

#### Weighted Sums Modelling

The application of Weighted Sums Modelling (WSM) to exploration geochemistry was described by Garrett and Grunsky (2001) as a means to model multi-element data using a priori knowledge of the mineralogy and element composition of the sought after mineral deposit (Kane, 1977; Garrett et al., 1980). In this procedure weights or relative importances are assigned to each variable, or a subset of variables, according to some geochemical or mineralogical model of the target mineral deposit type or geological process. Weighted sums (WS) are new variables calculated from the multi-element geochemical results. Like Principal Components Analysis (PCA) or Factor Analysis scores, WS scores have the form of normal or standardized scores with a mean of zero and a standard deviation of one. The main difference between WSM and traditional multivariate statistical methods is that the user assigns the variable weightings rather than determining them with a covariance/correlation matrix for the dataset, as is done in PCA. Furthermore WSM is a robust statistical technique that is not influenced by the presence of outliers (Beckman & Cook, 1983).

The reader is referred to Garrett and Grunsky (2001) for a description of the WS calculation. In summary, relative importance is assigned for each variable. A weighting of 3, for example, means that that particular element is three times more important than an element with a weighting of one. Weighting can be positive or negative. Positive weightings mean that the target model is associated with elevated concentrations of an element. Negative weightings indicate that low concentrations or depletions of an element are important.

Individual relative importance is converted into weights that sum to one by dividing each importance by the sum of the absolute values of importance (i.e., ignoring the negative signs). A requirement of the method is that the sums of the squares of the final weights also equal one. This is achieved by dividing each weight by the square root of the sum of the squares of the weights.

The next step involves calculation of the normal scores for the variables included in the model for each individual sample. To do this, robust estimates of the mean and standard deviation are used. The median (or 50th percentile) is used as a robust estimate of the mean and the inter-quartile range (IQR) multiplied by 0.7413 is used as a robust estimate of the standard deviation. IQR is the difference between the 75th and 25th percentiles of the data distribution and therefore covers a band of data 25% wide (or 0.67449 standard deviation units) on either side of the mean. The constant 0.7413 is used to convert the IQR, which covers a range of 1.3490 standard deviation units to an equivalent standard deviation<sup>1</sup>. Weighted sums are then calculated by multiplying the normal scores for each element by the element's corresponding weight and summing for each sample. The high resistance of the median and IQR to outliers mean that it is not usually necessary to trim outlier and far outliers from the dataset before calculation.

<sup>1</sup> For a normal distribution the standard deviation is equal to 0.7413\*IQR, where 0.7413 is the reciprocal of 1.349.

#### Models and Weightings

Six mineral deposit types (SEDEX, Porphyry Cu, W-Skarn, ICG, Polymetallic veins and Carlin) that are either known or believed to occur in the map sheet areas and one geochemical process (hydromorphic dispersion) are modeled using the WS method. Included elements and their relative importance are presented in Table 1.

#### Data Presentation

Results of each WS model are attached to the corresponding catchment basin polygons using a spatial join in ArcGIS. This process allows for the entire polygon to be assigned a colour based on its WS score. Colours are assigned on the basis of the following percentile breaks:

|         |            |
|---------|------------|
| 0-50%   | Dark blue  |
| 50-75%  | Pale blue  |
| 75-90%  | Pale green |
| 90-95%  | Yellow     |
| 95-98%  | Orange     |
| 98-100% | Red        |

With this scheme, catchment basins with the hotter colours represent samples with geochemical characteristics consistent with the mineralization style being modelled.

Table 1: Table of Relative Importances used to calculate weighted sums models

| Deposit Type            | Ag | Au | As | Ba | Bi | Cl | Co | Cs | Fe | Hg | K | Mn | Mo | Ni | Pb | S | Sb | Tl | W | Zn |
|-------------------------|----|----|----|----|----|----|----|----|----|----|---|----|----|----|----|---|----|----|---|----|
| Polymetallic Veins      | 4  | 4  | 3  | 3  | 4  | 1  | 2  | 1  | 1  | 1  | 1 | 1  | 1  | 5  | 3  | 5 |    |    |   |    |
| W-Skarn                 |    |    |    |    |    |    |    |    |    |    |   |    |    |    |    |   |    |    |   |    |
| Porphyry Cu             | 2  | 2  |    |    | 1  |    |    | 5  | 3  |    |   |    |    |    | 3  | 2 |    |    |   |    |
| Intrusive Related Cu-Au | 1  | 2  | 5  |    | 5  |    |    | 2  | 1  | 5  |   | 1  | 2  |    | 1  | 1 |    | 2  |   |    |
| SEDEX                   |    |    |    |    |    | 5  |    |    |    |    |   |    |    |    | 1  | 5 |    | 1  | 5 | 5  |
| Carlin                  | 2  | 1  | 5  | 2  |    |    |    |    |    |    |   |    |    |    |    | 5 |    |    |   |    |
| Hydromorphic Dispersion | 2  | 1  |    |    | 4  | 5  | 2  | 5  |    | 4  |   | 5  | 2  | 4  | 2  | 1 |    | 1  |   | 3  |

#### LEGEND

- Regional Geochemistry Sample (RGS) location

National Topographic System grid (1:250 000 scale)

National Topographic System grid (1:50 000 scale)

Yukon-Northwest Territories border

highway, paved

highway, unpaved

local road, unpaved

watercourse

waterbody

wetland

#### Pb (Levelled)

WSM Percentiles: WSM Score, Number of RGS Samples

0 - 50%: -3.272 - 0.119, 477 samples

50 - 75%: -0.118 - 0.537, 238 samples

75 - 90%: 0.538 - 1.216, 136 samples

90 - 95%: 1.217 - 1.705, 46 samples

95 - 98%: 1.706 - 2.481, 25 samples

98 - 100%: 2.482 - 5.050, 16 samples

#### QUATERNARY

Q

QUATERNARY: unconsolidated glacial, glaciofluvial and glaciolacustrine deposits; fluvialite silt, sand, and gravel, and local volcanic ash, in part with cover of soil and organic deposits

#### MID-CRETACEOUS

mKS

mKgS

mKgS

#### MIDDLE TO UPPER TRIASSIC

TJd

JONES LAKE: brown to buff weathering, calcareous fine-grained sandstone, argillite, and shale; extensive ripple cross-lamination and bioturbation; massive/light grey weathering, fine crystalline, dark grey limestone; minor orange weathering platy limestone

#### CARBONIFEROUS TO PERMIAN

CPMC

CPT

#### MISSISSIPPIAN

MK

#### DEVONIAN AND MISSISSIPPIAN

DME

DME1

DME2

#### ORDOVICIAN TO LOWER DEVONIAN

ODR

ODR1

ODR2

ODR3

ODR4

#### CAMBRIAN TO SILURIAN

CSM

CSM1

CSM5

#### UPPER CAMBRIAN AND ORDOVICIAN

COR1

COR2

#### LOWER CAMBRIAN

ICG1

ICG2

#### UPPER PROTEROZOIC TO LOWER CAMBRIAN

PCH

PCH1

PCH2

PCH3

PCH5

#### MIDDLE DEVONIAN

DH1

DH2

DH4

DL

DN

DA

#### UPPER LOWER TO LOWER MIDDLE DEVONIAN

DB

#### LOWER DEVONIAN

IDS

#### UPPER SILURIAN TO LOWER DEVONIAN

SDD

#### UPPER CAMBRIAN TO SILURIAN

CSH

#### UPPER ORDOVICIAN AND SILURIAN

OSK2

OSK4

#### MIDDLE ORDOVICIAN

OS

#### UPPER CAMBRIAN AND ORDOVICIAN

COF2

#### MIDDLE CAMBRIAN

mCH

mCR

#### LOWER CAMBRIAN

ICS

#### UPPER PROTEROZOIC TO LOWER CAMBRIAN

uPCV

#### UPPER PROTEROZOIC TO LOWER CAMBRIAN

PCB1

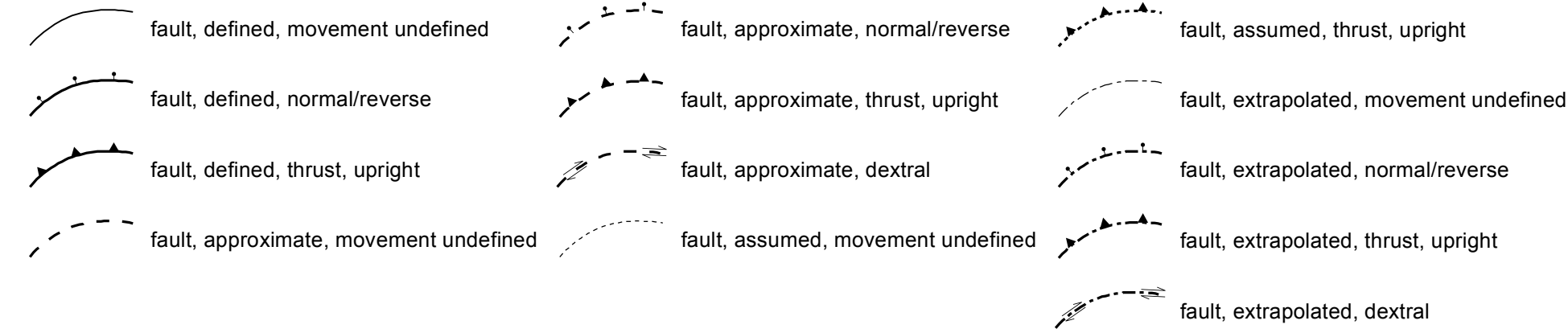


Table 2: List of Mineral Occurrences for NTS map sheets 1050 and part of 105P

| OCCURRENCE # | OCCURRENCE NAME | ALIAS(ES) | DEPOSIT TYPE                            | STATUS           | ECONOMIC COMMODITIES | OTHER COMMODITIES             |
|--------------|-----------------|-----------|---|------------------|----------------------|-------------------------------|
| 1050 001     | TOM             |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Deposit          | Pb, Ag, Zn, Ba       | Sb, barite, Cu                |
| 1050 002     | MACTUNG         |           | W Skarn                                 | Deposit          | W                    | Cu                            |
| 1050 003     | JEFF            |           | Porphyry Mo (Low F-Type)                | Showing          |                      | Mo                            |
| 1050 004     | ALP             |           | Au-Quartz Veins                         | Showing          |                      | Au, Ag                        |
| 1050 005     | NIDDERY         |           | Plutonic Related Au                     | Prospect         |                      | barite, Cd, Cu, Au, Ni, Ag    |
| 1050 006     | SCOT            |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Drilled Prospect |                      | Cu, Ni, Ag, Zn                |
| 1050 007     | ART             |           | Au-Quartz Veins                         | Prospect         |                      | Sb, As, Bi, Au, Pb, Ag        |
| 1050 008     | KEELE           |           | Porphyry Mo (Low F-Type)                | Showing          |                      | Mo                            |
| 1050 009     | EMERALD         |           | Porphyry-related Au                     | Showing          |                      | Bi, Cu, Au, Mo, Ag, W         |
| 1050 010     | HOHN            |           | Cu Skarn                                | Prospect         |                      | Cu, Au                        |
| 1050 011     | BEN             |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Showing          |                      | Pb, Zn                        |
| 1050 012     | ARROWHEAD       |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Showing          |                      | Cu, Pb, Zn                    |
| 1050 013     | RACCOT          |           | Sediment-Hosted Barite                  | Deposit          |                      | barite                        |
| 1050 015     | INCA            |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Past Producer    |                      | Ag                            |
| 1050 016     | STANDARD        |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Showing          |                      | Pb, Ag, Zn                    |
| 1050 018     | ODD             |           | Mississippi Valley-Type Pb-Zn (MVT)     | Drilled Prospect |                      | Pb, Ag, Zn                    |
| 1050 019     | JASON           |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Deposit          |                      | Pb, Ag, Zn                    |
| 1050 020     | SAMOVAR         | TEA       | Sediment-Hosted Barite                  | Deposit          |                      | barite                        |
| 1050 021     | WALT            | BAR       | Sediment-Hosted Barite                  | Deposit          |                      | barite, Cu, Pb, Ag, Zn        |
| 1050 022     | TRYALA          |           | Sediment-Hosted Barite                  | Drilled Prospect |                      | barite, Ba, Cu, Pb, Ag, Zn    |
| 1050 023     | ORZLE           | RAIN      | Shale-Hosted Ni-Zn-Mo-PGE (Nick)        | Showing          |                      | barite, Cu, Pb, Mo, Ni, V, Zn |
| 1050 024     | NIDPO           |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Drilled Prospect |                      | barite, Ag, Zn                |
| 1050 025     | BRENNER         |           | Unknown                                 | Drilled Prospect |                      | Cu, Pb, Zn                    |
| 1050 026     | DICKIE          |           | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Unknown          |                      | Cu, Pb, Mo, Zn                |
| 1050 027     | GARY            | GARGANTUA | Sediment-Hosted Barite                  | Deposit          |                      | barite                        |
| 1050 028     | FETCH           |           | Sediment-Hosted Barite                  | Drilled Prospect |                      | barite, Zn                    |
| 1050 029     | GOW             | TH        | Sedimentary Exhalative Zn-Pb-Ag (Sedex) | Anomaly          |                      | barite                        |
| 1050 030     | GRIZ            |           | Porphyry Mo (Low F-Type)                | Showing          |                      | Au, Mo, Ag, W                 |
| 1050 031     | VAN ANGEREN     |           | Porphyry Mo (Low F-Type)                | Showing          |                      | Mo                            |
| 1050 032     | NEVE            | BRICK     | Au-Quartz Veins                         | Drilled Prospect |                      | Sb, Au, Ag, Zn                |
| 1050 033     | KELVIN          | BORD      | Polymetallic Veins Ag-Pb-Zn+/-Au        | Prospect         |                      | Sb, Au, Pb, Ag                |
| 1050 036     | FAN             |           | Unknown                                 | Showing          |                      | barite                        |
| 1050 037     | LONER           |           | Barite Veins                            | Showing          |                      | Ba                            |
| 1050 038     | DUET            |           | Unknown                                 | Anomaly          |                      | Zn                            |
| 1050 039     | OLD CABIN       |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Showing          |                      | Cu, Au, Pb, Mo, Ag            |
| 1050 040     | URSA            |           | Unknown                                 | Anomaly          |                      | barite                        |
| 1050 041     | FANGO           |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Prospect         |                      | Sb, Au, Pb, Ag, Zn            |
| 1050 042     | FAL             |           | Unknown                                 | Unknown          |                      | FAL                           |
| 1050 043     | SIM             |           | W Skarn                                 | Showing          |                      | Pb, W, Zn                     |
| 1050 044     | NIT             |           | W Skarn                                 | Showing          |                      | Cu, Pb, Ag, W, Zn             |
| 1050 045     | STROSHIN        |           | Sediment-Hosted Barite                  | Showing          |                      | barite                        |
| 1050 046     | MINORCO         |           | Sediment-Hosted Barite                  | Showing          |                      | barite                        |
| 1050 048     | NUKE            |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Showing          |                      | Sb, As, Bi, Au, Cu, Pb, Ag    |
| 1050 049     | FAENZI          |           | Au-Quartz Veins                         | Showing          |                      | As, Au                        |
| 1050 050     | NORTH MACMILLAN |           | Barite Veins                            | Showing          |                      |                               |
| 1050 051     | DALL            | HARLAN    | Au-Quartz Veins                         | Prospect         |                      | Cu, Au                        |
| 1050 052     | BAILES          |           | Unknown                                 | Unknown          |                      | Cu, Au, Pb, Ag, Zn            |
| 1050 054     | ROGUE           |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Prospect         |                      | Au, Pb, Ag, Zn                |
| 1050 055     | CHRISTINA       |           | Subvolcanic Cu-Au-Ag (As-Sb)            | Showing          |                      | Cu, Au, Ag                    |
| 1050 056     | GOLD            |           | Porphyry Mo (Low F-Type)                | Anomaly          |                      |                               |
| 1050 057     | STUMP           | NID       | Plutonic Related Au                     | Showing          |                      | As, Cu, Au, Pb, Ag            |
| 1050 058     | LM              |           | Plutonic Related Au                     | Drilled Prospect |                      | Cu, Au, Ag                    |
| 1050 059     | SCRONK          |           | Polymetallic Veins Ag-Pb-Zn+/-Au        | Showing          |                      | Sb, Bi, Cu, Au, Ag, Zn        |
| 1050 060     | HASTEN          |           | Unknown                                 | Drilled Prospect |                      | Zn                            |
| 1050 061     | FUN             |           | Unknown                                 | Anomaly          |                      | Pb, Zn                        |
| 105P 001     | MEHTABEL        |           | Cu Skarn                                | Drilled Prospect |                      | Au                            |

#### Mineral Occurrence Deposit Type (Total on map)

- Au-Quartz Veins (5)
- Barite Veins (2)
- Cu Skarn (2)
- Mississippi Valley-Type Pb-Zn (MVT) (1)
- Plutonic Related Au (3)
- Polymetallic Veins Ag-Pb-Zn+/-Au (9)
- Porphyry Mo (Low F-Type) (5)
- Porphyry-related Au (1)
- Sediment-Hosted Barite (8)
- Sedimentary Exhalative Zn-Pb-Ag (Sedex) (7)
- Shale-Hosted Ni-Zn-Mo-PGE (Nick) (1)
- Subvolcanic Cu-Au-Ag (As-Sb) (1)
- Unknown (7)
- W Skarn (3)

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#### RECOMMENDED CITATION

HEBERLEIN, D., 2013. Yukon Geochemistry Weighted Sums Model for NTS 1050 and parts of 105P: Pb (Levelled). Yukon Geological Survey, Open File 2013-16, 116 sheets. Scale 1:250 000.

Digital cartography by J.O. Bruce, Yukon Geological Survey.

Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

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Funding for this project was provided by the Canadian Northern Economic Development Agency (CanNor) through their Strategic Investments in Northern Economic Development Initiative.