	Great Assays Laboratories Inc.										
H0802	ICP4C	Induction Coupled Plasma	Great Assays Laboratories Inc.										
H0900	*Comment*												
H1000	Hole_ID	From_m	To_m	*Recovery_pct*	Sample_ID	Sample_code	Au_gpt	Fe_pet	*Lithology*	*Texture_ code*	*Alteration _code*	*Mineralization _code*	*Comment*
H1002							FA50	ICP4C					
D	TDH001	0	10	*20*	ABC344	DD			*Czl*				
D	TDH001	10	65	*98.0*	ABC345	DD			*Ab*				
D	TDH002	0	15		ABC346	RC			*Czl*				
D	TDH002	15	40		ABC347	RC			Aum				

Table 7: Template DL1 - Drill hole log

H0001	**Version_of_ Format**	**1.0**							
H0100	**Table_name**	**DL1-Drill Hole Log**							
H0101	**Property_ owner**	**Great Plains Mining Inc.**							
H0102	**Project_ name**	**Polkadot Lake Project/2016 Drilling Program**							
H0200	**Start_date_ of_data_ aquisition**	**23/09/2016**							
H0201	**End_date_ of_data_ aquisition**	**29/09/2016**							
H0203	**Number_of_ data_records**	**2**							
H0300	**Location_ data_file**	**Downhole_ survey_data_ file**	**Lithology _dictionary**	Texture_ dictionary	Alteration_ dictionary	Mineralization _dictionary			
H0301	RP2016_02 _SL1.csv	RP2016_03_ DS1.csv	RP2016_04_ Lithology_ dict.csv	*RP2016_05_ Texture_dict. csv*	*RP2016_06_ Alteration_ dict.csv*	*RP2016_07_ Mineralization_ dict.csv*			
H0600	**Drill_code**	DD							
H0601	**Drill_type**	NQ diamond core							
H0900	*Comment*								
H1000	**Hole_ID**	**From_m**	**To_m**	**Drill_code**	**Lithology_ code**	*Texture_code*	*Alteration _code*	*Mineralization _code*	*Comment*
D	TDH001	0	10	DD	Czl				
D	TDH001	10	65	DD	Ab				

Template SG1 - Surface geochemical sample location and results

Template SG1 (Table 8) records locations and analytical results for samples collected on surface. The template includes analytical laboratories and methods, sample type, and datum and projection information. Optionally, grid coordinates and elevation can be recorded. If any geological observations are available, Station_ID can be entered and stations referenced in the Geology_outcrop_description (GO1) file. In this case, the file is referred to in the header (see H0300 and H0301).

Table 8: Template SG1 - Surface geochemical sample location and results

H0001	**Version_of_Format**	**1.0**								
H0100	**Table_name**	**SG1-Surface Geochemistry Sample Location and Results**								
H0101	**Property_owner**	Great Plains Mining Inc.								
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program								
H0200	**Start_date_of_ data_aquisition**	23/09/2016								
H0201	**End_date_of_data_ aquisition**	29/09/2016								
H0203	**Number_of_data_ records**	2								
H0300	*Sample_code_ dictionary_file*	*Geology_mineral_ occurence_file*	*Geology_ outcrop_ description_file*							
H0301	*RP2016_02_GO1_ Sample_code_dict. csv*	*RP2016_03_GM1.csv*	*RP2016_04_ GO1.csv*							
H0500	**Surveyed_feature**	surface location								
H0501	**Geodetic_datum**	NAD83								
H0503	**Projection**	UTM								
H0504	**Projection_zone**	17								
H0505	**Survey_instrument**	WGPS								
H0506	**Survey_ instrument_ description**	WAAS-enabled Garmin eTrex-30 GPS								
H0600	**Sample_code**	ROC	SOL							
H0601	**Sample_type**	Rock	Soil							
H0700	**Laboratory_ Certificate_ID**	A328749.98C								
H0800	**Assay_code**	FA50	ICP4C							
H0801	**Assay_description**	Fire assay	Induction Coupled Plasma							
H0802	**Assay_laboratory**	Great Assays Laboratories Inc.	Great Assays Laboratories Inc.							
H0900	*Comment*									
H1000	**Sample_ID**	**Station_ID**	**UTM_E**	**UTM_N**	*Grid_East*	*Grid_North*	*Elevation*	Au_gpt	Fe_pct ICP4C	**Sample_ code**
H1002								FA50	ICP4C	
D	ABC345	TRC001	348928.1	7719052.0	*-20.622*	*115.55*	*15.1*	2.31	9.5	ROC
D	ABC346	TRC002	348928.1	7719052.0	*-20.622*	*115.55*	*15.1*	0.58	5.7	SOL

Template GO1 - Geology outcrop description

Template G01 (Table 9) records any point surface observations. Locations are georeferenced with datum and projection information, UTM coordinates, optional grid coordinates and elevation. Points can be entered as Station_ID and stations referenced in the Surface Sampling Template SG1. In this case, the file is referred to in the header (see H0300 and H0301).

An observation code is required to distinguish between different types of observations and measurements. Depending on the type, either a lithology code or a structure code is required. In the latter case, the orientation of planar structural features will be recorded as either strike and dip or dip direction and dip, and the orientation of linear features will be recorded as trend and plunge. All azimuth measurements should be in relation to True North direction. The structural measurement convention for planar data is recorded in the header field number H0210 using either:

- Strike/Dip (Right Hand Rule): the strike of a plane is measured as the azimuth of a horizontal line on the plane (from 0-360 degrees) so that the dip is 90 degrees to the right of the strike (North American Right Hand Rule).
- Dip Direction/Dip: the dip direction of a plane is the azimuth of the down dip direction (from 0-360 degrees) as projected to the horizontal.

Observation type codes, lithology codes and optional texture, alteration and mineralization codes will each have a dictionary listed in the header.

Template GM1 - Geology mineral occurrence

Template GM1 (Table 10) highlights any mineral occurrences. Locations are georeferenced with datum and projection information, UTM coordinates, optional grid coordinates and elevation. Points can be entered as Station_ID and stations referenced in the Surface Sampling Template SG1. In this case, the file is referred to in the header (see H0300 and H0301).

The data includes the principal commodity, optional secondary commodities, and a deposit type (if known). The table also contains a grade comment field: a text field summarizing the highest grade grab, chip, channel or trench results. Values summarized in this field should be included in the accompanying SG1 template table.

Table 9: Template GO1 – Geology Outcrop Description

H0001	**Version_of_Format**	1.0														
H0100	**Table_name**	**GO1-Geology Outcrop Description**														
H0101	**Property_owner**	Great Plains Mining Inc.														
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program														
H0200	**Start_date_of_data_aquisition**	23/09/2016														
H0201	**End_date_of_data_aquisition**	29/09/2016														
H0203	**Number_of_data_records**	4														
H0210	**Planar_structural_measurement_convention**	Strike/Dip or Dip-Direction/Dip (1)														
H0300	*Observation_code_dictionary_file*	*Surface sample location and result file*	*Lithology_dictionary_file*	**Texture_dictionary_file**	*Alteration_dictionary_file*	*Mineralization_dictionary_file*	*Structure_dictionary_file*									
H0301	RP2016_02_GO1_dict_Observation_code.csv	*RP2016_03_SG1.csv*	*RP2016_04_GO1_dict_Lithology.csv*	*RP2016_05_GO1_dict_Texture.csv*	*RP2016_06_GO1_dict_Alteration.csv*	*RP2016_07_GO1_dict_Mineralization.csv*	*RP2016_08_GO1_dict_Lithology.csv*									
H0500	**Surveyed_feature**	Outcrop														
H0501	**Geodetic_datum**	NAD83														
H0503	**Projection**	UTM														
H0504	**Projection_zone**	17														
H0505	**Survey_instrument**	WGPS														
H0506	**Survey_instrument_description**	WAAS-enabled Garmin eTrex-30 GPS														
H0900	*Comment*															
H1000	*Station_ID*	**UTM_E**	**UTM_N**	*Grid_East*	*Grid_North*	*Elevation*	**Observation_code**	**Lithology_code**	*Texture_code*	*Alteration_code*	*Mineralization_code*	**Structure_code**	**Strike_Azimuth**	**Dip**	*Facing*	*Comment*
D	*TRC001*	348928.1	7719052	*-2015.5*	*504.6*	*325.6*	LIT	Czl								
D	*TRC002*	348947.6	7719037.2	*1007.8*	*-238.6*	*334.9*	LIT	Ab								
D	*TRC001*	348928.1	7719052	*-2015.5*	*504.6*	*325.6*	STR					S1	126	-64	*Normal*	
D	*TRC001*	348928.6	7719052	*-2015.5*	*504.6*	*325.6*	STR					L1	175	-28		

(1): Whole data file can be one format or the other but not both.

Table 10: Template GM1 – Geology mineral occurrence

H0001	**Version_of_ Format**	**1.0**										
H0100	**Table_name**	**GM1-Geology Mineral Occurrence**										
H0101	**Property_ owner**	Great Plains Mining Inc.										
H0102	**Project_ name**	Polkadot Lake Project/2016 Drilling Program										
H0200	**Start_date_ of_data_ aquisition**	23/09/2016										
H0201	**End_date_ of_data_ aquisition**	29/09/2016										
H0203	**Number_ of_data_ records**	2										
H0300	*Surface_ sample_ result_file*	*Lithology_ dictionary_file*	*Deposit_type_ dictionary_file*									
H0301	*RP2016_02 _SG1.csv*	*RP2016_03_ GO1_dict_ Lithology*	*RP2016_04_ GM1_ deposite_ type_dict.csv*									
H0500	**Surveyed_ feature**	Outcrop										
H0501	**Geodetic_ datum**	NAD83										
H0503	**Projection**	UTM										
H0504	**Projection_ zone**	17										
H0505	**Survey_ instrument**	WGPS										
H0506	**Survey_ instrument_ description**	WAAS-enabled Garmin eTrex-30 GPS										
H0900	*Comment*											
H1000	*Station_ID*	**UTM_E**	**UTM_N**	*Grid_ East*	*Grid_ North*	*Elevation*	**Principal_ commodity**	*Secondary_ commodity*	*Deposit_ type*	**Grade_ comment**	Lithology _code	*Comment*
D	TRC001	348928.1	7719052	*-2015.5*	*504.6*	*325.6*	Gold	*Silver*			*Czl*	
D	TRC002	348947.6	7719037	*1007.8*	*-238.6*	*334.9*	Copper	*Zinc, Lead*			*Ab*	

Templates GL1 and GP1 - Mapping line and polygon data

The last two templates contain only metadata. The header data is saved as csv or tab delimited text format. The actual data consists of cartographic lines and polygons accompanied by attribute information stored together in a shapefile, compatible with most Geographic Information System (GIS) software. The shapefile is a binary format composed of at least three

different files, all with the same name but with different extensions, namely shp, shx and dbf. The latter file contains the attribute data and can be read by most spreadsheet software programs such as Microsoft Excel.

If the user does not own commercial GIS software, there are some free and open source solutions that can produce line and polygon files. Appendix 3 includes a primer for Quantum GIS (QGIS). Two template shapefiles that can be saved to the UTM NAD83 projection zone of the project area are provided in WGS84 latitude/longitude datum projection and hence usable for any location in Canada.

Templates GL1 and GP1 (Tables 11 & 12) are the header templates and shapefile attributes for line and polygon data. Note that shapefiles can contain lines or polygons, but not both. The header includes datum and projection information, a feature dictionary that lists all the types of lines or polygons found in the shapefile, and the optional feature value dictionary in cases where the feature may have an attribute such as a lithology. The shapefile also includes the field Intrp_lvl to qualify the degree of confidence in the feature: observed, interpreted or presumed. Note that field names for shapefiles can contain a maximum of 10 characters.

Table 11: Template GL1 - Mapping line data

H0001	**Version_of_Format**	**1.0**	
H0100	**Table_name**	**GL1-Geology Line Data**	
H0101	**Property_owner**	Great Plains Mining Inc.	
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program	
H0200	**Start_date_of_data_aquisition**	23/09/2016	
H0201	**End_date_of_data_aquisition**	29/09/2016	
H0203	**Number_of_data_records**	3	
H0300	**Feature_dictionary_file**	*Feature_value_dictionary_file*	
H0301	RP2016_02_GL1_dict_Feature.csv	*RP2016_03_GL1_dict_Feature_value.csv*	
H0501	**Geodetic_datum**	NAD83	
H0503	**Projection**	UTM	
H0504	**Projection_zone**	17	
H0900	*Comment*		
The following to appear only in the Shape file			
Feat_ code	*Feat_value*	**Interp_lvl**	*Comment*
Flt		Interpreted	*Fault scarp*
Trc		Observed	*Trench*
Ctr		Presumed	*Geologic contact*

Table 12: Template GP1 – Mapping polygon data

H0001	**Version_of_Format**	**1.0**	
H0100	**Table_name**	**GP1-Geology Polygon Data**	
H0101	**Property_owner**	Great Plains Mining Inc.	
H0102	**Project_name**	Polkadot Lake Project/2016 Drilling Program	
H0200	**Start_date_of_data_aquisition**	23/09/2016	
H0201	**End_date_of_data_aquisition**	29/09/2016	
H0203	**Number_of_data_records**	3	
H0300	**Feature_dictionary_file**	*Feature_value_dictionary_file*	
H0301	RP2016_02_GP1_dict_Feature.csv	*RP2016_03_GP1_dict_Feature_value.csv*	
H0501	**Geodetic_datum**	NAD83	
H0503	**Projection**	UTM	
H0504	**Projection_zone**	17	
H0900	*Comment*		
The following to appear only in the Shape file			
Feat_code	*Feat_value*	**Interp_lvl**	*Comment*
Oct		Observed	*Outcrop*
Geo	*Gra*	Presumed	*Geologic unit, Granite*
Szn		Interpreted	*Shear zone*

Geophysical Survey Data

Two templates are proposed that cover all modern geophysical survey methods. Although the two templates may look similar the actual structure of the data fields in each will be considerably different. In the case of Single Variable surveys (PS1), measurements will represent single values even if there can be several variables measured. In the case of Array Variable surveys (PA1), each measurement will represent an array of measurements that typically represent time windows in a waveform decay profile. As with PS1 multiple parameters can be measured.

Template PS1 - Single Variable Geophysical Data

Template PS1 contains results of a Single Variable geophysical survey processed to different Levels. Because the fields recorded for different types of surveys can be quite different, a data columns description file is required to elaborate on the meaning of each variable recorded (Table 13). This file also contains a field that specifies the Level of processing of the data (e.g. Level 1, 2 or 3) according to the criteria defined earlier in this report. Refer to Table 14 for an example of the PS1 Template.

Results may include several measurements but each measurement is a single value. Note that for geophysical data, locations should be provided in latitude/longitude and in UTM-NAD83 coordinates with a record of the UTM Zone(s) in case the survey overlaps significantly onto two UTM Zones. Optionally the data can be located relative to a local grid coordinate system.

The format is adequate for any airborne, ground or drill hole survey and most types of geophysical methods.

Table 13: Example data columns description file for airborne magnetic survey results file.

PARAMETER	UNIT	Level of Processing	DESCRIPTION
LINE	number		Line number
FLIGHT	number		Flight number
DATE	date		Date in YYYY/MM/DD format
X_UTMnN	metres		Easting (WGS84, UTM Zone n(number)N)
Y_UTMnN	metres		Northing (WGS84, UTM Zone n(number)N)
LON	degrees		Longitude WGS84 (decimal degrees)
LAT	degrees		Latitude WGS84 (decimal degrees)
FID TIME	seconds		Fiducial Counter UTC Time (seconds after midnight)
HMS GPSALT	HMS metres		UTC Time (Hours Minutes and Seconds) GPS Altitude (metres Above Sea Level)
RADALT	metres		Radar Altitude (metres Above Ground Level)
DTM_FINAL	metres		Digital Terrain Model (metres Above Sea Level)
VMX	nT	1	Fluxgate X component
VMY	nT	1	Fluxgate Y component
VMZ	nT	1	Fluxgate Z component
MAGUNC MAGCMP	nT nT	1	Uncompensated Magnetic Intensity (Stinger) Compensated Magnetic Intensity (Stinger)
Diurnal	nT	1	Diurnal Magnetic Intensity (raw)
TF3CD_LAG TF3CD_LVL	nT nT	2	Total Magnetic Intensity (diurnal and lag corrected) Total Magnetic Intensity (diurnal, lag corrected, tie - line leveled)
TMI_Final HY_FINAL	nT nT/m	2	Total Magnetic Intensity (diurnal, lag corrected, tie - line leveled, micro-levelled, final processed TMI) Measured along line horizontal gradient

Template PA1 - Array Variable Geophysical Data

Template PA1 contains results of an Array Variable geophysical survey processed to different Levels. Because the fields recorded for different types of surveys can be quite different, a data columns description file is required to elaborate on the meaning of each variable recorded (see Table 13 above). This file will also contain a field that specifies the Level of processing of the data (e.g. Level 1, 2 or 3), according to the criteria defined earlier in this report. Refer to Table 15 for an example of the PA1 Template.

Results may include several measurements and each measurement will consist of an array of values. Note that for geophysical data, locations should be provided in latitude/longitude and in UTM-NAD83 coordinates with a record of the UTM Zone(s) in case the survey overlaps significantly onto two UTM Zones. Optionally the data can be located relative to a local grid coordinate system.

The format is adequate for any airborne, ground or drill hole survey and most types of geophysical methods.

Table 14: Template PS1 - Single Variable Geophysical Data

H0001	Version_of_ Format	1.0														
H0100	Table_name	PSI-Geophysics, Single Variable Results														
H0101	Property_ owner	Acme Mining Inc.														
H0102	Project_name	Coyote Project, Manitoba / 2016 Airborne Geophysics														
H0200	Start_date_ of_data_ aquisition	23/09/2016														
H0201	End_date_ of_data_ aquisition	29/10/2016														
H0203	Number_of_ data_records	3														
H0300	Survey_data _columns_ description	*Drill_hole_ collars*	*Downhole_ survey_ data*													
H0301	RP2016_02_ PS2_ DataColDesc. pdf	*RP2016_03 _SL1.csv*	*RP2016_04 _DS1.csv*													
H0501	Geodetic_ datum	NAD83														
H0503	*Projection*	UTM														
H0800	Survey_type	Method_ category	Airborne_ Ground_in _Hole	Surveying_ contractor												
H0801	Magnetic_ Gradiometric	Magnetic	Airborne	Great Duck Geophysics												
H0900	*Comment*															
H1000	*Tim_fiducial*	*Hole_ID*	*Depth_m*	***Radar_ altitude***	***GPS_ altitude***	Long_ decimal	Lat_ decima	Projection _zone	UTM_E	UTM_N	*VMX*	*VMY*	*VMZ*	Var1(1)	Var2	VarN
H1003														1	1	1
D	*47811.6*	*CO-16-01*	*125*	113.3	766.26	-87.556171	15.568745	16N	440367.6	1721311	*-4905*	*2240.01*	*3183.99*	38478.6	38536.7	38531.5
D	*47811.7*	*CO-16-01*	*130*	112.61	766.52	-87.556141	15.568765	16N	440370.9	1721313	*-4898*	*2226.01*	*3204.99*	38477.6	38536.4	38531.2
D	*47811.8*	*CO-16-01*	*135*	111.97	766.78	-87.556125	15.568785	16N	440372.6	1721315	*-4885.01*	*2215.01*	*3231.98*	38476.5	38536.1	38531

(1): Var1 to VarN to be replaced with actual variables in data file and listed in Survey_Data_Columns_Description file.

Table 15: Template PA1 - Array Variable Geophysical Data

H0001	**Version_of_ Format**	**1.0**														
H0100	**Table_name**	**PA1- Geophysics, Array Variable Results**														
H0101	**Property_owner**	Acme Mining Inc.														
H0102	**Project_name**	Coyote Project, Manitoba / 2016														
H0200	**Start_date_of_ data_aquisition**	23/09/2016														
H0201	**End_date_of_ data_aquisition**	29/10/2016														
H0203	**Number_of_ data_records**	3														
H0300	**Survey_data _columns_ description_file**	*Reference_ waveform_ file*	*Off-Time_sampling_ scheme_file*	*Location_ data_file*	*Downhole_ survey_ data*											
H0301	RP2016_02_ PS2_ DataColDesc.pdf	*RP2016_03 _PS1_Ref Waveform. pdf*	*RP2016_ 04_PS1_ OffTimeSampScheme. pdf*	*RP2016_05 _SL1.csv*	*RP2016_06 _DS1.csv*											
H0501	**Geodetic_datum**	NAD83														
H0503	*Projection*	UTM														
H0800	**Survey_type**	**Method_ category**	**Airborne_Ground_in _Hole**	**Surveying_ contractor**												
H0801	Electromagnetic	VTEM	Airborne	Great Duck Geophysics												
H0900	*Comment*															
H1000	*Tim_fiducial*	*Hole_ID*	*Depth_m*	***Radar_ altitude***	***GPS_ altitude***	**Long_ decimal**	**Lat_ decimal**	**Projection _zone**	**UTM_E**	**UTM_N**	*VMX*	*VMY*	*VMZ*	**Var1(1)**	**Var2**	**VarN**
H1003														1	1	1
D	*47811.6*	*CO-16-01*	*125*	113.3	766.26	-87.5562	15.568745	16N	440367.63	1721311	*-4905*	*2240.01*	*3183.99*	38478.6	38536.7	38531.5
D	*47811.7*	*CO-16-01*	*130*	112.61	766.52	-87.5561	15.568765	16N	440370.85	1721313	*-4898*	*2226.01*	*3204.99*	38477.6	38536.4	38531.2
D	*47811.8*	*CO-16-01*	*135*	111.97	766.78	-87.5561	15.568785	16N	440372.57	1721315	*-4885.01*	*2215.01*	*3231.98*	38476.5	38536.1	38531

The reference waveform file (ex. RP2016_PS1_RefWaveform.pdf) that accompanies Array Variable data is necessary to properly process Level 1 and Level 2 data. An example of a waveform file is shown below (Table 16).

Table 16: Example of waveform table that typically accompanies Array Variable time-domain electromagnetic data

```
/ ------------------------------------------------------------------------------
/ XYZ EXPORT [08/23/2016]
/ DATABASE   [.\NFMAGEM_Reference Waveform.gdb]
/ ------------------------------------------------------------------------------
/
/Rx_Receiver Tx_Current       time   fiducial
/=========== ========== ========== ==========
/
//Flight 1
//Date 2014/04/29
Line  1
       0.01       0.00       0.00        0.0
       0.21       0.06       0.01        1.0
       0.75       0.26       0.01        2.0
       1.57       0.69       0.02        3.0
       2.47       1.37       0.02        4.0
       3.24       2.26       0.03        5.0
       3.66       3.26       0.03        6.0
       3.77       4.29       0.04        7.0
       3.75       5.32       0.04        8.0
       3.72       6.34       0.05        9.0
       3.70       7.35       0.05       10.0
       3.70       8.36       0.06       11.0
       3.69       9.38       0.06       12.0
       3.69      10.39       0.07       13.0
       3.69      11.40       0.07       14.0
       3.68      12.41       0.08       15.0
       3.68      13.41       0.08       16.0
       3.68      14.42       0.09       17.0
       3.67      15.43       0.09       18.0
       3.67      16.43       0.10       19.0
       3.67      17.44       0.10       20.0
       3.66      18.44       0.11       21.0
       3.66      19.44       0.11       22.0
       3.66      20.45       0.12       23.0
       3.65      21.45       0.12       24.0
       3.65      22.45       0.13       25.0
       3.64      23.45       0.14       26.0
       3.64      24.44       0.14       27.0

This file continues
```

In addition, time domain systems typically have an off-time decay sampling scheme (ex. RP2016_PS3_OffTimeSampScheme.pdf). This file is required to process Level 1 and Level 2 data. An example of a time-domain decay sampling scheme, in this case for a VTEM survey, is shown in Table 17.

Table 17: Example of a time-domain electromagnetic decay sampling scheme

VTEM Decay Sampling Scheme				
index	Start	End	Middle	Width
Milliseconds				
14	0.090	0.103	0.096	0.013
15	0.103	0.118	0.110	0.015
16	0.118	0.136	0.126	0.018
17	0.136	0.156	0.145	0.020
18	0.156	0.179	0.167	0.023
19	0.179	0.206	0.192	0.027
20	0.206	0.236	0.220	0.030
21	0.236	0.271	0.253	0.035
22	0.271	0.312	0.290	0.040
23	0.312	0.358	0.333	0.046
24	0.358	0.411	0.383	0.053
25	0.411	0.472	0.440	0.061
26	0.472	0.543	0.505	0.070
27	0.543	0.623	0.580	0.081
28	0.623	0.716	0.667	0.093
29	0.716	0.823	0.766	0.107
30	0.823	0.945	0.880	0.122
31	0.945	1.086	1.010	0.141
32	1.086	1.247	1.161	0.161
33	1.247	1.432	1.333	0.185
34	1.432	1.646	1.531	0.214
35	1.646	1.891	1.760	0.245
36	1.891	2.172	2.021	0.281
37	2.172	2.495	2.323	0.323
38	2.495	2.865	2.667	0.370
39	2.865	3.292	3.063	0.427
40	3.292	3.781	3.521	0.490
41	3.781	4.341	4.042	0.560
42	4.341	4.987	4.641	0.646
43	4.987	5.729	5.333	0.742
44	5.729	6.581	6.125	0.852
45	6.581	7.560	7.036	0.979

Conclusions

The standards for digital data submission proposed within the EADDF are simple but serve as comprehensive guidelines explorers can use to submit geological, geochemical, geophysical and drill hole data in any Canadian mineral exploration jurisdiction. We are asking the mineral industry and provincial and territorial governments to consider the guidelines as a modern tool to improve the quantity and quality of digital assessment data.

The standards are designed to be simple enough for explorers with limited resources, durable enough to be read by software programs decades hence and extensible enough to allow for newer versions to be compatible with older formats. The standards were developed mainly with the idea that only newly generated assessment data submitted for exploration credits should be considered.

The resulting templates include file headers and example data saved in an ASCII format (preferably CSV) that can be read by any spreadsheet-type software and most word processing software packages. Other formats include: shapefiles for line and polygon data; Geosoft (CSV, GDB and GRD) files for geophysical data; GeoTIFF files for images and maps; PDF files for reports and print-ready maps; and JPG files for photographs.

In keeping with the Australian model upon which the standards are based, metadata is recognized as crucial because it provides the background information needed to assess the quality of the data submitted. In the Canadian proposal, the standard has been simplified to include only what is considered absolutely necessary such as location, dates, and ownership. Eventually, additional metadata desired by interested stakeholders can be included in the guidelines since the formats are extensible.

We recommend that provincial and territorial governments create an incentive to promote submission of digital assessment data by granting additional credits. Submitting exploration data in digital format in exchange for additional assessment credits will put more digital data in the hands of explorers and prospectors. As they gain access to new data that can be integrated quickly and easily with existing information, explorers will be able to generate better targets more efficiently and discovery rates should improve.

Appendix 1: Summary table of review of current digital assessment data submission requirements in jurisdictions across Canada

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Alberta	Canada: British Columbia	Canada: Ontario	Canada: Prince Edward Island	Canada: Manitoba	Canada: New Brunswick
1. Summary	Alberta does not require a prospecting license to explore for minerals within the Province. Alberta requires an application and exploration plan to be filed with the government prior to exploration work occuring. The Province has a proscribed format for which exploration data is to be submitted.	The Mineral Titles Branch of the Ministry of Energy and Mines administers the legislation governing the acquisition, exploration and development of mineral rights in British Columbia. Mineral exploration is regulated under the "free entry" principle. A Free Miner Certificate is required for an individual, partnership or corporation to register a mineral title in their name, acquire a mineral title through completion of a Bill of Sale, and to register exploration and development work or make a payment instead of exploration and development work on that recorded holder's mineral title.	Ontario requires a prospecting license in order to prospect and stake claims within the province. The province does allow cash-in-lieu to be paid every second year to meet assessment work requirements to maintain a mining claim in good standing. Ontario does not have a confidentiality period once the assessment information is accepted by the provincial mining recorder.	Prince Edward Island does not require a prospectors license to operate in the province. Cash-in-lieu of work is not accepted. No mining is currently taking place within the province.	Manitoba requires a prospecting license, cash-in-lieu may be paid instead of performing work to keep the rk to keep the k to keep the land in good standing.	New Brunswick requires a prospecting license, cash-in-lieu may be paid once during the first year for renewal of claims, but the work must still be completed in the second year. Work requirements are determined on an escalating schedule based on the age of the claim. Notice of work to be done must be filed prior to exploration work commencing.
2. Exploration Work Approval and Assessment	An application and exploration plan is required prior to exploration work commencing. Cash-in-lieu of work may be paid once during the duration of an exploration permit. Assessment costs increase over the duration of the permit.	A Notice of Work (NOW) is required prior to exploration work being undertaken in the Province of British Columbia. A NOW and subsequent Mines Act Permit (Permit) are required when mechanical disturbance is to be undertaken. Exploration activities such as geological mapping, geochemical sampling, prospecting, airborne geophysics, and some ground geophysics do not require the submission of a NOW/Permit. NOWs and Permits are administered and maintained by the Health, Safety, and Permitting Branch. Once exploration work has been completed, clients have one year to file a Statement of Work, applying the value of the work done to extend the expiration date of the tenure(s). If work is completed, a claim may be renewed up to ten (10) years into the future. The required work value is $5.00/hectare (first and second anniversary years), $10.00/hectare (third and fourth anniversary years), $15.00/hectare (fifth and sixth anniversary years), and $20.00/hectare (all subsequent anniversary years). Cash payment may be made instead of completing exploration and development work, however the cost is double the value of exploration and development that would be required to maintain the claim, and the claim may only be advanced a maximum of one (1) year with a six (6) month minimum. On Placer claims, the required work value is $20.00/hectare per.	Work must be conducted on land in order to meet annual assessment work requirements. Ontario allows for work to be transferred from other land types such as leases onto claims subject to certain conditions for renewal. Excess work can be banked for future renewals.	$5 per acre (0.4 hectares) of work must be submitted to the province within each 12 month period in order to keep the land in good standing.	Work must be completed, or cash-in-lieu paid on an escalating schedule dependent on the age of the license. The province is divided into Zone A and Zone B which alters the amounts required.	Work must be completed on an escalating schedule dependent on the age of the claim, or cash-in-lieu paid once during the first year.

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Alberta	Canada: British Columbia	Canada: Ontario	Canada: Prince Edward Island	Canada: Manitoba	Canada: New Brunswick
3. Work Types	Acceptable work types focus on exploration activities; administrative costs are not accepted.	There are two major work types: Physical Exploration and Development; and, Technical Exploration and Development. Refer to the definition section in the Mineral Tenure Act Regulation for clarification on what specific work types fall under each category.	Physical exploration, rehabilitation as well as administrative work can be claimed for credit towards claim renewal in the province.	Physical exploration work, administrative expenses, survey and studies are accepted.	Physical exploration work as well as administrative expenses are accepted for renewal of licenses. If an airborne survey is required an application must be submitted.	Physical exploration work, administrative expenses, survey and studies are accepted.
4. Submission Requirements	Not all exploration work needs to be submitted in the Province.	Only work being applied for assessment credit (to advance the mineral tenure expiry date) needs to be documented in the Physical or Technical Assessment Report. There is a fillable form that must be submitted for Physical Work Reports. For Technical work reports, the Assessment Report Title Page and Summary form must be submitted along with a technical report that contains required information as set out in the Mineral Tenure Act and Regulation.	Not all exploration work needs to be submitted in the Province.	All exploration work needs to be submitted to the Province.	All exploration work needs to be submitted to the Province.	All exploration work needs to be submitted to the Province.
5. Listing of Reports and Submissions	Two reports are required, an intent to file an assessment report which can also be used to accelerate the process of returning land to the Province. A full mineral assessment report in the proscribed format submitted to the province detailing geological information gleaned to support the renewal process.	Clients must register the work online as a Statement of Work, indicating the type and value of work completed, and the anticipated new expiration date of the tenures. Physical Work reports must be submitted within 30 days after the statement of work has been filed. Physical Work reports are reviewed by a Titles Inspector with the Mineral Titles Branch. Technical Work reports must be submitted within 90 days after the statement of work has been filed. Technical Work reports are reviewed by geologists with the Geological Survey Branch. Both Physical and Technical Work (assessment reports) may be submitted by email (Mineral.Titles@gov.bc.ca), uploaded through Mineral Titles Online, or mailed to the Mineral Titles Office in Vancouver, BC.	Work assessment, credit distribution and technical work reports are required to be submitted to the government. Work assessment and credit distribution reports are standard government forms, Technical work reports are required to detail the work completed, geological results and discoveries. Ontario reduces the value of work over time to 50% if not submitted within 24 months of completion, and to 0% if not submitted within 60 months.	A report of work done is the only report required in the Province.	Application to report and apply required work, allocation of work credits and technical work report are required for exploration reporting.	Notice of work on private or crown lands to be submitted prior to work commencing. If drilling was involved a drill report is to be submitted upon completion of the work program. A report of work is to be submitted for all exploration work.

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Alberta	Canada: British Columbia	Canada: Ontario	Canada: Prince Edward Island	Canada: Manitoba	Canada: New Brunswick
6. Mapping	No Mapping requirements specified.	No Mapping requirements specified.	Datum – NAD 83Grid Based Map Coordinates – Geographic North American Coordinate Data – Degrees, Minutes, Seconds	No Mapping requirements specified.	No Mapping requirements specified.	No Mapping requirements specified.
7. Confidentiality Provisions	Exploration submissions are kept confidential for one (1) year from the Mineral Assessment Report date.	Technical assessment reports are kept confidential for one (1) year from the date the work was registered in a Statement of Work. These reports are made available to the public through ARIS (Assessment Report Indexing System), managed by the Geological Survey Branch. There is currently no venue for the public release and download of Physical work reports.	Work and assessment reports are made public upon acceptance by the mining recorder.	Exploration work is held in confidence for 2 years after submission.	Exploration work reports are held in confidence for a period of three years after submission.	Exploration work reports are held in confidence for a period of two years after submission. The report is made public early if the claim is no longer active or if requested by the claim holder.
8. Open File Data Access	Data can be obtained from the mining recorder and some may be accessed through the Alberta Geological Survey web environment.	Technical Assessment Reports (.pdf format) are made available for public download through ARIS. In addition to the .pdf document (technical assessment report) submitted and made available to the public, any digital data (Excel spreadsheets, geophysical data, spatial files, etc) that are submitted are compiled into a .zip folder and are also made available for public download once the one (1) year confidentiality period passes.	For work reports submitted prior to 2006, assessment data is available at the local mining recorders office. Post 2006 data is also available on the Geology Ontario's online system. Assessment data after 2014 is now also available online at OGS Earth.	Data is available upon request of the mining recorder.	Data is available upon request of the mining recorder.	Work and data is posted after the confidentiality period on the provincial website.

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Alberta	Canada: British Columbia	Canada: Ontario	Canada: Prince Edward Island	Canada: Manitoba	Canada: New Brunswick
9. Source Documents and Digital Data Requirements	The following documents are available: Alberta Energy_ Exploring for Minerals; Alberta Energy_ Guideline for Prospectors; Alberta Energy_ Minerals Exploration Checklist; Alberta Geological Survey (AGS); Assessment_Report_ Guidelines; Exploration Regulation; Metallic and Industrial Minerals Exploration Regulation; Metallic and Industrial Minerals Tenure Regulation - Guidelines for Statement of Intent to File Assessment; Metallic and Industrial Minerals Tenure Regulation: Mines and Minerals Act: Mines and Minerals Administration Regulations; Part_A _Sample_Assessment_ Report _2008; Sample_ Assessment_Cover _Letters_2008.	Assessment reports are mostly submitted as electronic files (.pdf) format, however paper copies of reports are still accepted. Hard copy reports are scanned for eventual electronic release of the reports. Electronic versions are the preferred method. For large digital files, Mineral Titles accepts mailed in digital copies of reports on CD/DVD or USB Flash drives. There is currently no legislative requirement that digital data be submitted, however the Brisith Columbia Geological Survey welcomes the submission of such data along with the technical assessment reports. When clients submit 'digital data' in the form of excel spreadsheets (geochemistry, assays, core logs, geophysical results), geophysical data files (various formats), spatial files, imagery, etc. these data are compiled into a .zip file and made available for public download with the report. These data are not compiled into dedicated databases.	As of 2012 assessment reports are submitted in paper (45%) and in electronic (55%) form. EAS (Electronic Assessment System) is designed to be an easy method of submitting work reports, it is free, you may submit directly from your desk and it is available 24/7/365. Other than that, there is no explicit encouragement in regulations to submit digitally/electronically. Please note that Ontario is proposing to move away from ground staked mining claims and to implement province-wide online mining claim registration and a new electronic Mining Lands Administration System (MLAS), as part of the ongoing roll-out of the Mining Act Modernization (MAM) process. The claim holder would submit assessment work reports and distributions online through MLAS.	The following source documents are available: Mineral Resources Act; Work Regulations.	The following source documents are available: The Mines and Minerals Act; Allocation of Required Work Credits - mb6; Application to Report and Apply Required Work mb5; Drilling Regulation, 1992; Fee Schedule; Mineral Disposition and Mineral Lease Regulation; Notice of Airborne Survey - mb27; Prospecting Application - Company - mb2; Prospecting Application - Individual – mb1; Application for Borehole License.	Reports of work can be submitted in digital format or paper, although digital format is strongly encouraged. Guidelines for completing reports of work are available on our provincial website.
10. Source Documents and Digital Data Requirements (cont'd)		Legislation: Mineral Tenure Act; Mineral Tenure Act Regulation; Mines Act. Mineral Titles Online: Statement of Work, Information Updates, Notices, Frequently Asked Questions, Forms, Physical Work Report Form Geological Survey Branch: Title Page and Summary Form, Schedule A (Regulation) Checklist, ARIS FrontCounterBC: Notice of Work application	The following source documents are available: Application for Prospectors License; Application for Renewal of Prospectors License; Application for a Duplicate Prospectors License; Application for Extension of Time to Perform and or File Work; Application to Distribute Banked Assessment Work Credits; Assessment Work Performed Before Recording Claim(s); Assessment Work Performed on Mining Lands; Drill Core Library Submission receipt MNDM Drill Core Library; Drill Hole Summary Sheet; Drill Log; Geology Ontario _ Ministry of Northern Development and Mines; Mining Act, R.S.O. 1990; Notice of Intention to Perform Assessment Work; Ontario Regulation 6 96; Schedule for Assessment Work Performed on Mining Land.			The following source documents are available: Mining Act - New Brunswick; Mining Regulations 86 - 98 - New Brunswick; Form 18 - Notice of Planned Work on Private Land; Form 18.1 Notice of Planned Work on Crown Lands; Prospecting License Requirement; Work Report Confidentiality Statement; Report of work guidelines. http://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/minerals.html

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Newfoundland and Labrador	Canada: Nova Scotia	Canada: Nunavut	Canada: Quebec	Canada: Saskatchewan	Canada: Yukon
1. Summary	Newfoundland and Labrador does not require a prospecting license, however it is possible to register as a genuine prospector which allows for staking more claims without posting a security deposit. Work required is on an escalating schedule based on the age of the claims. A security deposit may be posted if the work cannot be completed in time, however the work must be completed and reported within the next reporting period.	Nova Scotia requires a prospecting license, cash-in-lieu may be paid instead of performing work to keep the land in good standing subject to restrictions and approval.	Mining activity in the Territory is governed by Indigenous and Northern Affairs Canada at the Federal Level. A license to prospect is required. Work requirements are on an escalating schedule depending on the age of the license. Nunavut Tunngavik Incorporated (NTI) is responsible for subsurface tenure administration on Inuit owned lands. An agreement with the local Regional Inuit Association is required for access to these lands.	A prospecting license is required in the province. Cash-in-lieu is accepted for renewal of a claim. Note, if the company is based in Quebec, all reports and forms must be submitted in French.	A prospecting license is not required in the province. Work must be completed on an escalating schedule for renewals. A security deposit can be made if work cannot be completed in time for a renewal, though the work must be completed and filed during the next renewal term to have the deposit refunded. Cash-in-lieu is accepted for renewal of a disposition. Neither of these options can occur for more than three consecutive assessment work periods.	A prospecting license is not required in the Yukon. Yukon land types are divided in Quartz and Placer and the regulations differ between the two. Cash-in-lieu is valid for Quartz claims, NOT for Placer claims.
2. Exploration Work Approval and Assessment	Work must be completed on an escalating schedule dependent on the age of the license, or a security deposit posted, though work still needs to be completed during the next renewal period. A notice must be filed with the province prior to commencing a work program.	Work must be completed on an escalating schedule depended on the age of the license. Cash-in-lieu may be posted subject to restrictions if the work cannot be completed. Notice of work needs to be submited prior to work that includes the risk of significant ground disturbance. Notice of drilling needs to be submitted prior to drilling, if bulk sampling a notification needs to be submitted.	For prospecting permits, the territory is divided into two zones which determine the required work amounts, claims are not subject to the division. NTI issues Exploration agreements which grant a right to explore on Inuit owned lands.	Work must be completed on an escalating schedule dependent on the age of the license. The province is divided in two which alters the amounts required.	Work must be completed on an escalating schedule dependent on the age of the license.	Work required does not escalate by the age of the claim, though is different between quartz and placer claims.
3. Work Types	Physical exploration work is accepted for renewal expenses.	Physical work and ancillary work are accepted. Work value for surveys is accepted, but the value declines as to the length of time between program completion and data submission.	Physical work, as well as work on roads and airstrips are acceptable for renewal expenses.	Physical exploration work, administrative expenses, survey and studies are accepted.	Physical exploration work, administrative expenses, survey and studies are accepted.	All work completed for assessment credit must be submitted to the government.
4. Submission Requirements	All exploration work needs to be submitted to the Province.	Nova Scotia assumes that all exploration work is submitted, though there is no legislated requirement for such.	All exploration work needs to be submitted to the government.	All exploration work needs to be submitted to the government.	All work completed for assessment credit must be submitted to the government.	All work completed for assessment credit must be submitted to the government.

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Newfoundland and Labrador	Canada: Nova Scotia	Canada: Nunavut	Canada: Quebec	Canada: Saskatchewan	Canada: Yukon
5. Listing of Reports and Submissions	Physical exploration work must be reported as well as costs incurred for the work program.	Prospectors statement which is a brief description of the work program, technical work report, and statement of work expenditure are required. An application for bulk sampling and drilling are required before either activity.	A statement of representation work, detailed statement of expenses and exploratory work are required to be submitted.	A simplified work report, work declaration form and report of technical evaluation studies are required depending on the work types completed. Surveys, stripping and excavation, sampling and work to open a face, drilling, research and technico-economic study reports are required if these activities are undertaken.	The following Reports/ Submissions are required: Online Record of Expenditures for Assessment Work; Technical Reports and Data; and, Grouping Instructions.	Certificates of work, application for grant renewal and technical reports need to be submitted for renewal of quartz or placer claims.
6. Mapping	No Mapping requirements specified.	No Mapping requirements specified.	No Mapping requirements specified.	Datum required is NAD27 or NAD83 in accordance with the National Topographic System of Canada (NTS), and all maps must be submitted at 1:50,000 scale.	Datum required is North American Datum 1983 (NAD83) CSRS98, and projection is Universal Transverse Mercator (UTM) with zone indicated. Maps must be at a scale sufficient to clearly depict all observations made.	No Mapping requirements specified.
7. Confidentiality Provisions	Exploration work reports are held in confidence for a period of three years after submission.	Exploration work reports are held in confidence for a period of two years after submission.	Exploration work reports are held in confidence for a period of three years after submission.	Reports are published once accepted by the mining recorder.	Exploration work reports are held in confidence for a period of three years after submission or when the mineral disposition for which the assessment work was done lapses or is terminated, whichever arises first.	Exploration reports are held in confidence for a period of five years or six months after all claims the report covers have expired.
8. Open File Data Access	Newfoundand and Labrador posts work and data after the confidentiality period to its online system Geofiles.	Data is available through the library system, scanned pdf files are also provided.	Data is available upon request of the mining recorder.	Data is available upon request of the mining recorder or through the Geology Quebec web portal.	Data is available upon request of the mining recorder and may be subject to a fee.	Data are available upon request of the mining recorder or through the Yukon Geological Survey web portal **www.geology.gov.yk.ca.** Assessment report footprints are spatially searchable through an online mapviewer site: **http://yukon2.maps.arcgis.com/**

Exploration Assessment Data Digital Formats v1.0

Jurisdiction Summaries	Canada: Newfoundland and Labrador	Canada: Nova Scotia	Canada: Nunavut	Canada: Quebec	Canada: Saskatchewan	Canada: Yukon
9. Source Documents and Ditigal Data Requirements	The following source documents are available: Acquiring mineral rights and Managing your Mineral Exploration License; Application for Exploration Approval and Notice of Planned Mineral Exploration Work; Form for Preparation of a Work Plan for Mineral Exploration in Labrador Inuit Lands; Assessment Report Checklist; Genuine Prospector Application; Genuine Prospector Renewal; Guidebook to Exploration, Development and Mining in Newfoundland and Labrador; Guidelines for the Form of Reports and Illustrations; Mineral Act; Mineral Regulations under the Mineral Act; Standard for Exploration - Labrador Inuit Lands.	The following source documents are available: Mineral Resources Act; Mineral Resources Regulations - Mineral Resources Act (Nova Scotia).; A Guide to Mineral Exploration Legislation in Nova Scotia; Application for a Letter of Authorization; Application to Register as a Prospector; Excavation Registration; Notification of Proposed Drilling Program; Prospectors Statement; Statement of Assessment Work Expenditure.	Currently they are required to submit 1 hardcopy and 1 digital report to us, although we will shortly be changing to digital-only. The requirements for digital data are numerous but these covered in a PDF document. However any data which is processed to produce diagrams, maps, charts or illustrations shall be submitted in the final processed form such that it may be further manipulated, analyzed or interpreted. We now accept digital or hard copies of reports. The following source documents are available: Territorial Lands Act; Nunavut Mining Regulations; Statement of Representation Work; NTI_Lands_brochure.	The following source documents are available: form-mines-management-mining-titles; form-mines-prospecting-licence-application; form-mines-prospecting-licence-duplicate; form-mines-prospecting-licence-renewal; form-mines-simplified-exploration-work; form-mines-work-declaration; Loi sur les mines - Mining Act – English; Loi sur les mines - Mining Act – French; Règlement sur les substances minérales autres que le pétrole, le gaz naturel et la saumure; Regulation respecting mineral substances other than petroleum, natural gas and brine – English; Geologie Quebec - Sigeom a la carte; SimplifiedExplorationReport _info.	All data is submitted in digital format. This has been required under the regulations since 2005, except where an individual prospector submits a report for work valuing less than $20,000.	The following source documents are available: Placer Mining Act Land Use Regulations; Placer Mining Act; Quartz Mining Act Land Use Regulation; Quartz Mining Act; Quartz Mining Fees and Forms Regulation; Schedule of Representation Work (Placer Mining), 2003; Schedule of Representation Work (Quartz Mining), 2003; Yukon Geological Survey.
10. Source Documents and Ditigal Data Requirements (cnt'd)					The following source documents are available: Assessment Report Guidelines; The Mineral Tenure Registry Regulations, 2012, Evidence of Assessment Work; Bill 125 Amendment to Crown Minerals Act; Chapter 9 Amendment to Crown Minerals Act; Crown Minerals Act; Declaration of Responsibility for Assessment Work Submission; Grouping Instructions; Map Standards; Mineral Resources Act.	

Appendix 2: Example Manifest List File

The following table lists all the files and types in the assessment data submission. It is important that all files are listed to ensure that no files are missing. The Manifest file will be labelled with the project name and the year of the report followed by the word Manifest and a file extension such as .csv (eg: BlueLagoon_2014_Manifest.csv).

Exploration Work Type *	Num	File Name	Format
Number of Files in Submission			
PDF Assessment Report			
Office Compilation			
Geological Compilation			
Geophysical Compilation			
Geochemical Compilation			
Other (specify)			
Airborne Surveys			
Aeromagnetics			
Radiometrics			
Electromagnetics			
Gravity			
Digital terrain modelling			
Other (specify)			
Ground Surveys			
Geological Mapping			
Regional			
Reconnaissance			
Prospect			
Underground			
Other (specify)			

Exploration Work Type *	Num	File Name	Format
Ground geophysics			
Radiometrics			
Magnetics			
Gravity			
Electromagnetics			
IP			
AMT			
Well logging			
Other (specify)			
Exploration Work Type *	**Num**	**File Name**	**Format**
Geochemical Surveying			
Drill sample			
Stream sediment			
Soil			
Rock chip			
Water			
Biogeochemistry			
Whole rock			
Other (specify)			
Drilling			
Diamond drilling			
Reverse circulation			
Other (specify)			
Other			
Specify			
* Use one line per file but more than one line can be used for same category			

Appendix 3: Quantum GIS (QGIS) Primer

Shapefiles require special software to read, write and display. If you do not already have GIS software, you can download and install Quantum GIS, a free and open source software.

This is the latest version of Quantum GIS:

https://www.qgis.org/en/site/forusers/download.html

Be sure to download the correct version for your Windows operating system, namely 64bit or 32bit. To determine which version you should use click on the Windows "Start" button (Windows symbol in lower left hand of screen), right-click on "Computer" and select "Properties". The System Type will list 32 or 64 bits (Figure A-1). After downloading the software package, double click to launch the exe file and follow any instructions (it won't be

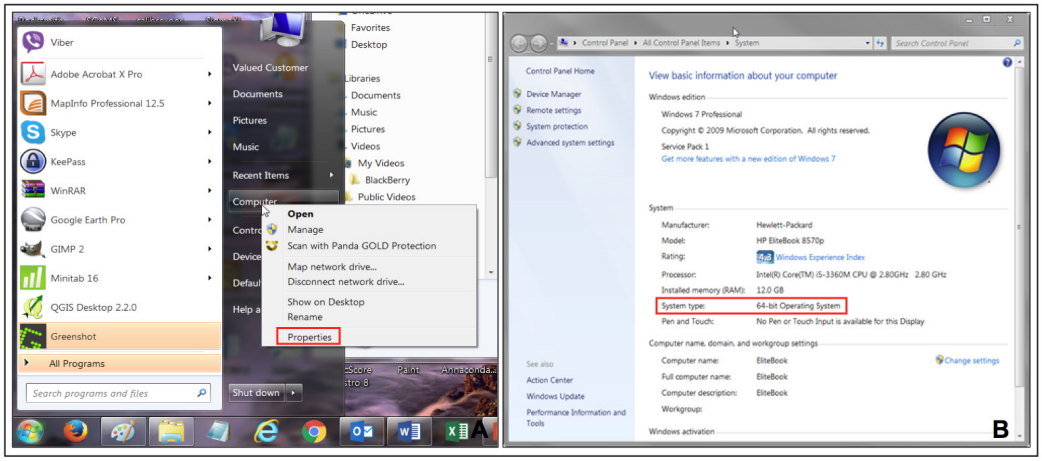


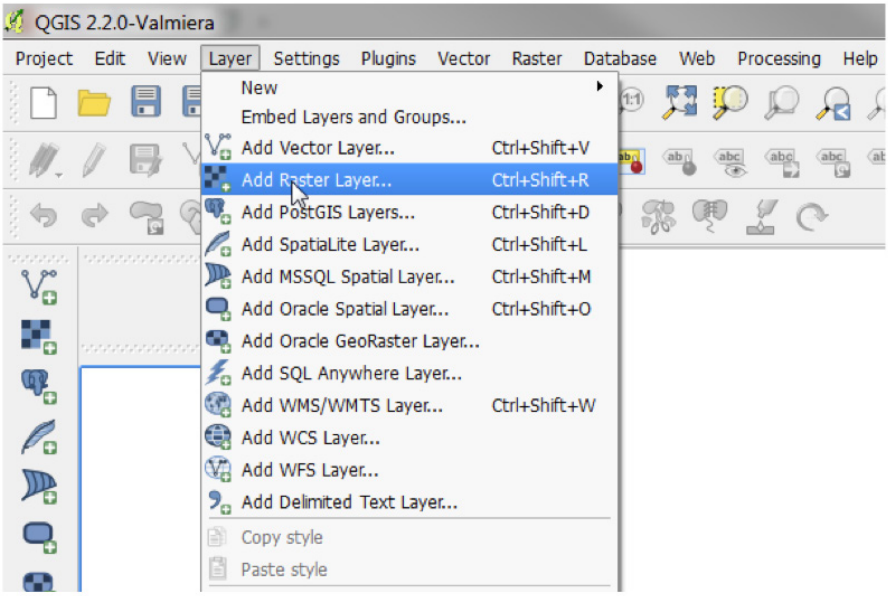
Figure A-1: Identification of type of Windows operating system, 64 bit in this example.

Although QGIS is a full-featured, highly-sophisticated software package, only a few functions are required to create georeferenced layers in UTM NAD83, add lines or polygons to layers, enter database information, combine layers into composite layers with the lines in one layer and the polygons in a second, and finally export the layer to a shapefile.

The best way to capture lines and polygons is to digitize the features on a base map or image. There are a few options, but the simplest is to download images of 1:50,000 scale map sheets in GeoTIFF format from:

http://ftp.geogratis.gc.ca/pub/nrcan_rncan/raster/toporama/50k_utm_tif/

Open the GeoTIFF file by selecting the "Layer "menu item and clicking on "Add Raster Layer".



Navigate to the appropriate directory and select a GeoTIFF file. Click "Open"(Figure A-2).

Figure A-2: Menu navigation to open a raster layer in QGIS.

Another option is to install a QGIS plugin called OpenLayers. In this case:

- Click on menu item "Plugins"
- Select "Manage and Install Plugins" while connected to the internet (Figure A-3).
- Scroll down the list and select "OpenLayers Plugin" and click on "Install plugin".
- Return to the Plugins menu, click on the "OpenLayers Plugin" and select a source of map data. Google Satellite generally works well down to the property scale and can sometimes zoom in to the outcrop scale. However, there are a number of data sources

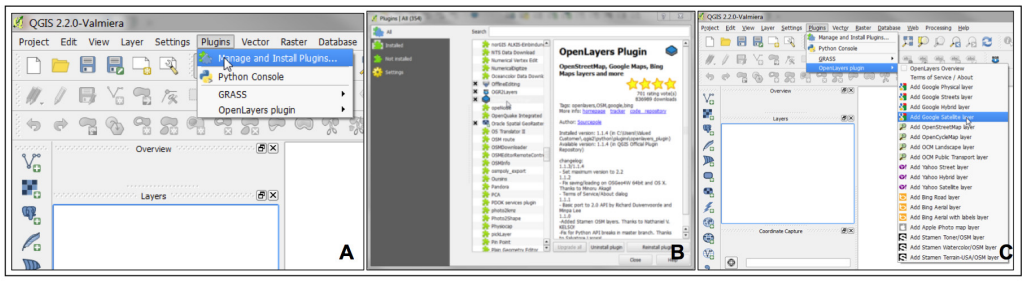


Figure A-3: Accessing and loading the OpenLayers Plugin. A: Accessing the Plugin menu; B: Selecting OpenLayers plugin;
C: Accessing the OpenLayers menu.

A good source of more detailed, 1:50,000 scale vector topographic data published in UTM NAD83 format can be obtained from the Canadian government at the Geogratis website:

http://geogratis.gc.ca/site/eng/extraction?bbox=-141.00,41.00,-51.00,85.00

The federal, provincial and territorial governments publish large amounts of geological, geochemical and geophysical data, often in shapefile or GeoTIFF formats or, in the case of point data, as georeferenced csv delimited ASCII text files. You can find this data easily on different government mining ministry and geological survey websites.
Regardless of the solution, you are now ready to add lines and polygons from property scale mapping.

Two template shapefiles are provided in WGS84 lat-long coordinates; these templates will store lines and polygons: RP2016_GL1_lin_WGS84_LatLong.shp & RP2016_GL1_pol_WGS84_LatLong.shp. Open both layers, which contain no features, and save both files in the appropriate UTM NAD83 zone corresponding to your project area.

To open a vector layer within QGIS Desktop:

- Select menu item “Layer”
- Click on “Add Vector Layer” to open a new window (Figure A-4).
- Click on “Browse” and navigate to the directory containing the two files listed above.
- Select both by pressing on the Cntrl key while left clicking on each file and clicking on “Open”.
- Click on “Open” again. Note that there are no features in either layer so nothing will

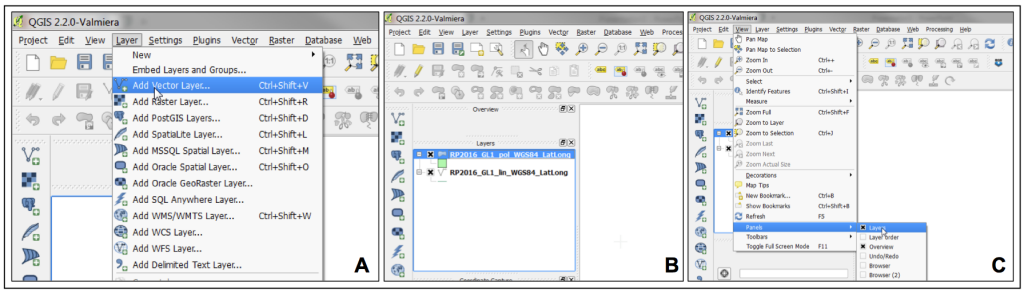


Figure A-4: Opening a Vector layer in QGIS. A: Accessing the Add Vector Layer menu; B: WGS84-LatLong, Line and Polygon layer appear in Layers sidebar window; C: Opening the Layers sidebar window.

There should a sidebar panel window on the left labelled “Layers”. If not, turn it on by selecting the menu item “View” and clicking on “Panels” followed by “Layers” then:

- Right click on RP2016_GL1_lin_WGS84_LatLong
- Select “Save As” to open a new window.
- In the “Save As” section, click on “Browse”, navigate to the appropriate directory and rename the file to an appropriate name.
- In the “CRS” section, click on “Browse” and select an appropriate UTM NAD83 zone that corresponds to your project area. The name of the layer and the projection will appear in the window.
- Click on “OK”
- Repeat for the file RP2016_GL1_pol_WGS84_LatLong and you will now have master template layers for your project. You can copy and rename these files but take care to ensure that all four or five files with different extensions have the same label (but different extensions) to avoid errors.

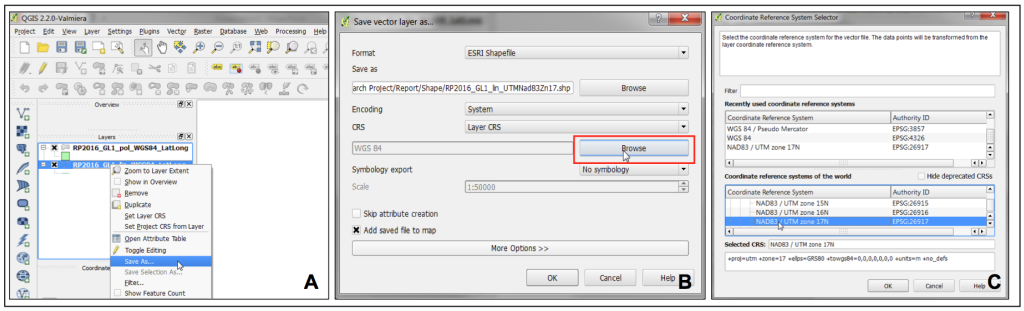


Figure A-5: Saving a vector layer to a different projection. A: Save layer by right clicking on layer in Layers side window;
B: Select Browse in CRS section; C: Select appropriate UTM projection for project area.

A detailed "how to" reference to create vectors is available at:

https://docs.qgis.org/2.2/en/docs/training_manual/create_vector_data/create_new_vector.html

It is beyond the scope of this primer to provide instructions on how to create polygons in QGIS but, if necessary, instructions are available at:

https://github.com/mtop/speciesgeocoder/wiki/Tutorial-for-creating-polygons-in-QGIS

To make a layer editable, right click on the layer in the layers sidebar window and select "Toggle Editing" (Figure A-6).

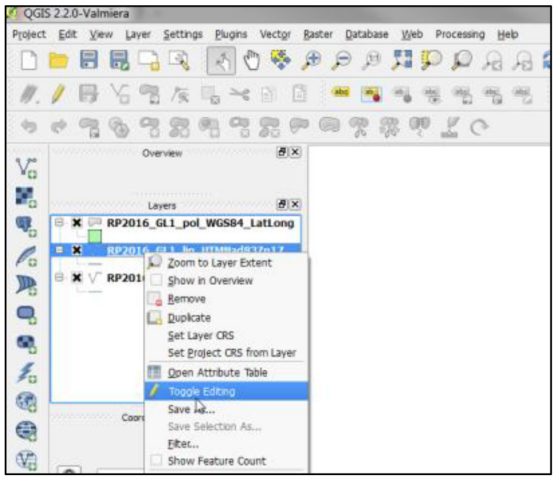


Figure A-6: How to toggle the Edit mode for vector by right clicking on the layer in the Layers sidebar window and selecting Toggle Editing.

You can create as many line and polygon layers as needed to keep the map data clean and easy to work with. However, ultimately all the layers must be combined into one for publication. Instructions on combining features from different layers are available at:

http://gis.stackexchange.com/questions/90119/add-objects-from-one-layer-to-another-at-qgis

Put simply, features can be cut and pasted from one editable layer to another just like with any other Windows program. The only requirement is that the layers have the same type of objects, namely lines or polygons, and that the layers have the same attribute table structure. Once the map features are combined together, the resulting layer can be saved to the final shapefile that will be published for assessment.

The two shapefile templates for lines and polygons each contain four alphanumeric fields as follows:

Variable Name	Definition	Description
Feat_code	Feature code	Type of feature
Feat_value	Feature code value	Coded value of feature
Interp_lvl	Interpretation level	Observed, Interpreted, or Presumed
Comment		80 character comment

Table A1: List of fields required in shapefiles.

Because the lines and polygons in shapefiles may contain coded information for several geological features, dictionaries should contain additional fields or columns to identify the type of geological data (e.g. Lithology for geological units; Fault_type for faults) in addition to the list of codes and corresponding descriptions. This will make the dictionary more readable and facilitate the transfer of data into separate dictionaries.

You can include additional fields but the ones in Table A1 must bepresent. Remember that field names can only have a maximum of 10 characters.

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