GSA Data Repository 2020063

Gadd, M.G., et al., 2020, A Middle Devonian basin-scale precious metal enrichment event across northern Yukon (Canada): Geology, v. 48, https://doi.org/10.1130/G46874.1

Conodont samples near HEBS at the Peel, Nick and Cardiac Creek prospects

Methods

- Conodont laboratory:
  - 2.5 kg of calcareous rock is crushed into walnut-size fragments and dissolved in glacial acetic acid (10 % concentration). This procedure includes several acid changes until all rock material is dissolved.
  - Insoluble residues are sieved (75µm and 2mm sieves), washed and dried.
  - Boiling of residues in diluted bleach for 4-6 hours to remove organic material. Residues are washed and dried.
  - Separation of light and heavy mineral fractions of the residues using Lithium Metatungstate.
  - Washing and drying of the heavy residue.
- Conodont biostratigraphy:
  - Heavy residues are scanned and picked for conodonts under a stereo microscope.
  - Identification of conodonts through comparison with relevant literature.
  - Biostratigraphic age determination based on the identified fauna.

Results

Peel prospect (Gouwy, 2018)

- C-626870: 1.1 m below HEBS: *Polygnathus eiflius* Bischoff & Ziegler, 1957

  Age of the sample falls withing the *eiflius* to *ansatus* zones interval.

- C-626871: 0.9 m above HEBS: *Polygnathus linguiformis klapperi* Clausen, Leuteritz & Ziegler, 1979, *Polygnathus linguiformis weddigei* Clausen, Leuteritz & Ziegler, 1979, *Polygnathus rhenanus* Klapper, Philip & Jackson, 1970, *Polygnathus varcus* Stauffer, 1940

  Age of the sample falls within the *rhenanus*/*varcus* to *ansatus* zones interval.

Samples from above and below the HEBS indicate that the age of HEBS falls within the *eiflius* to *ansatus* zones interval.

Nick prospect (Orchard, 1991)

- C-175526: 2.5-3.3 m below HEBS: *Tortodus? intermedius* (Bultynck, 1966), *Polygnathus costatus costatus* Klapper, 1971, *Tortodus?* sp.

Age of the sample falls within the *australis* to *kockelianus* zones interval.

- C-175530: 1.2-1.9 m below HEBS: *Tortodus? intermedius* (Bultynck, 1966), *Polygnathus angusticostatus* Wittekindt, 1966, *Polygnathus* ex. gr. *costatus* Klapper, 1971, *Polygnathus* sp., *Dvorakia* sp.

  Age of the sample falls within the *australis* to *ensensis* zones interval.

Both samples were taken below HEBS, the closest one giving an age within the *australis* to *ensensis* zones interval. With no data at or above HEBS to delimit any conodont zones we can only estimate that the age of HEBS is close to the age of C-175530, probably slightly younger.

Cardiac Creek (Gouwy, 2019)

- O-255899: 6 m above HEBS: *Polygnathus parawebbi* Chatterton 1974

  Age of the sample falls within the *australis* to *ansatus* zones interval.

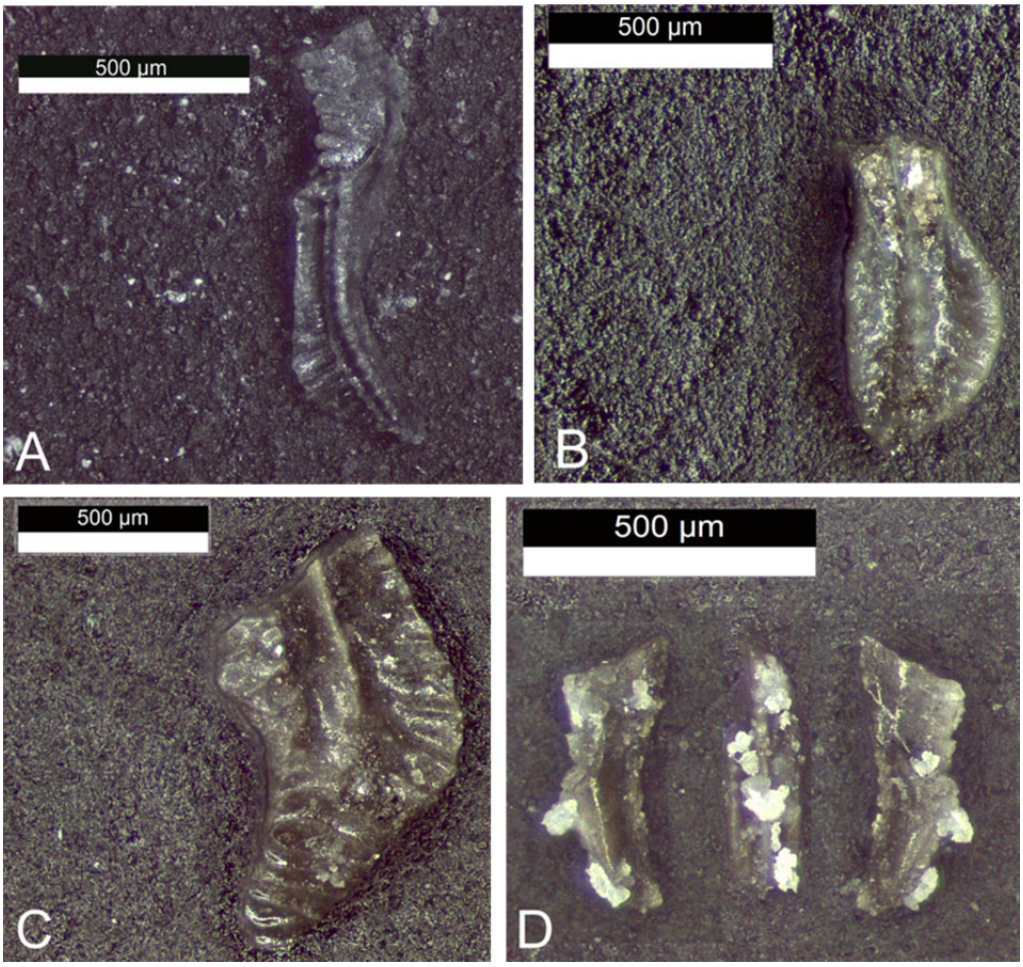

Figure DR3: Conodont specimens from the studied samples. A: *Polygnathus parawebbi* Chatterton, 1974, upper oblique view, O-255899; B: *Polygnathus eiflius* Bischoff & Ziegler, 1957, upper view, C-626870; C: *Polygnathus linguiformis klapperi* Clausen, Leuteritz & Ziegler, 1979, upper view, C-626871; D: *Polygnathus rhenanus* Klapper, Philip & Jackson 1970, right lateral, upper and left lateral views of one specimen, C-626871.

References

Bischoff, G. & Ziegler, W., 1957, Die Conodontenchronologie des Mitteldevons und des tiefsten Oberdevons : Abhandlungen des Hessischen Landesamtes für Bodenforschung, v. 22, p. 1-136.

Bultynck, P., 1966, Répartition stratigraphique de quelques conodontes dans le Couvinien : Annales de la Société Géologique de Belgique, v. 89, no. 5-10, p. 189-206.

Chatterton, B. D.E ., 1974. Middle Devonian conodonts from the Harrogate Formation, Southeastern British Columbia: Canadian Journal of Earth Sciences, v. 11, p. 1461- 1484.

Clausen, C. -D., Leuteritz, K. & Ziegler, W., 1979, Biostratigraphie und Lithofazies am Südrand der Elsper Mulde (hohes Mittel- und tiefes Oberdevon; Sauerland, Rheinisches Schiefergebirge): Geologisches Jahrbuch, Reihe A, v. 51, p. 3-37.

Gouwy, S. G., 2018, Report on fifteen conodont samples from the Canol and Road River formations from the Peel River banks and Eagle Plains (Yukon) NTS 106E and NTS 116I collected and submitted by Tiffani Fraser (Yukon Geological Survey) and Mike Gadd (GSC-Ottawa) under the TGI 5 Volcanic- and sediment-hosted base metal deposits or system program (VS1.2) (Con no. 1819-1 to 1819-15).

Gouwy, S. G., 2019, Report on twenty-three samples from the Road River Group at Monster River and Olfert Creek in Yukon, NTS 106D, NTS 166C and the Road River Group and Earn Group at Cardiac Creek, British Columbia, NTS 94F, collected and submitted by Jan Peter and Mike Gadd (Cardiac Creek and Olfert Creek) and Tiffany Fraser (Monster River) under the TGI Activity VS1.1 and 1.2, Geological Survey of Canada, Paleontological Report SAG-2019-03, p. 8.

Klapper, G., 1971, Sequence within the conodont genus *Polygnathus* in the New York lower Middle Devonian: Geologica et Palaeontologica, v. 5, p. 59-79.

Klapper, G., Philip, G. M. & Jackson, J.H., 1970, Revision of the Polygnathus varcus Group (Conodonta, Middle Devonian): Neues Jahrbuch für Geologie und Paläontologie, Monatshefte, v. 7, p. 650-667.

Orchard, M. J., 1991, Report on conodonts and other microfossils, Nash Creek, 34 collections (11 productive) made by R. Turner and W.D. Goodfellow in 1989: Geological Survey of Canada, Paleontological Report OF-1991-7, p. 7.

Stauffer, C. R., 1940, Conodonts of the Olentangy Shale. Journal of Paleontology, 12: 411-443.

Wittekindt, H., 1966. Zur Conodontenchronologie des Mitteldevons : Fortschritte in der Geologie von Rheinland und Westfalen, v. 9, p. 621-649.

Appendices

Table DR1: Estimated modal mineralogy of mineral separates produced for this study

Table DR1 Caption: The relative magnetic susceptibility (χ) between rocks or rock fragments is given in the second column, where higher values refer to higher χ values. Py - pyrite, M - millerite, Sph - sphalerite, Sh -Shale. See Figures DR1 - DR2 for images of these samples. The Peel River sample collection name was 17-POA-049C, whereas the Nick sample collection name was 18-POA-077. Samples with no mineralogical data are indicated by "n.d", but likely follow a continuum between end members.

Table DR2: Re-Os data

Table DR2 caption: Table DR2: Re-Os data. In the "Separation Procedure" column the first value reported is the grain size of the mineral separate in μm. If heavy liquid separation was used the designation HL is used. If the sample has undergone magnetic separation the designation "Mag" is given. The relative magnetic susceptibility (χ) between rocks or rock fragments is given in the third column where higher values refer to higher χ values. Model ages are determined using an initial Os ratio of 0.22 for Peel River and 0.31 for Nick. Model ages were calculated using a decay constant of 1.666×10^{-5} Myr^{-1}. See Figures DR1 - DR2 for pictures of these samples. Uncertainties on the abundances of Re and Os measured by isotope dilution are less than 2%. Blanks for these samples were 0.045 ± 0.046 pg for Os at a $^{187}Os/^{188}Os$ of 0.28 ± 0.14 and 2.0 ± 1.6 pg for Re.

Figure DR1: Supplemental images for Peel River. A) Hand-sample specimen from Peel River (17-POA-049C) showing semi-massive sulfides. B) Photomicrograph showing complex, intergrown relationships among sulfide minerals in a siliceous shale matrix. C) Peel River M0.8 mineral

separate D) Peel River NM0.8 mineral separate E) Peel River NM1.7 mineral separate F) Peel River NM1.9 mineral separate. Images B-F are divided into reflected light (left) and reflected light in cross-polarized light (right); Sph = sphalerite.

Figure DR2: Supplemental images for Nick. A) Hand-sample specimen from Nick (18-POA-077) showing semi-massive sulfides. B) Photomicrograph of pyrite-vaesite mineralization wherein pyrite is overgrown and replaced by vaesite. C) – F) Magnetic mineral separates showing an overall decreasing proportion of vaesite through progressive separation stages. Images B-F are divided into reflected light (left) and reflected light in cross-polarized light (right).

DR3: Supplemental information regarding specific conodont taxonomic data and metadata.

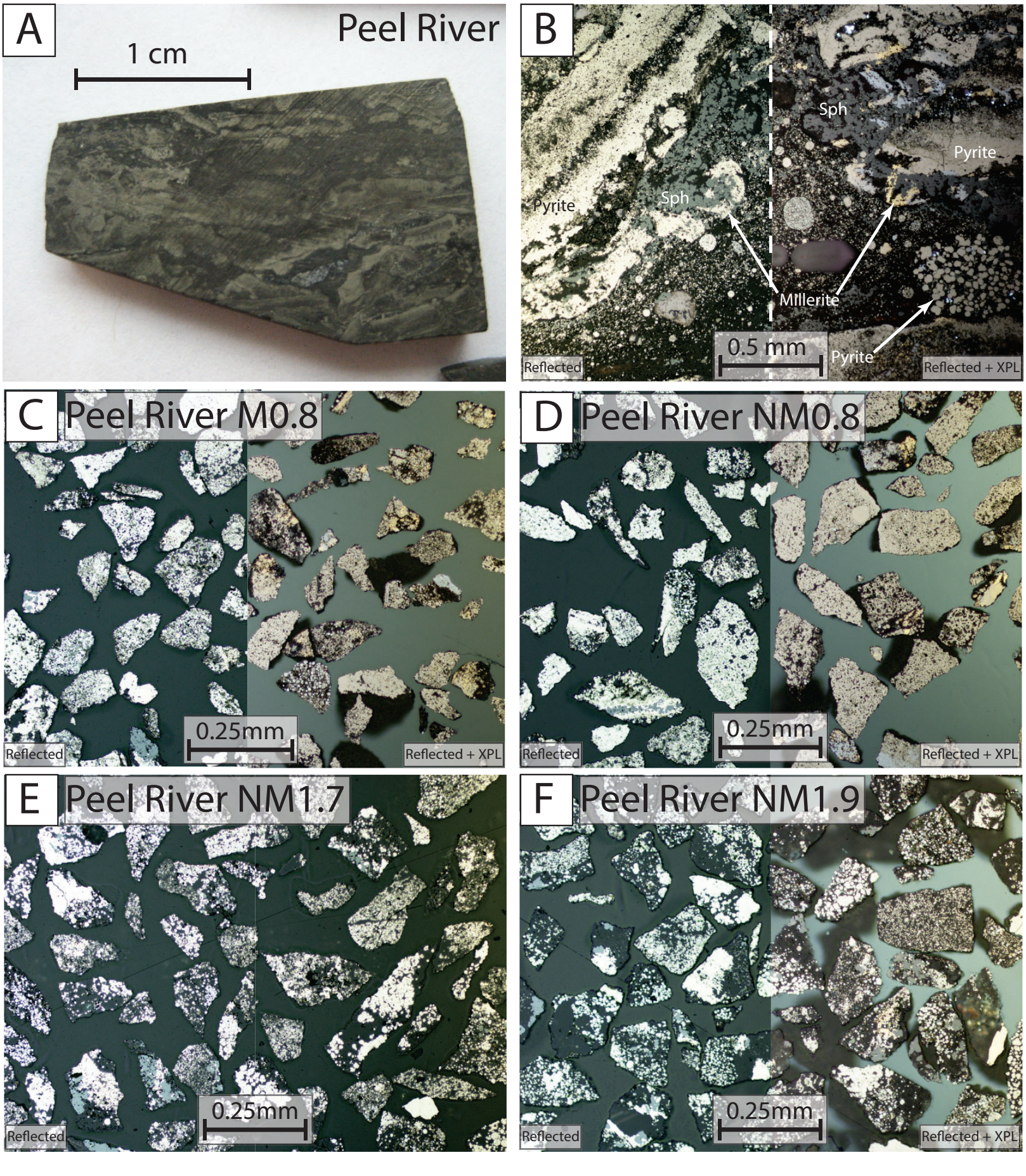
A
Peel River
1 cm
B
Sph
Pyrite
Pyrite
Sph
Millerite
Pyrite
0.5 mm
Reflected
Reflected + XPL
C
Peel River M0.8
0.25mm
Reflected
Reflected + XPL
D
Peel River NM0.8
0.25mm
Reflected
Reflected + XPL
E
Peel River NM1.7
0.25mm
Reflected
F
Peel River NM1.9
0.25mm
Reflected
Reflected + XPL

Fig. DR1

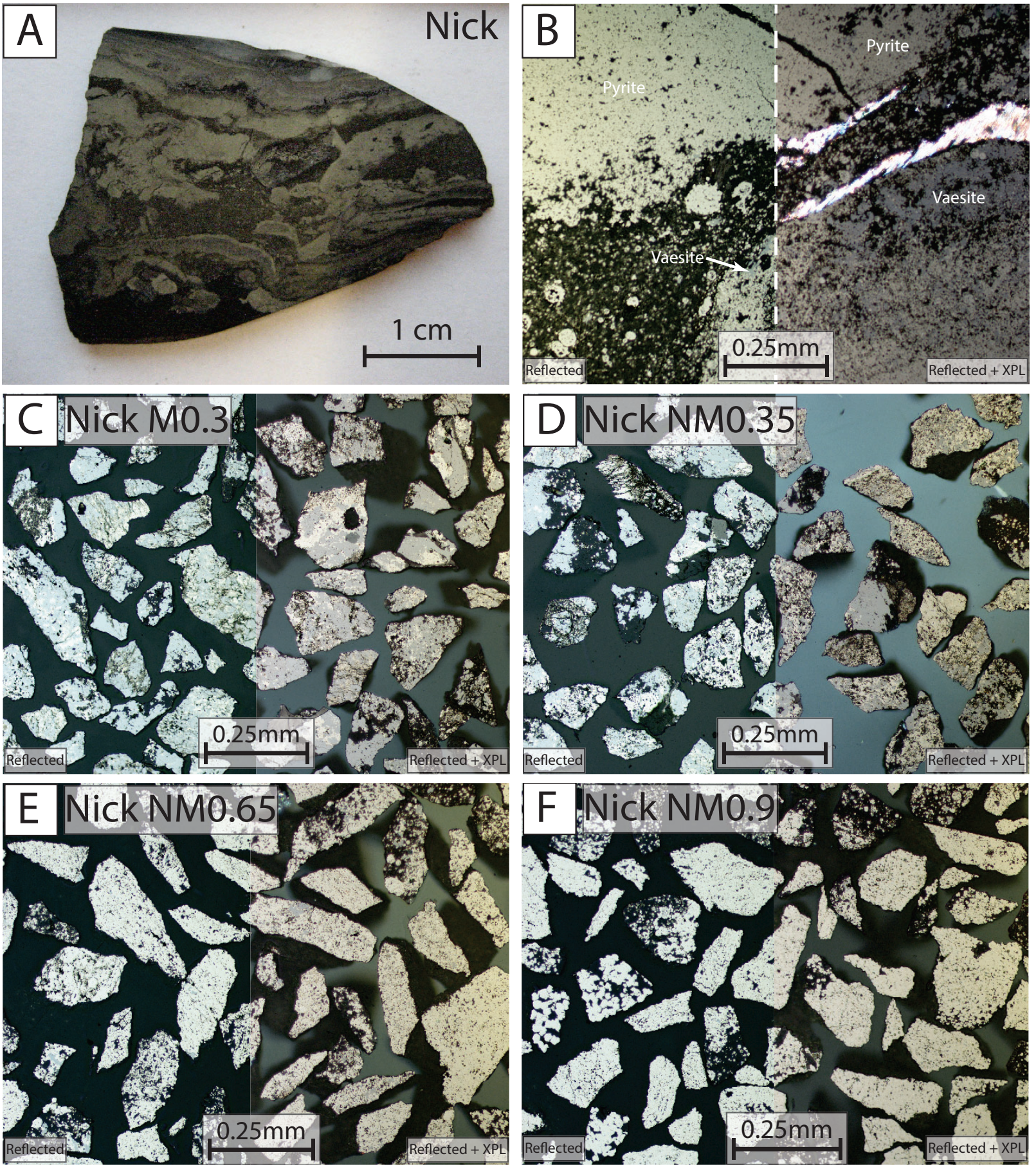
A
Nick
1 cm
B
Pyrite
Pyrite
Vaesite
Vaesite
0.25mm
Reflected
Reflected + XPL
C
Nick M0.3
0.25mm
Reflected
Reflected + XPL
D
Nick NM0.35
0.25mm
Reflected
Reflected + XPL
E
Nick NM0.65
0.25mm
Reflected
Reflected + XPL
F
Nick NM0.9
0.25mm
Reflected
Reflected + XPL

Fig. DR2

Mineral Separate	Qualitative χ	Mineralogy (Approximate Modal Abundance)					
		Pyrite	Millerite	Vaesite	Sphalerite	Shale	Order
Peel River M0.8	7	> 10%	> 10%	0%	< 10%	> 10%	Py > M/Sh > Sph
Peel River NM0.8	6	> 10%	> 10%	0%	< 10%	> 10%	Py > M/Sh > Sph
Peel River NM1.0	5	*n.d*	*n.d*	*n.d*	*n.d*	*n.d*	n.d
Peel River NM1.3	4	*n.d*	*n.d*	*n.d*	*n.d*	*n.d*	n.d
Peel River NM1.5	3	*n.d*	*n.d*	*n.d*	*n.d*	*n.d*	n.d
Peel River NM1.7	2	> 10%	> 10%	0%	> 10%	> 10%	Py/Sh > M/Sph
Peel River NM1.9	1	> 10%	> 10%	0%	> 10%	> 10%	Py/Sh > M/Sph
Nick M0.3	6	> 10%	0.0%	> 10%	0.0%	> 10%	V > Py > Sh
Nick NM0.35	5	> 10%	0%	> 10%	0%	> 10%	V > Py > Sh
Nick NM0.54	4	*n.d*	*n.d*	*n.d*	*n.d*	*n.d*	n.d
Nick NM0.65	3	> 10%	0%	> 10%	0%	> 10%	Py/V > Sh
Nick NM0.75	2	*n.d*	*n.d*	*n.d*	*n.d*	*n.d*	n.d
Nick NM0.9	1	> 10%	0%	<1%	0%	> 10%	Py > Sh

Table DR1: The relative magnetic susceptibility (χ) between rocks or rock fragments is given in the second column, where higher values refer to higher χ values. Py - pyrite, M - millerite, Sph - sphalerite, Sh -Shale. See Figures DR1 - DR2 for images of these samples. The Peel River sample collection name was 17-POA-049C, whereas the Nick sample collection name was 18-POA-077. Samples with no mineralogical data are indicated by "n.d", but likely follow a continuum between end members.

Sample Name	Separation Procedure	Qualitative χ	Sample Mass	Re ppm	Os ppb	$^{187}Re / ^{188}Os$	± 2σ	$^{187}Os / ^{188}Os$	± 2σ	Rho	Model Age	± 2σ
Peel River M0.8	74-210 / HL / Mag	7	1.54 mg	44.2	325	1494.1	5.5	9.92	0.04	0.41	388.4	1.7
Peel River NM0.8	74-210 / HL / Mag	6	1.39 mg	39.6	272	1725.9	17.8	11.29	0.20	0.55	383.8	5.8
Peel River NM1.0	74-210 / HL / Mag	5	1.09 mg	34.7	226	1993.4	9.2	13.10	0.09	0.45	386.7	2.5
Peel River NM1.3	74-210 / HL / Mag	4	1.16 mg	32.1	196	2385.4	10.1	15.67	0.09	0.47	387.6	2.0
Peel River NM1.5	74-210 / HL / Mag	3	1.55 mg	32.7	203	2289.0	11.1	15.08	0.11	0.48	388.5	2.5
Peel River NM1.7	74-210 / HL / Mag	2	1.73 mg	30.4	187	2327.6	7.9	15.31	0.06	0.38	388.0	1.5
Peel River NM1.9	74-210 / HL / Mag	1	2.09 mg	30.1	179	2603.1	12.5	17.16	0.12	0.47	389.4	1.3
Peel River Bulk 1	Hand-picked	-	0.94 mg	35.5	225	2155.0	6.7	14.15	0.03	0.40	386.8	1.2
Peel River Bulk 2	Hand-picked	-	1.23 mg	37.5	243	2021.0	5.8	13.29	0.02	0.32	387.0	1.1
Peel River Shale	Hand-picked	-	10.63 mg	1.12	5.82	4398.8	32.6	28.66	0.21	0.91	386.8	1.2
Nick M0.3	74-210 / HL / Mag	6	2.77 mg	42.2	311	1494.2	4.8	9.97	0.03	0.36	386.9	1.4
Nick NM0.35	74-210 / HL / Mag	5	3.52 mg	41.7	294	1691.7	6.1	11.45	0.05	0.41	393.8	1.7
Nick NM0.54	74-210 / HL / Mag	4	5.96 mg	37.6	236	2251.3	6.8	14.96	0.04	0.31	389.3	1.2
Nick NM0.65	74-210 / HL / Mag	3	5.18 mg	15.6	86.7	3472.9	15.5	23.22	0.14	0.49	394.7	2.1
Nick NM0.75	74-210 / HL / Mag	2	13.60 mg	8.88	46.6	4233.9	12.5	27.85	0.06	0.29	389.1	1.2
Nick NM0.9	74-210 / HL / Mag	1	10.84 mg	8.97	46.3	4655.0	19.7	30.67	0.18	0.44	390.2	2.1
NIck Shale	Hand-picked	-	6.92 mg	1.42	8.87	2319.2	12.4	15.50	0.08	0.79	391.8	1.3

Table DR2: Re-Os data. In the "Separation Procedure" column the first value reported is the grain size of the mineral separate in μm. If heavy liquid separation was used the designation HL is used. If the sample has undergone magnetic separation the designation "Mag" is given. The relative magnetic susceptibility (χ) between rocks or rock fragments is given in the third column where higher values refer to higher χ values. Model ages are determined using an initial Os ratio of 0.22 for Peel River and 0.31 for Nick. Model ages were calculated using a decay constant of 1.666×10^{-5} Myr^{-1}. See Figures DR1 - DR2 for pictures of these samples. Uncertainties on the abundances of Re and Os measured by isotope dilution are less than 2%. Blanks for these samples were 0.045 ± 0.046 pg for Os at a $^{187}Os/^{188}Os$ of 0.28 ± 0.14 and 2.0 ± 1.6 pg for Re.