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2024

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ONTARIO GEOLOGICAL SURVEY

RESIDENT GEOLOGIST PROGRAM

REPORT OF ACTIVITIES—2023

TIMMINS
REGIONAL RESIDENT GEOLOGIST REPORT

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by

V. D'Angelo, M. Krukowski, P. Bousquet, C.M. Daniels, S.L.K. Hinz, G. Meyer and N. Sabiri

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Timmins Regional Resident Geologist (Timmins District)—2023

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INTRODUCTION

The Timmins Resident Geologist District extends in the north from the coast of Hudson Bay down southward past the community of Gogama (Figure 1). It is bordered to the east by the Kirkland Lake District and to the west by the Thunder Bay North and Thunder Bay South districts (*see* Figure 1). In 2023, the primary commodity being mined in the district was gold, with a total of 7 producing gold mines. Additionally, the Timmins District also has 1 base metal and silver mine (Kidd Mine) and 1 industrial minerals mine (talc; Penhorwood) (Figure 2).

Timmins saw an increase in active claims by 11% in 2023, with an additional 160 425 hectares of area covered by claims compared to 2022. At the end of the year, Timmins had a total of 1 669 803 hectares of area covered by claims, second only to the Thunder Bay North District. The value of assessment work filed in 2023 was over C$56.5 million dollars, an increase of 115% compared to 2022 (C$26 million) (Table 6). At least 75 individuals or companies held active permits in the district for a minimum of 100 projects, a significant increase over 2022. While gold projects still held the majority of active plans and permits in 2023, the district saw a significant increase in exploration activity for base metals, nickel in particular (Tables 6, 7 and 8). There were 18 early exploration projects (*see* Figure 4) and 6 advanced exploration projects in the Timmins District (*see* Figure 3), 4 of which saw activity in 2023.

Gold prices started off the year trading at US$1843.95 per ounce and ended the year at US$2065.45 per ounce, peaking at its highest value of US$2078.95 per ounce on December 27, 2023. The lowest gold price occurred on February 24, 2023, when it traded at US$1809.85 per ounce; however, gold also saw a significant dip in price in early October, when it hit a low value of US$1818.40 per ounce (Figure 5; www.spglobal.com/en/).

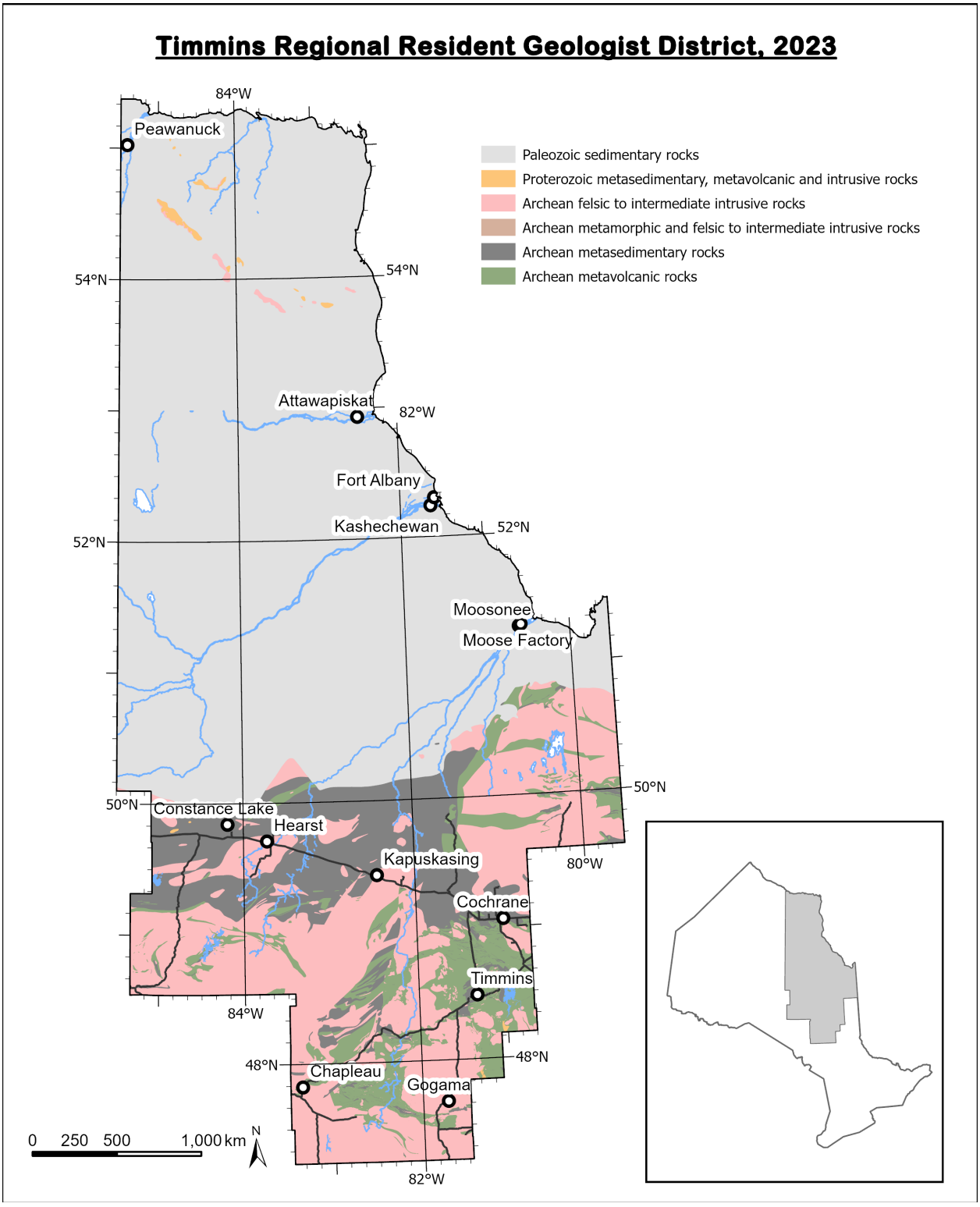

Figure 1. The geology and administrative boundary of the Timmins Resident Geologist District, 2023. Bedrock geology *from* Ontario Geological Survey (2011).

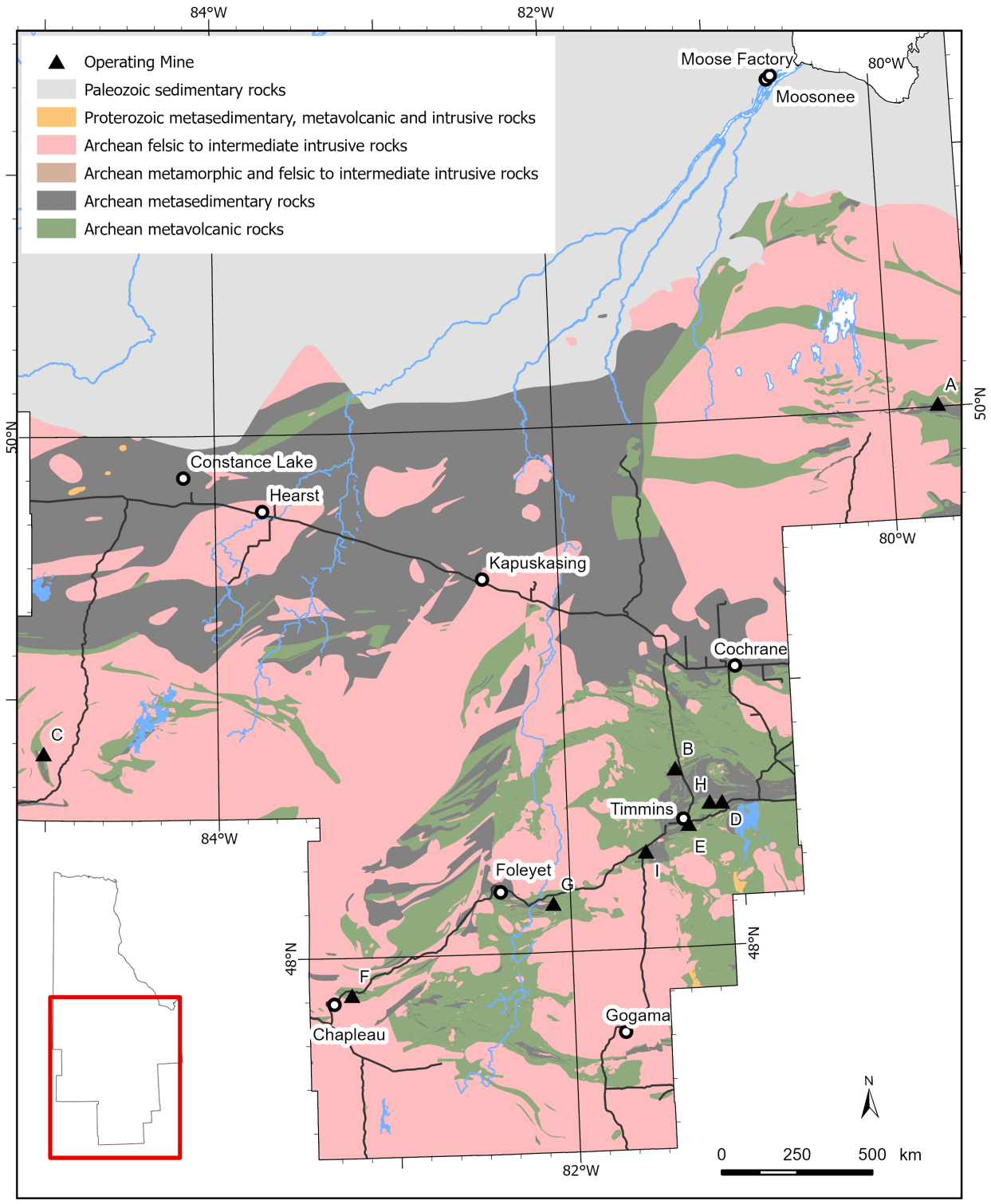

Figure 2. Active mines in the Timmins Resident Geologist District, 2023. Letters are keyed to Table 1. Bedrock geology *from* Ontario Geological Survey (2011).

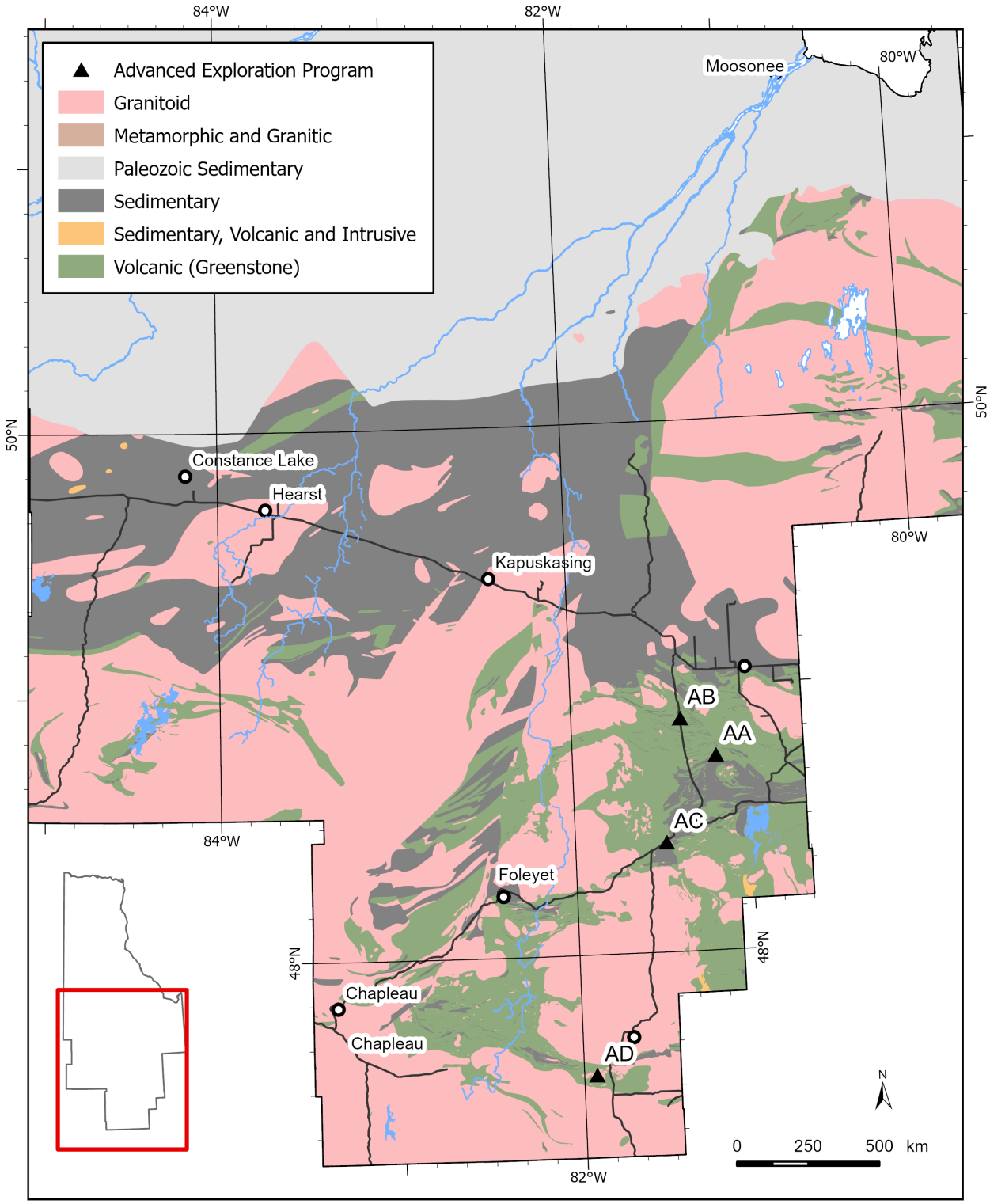

Figure 3. Advanced exploration programs in the Timmins Resident Geologist District, 2023. Letters are keyed to Table 8. Bedrock geology *from* Ontario Geological Survey (2011).

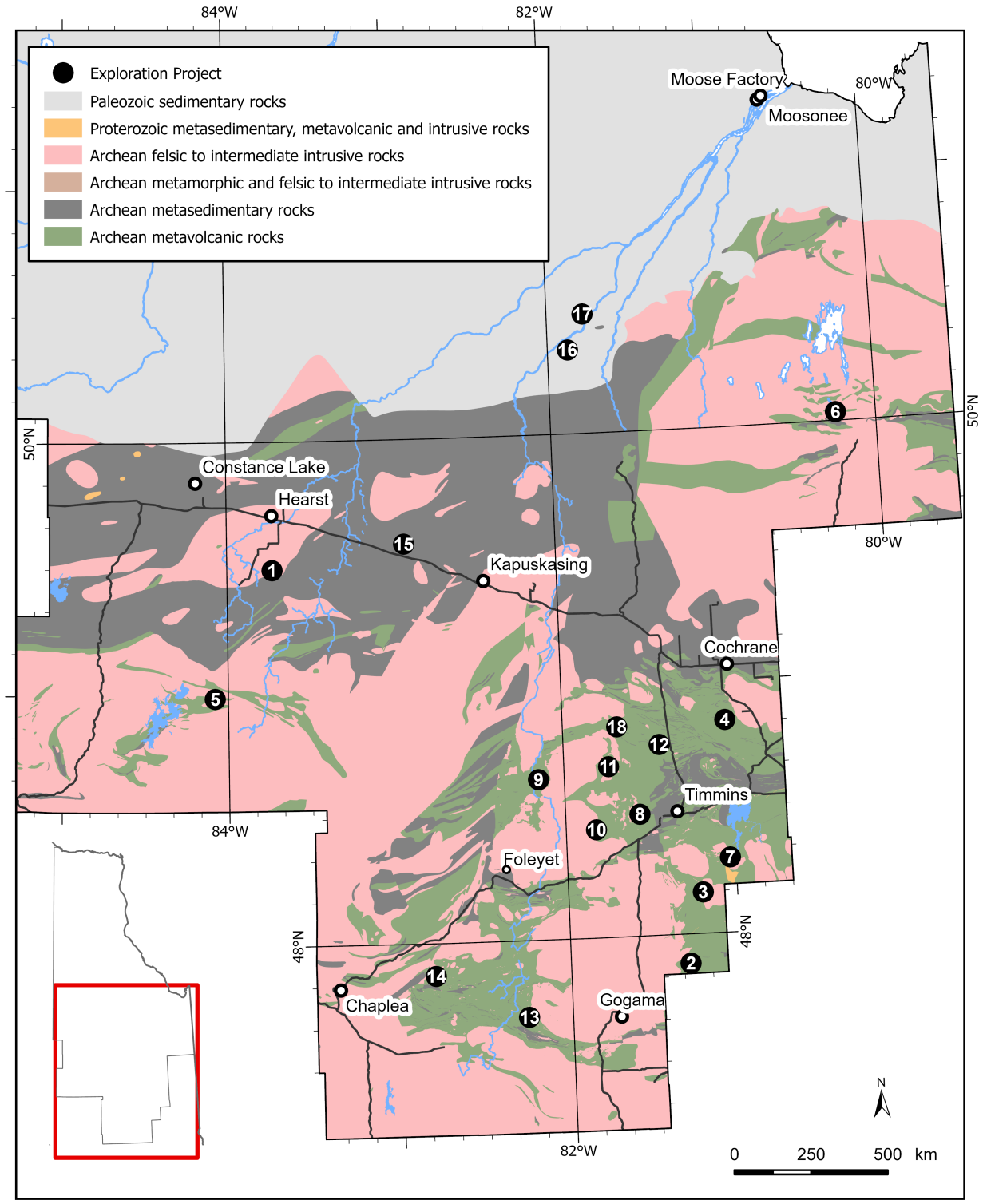

Figure 4. Exploration programs in the Timmins Resident Geologist District, 2023. Numbers are keyed to Table 8. Bedrock geology *from* Ontario Geological Survey (2011).

Figure 5. Gold prices throughout 2023. Data *from* www.spglobal.com/en/.

MINING ACTIVITY

There were 7 producing gold mines, 1 base metal and silver mine and 1 industrial minerals mine operating in the Timmins District in 2023. Combined, the mines produced a total of 1 068 134 oz Au, 1 394 000 oz Ag, 22 600 t Cu, 38 600 t Zn, and 141 000 t talc. A summary of 2023 production is tabulated below in Table 1 and historic production for the Timmins District up to 2023 is tabulated in Table 2 (Historical Gold Production) and Table 3 (Historical Base Metals and Diamond Production).

Table 1. Total production values for mines within the Timmins District in 2023. Letters in first column keyed to Figure 2.

	Company	Mine	Production in 2023		Reserves (Proven + Probable) as of 2023	
			Tonnage at Grade	Total Commodity	Tonnage Grade	Contained Commodity
A	Agnico Eagle Mines Limited	Detour Lake Mine	25 435 000 t at 0.91 g/t Au	677 446 oz Au	819 049 000 t at 0.76 g/t Au	19 928 000 oz Au
B	Glencore Canada	Kidd Mine	1 340 000 t at 3.70% Zn, 1.69% Cu, 45 g/t Ag	38 600 t Zn 22 600 t Cu 1 378 000 oz Ag	2 530 000 t	1.44% Cu, 3.12% Zn, 0.13% Pb, 38 g/t Ag
C	Silver Lake Resources	Sugar Zone	134 886 t at 5.40 g/t Au	23 587 oz Au	2 872 000 t at 5.5 g/t Au	506 000 oz Au
D	Newmont Corporation	Hoyle Pond	221 654 t at 7.61 g/t Au	50 162 oz Au	Porcupine Operations: 32 700 000 t at 2.09 g/t Au	2 200 000 oz Au
E		Hollinger	2 029 665 t at 1.49 g/t Au	87 680 oz Au		
F		Borden	659 846 t at 6.17 g/t Au	120 046 oz Au		
G	Magris Performance Materials	Penhorwood	352 506 t at 40% talc	141 002 t talc	12 540 000 t	

	Company	Mine	Production in 2023		Reserves (Proven + Probable) as of 2023	
			Tonnage at Grade	Total Commodity	Tonnage Grade	Contained Commodity
H	Pan American Silver	Bell Creek Mine	547 100 t at 2.75 g/t Au	47 400 oz Au 16 000 oz Ag (all operations)	Timmins Operations: 9 700 000 t at 2.93 g/t Au (proven) and 2.80 g/t Au (probable)	892 940 oz Au
I		Timmins West Mine	1 026 600 t at 2.66 g/t Au	85 400 oz Au		

Table 2. Historical gold production from mines within the Timmins District to December 31, 2023.

Mine	Township	Years of Production	Total Milled (Tons)	Total Milled (Tonnes)	Production (oz Au)	Grade[1] (oz/t)
Ankerite (March)	Deloro	1926–1935	317 769	288 275	61 039	0.19
Aquarius	Macklem	1984, 1988–1989	139 634	126 674	27 117	0.19
Aunor (Pamour #3)	Deloro	1940–1984	8 482 174	7 694 899	2 502 214	0.29
Banner	Whitney	1927–1928, 1933, 1935	315	286	670	2.13
Bell Creek	Hoyle	1987–1991, 1992–1994	576 017	522 554	112 739	0.20
Bell Creek	Hoyle	2011–2023	6 284 166	5 700 990	638 647	0.10
Bonetal	Whitney	1941–1951	352 254	319 559	51 510	0.15
Bonwhit	Whitney	1951–1954	200 555	181 940	67 940	0.34
Borden	Cochrane	2018–2023	3 007 351	2 728 223	514 432	0.22
Broulan Porcupine	Whitney	1939–1953	1 146 059	1 039 687	243 757	0.21
Broulan Reef Mine	Whitney	1915–1965	2 144 507	1 945 464	498 932	0.23
Brown–McDade	Denton	1982	1038	942	145	0.16
Buffalo Ankerite	Deloro	1926–1953, 1978	4 993 929	4 530 416	957 292	0.19
Carshaw	Shaw	1983–1984	100 000	90 718	20 500	0.23
Cincinnati	Deloro	1914, 1922–1924	3200	2903	736	0.23
Clavos	Stock	2005–2007	188 743	171 225	24 609	0.13
Clavos	Stock	2017–2018	37 438	33 963	2164	0.06
Concordia	Deloro	1935	230	209	16	0.07
Coniarum (Carium)	Tisdale	1913–1918, 1928–1961	4 464 006	4 049 678	1 109 574	0.25
Crown (Hollinger)	Tisdale	1913–1921	226 180	205 187	138 330	0.61
Davidson–Tisdale	Tisdale	1918–1920, 1988	53 221	48 218	9739	0.18
Delnite	Deloro	1937–1964	3 847 364	3 490 270	920 404	0.24
Delnite (Open Pit)	Deloro	1987–1988	56 067	50 863	3602	0.06
DeSantis	Ogden	1933, 1939–1942, 1961–1964	196 928	178 650	35 842	0.18
Detour Lake[2]	Sunday Lake area	1983–1999	17 643 085	16 005 538	1 781 858	0.10
Detour Lake[2]	Sunday Lake area	2013–2023	255 333 880	231 635 000	6 339 846	0.03
Dome (incl stockpile)	Tisdale	1910–2019	119 065 098	108 014 169	16 655 432	0.14
Faymar	Deloro	1940–1942	119 181	108 119	21 851	0.18
Fuller (Vedron)	Tisdale	1940–1944	44 028	39 942	6566	0.15
Gillies Lake	Tisdale	1921–1931, 1935–1937	54 502	49 443	15 278	0.28
Goldhawk	Cody	1947	636	577	53	0.08
Goldhawk (open pit)	Cody	1980	40 000	36 287	3967	0.10
Halcrow–Swayze[3]	Halcrow	1935	211	191	40	0.19
Hallnor (Pamour #2)	Whitney	1938–1968, 1981	4 226 419	3 834 143	1 645 892	0.39

Mine	Township	Years of Production	Total Milled (Tons)	Total Milled (Tonnes)	Production (oz Au)	Grade[1] (oz/t)
Hollinger	Tisdale	1910–1968	65 778 234	59 673 011	19 327 691	0.29
Hollinger (Pamour Timmins)	Tisdale	1976–1988	2 615 866	2 373 074	182 058	0.07
Hollinger	Tisdale	2014–2023	23 649 227	21 454 218	826 806	0.05
Hoyle (Falconbridge)	Whitney	1941–1944, 1946–1949	725 494	658 157	71 843	0.10
Hoyle Pond	Hoyle	1985–2023	12 634 595	11 461 912	4 361 213	0.28
Hugh–Pam	Whitney	1926, 1948–1965	636 751	577 651	119 604	0.19
Jerome[3]	Osway	1941–1943, 1956	335 060	303 961	56 893	0.17
Joburke[3]	Keith	1973–1975, 1979–1981	440 117	399 267	43 571	0.10
Kingbridge/Gomak[3]	Chester	1935–1936	1387	1258	98	0.07
Marlhill	Hoyle	1989–1991	156 800	142 247	30 924	0.20
McIntyre (Pamour Schumacher)	Tisdale	1912–1988	37 634 691	34 141 618	10 751 941	0.29
(ERG Tailings Recovery)	Tisdale	1988–1989	2 549 189	2 312 585	18 260	0.01
McLaren	Deloro	1933–1937	876	795	201	0.23
Moneta	Tisdale	1938–1943	314 829	285 608	149 250	0.47
Naybob (Kenilworth)	Ogden	1932–1964	304 100	275 875	50 731	0.17
Nighthawk	Macklem	1995–1999	1 479 607	1 342 277	175 803	0.12
Owl Creek	Hoyle	1981–1989	1 984 400	1 800 217	236 880	0.12
Pamour #1 (incl 3,4,7 and Hoyle pits)	Whitney	1936–1999	45 795 863	41 545 308	4 078 525	0.09
Pamour #1 (incl 3,4,7 and Hoyle pits)	Whitney	2005–2011, 2015–2016	19 849 938	18 007 561	741 543	0.04
Pamour (other sources)	Whitney	1936–1999	7 416 634	6 728 257	676 645	0.09
Paymaster	Deloro	1915–1919, 1922–1966	5 607 402	5 086 950	1 192 206	0.21
Porcupine Lake (Hunter)	Whitney	1937–1940, 1944	10 821	9817	1369	0.13
Porcupine Peninsular	Cody	1924–1927, 1940, 1947	99 688	90 435	27 354	0.27
Preston	Tisdale	1938–1968	6 284 405	5 701 116	1 539 355	0.24
Preston NY	Tisdale	1933	2800	2540	153	0.05
Preston (Porcupine Pete)	Deloro	1914–1915	N/A	0	314	
Preston (Porphyry Hill)	Deloro	1913–1915	46	42	312	6.78
Schumacher (Hollinger)	Tisdale	1915–1918	112 124	101 717	27 182	0.27
Stock	Stock	1989–1994, 2000	821 304	745 074	129 856	0.16
Sugar Zone	Odlum	2017–2023	1 143 338	1 037 219	200 770	0.21
Timmins West (incl 144 Gap + Thunder Creek)	Bristol	2009–2023	13 068 532	11 855 573	1 350 806	0.10
Tionaga/Smith Thorne[3]	Horwood	1938–1939	6653	6036	2299	0.35
Tisdale Ankerite	Tisdale	1952	14 655	13 295	2236	0.15
Tommy Burns/Arcadia	Shaw	1917	21	19	14	0.66
Triple Lake	McArthur	1932	155	141	121	0.78
Vipond (Anglo–Huronian)	Tisdale	1911–1941	1 565 218	1 419 942	414 367	0.26
Young Shannon[3]	Chester	1937, 1975	3265	2962	91	0.03
		Total	686 390 270	622 682 937	81 202 018	

***Notes**: [1]Grade: ounce per ton gold; [2]Detour Lake greenstone belt; [3]Swayze greenstone belt; N/A = data not available. All metric tonnages have been converted to Imperial tons using a conversion factor of 1.1023113. Metric tonnes reported for inactive mines in this table differ from those reported in previous years because the above conversion factor from tons to tonnes was used for all calculations.*

Table 3. Historic production of base metals and diamonds in the Timmins District up to December 31, 2023.

Mine	Township	Years of Production	Ore Milled	Grade
Alexo / Kelex	Dundonald, Clergue	1912–1919, 1943–1944 2004–2005	51 857 tons, 4923 tons, 17 398 t	4.5% Ni, 0.55% Cu, 2.3% Ni, 0.23% Cu, 0.07% Co
Canadian Jamieson	Godfrey	1966–1971	816 173 tons	2.44% Cu, 4.22% Zn
Genex	Godfrey	1966	Produced 240 tons Cu concentrate	
Jameland	Jamieson	1969–1972	509 356 tons	0.99% Cu, 0.88% Zn
Kam Kotia	Robb	1943–1944, 1961–1972	6.6 Mt	1.1% Cu, 1.17% Zn, 0.10 oz/t Ag, 0.00085 oz/t Au
Kidd Mine	Kidd	1966–2023	168 385 000 t	2.23% Cu, 5.76% Zn, 0.22% Pb, 76 g/t Ag
Langmuir #1	Langmuir	1990–1991	111 502 tons	1.74% Ni
Langmuir #2	Langmuir	1972–1978	1.1 M tons	1.43% Ni
McIntyre	Tisdale	1963–1982	10 M tons	0.67% Cu
McWatters	Langmuir	2008–2010, 2011–2012	15 361 t, 148 921 t, 153 703 t	0.55% Ni, 0.50% Ni
Montcalm	Montcalm	2004–2009	3 931 610 t	1.25% Ni, 0.67% Cu, 0.051% Co
Redstone	Eldorado	1989–1992, 1995–1996 2006–2008, 2009–2010	294 895 tons, 10 228 tons, 133 295 t, 78 956 t	2.4% Ni, 1.7% Ni, 1.92% Ni, 1.11% Ni
Texmont	Geikie, Bartlett	1971–1972	196 800 tons	0.85% Ni
Victor	BMA 527 834	2008–2019	31 636 t	8355 carats of diamond

Base Metal Mining

GLENCORE CANADA – KIDD OPERATIONS

Kidd Operations (Kidd Mine) is located in Kidd Township, 25 km north of Timmins and is accessible via Highway ON-655 (*see* Figure 2). Mining activity is currently at a depth of 9800 feet (2987 m), with shaft bottom at 9889 feet (3014 m), making Kidd Operations the deepest base-metal mine in the world. In 2023, the total employment numbers for both salaried and contact employees was 663 personnel.

Production in 2023 totaled 1 340 000 tonnes at 3.70% Zn, 1.69 % Cu and 45 g/t Ag. As of December 31, resource numbers for Kidd Operations (inclusive of Reserves) stood at 4 700 000 tonnes grading 1.43% Cu, 3.21% Zn, 0.13% Pb and 39 g/t Ag. Reserves were 2 530 000 tonnes grading 1.44% Cu, 3.12% Zn, 0.13% Pb and 38 g/t Ag. The current life of mine for Kidd Operations is to the end of year 2025 (B. Drolet; personal communication, 2023), and total historical production for the mine is estimated to be 168 385 000 tonnes of ore grading 2.23% Cu, 5.76% Zn, 0.22% Pb and 76 g/t Ag.

Gold Mining

NEWMONT CORPORATION – PORCUPINE OPERATIONS

Newmont Corporations' Porcupine Operations consists of the Hoyle Pond underground operation, the Hollinger open pit, both in Timmins, and the Borden underground operation near Chapleau, Ontario (*see* Figure 2). Newmont's land package across these 3 operations consists of 1129 mining claims, 983 mining patents and 113 mining leases for a total area of 137 763 hectares. In 2023, the total production across all

3 mines totaled 258 000 oz Au from 2 911 165 tonnes with an average head grade of 3.01 g/t Au and a recovery of 91.5% (Table 4). At the end of 2023, the Porcupine deposits had combined Reserves and resources of 32 700 000 tonnes at 2.09 g/t for a total of 2 200 000 oz (Proven and Probable) and 129 872 000 tonnes at 1.72 g/t Au for 7 208 000 oz Au (Measured and Indicated) (C. Brooks, personal communication, 2023).

Table 4. Production totals from Newmont Porcupine Operations in 2023 (C. Brooks, Newmont, personal communication, January 19, 2024).

Mine	Tonnes	Grade (g/t)	Head Ounces	Recovery (%)	Recovered Ounces
Hoyle Pond	221 654	7.61	54 249	92.47	50 162
Borden	659 846	6.17	130 844	91.75	120 046
Hollinger open pit	2 029 665	1.49	97 125	90.28	87 680

Stripping and dewatering activity began at the Pamour Mine, which is slated to come into production in 2024. Ore from the Pamour Project will add volume and support high-grade ore from Borden and Hoyle Pond. The Porcupine operations employed 764 full-time and 300 contract staff in 2023, for a total of 1064 employees (C. Brooks, personal communication, 2023).

AGNICO EAGLE MINES LIMITED – DETOUR LAKE MINE

The Detour Lake Operation is located about 208 km northeast of Timmins and can be accessed via Highway ON-652 (Detour Mine Road) east of Cochrane (*see* Figure 2). Gold was first discovered at the Detour Lake property in 1974 and mining at the property initially took place between 1983 and 1999 as an open pit and underground mine. Detour Lake currently has mine life up to 2052 and employed a total of 1486 salaried and contract employees in 2023. Recent production from Detour Lake (post Detour Gold ownership) is summarized in Table 5. Total production in 2023 was 677 446 oz from 25 435 tonnes at 0.91 g/t Au (Agnico Eagle Mines Limited, news release, February 15, 2024), despite a transformer failure at the mill during the third quarter. Ongoing optimization studies are occurring, with the potential to exceed mill throughput of 28.0 millions of tons per annum (Mtpa), with the implementation of advanced ore sorting processes and the utilization of artificial intelligence (Agnico Eagle Mines Limited, news release, October 25, 2023).

Table 5. Recent production data from Detour Lake gold mine between 2023 and 2023 (K. Byrnes, Agnico Eagle Mines Limited, personal communication, January 26, 2024).

Year	Ore Milled (Mt)	Grade (g/t Au)	Recovered Gold (koz)
2020	21.1	0.83	516.8
2021	24.1	1.00	713
2022	25.5	0.97	732.6
2023	25.4	0.91	677.5

Exploration on the Detour Lake property primarily focused on the western extension of the pit, as well as mineralized horizons within and below the West Pit mineral reserve, with the focus on investing the continuity of mineralization between existing drill holes and testing the western plunge extension of the deposit and zones which may be amenable to underground mining (Figure 6). A total of 213 000 m of drilling in 306 holes were completed in 2023 (Agnico Eagle Mines Limited, news release, October 25, 2023).

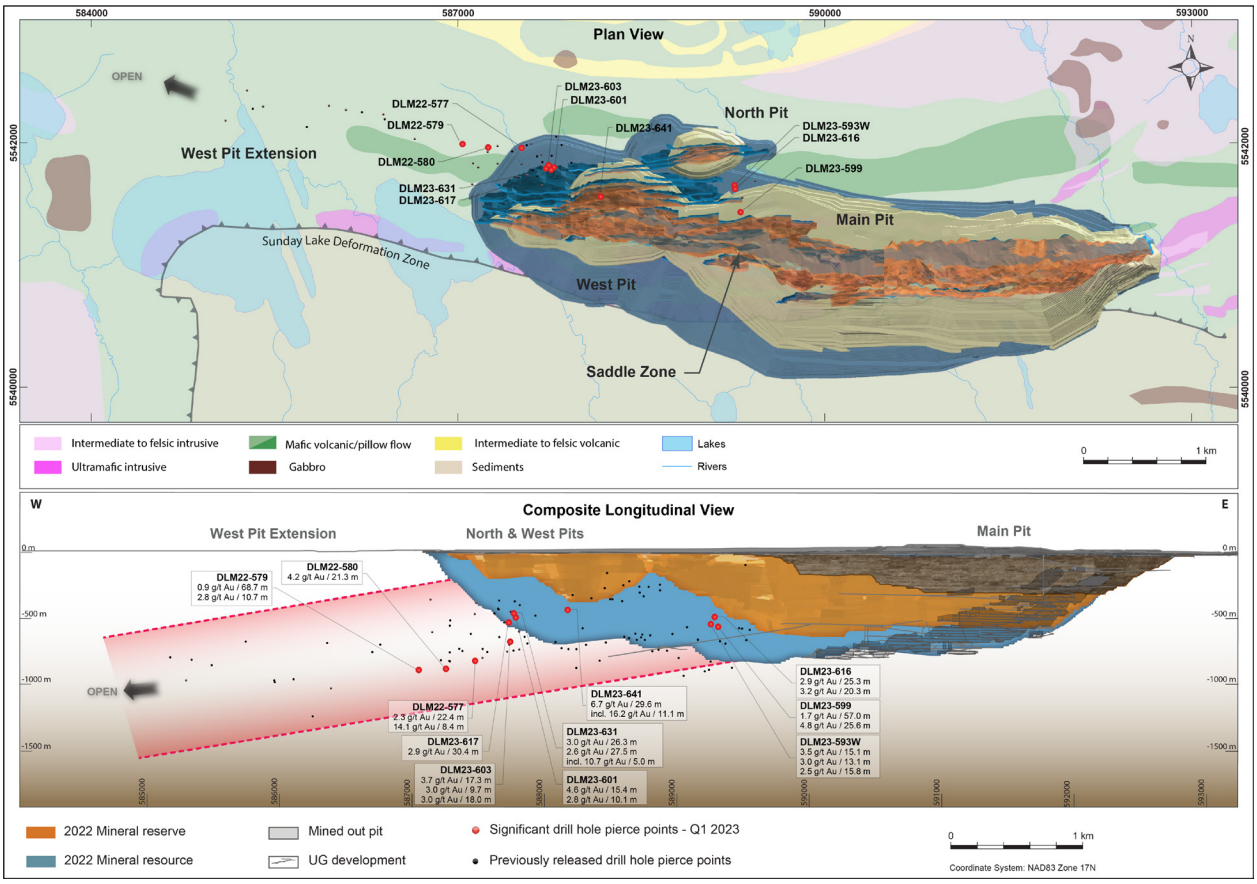

Figure 6. Plan view and long section view of Detour Lake open pit with 2023 drilling intercepts (Agnico Eagle Mines Limited, news release, April 27, 2023).

Selected highlights from 2023 drilling are (Agnico Eagle Mines Limited, news releases, April 27 and July 26, 2023)

- DLM23-632 (West Pit Infill): 11.4 m at 2.5 g/t Au at 309 m depth, 12.9 m at 12.9 g/t Au at 400 m depth, and 57.4 m at 1 g/t Au at 436 m depth
- DLM23-654A (West Pit Extension): 14.9 m at 2.7 g/t Au at 424 m depth, 2.7 m at 7.6 g/t Au at 521 m depth, and 16.1 m at 2.5 g/t Au over 16.1 m at 573 m depth
- DLM23-665 (West Pit Extension): 14.4 m at 2.8 g/t Au at 1061 m depth
- DLM23-631 (West Pit Infill): 26.3 m at 3.0 g/t Au at 294 m depth 2.6 g/t gold over 27.5 m at 450 m depth, including 10.7 g/t gold over 5.0 m at 468 m depth
- DLM22-577 (West Pit Extension): 22.4 m at 2.3 g/t gold at 752 m depth and 8.4 m at 14.1 g/t gold at 777 m depth.

Drilling results from the first half of 2023 are to be integrated into a maiden underground mineral resource model which will evaluate potential underground mining scenarios that is expected to be reported in the first half of 2024 (Agnico Eagle Mines Limited, news release, July 26, 2023).

SILVER LAKE RESOURCES – SUGAR ZONE MINE

Silver Lake Resources' Sugar Zone Mine is currently in a state of idled production while activity at the mine is focused on grade control and near mine exploration. The mine is located approximately 30 km

north of White River and can be accessed via Highway ON-631 (see Figure 2). Sugar Zone had a total headcount of 337 salaried and contract employees during the first half of the year, until focus at the mine shifted to exploration as opposed to production. As of October, the workforce was reduced to a total of 94 (G. Winder, Silver Lake Resources personal communication, 2023).

In 2023, Sugar Zone processed 134 886 tonnes of ore at head grades between 4.5 and 5.4 g/t Au (Silver Lake Resources, September 2023 Quarterly Report, October 26, 2023). Mineral Reserves for the operation combine the Sugar Zone and Middle Zone and currently stand at 2.8 Mt at 5.5 g/t for 506 000 oz Au, and the Resource is currently estimated at 6.2 Mt at 7.6 g/t for 1 528 000 oz Au (G. Winder, Silver Lake Resources personal communication, 2024).

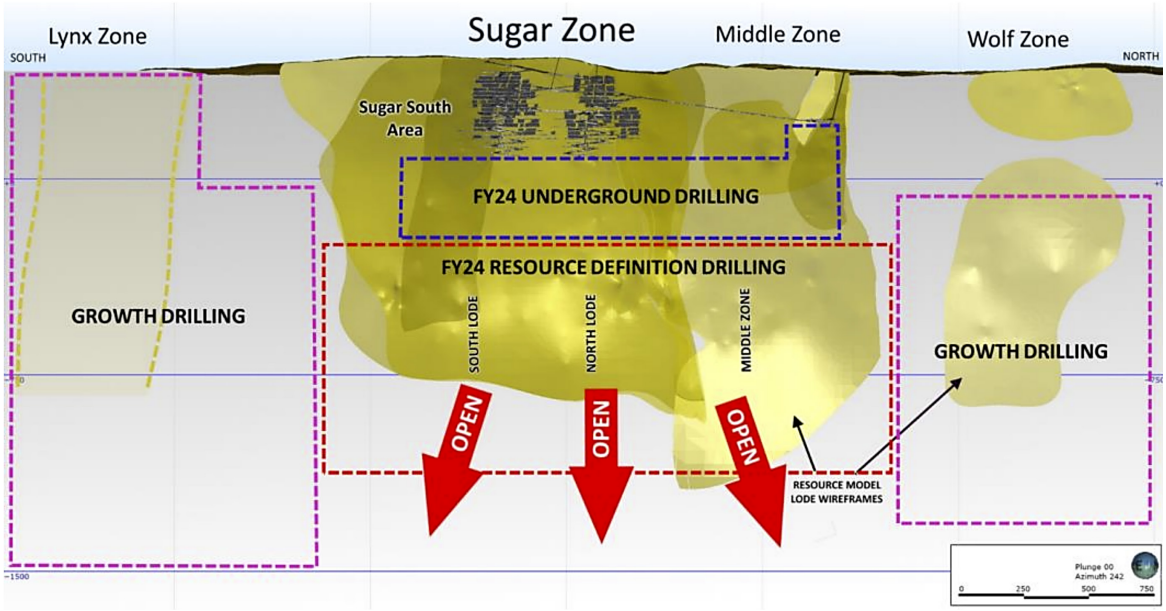

Figure 7. Long section of Sugar Zone deposit with areas of 2023–2024 exploration drilling highlighted.

Underground activity after August concentrated on the development of 3 new exploration drives to support the ongoing 93 000 m exploration drilling program. Of the 93 000 m program, 52 000 m is planned for underground exploration and the remaining 42 000 m are surface metres targeting step outs along the mine corridor (Figure 7) (Silver Lake Resources, corporate presentation, November 25, 2023).

PAN AMERICAN SILVER – TIMMINS OPERATIONS

Pan American Silver's Timmins Operation consists of the Timmins West and Bell Creek underground mines and the Bell Creek mill (*see* Figure 2). Production results released in February 2024 reported a total combined production of 132.9 koz Au and 16 koz Ag from the Timmins operations. In March 2023, Pan American Silver and Agnico Eagle completed the acquisition of Yamana (Pan American Silver, https://www.panamericansilver.com/invest/arrangement-agreement-with-yamana/ , accessed January 15, 2024).

Pan American Silver announced $11 to 12.5 million dollars of project capital investment into the construction of a stage six storage facility and into the completion of a paste fill plant at Bell Creek. The paste fill plant is expected to improve quality and availability of backfill, increasing resource recovery and throughput. Construction is expected to be completed in the third quarter of 2024 (Pan American Silver, news release, January 17, 2024).

In 2023, Pan American Silver completed a 26 hole drilling program totaling 5979 m testing mineralization in unmined veins and wall rocks adjacent to historical mined stopes to confirm resources in Hallnor and historical resources in Broulan reef (Pan American Silver, news release, December 5, 2023).

Significant assays from drilling in the Hallnor Zone include the following:

- TW22-719: 1.20 m at 145.73 g/t Au
- TW22-712: 5.80 m at 26.64 g/t Au and 3.10 m at 9.97 g/t Au
- TW22-705A: 16.60 m at 5.39 g/t Au
- TW22-709: 8.00 m at 6.76 g/t Au
- TW22-694: 4.60 m at 10.43 g/t Au

Significant assays from the drilling at Broulan Reef include the following:

- TW23-747: 10.00 m at 38.11 g/t Au
- TW23-740: 8.00 m at 6.39 g/t Au
- TW23-745: 9.00 m at 6.38 g/t Au
- TW23-743: 9.0 m at 3.45 g/t Au
- TW23-730: 3.00 m at 4.71 g/t Au

Industrial Minerals Mining

MAGRIS INDUSTRIAL MINERALS – PENHORWOOD MINE

The Penhorwood Mine is located approximately 70 km southwest of Timmins and accessible via Highway ON-101 (*see* Figure 2). In 2023, Magris mined 352 506 tonnes of ore at an average grade of 40% talc. Mining generally occurs over the winter, creating a stockpile for processing throughout the remainder of the year. Current life of mine for the Penhorwood operation is 38 years, with approximately 12 540 000 tonnes of ore in resource.

Penhorwood employs 4 employees full time, and contracts 50 employees during the winter mining campaigns, with an average of 1 blast per week (S. McCarthy, Magris Industrial Minerals, personal communication, 2024).

EXPLORATION ACTIVITY

Introduction

The Timmins District recorded an 11% increase in active claims during 2023, with an additional 160 425 hectares of area covered by claims compared to 2022 (Figure 8). At the end of the year, Timmins had a total of 1 669 803 hectares of area covered by claims, second only to the Thunder Bay North District. Over C$56.5 million dollars of assessment work was filed between January 1 and December 31, 2023, which represents an increase of 115% when compared to 2022 (C$26 million) (*see* Table 6). There were a minimum of 75 individuals or companies that held active permits in the district for a minimum of 100 projects, a significant increase over 2022. Gold was the most explored for commodity across the district; however, significant work was completed on rare earth elements (REEs), base metals and niobium projects (Table 8). There were 181 active exploration permits and 13 exploration plans active during 2023 (Table 7).

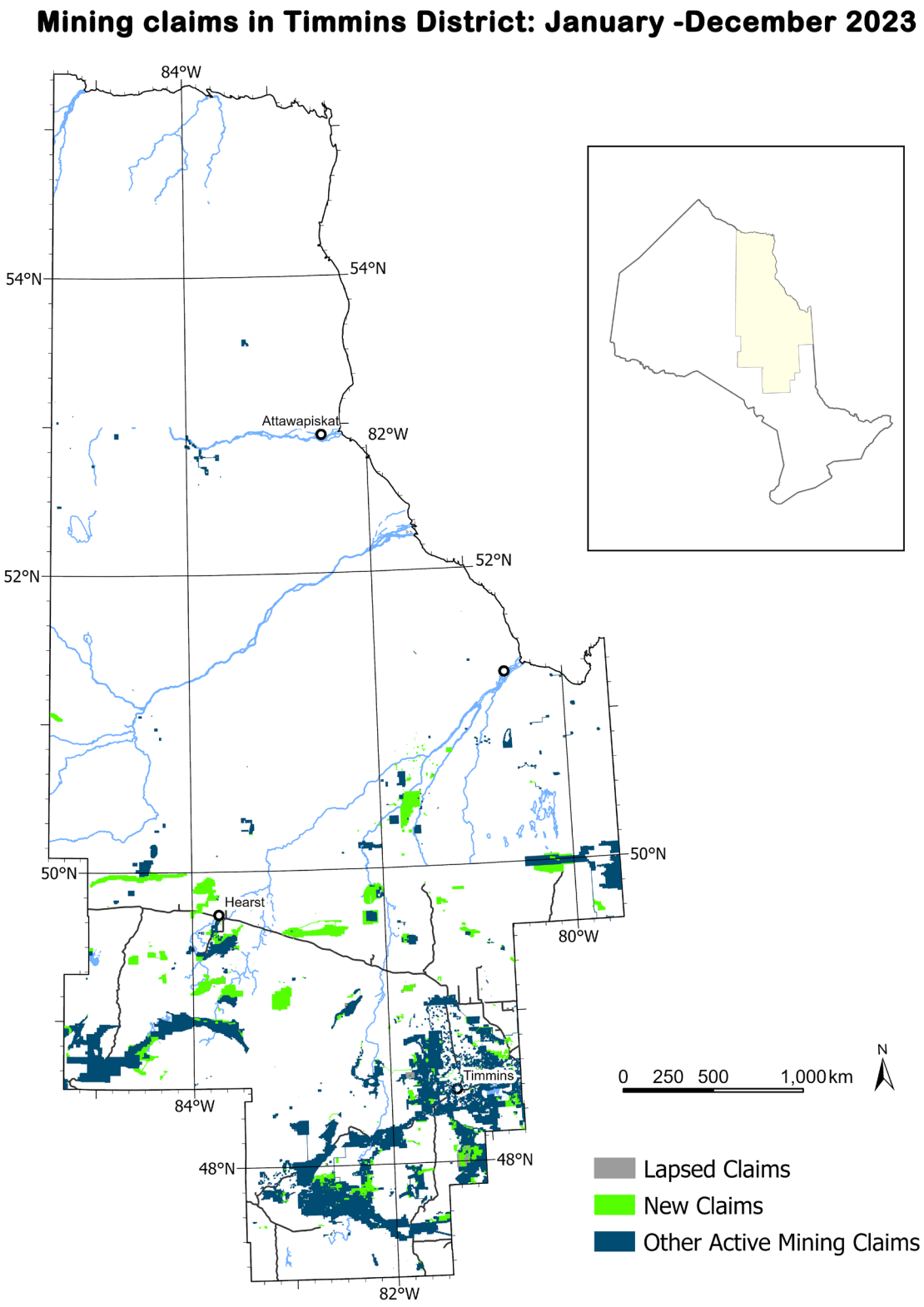

Figure 8. New, lapsed and active mining claims in the Timmins District as of December 31, 2023.

Table 6. Assessment files received in the Timmins District in 2023 (Ontario Geological Survey 2024).

Abbreviations

ACOMP ..... Compilation and interpretation – airborne geophysics
AEM ..... Airborne electromagnetic survey
AGRAD ..... Airborne gradiometer survey
AGVT ..... Airborne gravity survey
AMAG ..... Airborne magnetometer survey
ASSAY ..... Assaying and analyses
BENEF ..... Beneficiation studies
CHNL ..... Channel sampling
DATA ..... Database data
DHRLG ..... Drill core relogging
DHRSMP ..... Drill core resampling
EM ..... Electromagnetic survey
GCBIO ..... Geobotanical and biogeochemical survey
GCCOMP ..... Compilation and interpretation – geochemistry
GCHEM ..... Geochemical
GCOMP ..... Compilation and interpretation – ground geophysics
GEOL ..... Geological survey / mapping
GLCOMP ..... Compilation and interpretation – geology
GR ..... Resistivity survey
GRAV ..... Gravity survey
INDUS ..... Industrial mineral testing and marketing
IP ..... Induced polarization
LC ..... Linecutting
LIDAR ..... Light detection and ranging survey
MAG ..... Magnetic / magnetometer survey
MAGSUS ..... Magnetic susceptibility
MCOMP ..... Miscellaneous compilation and interpretation
METAL ..... Metallurgical testing and bulk sampling
MMI ..... Mobile metal ion™ soil sampling survey
OPET ..... Other petrographic work
OTHER ..... Other
PCOMP ..... Compilation and interpretation – diamond drilling
PDRILL ..... Diamond drilling
PHOTO ..... Air photo and remote imagery interpretations
PMAN ..... Manual labour
POVERB ..... Overburden drilling
PROSP ..... Prospecting by licence holder
PSTRIP ..... Overburden stripping
PTRNCH ..... Bedrock trenching
ROCK ..... Rock sampling
SOIL ..... Soil/till sampling
VLF ..... Electromagnetic very low frequency survey

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000020933	Jessop	Edward Shynkorenko	Claims#717592 and 717593	2022	ASSAY, GCBIO	$2400	5501, 93790
20000020934	Mann, Duff, Hanna, Little, McCart, Newmarket, Reaume	C Cox, Canada Nickel Company Inc., Noble Mineral Exploration Inc.	Mann Project	2022	ACOMP, AEM, AGVT	$470 744	5502, 5503, 5618, 5619, 5620, 5621, 5622, 5623, 5624, 93797, 93821, 95133, 95136, 95137, 95139, 95149, 95152, 95154
20000020935	Geikie, Bartlett	Canada Nickel Company Inc.	Texmont Property	2022	ACOMP, AEM, AMAG	$6981	5512, 93969
20000020914	Whitney	Hermann Daxl	Whitney Township Property	2022	ASSAY, BENEF, PROSP, ROCK	$34 600	5609, 94860
20000020880	Marion	Normand Collins	Gloster Marion Property	2022	GCOMP, MAG, VLF	$24 696	5268, 90389
20000020885	Loveland	Western Kidd Resources Inc.	UTEM5 Loveland Grid	2022	EM, LC	$378 046	5367, 5372, 91991, 92030
20000020887	Geary, Mahaffy, Thorburn	North American Exploration Ltd.	Timmins Nickel Property	2021–2022	ACOMP, AMAG, MMI	$81 296	5395, 92120
20000020890	English	DH Exploration Inc.	Muskasenda Project	2019–2022	ASSAY, PROSP, ROCK	$17 094	5416, 92471
20000020894	McCoig	Rio Tinto Exploration Canada Inc.	McCoig Property	2022	ACOMP, AMAG	$28 377	5466, 93320
20000020899	Hogg	VR Resources Ltd.	Northway Project	2022	ACOMP, AMAG, OTHER	$24 545	5488, 93611

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000020922	BMA 528 844	Metalex Ventures Ltd.	U2 Property	2022	DATA	$36 510	5421, 92507
20000021059	Zavitz, Hincks	New Break Resources Ltd.	Moray Au-Ag-Ni-Cu Property	2020	ASSAY, DHRSMP, ROCK	$11 291	5188, 88757
20000021067	Welsh, Magone	Terry W Halverson	Tyko Cu-Ni-PGE Property	2021	ASSAY, SOIL	$50 294	5253, 90074
20000021080	Cunningham	1537763 Ontario Inc.	Allen Lake Project	2022	PSTRIP	$5849	5611, 94874
20000021085	Keith, Muskego	GFG Resources Inc.	Pen Gold Project	2021	ACOMP, AMAG	$53 336	5786, 97818
20000021086	Lackner	Maurice Labelle	Lackner Carbonatite	2022	ASSAY, ROCK	$12 069	5792, 98197
20000021087	Sothman, Halliday	Kelly Malcolm	Halliday Lake	2023	ACOMP, AMAG	$54 818	5795, 98268
20000020806	Heenan	Michael Thompson	Heenan Property	2022	ACOMP, AMAG	$28 916	5347, 91690
20000020561	Carman, Shaw	Kraken Gold Corp.	Carman-Langmuir Property	2021–2022	PHOTO, PMAN	$5700	4857, 83911
20000020562	Sheraton, Thomas	2628860 Ontario Ltd.	Sheraton Property	2022	PHOTO	$3750	4858, 83946
20000020564	Swayze	Blackrock Exploration Inc.	Cree Lake Property	2020	ASSAY, PROSP, ROCK	$70 044	4861, 83991
20000020569	Foleyet	Enviromine Inc.	Shawmere Anorthosite Project	2021–2022	ASSAY, PDRILL, ROCK	$335 184	4899, 84507
20000020572	Robb	Lance Eden	Kamiskotia Project	2020	ASSAY, PROSP, PSTRIP, ROCK	$8003	4922, 84738
20000020588	Ottaway	Fortune Nickel and Gold Inc.	Beck-Ottaway Project	2022	GCOMP, IP, LC, MAG	$43 480	5002, 85915
20000020592	Hoyle, Murphy	Canada Nickel Company Inc.	Hoyle Township	2022	ACOMP, AEM	$26 688	5014, 5015, 5016, 86166, 86167, 86168
20000020613	Murphy	Hermann Daxl	Claim #612204-208, 630978, 630994-995	2020–2022	ASSAY, BENEF, PROSP	$15 100	5063, 86861
20000020616	Sheraton, Timmins	Selkirk Metals Corp.	Sheraton-Timmins Property	2022	LIDAR, PHOTO	$56 392	5072, 86998
20000020623	Murphy	Moneta Gold Inc.	North Tisdale Project	2020	PROSP	$2730	5100, 87365
20000021227	Reaume, Duff, Hanna	Canada Nickel Company Inc.	Reaume Target Property	2022	AEM, ASSAY, PDRILL	$443 978	100370, 100379, 100380, 5943, 5946, 5947
20000021241	Cunningham	1537763 Ontario Inc.	Allen Lake Project	2022	PSTRIP	$6706	5507, 93849
20000020698	Langmuir	EV Nickel Inc.	Langmuir Property	2021	ASSAY, PCOMP, PDRILL	$939 160	4874, 84214
20000020705	Nursey, Semple, Sothman	DGX Resources Ltd.	Golden Road and CulRoc Property	2022	ACOMP, AMAG	$6726	4954, 85184

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000020721	Carscallen	Moon Energy Corp. Foundation Canada	Carscallen Extension Property	2020–2022	ASSAY, PCOMP, PDRILL	$315 674	5041, 86480
20000020735	Gowan	5007223 Ontario Inc.	Gowan Property	2022	ASSAY, PCOMP, PDRILL	$327 132	5105, 87395
20000020737	Penhorwood, Reeves, Sewell	GFG Resources Inc., Magris Talc Canada Inc.	Pen Gold Project	2020	AMAG, LIDAR	$125 797	5117, 5123, 87554, 87602
20000021549	Tooms, Greenlaw	Exiro Minerals Corp	Sylvanite Gold Property	2022	ASSAY, PDRILL	$1 735 635	104733, 104741, 104885, 6222, 6223, 6228
20000021550	Lackner	International Explorers and Prospectors Inc.	Lackner Lake property	2023	ACOMP, AEM, LIDAR	$24 066	104744, 6224
20000021555	McCoig	Rio Tinto Exploration Canada Inc.	McCoig Property	2021–2022	PROSP, ROCK	$18 452	107085, 6272
20000021569	Foleyet	Enviromine Inc.	Shawmere Anorthosite Project	2022	ASSAY, METAL, PROSP	$88 909	108565, 6331
20000021570	Aurora	Global GenX Resources Ltd.	Nellie Property	2023	AGRAD, PROSP, ROCK	$9559	108581, 6332
20000021573	Moher	Ashley Gold Mines Ltd.	Moher Property	2023	GCOMP, PROSP, ROCK	$7930	108910, 6325
20000020756	Glackmeyer	Jean-Pierre Ouellette	Glackmeyer Property	2020	PROSP, ROCK	$1230	5185, 88748
20000020772	Bartlett	Victor Warford	Bartlett Property	2022	PROSP, ROCK	$2000	5249, 89955
20000020781	McCart	Mark Wellstead	McCart Property	2022	ASSAY, PROSP, ROCK	$5873	5282, 90533
20000020788	Murphy	Hermann Daxl	Claim#645006	2021	ASSAY, BENEF, PROSP	$4316	5301, 90929
20000020791	Ogden, Deloro	Goldcorp Canada Ltd., Metal Creek Resources Corp.	Ogden Property	2021	GCCOMP, GCHEM	$39 110	5318, 91127
20000020793	Ogden, Deloro	Goldcorp Porcupine Nominee Ltd.	Ogden Property	2020–2021	GCCOMP, GCHEM	$29 836	5315, 5316, 5317, 91122, 91124, 91126
20000020801	Sheraton	Selkirk Metals Corp.	Nighthawk JV Property	2022	LIDAR	$12,119	5341, 91576
20000020807	Denton	Melkior Resources Inc.	Denton "Melkior-Kirkland Lake Gold" JV Project	2022	ASSAY, PHOTO, PROSP, ROCK	$21 509	5349, 91710
20000021425	Prosser, Kidd, Wark	Glencore Canada Corp.	Timmins Glencore Claims Project	2023	AMAG	$30 693	101666, 6070
20000021426	Semple	DH Exploration Inc.	Semple Gold Project	2019–2021	ASSAY, CHNL, PROSP	$8630	104393, 6196
20000021427	Montcalm	Mink Ventures Corp.	Montcalm Property	2023	ASSAY, PDRILL	$228 821	104547, 6210
20000021496	Welsh, Magone	Terry Halverson	Tyko Cu-Ni-PGE Property	2021–2022	EM	$10 309	107359, 6282

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000020822	Turnbull	Kirkland Lake Gold Ltd.	Turnbull Property	2022	ASSAY, PROSP, ROCK, SOIL	$77 313	5399, 92190
20000020834	Clergue	International Explorers & Prospectors Inc.	Goldarm Project	2022	ASSAY, PCOMP, PDRILL	$732 653	5430, 5431, 5432, 5433, 5434, 5436, 5437, 5438, 5439, 92703, 92705, 92707, 92718, 92723, 92730, 92732, 92735, 92737
20000021181	Denyes, Crockett, Cunningham, Greenlaw, Halcrow, Raney, Swayze, Tooms	Exiro Minerals Corp.	Sylvanite Gold Property	2021–2022	ACOMP, GEOL, ROCK	$304 277	5824, 5830, 5833, 5834, 5835, 5836, 5840, 5854, 98798, 98902, 98906, 98907, 98911, 98912, 98919, 99048
20000021250	Carscallen	Melkior Resources Inc.	Carscallen Property	2022	PDRILL	$1 144 948	100166, 5927
20000021255	Garnet, Cunningham	1537763 Ontario Inc.	Yarwood wood lake project	2022	PSTRIP, PTRNCH	$14 913	101038, 5998
20000021188	Valentine, Pitt	NioBay Metals Inc.	Valentine Property	2021–2022	GLCOMP, MCOMP	$51 382	5405, 92351
20000021189	English, Beemer, Moher, Semple	Cloudbreak Discovery (Canada) Ltd.	South Timmins Property	2021–2022	AGRAD, SOIL	$295 900	5408, 5409, 5410, 92386, 92388, 92389
20000021197	Ogden	Goldcorp Canada Ltd.	Ogden Property	2021–2022	ASSAY, PDRILL	$1 172 188	5479, 93563
20000021198	Ogden	Metals Creek Resources Corp.	Ogden Property	2021–2022	ASSAY, PDRILL	$333 410	5480
20000021211	Reaume	Promiseland Exploration Ltd.	Broken Evil Property	2022	AEM, AMAG, ASSAY, MAGSUS, PDRILL	$618 380	5614, 95046
20000021212	Lizar	Michael Thompson	Lizar Property	2022	ACOMP, AMAG, PMAN	$91 150	5702, 96391
20000021267	Keith, Penhorwood, Reeves	GFG Resources Inc.	Pen Gold Project	2021	POVERB, SOIL	$308 299	5797, 98292
20000021444	Fintry	Rio Tinto Exploration Canada Inc.	Fintry Property	2021–2022	ASSAY, DHRLG, DHRSMP, GRAV, ROCK	$71 355	101286, 6025
20000021452	Calder	Noble Mineral Exploration Inc.	Calder Property	2022	ASSAY, PDRILL	$484 328	104642, 104644, 6218, 6219
20000021455	Carscallen	Hanna Capital Corp.	Carscallen Property	2023	VLF	$2500	104921, 6231
20000021504	Sothman, Burrows, Halliday, Hutt, Kemp, Nursey, Semple	Aston Minerals Ltd.	Edleston Property	2020–2022	ASSAY, DHIMG, GLCOMP, IP, LC, LIDAR, OPET, PDRILL	$27 772 435	101341, 101342, 101343, 101357, 6037, 6038, 6039, 6042

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000021508	Chester	1571925 Ontario Ltd.	Chester North and South Properties	2022	ASSAY, PROSP, ROCK	$15 959	103321, 6136
20000021518	Rollo	Richmond Minerals Inc.	Ridley Lake Property	2020–2022	ASSAY, PDRILL	$238 063	5607, 98481
20000021526	Welsh, Matthews	Fulcrum Metals Canada Ltd.	Tocheri Lake Property	2023	AEM	$60 180	107491, 6306
20000021482	Lizar	Bear Creek Gold Ltd.	Hiawatha Lizar	2021–2022	IP	$30 406	101294, 6029
20000021483	Mountjoy	Oakhurst Exploration Corp.	Mountjoy Project	2022–2023	ASSAY, PDRILL	$113 730	101665, 6069
20000021486	Godfrey	Melkior Resources Inc.	Genex Minesite Property	2022	IP	$43 800	105907, 6247
20000021017	MacDiarmid	North American Exploration Ltd., Xander Resources Inc.	Nickel North	2021–2022	AEM, GEOL	$87 569	5262, 90240
20000021021	Bartlett, McArthur	DH Exploration Inc.	McArthur Lake Property	2022	PMAN, PROSP, ROCK	$9915	5303, 90955
20000021024	Clergue	GFG Resources Inc.	Montclerg Gold Project	2021	ASSAY, PCOMP, PDRILL	$451 381	5311, 5312, 5313, 91079, 91082, 91085
20000021041	Montcalm	Mink Ventures Corp, Voltage Metals Inc.	Montcalm Project	2023	GCOMP, GR, IP	$171 671	5761, 5762, 97458, 97462
20000021045	Huffman	Patrick Jutras	Claim#653132	2022	PROSP, ROCK	$5820	5778, 97609
20000021046	Way, Lowther	Noble Mineral Exploration Inc.	Boulder Project	2022	ACOMP, AEM	$56 946	5779, 97619
20000021364	Thomas	Randall W Salo	McLeod Au-Cu Property	2022	ASSAY, PROSP, PTRNCH	$163 174	102209, 6092
20000020959	Denyes, Greenlaw, Halcrow, Swayze, Tooms	David Gibson, Don Fudge, Exiro Minerals Corp, Jonathan Camilleri	Sylvanite Gold Property	2021	ASSAY, PROSP, ROCK	$137 984	5474, 5476, 5477, 5478, 93548, 93549, 93550, 93551
20000020968	Langmuir, Carman, Eldorado	EV Nickel Inc.	Shaw Dome Project	2022	ASSAY, PCOMP, PDRILL	$3 825 375	5644, 95432
20000020978	Ottaway, Beck, Lennox, Nesbitt	Fortune Nickel and Gold Inc.	Beck-Ottaway Project	2023	DATA	$14 520	5683, 96228
20000020987	Hambleton, Magone	First Class Metals Canada Inc.	Sugar Cube Property	2023	ACOMP, AEM, AMAG	$94 906	5722, 96808
20000020990	Desrosiers	Hermann Daxl	Alike Lake Property	2021–2022	ASSAY, BENEF, PROSP	$29 961	5726, 96875
20000021321	Lowther	Brunswick Exploration Inc.	Lowther Pegmatite	2022	ASSAY, GCHEM	$9685	100988, 5992
20000021329	Keith, Foleyet, Ivanhoe, Sewell	GFG Resources Inc.	Pen Gold Project	2021	ASSAY, ROCK	$212 082	101598, 6066
20000021332	Hawkins, Derry, Ermine	E2Gold Inc.	Hawkins Project	2021	GEOL, ROCK	$46 566	102046, 102047, 6081, 6082
20000021154	Zavitz, Hincks	New Break Resources Ltd.	Moray Project	2022	GCCOMP, SOIL	$48 600	5856, 99055

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	File Identifier
20000021159	Benton, Blamey, Cunningham, Dore, Esther, Fawn, Garnet, Heenan, Mallard	Northern Superior Resources Inc.	October Gold Property	2022–2023	ASSAY, GCOMP, MAG, PCOMP, PDRILL, PROSP, ROCK	$585 791	5866, 5869, 5871, 5872, 99354, 99369, 99373, 99375
20000021160	Geikie, Bartlett	Canada Nickel Company Inc.	Texmont Property	2022–2023	ASSAY, PDRILL	$395 470	5867, 99356
20000021166	Reid, Geary, Mahaffy, Thorburn	Canada Nickel Company Inc.	Reid Target property	2022	ASSAY, PDRILL	$2 359 191	5881, 99540
20000021103	Montcalm	Mink Ventures Corp, Voltage Metals Inc.	Montcalm Property	2023	GCOMP, IP	$91 325	5745, 5746, 97215, 97219
20000021105	Huffman	Patrick Jutras	Claim#653132	2022	PROSP, ROCK	$5820	5778, 97609
20000021106	Way, Lowther	Noble Mineral Exploration Inc.	Boulder Project	2022	ACOMP, AEM	$56 946	5779, 97619
20000021109	Hawkins	E2 Gold Inc., Pavey Ark Minerals Inc.	Hawkins Project	2021–2022	ASSAY, PCOMP, PDRILL	$2 338 752	5791, 98196
20000021119	Clergue	Goldcorp Canada Ltd.	Clergue Property	2022	ASSAY, PROSP, ROCK	$23 939	5831, 98903
20000020945	Keith, Penhorwood, Reeves, Sewell	Magris Talc Canada Inc.	Pen Gold Project	2021	ASSAY, PCOMP, PDRILL	$1 049 287	5626, 5627, 95172, 95173
20000020954	Gowan	Fortune Nickel and Gold Inc.	Gowan Project	2023	DATA, MCOMP	$16 141	5678, 96135
20000021274	Matthews, Welsh	Fulcrum Metals	Tocheri Lake Project	2022	ASSAY, ROCK	$29 670	101344, 6040
20000021275	Sheraton, Bond, Thomas	2628860 Ontario Ltd.	Sheraton Property	2022–2023	MCOMP, PHOTO	$11 918	101351, 6041
20000021282	Stetham	Rockland Resources Ltd.	Stetham Uranium Property	2021	ROCK	$4341	5813, 98504
20000021382	Ottaway	Maurice Valliere	Ottaway Property	2023	AMAG	$34 690	101686, 6073
20000021385	Chester	Iamgold Corp	Gosselin Deposit	2020–2023	ASSAY, PDRILL	$2 561 268	102800, 6125
20000021395	Hawkins, Byng, Derry, Ermine, Hayward, Legge, Lipton, Lizar, Minnipuka, Puskuta, Walls, Woolrich	E2Gold Inc.	Hawkins Property	2022	ASSAY, GEOL, LIDAR, ROCK, SOIL	$856 800	103602, 103608, 103617, 103618, 103620, 103631, 103656, 103660, 103674, 103678, 103679, 103680, 105683, 6153, 6154, 6155, 6156, 6157, 6158, 6159, 6160, 6161, 6162, 6163, 6164, 6165
20000021406	Moberly, Thorburn	Glencore Canada Corp.	Moberly Project	2023	MAG, VLF	$11 500	5805, 98402
20000021472	Thorburn, Geary	Xander Resources Inc.	Timmins Nickel Property	2022–2023	ASSAY, PDRILL	$400 340	104381, 6195
20000021475	Denton	Canadian Silver Hunter Inc.	Lost Dog Property	2021	ASSAY, SOIL	$16 325	105489, 6243

Table 7. Active exploration plans and permits in the Timmins District in 2023.

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PL-22-000061	Rio Tinto Exploration Canada Inc.	Fintry	Fintry
PL-22-000065	Ashley Gold Mines Limited	Fawn	Fawn
PL-22-000066	2771906 Ontario Inc.	Edleston Project	Sothman
PL-22-000116	1537763 Ontario Inc	AR2	Cunningham, Swayze
PL-22-000117	1537763 Ontario Inc	A8	Cunningham, Garnet
PL-22-000118	1537763 Ontario Inc	RT1	Cunningham, Garnet
PL-22-000126	Noble Mineral Exploration Inc.	Fly Creek	Carnegie, Kidd
PL-23-000001	E2Gold Inc.	Dubroy – E2Gold A	Hawkins, Walls
PL-23-000002	E2Gold Inc.	Dubroy – E2Gold B	Hawkins, Walls
PL-23-000003	Pavey Ark Minerals Inc.	Dubroy – Pavey Ark	Hawkins, Walls
PL-23-000004	Gordon Henriksen	Dubroy – Henrikson	Walls
PL-23-000006	Tiger Gold Exploration Corporation	Bradette Project	Bradette, Kingroy Lake Area
PL-23-000094	Wayne Holmstead	Boulder	Lowther, Way
PR-20-000358	Douglas Lalonde	Gold Rush	Carscallen, Turnbull
PR-20-000372	Silver Lake Ontario Inc.	Sugar Zone Property – Southern Zone	Cooper, Strickland
PR-20-000375	2771906 Ontario Inc.	Edleston Gold Project	Sothman
PR-21-000011	2771906 Ontario Inc.	Edleston Gold Project	Halliday, Nursey, Semple, Sothman
PR-21-000018	EGR Exploration Ltd.	Detour West	Hopper Lake Area, Kesagami River Area, Marquis Lake Area, Ministik Creek Area, Newnham Creek Area
PR-21-000052	Silver Lake Ontario Inc.	Sugar Zone Property – Nameigos East	Mosambik, Nameigos
PR-21-000053	Silver Lake Ontario Inc.	Sugar Zone Property – Nameigos South	Mosambik, Nameigos
PR-21-000054	Silver Lake Ontario Inc.	Sugar Zone Property – Nameigos West	Nameigos
PR-21-000066	Melkior Resources Inc./Ressources Melkior Inc.	Carscallen	Carscallen, Denton
PR-21-000068	Canada Nickel Company Inc.	Mahaffy Target	Aubin, Mahaffy
PR-21-000074	Melkior Resources Inc. / Ressources Melkior Inc.	Carscallen	Carscallen, Denton
PR-21-000095	Metals Creek Resources Corp.	Ogden West	Ogden
PR-21-000096	Goldcorp Canada Ltd.	Ogden South	Ogden
PR-21-000103	Canada Nickel Company Inc.	MacDiarmid South Target	Macdiarmid
PR-21-000112	Darren Blaney	Robb PGE	Robb
PR-21-000124	5007223 Ontario Inc.	Gowan	Gowan
PR-21-000125	EV Nickel Inc.	Langmuir Ni Project	Langmuir
PR-21-000127	The Claim Group Inc.	Tomorrow Lake – West of Sunday Lake Area Claims	West of Sunday Lake Area
PR-21-000129	The Claim Group Inc.	Tomorrow Lake – East of Kesagami Lake Area	East of Kesagami Lake Area
PR-21-000130	Legendary Ore Mining Corporation	Dundonald Project	Dundonald, German
PR-21-000131	Randall Salo	Douglas	Douglas
PR-21-000137	2771906 Ontario Inc.	Edleston Gold Project	Semple, Sothman
PR-21-000138	2771906 Ontario Inc.	Edleston Gold Project	Semple
PR-21-000139	2771906 Ontario Inc.	Edleston Gold Project	Semple
PR-21-000167	Silver Lake Ontario Inc.	Sugar Zone Property – Big Bear Trenching	Cooper, Strickland
PR-21-000168	Silver Lake Ontario Inc.	Sugar Zone Property – Southern Trenching	Cooper, Strickland
PR-21-000169	Silver Lake Ontario Inc.	Sugar Zone Property – K7 South Trenching	Cooper, Strickland, Tedder
PR-21-000179	David Harrison	Harrison Prospects	Calvert

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PR-21-000189	Goldcorp Canada Ltd.	Bowtie	Deloro
PR-21-000196	St Andrew Goldfields Ltd.	Taylor West #1	Stock
PR-21-000202	2771906 Ontario Inc.	Edleston Gold Project	Sothman
PR-21-000213	Canada Nickel Company Inc.	Nesbitt Target	Nesbitt
PR-21-000220	EV Nickel Inc.	Langmuir Project – TZ3 Target	Eldorado
PR-21-000221	Silver Lake Ontario Inc.	Sugar Zone Property – 007 Stripping	Hambleton
PR-21-000222	Canada Nickel Company Inc.	Bradburn Target	Bradburn
PR-21-000226	Harfang Exploration Inc.	Egan	Egan, McEvay, Sheraton, Timmins
PR-21-000227	Argo Gold Inc.	Hurdman	Hurdman
PR-21-000245	Harfang Exploration Inc.	Egan	Egan, Sheraton
PR-21-000250	New Break Resources Ltd.	Moray	Hincks, Hutt, Zavitz
PR-21-000259	GFG Resources Inc.	Pen Gold	Ivanhoe, Keith, Kenogaming, Penhorwood, Reeves, Sewell
PR-21-000269	Epica Gold Inc.	Golden Mile	Dundonald, Evelyn, German, Matheson
PR-21-000272	Tyko Resources Inc.	Tyko	Magone, Shabotik, Welsh
PR-21-000276	Enviromine Inc.	Shawmere	Foleyet, Lemoine
PR-21-000291	5007223 Ontario Inc.	Gowan NE Target	Gowan
PR-21-000293	Exiro Minerals Corp.	Sylvanite Gold Project – Halcrow A	Halcrow
PR-21-000294	Exiro Minerals Corp.	Sylvanite Gold Project – Halcrow B	Halcrow
PR-21-000295	Exiro Minerals Corp.	Sylvanite Gold Project – Hotstone A	Greenlaw, Tooms
PR-21-000296	Exiro Minerals Corp.	Sylvanite Gold Project – Hotstone B	Greenlaw
PR-21-000297	Exiro Minerals Corp.	Sylvanite Gold Project – Dyment A	Denyes, Halcrow
PR-21-000298	Exiro Minerals Corp.	Sylvanite Gold Project – Dyment B	Denyes
PR-21-000299	Jonathan Camilleri	Sylvanite Gold Project – Dyment C	Denyes, Swayze
PR-21-000314	Exiro Minerals Corp.	Sylvanite-Hotstone Property	Greenlaw
PR-21-000321	2771906 Ontario Inc.	Edleston Gold Project	Sothman
PR-21-000331	Pavey Ark Minerals Inc.	Hawkins #2	Derry, Hawkins, Walls
PR-21-000340	North American Exploration Ltd.	Timmins North	Geary, Thorburn
PR-21-000341	North American Exploration Ltd.	Timmins Northeast	Geary, Mahaffy
PR-21-000342	North American Exploration Ltd.	Timmins South	Macdiarmid
PR-21-000345	E2Gold Inc.	Hawkins #3	Derry, Ermine, Hawkins
PR-21-000348	Moon Energy Corp. Foundation, Canada	Stargate 1	Keefer
PR-21-000351	Gail Resources Inc.	Sangold	Keith
PR-21-000356	Fortune Nickel and Gold Inc.	Gowan Project	Gowan
PR-21-000357	Silver Lake Ontario Inc.	Sugar Zone Property – Eagle West	Johns
PR-21-000358	Silver Lake Ontario Inc.	Sugar Zone Property – Eagle Zone	Odlum
PR-21-000359	Silver Lake Ontario Inc.	Sugar Zone Property – Flat Lake East	Bayfield, Gourlay
PR-21-000360	Silver Lake Ontario Inc.	Sugar Zone Property – Flat Lake West	Bayfield, Gourlay, Hambleton, Matthews
PR-21-000361	Silver Lake Ontario Inc.	Sugar Zone Property – Hambleton	Hambleton
PR-21-000362	Silver Lake Ontario Inc.	Sugar Zone Property – K7 South	Cooper, Odlum, Strickland, Tedder
PR-21-000363	Silver Lake Ontario Inc.	Sugar Zone Property – K7 South Area 1	Strickland
PR-21-000364	Silver Lake Ontario Inc.	Sugar Zone Property – Nameigos Area 6	Nameigos, Strickland
PR-21-000365	Silver Lake Ontario Inc.	Sugar Zone Property – Nameigos Central	Mosambik, Nameigos
PR-21-000366	Silver Lake Ontario Inc.	Sugar Zone Property – TNT	Gourlay, Hambleton
PR-21-000367	Fortune Nickel and Gold Inc.	Beck Ottaway Project	Beck, Lennox, Nesbitt, Ottaway
PR-21-000375	Canada Nickel Company Inc.	Reaume Target	Reaume
PR-21-000376	Canada Nickel Company Inc.	Reaume Target	Reaume
PR-22-000004	Canada Nickel Company Inc.	Deloro Target	Deloro
PR-22-000007	Noble Mineral Exploration Inc.	Nagagami	Nagagami River Area, Pitopiko River Area

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PR-22-000008	Canada Nickel Company Inc.	Reid Target	Geary, Mahaffy, Reid, Thorburn
PR-22-000015	Fortune Nickel and Gold Inc.	The Lennox Project (Block A)	Lennox
PR-22-000016	Fortune Nickel and Gold Inc.	The Beck Project	Beck
PR-22-000020	Global Genx Resources Ltd.	Woolley Bugger	Aurora, Edwards, Mortimer
PR-22-000022	GFG Resources Inc.	Pen Gold	Foleyet, Ivanhoe, Keith, Muskego
PR-22-000024	5007223 Ontario Inc.	Gowan SW Target	Gowan
PR-22-000031	Randall Salo	McLeod 1	Thomas
PR-22-000032	Randall Salo	McLeod 2	Sheraton, Thomas
PR-22-000042	EV Nickel Inc.	Langmuir Project	Langmuir
PR-22-000064	The Claim Group Inc.	Tomorrow Lake – Partridge Lake Area	Partridge Lake Area, West of Glaister Lake Area
PR-22-000065	The Claim Group Inc.	Tomorrow Lake – Glaister Lake Area	Glaister Lake Area
PR-22-000066	The Claim Group Inc.	Tomorrow Lake – Southbluff Creek Area	East of South Bluff Creek Area, South Bluff Creek Area, South of South Bluff Creek Area, West of Glaister Lake Area
PR-22-000067	The Claim Group Inc.	Tomorrow Lake – Atick River Area	Atick River Area, West of Atick River Area
PR-22-000068	The Claim Group Inc.	Tomorrow Lake – Nattabisha Point Area	Nattabisha Point Area
PR-22-000069	The Claim Group Inc.	Tomorrow Lake – East of Southbluff Creek Area	East of South Bluff Creek Area
PR-22-000070	The Claim Group Inc.	Tomorrow Lake – South of Hannah Bay Area	South of Hannah Bay Area
PR-22-000071	The Claim Group Inc.	Tomorrow Lake – South of Low Shoal Island Area	South of Low Shoal Island Area
PR-22-000072	The Claim Group Inc.	Tomorrow Lake – Flinch and Felst Lake Areas	Felst Lake Area, Flinch Lake Area
PR-22-000074	Sanatana Resources Inc.	Fortune Lake	Byers, Cote, Enid, Fortune
PR-22-000086	Melkior Resources Inc. / Ressources Melkior Inc.	Carscallen Project	Carscallen, Denton
PR-22-000108	EV Nickel Inc.	Langmuir #2 Nickel Project	Langmuir
PR-22-000109	EV Nickel Inc.	Carman-Langmuir Nickel Project	Carman, Langmuir
PR-22-000110	EV Nickel Inc.	Crimson Nickel Project	Carman
PR-22-000128	Pelangio Exploration Inc.	Kenogaming Project	Kenogaming
PR-22-000150	IAMGOLD Corporation	TAAC West	Huffman, Osway
PR-22-000156	IAMGOLD Corporation	Chester Yeo	Chester, Potier, Yeo
PR-22-000158	David Meunier	Calder	Calder
PR-22-000187	EV Nickel Inc.	Groves Project	Groves
PR-22-000198	2771906 Ontario Inc.	Edleston Project	Sothman
PR-22-000213	Bear Creek Gold Ltd.	Hiawatha BCG	Lizar
PR-22-000227	2254022 Ontario Ltd.	Mortimer Block	Dore
PR-22-000231	Voltage Metals Inc.	Montcalm	Montcalm
PR-22-000236	International Explorers & Prospectors Inc.	Gexex	Godfrey
PR-22-000237	VR Resources Ltd.	Northway	Hogg, Pickett
PR-22-000243	Noble Mineral Exploration Inc.	Fly Creek	Carnegie, Kidd
PR-22-000245	Oakhurst Capital Corp.	Oakhurst – M10	Mountjoy
PR-22-000246	Oakhurst Capital Corp.	Oakhurst – M11	Mountjoy
PR-22-000247	Oakhurst Capital Corp.	Oakhurst – M12	Mountjoy, Ogden
PR-22-000248	Northern Superior Resources Inc.	October Gold	Benton
PR-22-000249	Northern Superior Resources Inc.	October Gold	Benton, Garnet
PR-22-000250	Northern Superior Resources Inc.	October Gold	Blamey, Cunningham
PR-22-000251	Northern Superior Resources Inc.	October Gold	Benton, Heenan
PR-22-000252	Northern Superior Resources Inc.	October Gold	Benton, Mallard

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PR-22-000253	Northern Superior Resources Inc.	October Gold	Benton
PR-22-000267	Richard Stroz	K-39	Bartlett, English
PR-22-000268	Silver Lake Ontario Inc.	SZM_Near-Mine	Gourlay, Hambleton, Odlum, Strickland
PR-22-000269	Maurice Valliere	Upper Deception	Ottaway
PR-22-000287	Aecon Mining Inc.	Whitney Quarry	Whitney
PR-22-000302	International Explorers & Prospectors Inc.	Montclerg / Goldern Arm	Clergue, Walker
PR-22-000303	International Explorers & Prospectors Inc.	Montclerg / Goldern Arm	Clergue, Stock
PR-22-000304	Voltage Metals Inc.	Montcalm Township	Montcalm
PR-22-000307	Xander Resources Inc.	Timmins North	Thorburn
PR-22-000323	Pavey Ark Minerals Inc.	Grid 3 – Drilling	Hawkins
PR-22-000325	E2Gold Inc.	Goldfields – E2Gold	Derry, Hawkins
PR-22-000326	Pavey Ark Minerals Inc.	Goldfields – Pavey Ark	Derry, Hawkins
PR-22-000339	VR Resources Ltd.	H-K	Hecla, Kilmer
PR-22-000346	EV Nickel Inc.	Langmuir Project – Link Area	Langmuir
PR-22-000352	Noble Mineral Exploration Inc.	Noble Kidd / Carnegie Project	Carnegie, Kidd
PR-23-000011	Voltage Metals Inc.	Montcalm Ni Cu Co Project	Montcalm
PR-23-000025	Rockridge Resources Ltd.	Raney Gold Project	Raney
PR-23-000036	John Leliever	Cree Lake Project	Swayze
PR-23-000038	C. Cox	Mann	Duff, Mann
PR-23-000041	2681891 Ontario Inc.	Massey Township	Massey
PR-23-000051	Noble Mineral Exploration Inc.	Noble Kidd / Carnegie Project	Carnegie, Kidd
PR-23-000052	B. Laurin	Jawbone Creek Property	Ireland
PR-23-000057	2004402 Ontario Inc.	Hearst 1	Lowther
PR-23-000058	Last Resort Resources Ltd.	Hearst 2	Lowther
PR-23-000086	Goldcorp Canada Ltd.	Joanis	Hoyle
PR-23-000094	Voltage Metals Inc.	Montcalm Ni-Cu-Co Project	Montcalm
PR-23-000108	Goldcorp Canada Ltd.	HEN H	Matheson
PR-23-000109	2758145 Ontario Ltd.	Mead	Landry, Lowther, Templeton
PR-23-000121	Fred Kiernicki	Inglis Project	Inglis
PR-23-000149	EV Nickel Inc.	W4 Nickel Project	Langmuir
PR-23-000150	Goldcorp Canada Ltd.	Swipe	Deloro
PR-23-000151	Cloudbreak Discovery (Canada) Ltd.	South Timmins	Beemer, English, Moher, Semple
PR-23-000156	Canada Nickel Company Inc.	Newmarket	McCart, Newmarket
PR-23-000160	Canada Nickel Company Inc.	Reaume East	Reaume
PR-23-000162	Gowest Gold Ltd.	North Timmins Gold Project S	Gowan, Prosser, Tully
PR-23-000163	Gowest Gold Ltd.	North Timmins Gold Project N	Tully
PR-23-000164	Mark Rochefort	Longbow East	Dale, Genoa, Marion, McCowen, Newton
PR-23-000165	Mark Rochefort	Longbow West	Heenan, Newton
PR-23-000166	Goldcorp Canada Ltd.	HEN I	Matheson
PR-23-000167	Gail Resources Inc.	Sangold	Keith
PR-23-000168	C. Cox	Mann_Cox	Mann, Newmarket
PR-23-000169	Noble Mineral Exploration Inc.	Mann_Noble1	Mann
PR-23-000171	Noble Mineral Exploration Inc.	Mann_Noble2	Hanna, Mann
PR-23-000175	RT Minerals Corp.	Ireland Project	Ireland
PR-23-000176	RT Minerals Corp.	Kendry Project	Colquhoun, Kendrey
PR-23-000177	RT Minerals Corp.	Kenogaming Project	Kenogaming
PR-23-000180	RT Minerals Corp.	Pharand Project	Pharand
PR-23-000181	RT Minerals Corp.	Timmins Project	Timmins

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PR-23-000201	South Timmins Mining Inc.	Mallard Gold Project (Heenan Block)	Heenan
PR-23-000202	Jonathan Camilleri	Marion Property	Dale, Heenan, Marion, Newton
PR-23-000210	Canada Nickel Company Inc.	Calder	Calder, Ottaway
PR-23-000213	Rio Tinto Exploration Canada Inc.	Fintry	Fintry
PR-23-000236	New Break Resources Ltd.	Moray	Hincks, Hutt, Zavitz
PR-23-000246	Libra Lithium Corp.	Lithium Hill	Nomunheka River Area, South of Quantz Lake Area
PR-23-000248	Pavey Ark Minerals Inc.	Hawkins – Grid 3 2023	Hawkins
PR-23-000255	RT Minerals Corp.	Sheba-Michie Project	Michie
PR-23-000269	2254022 Ontario Ltd.	Swayze	Dore, Swayze
PR-23-000274	Enviromine Inc.	Shawmere	Foleyet
PR-23-000275	South Timmins Mining Inc.	Mallard Gold Project (Woman River Zone)	Mallard
PR-23-000276	Central Timmins Nickel Company Inc	Texmont Drone Survey	Douglas, Geikie, McArthur
PR-23-000283	Juno Corp.	P11Q10Q11	BMA 528 853, BMA 531 852, BMA 531 853, BMA 531 854, BMA 532 853, BMA 532 854, BMA 532 861, BMA 533 854, BMA 533 861
PR-23-000299	Canada Nickel Company Inc.	Sothman Property	Kemp, Sothman

Abbreviation: BMA – Bear Management Area.

Table 8. Exploration activity in the Timmins District in 2023. Numbers are keyed to Figure 4 (*see* "Exploration Activity"). Letters are keyed to Figure 3 (*see* "Advanced Exploration Projects") (Ontario Geological Survey 2024).

Abbreviations

AGMNT ..... Agreement
ASSAY ..... Assaying and analyses
BEEP ..... Beep Mat survey
CHNL ..... Channel sampling
CLMREG ..... Claim registration
CORPUP ..... Corporate update
EXPLUD ..... Exploration update
FEAS ..... Feasibility study
FINANC ..... Financing
GCHEM ..... Geochemical
GEOL ..... Geological survey / mapping
IP ..... Induced polarization survey
LC ..... Linecutting
MAG ..... Magnetic / magnetometer survey
METAL ..... Metallurgical testing and bulk sampling
PDRILL ..... Diamond drilling
PROSP ..... Prospecting by licence holder
PSTRIP ..... Overburden stripping
PTRNCH ..... Bedrock trenching
RRCALC ..... Reserve/resource calculations
ROCK ..... Rock sampling
SOIL ..... Soil/till sampling
T43101 ..... NI 43-101 report

No.	Company/Individual - Property Name (Commodity)	Township/Area (Commodity)	Exploration Activity
1	Brunswick Exploration – Hearst Project (Li)	Lowther	PROSP, PSTRIP, PDRILL, GEOL, PTRNCH, ASSAY
2	Aston Minerals – Edleston Project (Au, Ni)	Sothman	PDRILL, ASSAY
3	Canada Nickel Company Inc – Texmont (Ni)	Bartlett	PDRILL, ASSAY
4	Canada Nickel Company Inc – Mann Property (Ni)	Mann	PDRILL, ASSAY
5	E2Gold Inc – Hawkins Gold (Au)	Hawkins	SOIL, ROCK, PROSP, ASSAY
6	EGR Exploration Ltd – Detour West Gold Project (Au)	Newnham Creek Area	PROSP, MAG, ASSAY, CLMREG
7	EV Nickel – Shaw-Dome (Ni)	Langmuir	T43101, PDRILL, RRCALC
8	Melkior Resources Inc – Genex Au-Cu Project (Ni, Cu, Au)	Godfrey	PTRNCH, ROCK, PROSP, CHNL, BEEP, ASSAY
9	Mink Ventures Corporation – Montcalm (Au)	Montcalm	IP, PDRILL, ASSAY
10	Mink Ventures Corporation – Warren Project (Au)	Whitesides	PROSP, ROCK, ASSAY

No.	Company/Individual - Property Name (Commodity)	Township/Area (Commodity)	Exploration Activity
11	Moneta Gold Inc – Loveland Nickel Property (Ni)	Byers	AGMT, CLMREG
12	Noble Minerals Ltd – Kidd2 / Carnegie Project (REE)	Carnegie	IP, LC
13	Platinex Inc – Heenan Mallard (Au)	Mallard	CHNL, PTRNCH, PSTRIP, PDRILL, ASSAY
14	Rockridge Resources Ltd – Raney Gold (Au)	Raney	PDRILL, ASSAY
15	Torr Metals Inc – Filion Gold Project (Au)	McCowan	ROCK, SOIL, PROSP, GEOL, ASSAY
16	VR Resources Ltd – Hecla-Kilmer (REE)	Hecla	PDRILL, GCHEM, METAL, ASSAY
17	VR Resources Ltd – Northway (Diamond)	Hogg	PDRILL, GCHEM, ASSAY
18	Xander Resources – Timmins Nickel Project (Ni)	Geary	PDRILL, ASSAY
Advanced Projects			
AA	Gowest Gold Ltd – Bradshaw (Au)	Tully (Au)	PDRILL, ASSAY, EXPLUP, AGMNT
AB	IAMGold Corp – Côté Lake (Au)	Chester (Au)	PDRILL, ASSAY, EXPLUP, AGMNT
AC	Galleon Gold Corp – West Cache (Au)	Bristol, Ogden (Au)	PDRILL
AD	Canada Nickel Company Inc - Crawford Ni-Co Project (Ni, Co)	Crawford (Ni, Cu, Co, PGE)	AGMT, FINANC, PDRILL, FEAS
	[1]NioBay Metals Inc – James Bay Niobium (Nb)	West of Marberg Creek Area (Nb)	CORPUP
	[1]Fox River Resources Corp – Martinson Phosphate (Phosphate)	South of Ridge Lake Area (Phosphate, Nb)	

[1]*No exploration activity in 2023.*

Advanced Exploration Projects

GOWEST GOLD – BRADSHAW DEPOSIT

The Bradshaw gold deposit is located 32 km north-northeast of the city of Timmins (*see* Figure 3, AA) within Gowest Gold's North Timmins Gold Project (NTGP) and can be accessed via Highway ON-655 and a 13.5 km long, all-weather gravel road. The Timmins Gold Project consists of 1 patented mining claim, 11 mining leases and 56 unpatented mining claims with a total area of approximately 109 km^2. Twenty-six unpatented mining claims are under joint venture with Transition Metals Corp., while Gowest has a 100% interest in all other claims (Gowest Gold, https://gowestgold.com/north-timmins-gold-project/overview/, website accessed January 15 2024).

Gowest reinitiated mining and underground development operations at Bradshaw on April 10, 2023, following a successful bulk sampling program in 2021. In June, Gowest announced 2 safe months of underground development and production and the timely progression of key production and infrastructure projects (Gowest Gold, news release, June 7, 2023).

Gowest completed 4403 m of exploration as of October 31 over 14 drill-holes on the eastern portion of the deposit (Gowest Gold, news release, November 14, 2023). Significant intercepts include

- GW23-328: 2.8 m at 8.08 g/t Au, including 1.80 m at 11.10 g/t from Hanging Wall 2 Zone
- GW23-330: 3.0 m at 9.77g/t Au, including 1 m at 27.60 g/t Au from the YDA Zone
- GW23-333: 2.6 m at 5.27 g/t Au, including 1.1 m at 11.98 g/t Au in Hanging Wall 2 Zone and 1.5 m at 7.57 g/t Au in a new unnamed zone.

Development highlights at the Bradshaw deposit include sill development on the 30, 45 and 60 m levels in the 2 main East Zone vein areas, a 5 m access ramp developed towards the Central and West zones and a permanent explosive storage area (Gowest Gold, news release, July 11, 2023). The first long-hole stope

blast occurred between the 30 and 45 m levels on July 4, 2023, and an underground ventilation upgrade is in progress, with the completion of an Alimak raise from the 60 m level to surface in June. By the end of June, Gowest announced they had stockpiled 8000 tons of ore on surface (Gowest Gold, news release, November 14, 2023).

Gowest announced moving Bradshaw into care and maintenance on a temporary basis to conserve funds, until construction of the Northern Pond tailings pond has been completed, scheduled for July of 2024 (Gowest Gold, news release, November 10, 2023).

IAMGOLD CORP. – CÔTÉ GOLD DEPOSIT

The Côté Gold deposit is a joint venture between IAMGOLD and Sumitomo Metal Mining Co., Ltd. (IAMGOLD Corp., news release, February 2, 2023). The project is located in Chester and Yeo townships, approximately 25 km southwest of the town of Gogama (*see* Figure 3, AB). The Côté Project is accessible year-round via Highway ON-144 and sits in an extensive land package covering a total of 596 km^2 (IAMGOLD Corp., https://www.iamgold.com/English/operations/cote-gold-project-ontario/default.aspx, website accessed January 15, 2024).

The Côté Gold Project has a Reserve (Proven and Probable) of 233 Mt at 0.86 g/t Au, for a total of 7.17 million ounces. Additionally, the Côté Gold Project also has a total of 13.55 million ounces Au in Measured and Indicated resources between the Côté and Gosselin deposits, with a total tonnage of 490 Mt at 0.86 g/t Au. As of September 2023, the Côté Gold Project was estimated to be 90.6% complete, with commercial production on track to begin in March 2024 (IAMGOLD Corp., news release, November 6, 2023). As of September 30, Côté averaged a workforce between 1800 and 1900 workers on site, both contract and salaried (IAMGOLD Corp., news release, October 23, 2023).

Additional exploration at Gosselin in 2023 yielded positive results, suggesting that the Gosselin deposit could expand to a similar size as Côté (IAMGOLD Corp., news release, October 23, 2023). Highlights from the Gosselin drilling program include

- GOS23-131: 472 m at 0.65 g/t Au, including 51 m at 1.59 g/t Au
- GOS23-133: 356 m at 0.82 g/t Au, including 132.0 m at 1.09 g/t Au
- GOS23-134: 300.8 m at 1.40 g/t Au, including 207.3 m at 1.71 g/t Au
- GOS23-136: 240.0 m at 1.53 g/t Au, including 120.0 m at 2.26 g/t Au
- GOS23-144: 500.8 m at 0.72 g/t Au.

CANADA NICKEL COMPANY – CRAWFORD

Canada Nickel Company's Crawford Project is located 42 km north of Timmins (*see* Figure 3, AD) and consists of 116 patents, 148 single-cell mining claims and 2 multi-cell mining claims, totaling an area of approximately 9611 hectares (Canada Nickel Company, https://canadanickel.com/, website accessed January 15, 2024). The Crawford Project currently has a resource (Measured and Indicated) of 6.0 Mt Ni across all zones, and an additional 3.7 Mt in Inferred Resources (Table 9). The project currently has a 41 year mine life. Canada Nickel also welcomed significant investment in 2023 by Agnico Eagle Mines Ltd and Anglo American, who invested C$34 million (Canada Nickel Company, news release, February 8, 2023) and C$24 million dollars into the project, respectively (Canada Nickel Company, news releases, January 2, 2024).

Table 9. Crawford Mineral Resources update, effective August 31, 2023 (Canada Nickel Company, news release, November 25, 2023).

Resource category	Tonnage (Mt)	Grade							Contained Metal					
		Ni (%)	Co (%)	Pd (g/t)	Pt (g/t)	Fe (%)	Cr (%)	Bruc (%)	Ni (kt)	Co (kt)	Pd (koz)	Pt (koz)	Fe (Mt)	Cr (kt)
Higher Grade Main Zone														
Proven	208	0.31	0.013	0.027	0.011	6.23	0.60	1.78	641	27	180	74	13	1249
Probable	64	0.29	0.013	0.023	0.012	6.47	0.54	1.98	185	8	47	24	4	348
Measured	253	0.30	0.013	0.027	0.012	6.40	0.59	1.73	770	33	219	96	16.2	1503
Indicated	296	0.28	0.013	0.023	0.012	6.93	0.57	1.36	830	39	218	112	20.5	1694
Inferred	212	0.28	0.013	0.018	0.011	6.91	0.56	1.21	587	28	123	73	14.6	1190
Lower Grade Main Zone														
Proven	213	0.21	0.013	0.011	0.009	6.69	0.58	1.15	445	27	75	58	14	1226
Probable	368	0.18	0.013	0.011	0.009	6.82	0.53	1.03	678	47	133	106	25	1961
Measured	280	0.22	0.013	0.011	0.009	6.89	0.59	1.15	607	37	96	79	19.3	1646
Indicated	698	0.21	0.013	0.011	0.009	7.10	0.57	1.07	1465	92	249	207	49.6	3998
Inferred	1324	0.21	0.013	0.010	0.009	7.20	0.57	0.94	2772	174	420	386	95.4	7544
Higher Grade East Zone														
Proven	375	0.26	0.012	0.014	0.009	5.92	0.64	2.84	965	47	170	112	22	2418
Probable	148	0.25	0.012	0.009	0.007	5.83	0.63	2.87	369	18	44	32	9	926
Measured	394	0.26	0.012	0.015	0.009	5.92	0.65	3.10	1022	49	185	119	23.3	2546
Indicated	300	0.26	0.013	0.011	0.007	5.85	0.63	3.19	774	38	103	69	17.5	1887
Inferred	112	0.26	0.013	0.010	0.007	5.90	0.62	2.89	289	14	37	25	6.6	695
Lower Grade East Zone														
Proven	198	0.15	0.012	0.011	0.011	7.00	0.50	0.32	295	24	73	67	14	998
Probable	141	0.15	0.011	0.012	0.010	6.54	0.47	0.60	212	16	53	46	9	659
Measured	169	0.16	0.013	0.011	0.009	7.25	0.54	0.40	279	21	57	49	12.3	908
Indicated	172	0.17	0.012	0.011	0.009	7.11	0.52	0.93	289	21	61	52	12.2	886
Inferred	45	0.17	0.013	0.010	0.008	7.11	0.54	0.55	78	6	14	12	3.2	244
Total Crawford Resource														
Proven + Probable	1715	0.22	0.013	0.014	0.009	6.44	0.57	1.61	3789	215	777	519	110	9787
Measured + Indicated	2562	0.24	0.013	0.014	0.010	6.67	0.59	1.69	6035	330	1189	783	170.9	15 066
Inferred	1693	0.22	0.013	0.011	0.009	7.08	0.57	1.09	3726	222	594	496	119.9	9674

Canada Nickel continued to advance the Crawford Nickel Project and released the results of its Carbon Storage Pilot Plant as part of its Integrated Feasibility Study, released on October 12. The study announced the potential to store more than 20 million tonnes of annual storage capacity of CO_2 at a price in excess of $25 per tonne (Canada Nickel Company, news release, November 24, 2023).

Additionally, the Bankable Feasibility Study released on November 24, highlights a long life of mine and the production of over 38 000 tons of nickel at a cost of $0.39 per pound nickel (All-In Sustaining Cost (AISC) based on price of $1.54 per pound nickel). The study also announced significant improvements in the recoveries of nickel, bringing recovery rates up to 41% (Canada Nickel Company, news release, November 24, 2023).

Exploration Projects

BASE METAL EXPLORATION PROJECTS

EV Nickel – Shaw Dome Project

The Shaw Dome Project is located approximately 25 km southwest of the city of Timmins and is accessible year-round via road (*see* Figure 4 (no.7) and Figure 9). The project consists of 942 mining claims with over 30 000 hectares in area. EV Nickel has 2 main projects on the property: the W4 Project and the CarLang Project (EV Nickel, https://evnickel.com/project/the-shaw-dome-project/, website accessed January 15, 2024).

EV Nickel announced a $500 000 investment by the Government of Ontario into its Clean Nickel Strategy, which aims to develop the lowest possible carbon cost for nickel production at its Shaw Dome Project (EV Nickel, news release, March 6, 2023). EV Nickel was also the recipient of a $200 000 grant via the Ontario Junior Exploration Program (OJEP).

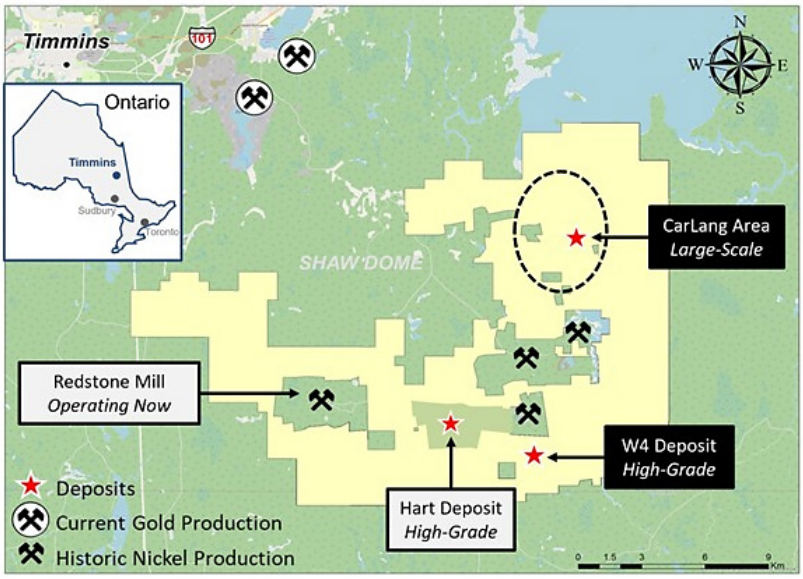

Figure 9. Location of the CarLang and W4 deposits within EV Nickel's Shaw Dome Project (*from* EV Nickel, https://evnickel.com/project/the-shaw-dome-project/#large-scale-track, accessed January 15, 2024).

EV Nickel conducted a diamond-drilling program with objectives to expand the known mineralization at the W4 deposit down plunge (Figure 10; EV Nickel, news release, March 28, 2023) and to provide a composite sample to be used in their Bioleaching test program (EV Nickel, news release, May 15, 2023). Highlights from the 2023 drilling program include

- EVMET23-01: 71.9 m at 0.97% Ni, including 29.9 m at 1.44% Ni and 4.0 m at 4% Ni in-hole
- EVMET23-02: 61.3 m at 0.81% Ni, including 13 m at 1.87% Ni in-hole.

Diamond drilling between 2021 and 2023 was used to produce an updated Mineral Resource Estimate (Table 10) and refined deposit model for the W4 deposit (EV Nickel, news release, June 12, 2023), and a technical report was released on July 26 (Figure 10).

Table 10. Mineral Resource Estimate for the W4 deposit, released in 2023 (Jobin-Bevans, Mortimer and Siriunas 2023a).

Resource Category	Tonnage	Grade						Contained Metal				
		Ni (%)	Cu 4 (%)	Co (%)	Pt (g/t)	Pd (g/t)	NiEq	Ni (Klbs)	Cu (Klbs)	Co (Klbs)	Pt (Koz)	Pd (Koz)
Open Pit (0.3% Ni COG[1])												
Measured	479 487	1.06	0.07	0.02	0.26	0.59	1.1	11 249	778	175	3.98	9.1
Indicated	115 733	0.88	0.06	0.02	0.33	0.75	0.93	2251	158	43	1.21	2.79
Measured +Indicated	595 220	1.03	0.07	0.02	0.27	0.62	1.07	13 500	937	218	5.2	11.89
Inferred	52 429	0.54	0.03	0.01	0.3	0.6	0.58	626	38	15	0.51	1.02
Under Ground (0.5% Ni COG)												
Measured	7831	1.58	0.09	0.02	0.16	0.32	1.6	272	15	3	0.04	0.08
Indicated 849 091	7831	0.93	0.07	0.02	0.57	1.37	1.01	17 487	1347	317	15.68	37.37
Measured + Indicated	856 922	0.94	0.07	0.02	0.57	1.36	1.02	17 759	1362	320	15.72	37.45
Inferred	506 785	1.02	0.08	0.02	0.53	1.26	1.09	11 438	894	187	8.67	20.52
Total Open Pit and Under Ground												
Measured	487 319	1.07	0.07	0.02	0.26	0.59	1.11	11 521	793	178	4.02	9.18
Indicated	964 824	0.93	0.07	0.02	0.54	1.29	1	19 738	1505	361	16.89	40.15
Measured +Indicated	1 452 142	0.98	0.07	0.02	0.45	1.06	1.04	31 260	2298	538	20.92	49.33
Inferred	559 214	0.98	0.08	0.02	0.51	1.2	1.05	12 064	932	202	9.18	21.53

[1] *Cut Off Grade (COG) – minimum grade required for a mineral to be economically mined.*

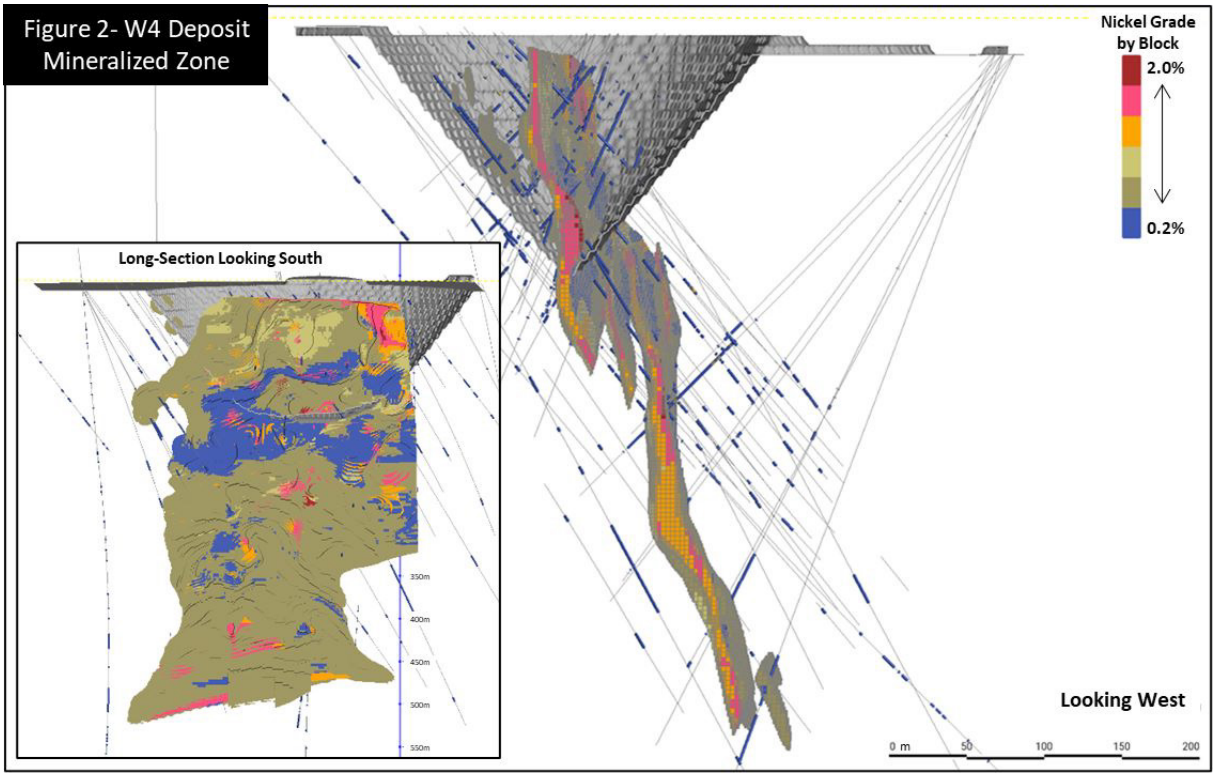

Figure 10. West-facing long section of the W4 deposit with grade estimates (Jobin-Bevans, Mortimer and Siriunas 2023a).

EV Nickel completed an 8295 m (28 holes) diamond-drilling program in 2022 at the CarLang A Zone and released a maiden mineral resource this year (EV Nickel, news release, February 28, 2023) for the deposit (Table 11).

Table 11. Mineral Resource Estimate for the A Zone Deposit on the CarLang Nickel property (Jobin-Bevans, Mortimer and Siriunas 2023b).

Domain	Resource Category	Tonnage (Mt)	Grade				Contained Metal		
			Ni (%)	Co (%)	Fe (%)	S (%)	Ni (t)	Co (t)	Fe (t)
Higher Grade	Indicated	290	0.27	0.0110	5.42	0.06	771 566	31 991	15 724 808
	Inferred	203	0.27	0.0111	5.47	0.06	548 195	22 523	11 110 851
Lower Grade	Indicated	219	0.22	0.0103	5.41	0.06	482 172	22,642	11 860 379
	Inferred	294	0.21	0.0105	5.64	0.07	613 110	30 747	16 563 781
Totals:	Indicated	510	0.25	0.0107	5.41	0.06	1 253 738	54 633	27 585 187
	Inferred	497	0.23	0.0107	5.57	0.07	1 161 305	53 270	27 674 632

Assay highlights from 2022 drilling that were released in 2023 and were used in the 2023 maiden resource include (EV Nickel, news release, February 6, 2023)

- EV22-38: 255.1 m at 0.23% Ni
- EV22-47: 297.5 m at 0.28% Ni
- EV22-48: 234.0 m at 0.27% Ni.

Moneta Gold – Loveland Project

Moneta Gold's Loveland Nickel Project is located approximately 45 km northwest of Timmins (*see* Figure 4, no.11) and contains the Cominco and Hollinger Zone targets. The Hollinger Zone has a historical resource estimate of 401 tonnes at 0.71% Ni and 0.42% Cu from 1974 (Moneta Gold, news release, August 23, 2023). In August, Moneta announced the expansion of the claim project with the addition of 187 single-cell mining claims for 3920 hectares, bringing the Loveland land package to 6244 hectares (Moneta Gold, news release, August 23, 2023) (Figure 11).

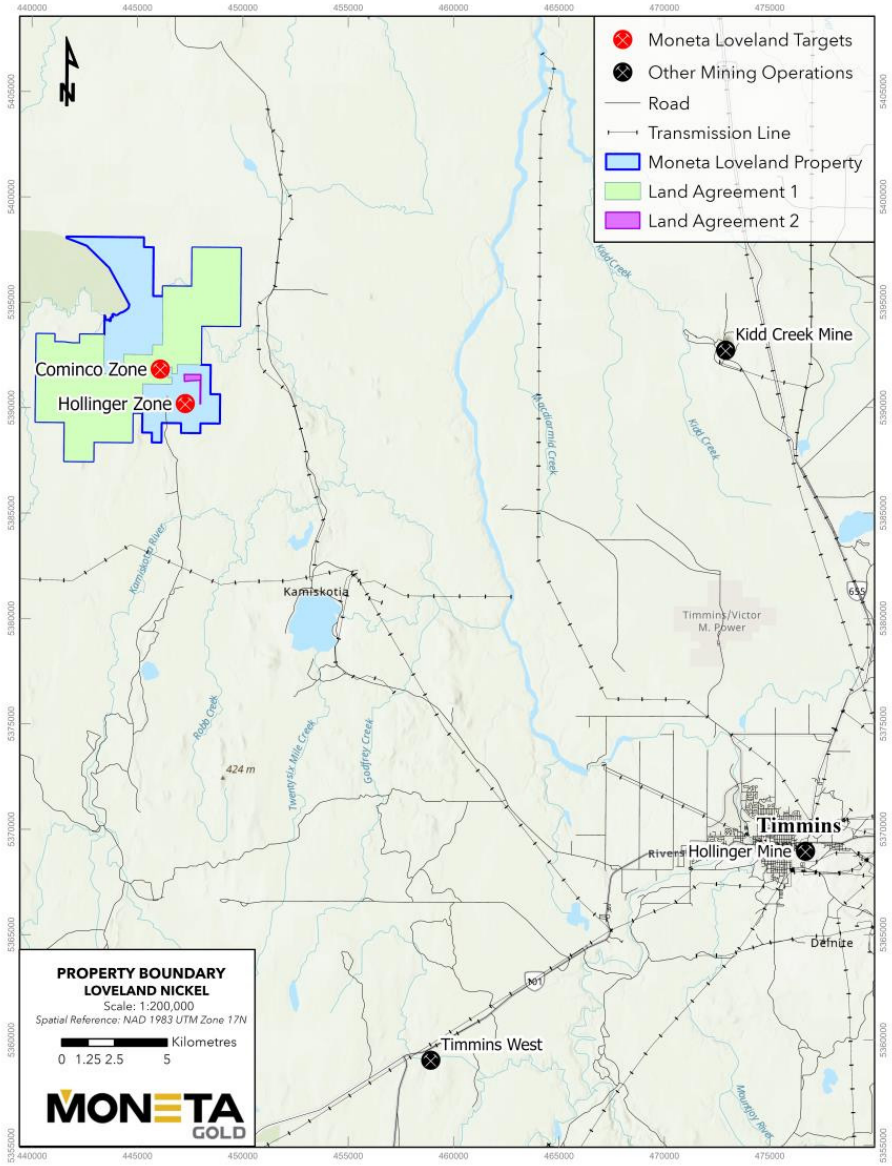

Figure 11. Moneta Gold's expanded land holdings in the Timmins district (Moneta Gold, news release, August 23, 2023).

Moneta announced an at-market merger with Nighthawk Gold Corp. This will create a new entity, STLLR Resources, and includes a 34% and 66% ownership for Nighthawk and Moneta shareholders, respectively. The merger also includes financing to advance STLLR's Tower Gold (located in the Kirkland Lake District) and the Colomac Gold (located in the Northwest Territories) projects (Moneta Gold, news release, November 28, 2023).

Noble Mineral Exploration Inc – Kidd2/Carnegie Project

The Kidd2/Carnegie Project is located 24 km north of Timmins (*see* Figure 4, no.12) and is a joint venture with 11530313 Canada Inc. Noble Metals announced the completion of a line cutting and induced polarization (IP) survey on the Kidd2/Carnegie Project (Noble Mineral Exploration Inc., news release, February 22, 2023).

Noble Mineral Exploration was the recipient of an Ontario Junior Exploration Program (OJEP) grant that offers up to $200 000 towards the exploration for critical minerals in Ontario. Noble plans to use the funding from the grant to support a diamond-drilling program (approximately 3500 m of planned drilling) at their Kidd2/Carnegie Project (Noble Mineral Exploration Inc., news release, July 18, 2023), intended to investigate an IP anomaly. Drilling commenced in November, and results have not been released as of this report (Noble Mineral Exploration Inc., news release, November 20, 2023).

Canada Nickel Company – Texmont Project

The Texmont Project is located approximately 36 km south of Timmins, and Canada Nickel consolidated 9520 hectares of mining claims for the project in 2023 (Canada Nickel Company, news release, June 22, 2023). Canada Nickel Company completed a 39-hole drilling program at Texmont (*see* Figure 4, no.3) that began in 2022 and ended in 2023, for a total of 9670 m, and confirmed the presence of high-grade, near-surface nickel mineralization. These initial drilling results confirm the zonation of the Texmont deposit which has a higher grade core of <1.0% Ni that ranges between 2 to 8 m thick, enveloped in a moderate-grade mineralization shell of 0.6 to 1.0% Ni, and a lower grade shell of 0.25 to 0.6% Ni over widths up to 150 m. These drilling results are to be included in a mineral resource estimate in conjunction with 28 884 m of drilling completed between 2006 and 2008 (Canada Nickel Company, news release, June 1, 2023).

Highlights from the 2022–2023 winter drilling program are

- TEX23-19: 40.0 m at 0.69% Ni including 7 m at 1.03% Ni
- TEX23-26: 52.5 m at 0.5% Ni including 13.45 m at 0.82% Ni and 3.0 m at 1.47% Ni
- TXT23-39: 3.0 m at 2.31% Ni within 15.0 m at 0.83% Ni
- TXT23-36: 96.5 m at 0.36% Ni from 4.5 m including 12 m at 1.06% Ni and 3.0 m at 2.34% Ni.

Xander Resources – Timmins Nickel Projects

The Xander Resources Timmins Nickel Project consists of the Xander North and Xander South properties and comprises a total of 393 claims (*see* Figure 4, no.18; Xander Resources, https://xanderresources.ca/timmins/, accessed January 15, 2024). A maiden 11-hole drilling program, started in 2022, was completed in 2023, with 8 drill holes (NKV22-01 to NKV22-06 and NKV23-01 to NKV23-03) at Xander North and 3 holes (NKV23-04 to NKV23-06) at Xander south (Xander Resources, news release, April 18, 2023).

Highlights from the drilling program include

- NKV23-04: from 187.5 m to 231 m, selectively sampled core includes intervals such as 0.14% Ni over 3 m, 0.21% Ni over 2.7, and 0.19% Ni over 4.5 m
- NKV23-05: from 67 m to 229 m, multiple intervals of 0.18% Ni over 3 m and 0.14% Ni over 30 m.

Mink Ventures Corporation – Montcalm Project

The Montcalm Project is located 65 km northwest of Timmins (*see* Figure 4) and is proximal to the historical Montcalm Mine, which produced 3.93 million tons of ore over its lifespan. The property is approximately 40 km^2 in size and consists of 177 single cell and 19 boundary cell claims. The property can be accessed via Highway ON-101 west from Timmins, then north via Montcalm Mine Road and

subsequent secondary roads (Mink Ventures Corp., https://minkventures.com/projects/montcalm-project/overview/, accessed January 15, 2024).

Mink received a $77 405 Ontario Junior Exploration Program grant in September 2023 to support exploration activities at the Montcalm Project (Mink Ventures Corporation, news release, September 21, 2023). A diamond-drilling program targeting an IP anomaly in the South Target area was completed in October and intersected a zone of disseminated sulphides with no significant metal values. An additional geophysics program was initiated in order to identify new targets (Mink Ventures Corporation, news release, November 27, 2023).

Mink Ventures Corporation – Warren Project

The Warren Project is located approximately 35 km west of Timmins (*see* Figure 4, no.10) and consists of 14 patents and 42 claims for a total discontinuous area of 1010 hectares. The program is currently under option from Mink, who has the ability to earn 100% interest in the property following $300 000 spent on exploration and an additional 750 000 common shares in MINK (Mink Ventures Corp., https://minkventures.com/projects/warren-project/overview/, accessed January 15, 2024).

A summer sampling campaign identified prospective copper, nickel, cobalt and silver mineralization for future drilling targeting. Sampling from trenches in the A Zone returned between 1.075% and 2.08% Cu, 0.313% and 0.348% Ni, 0.0389% and 0.0498% Co, and 10.3 ppm to 23.8 ppm Ag (Mink Ventures Corporation, news release, September 20, 2023).

In 2023, Mink received an $80 000 Ontario Junior Exploration Program grant towards exploration at Warren project for a planned 2024 drilling program at the A zone to test down-plunge of the zone as well as areas below previous evaluations (Mink Ventures Corporation, news release, December 13, 2023).

RARE METAL EXPLORATION PROJECTS

VR Resources – Hecla-Kilmer

VR Resources Ltd.'s Hecla Kilmer property is located approximately 100 km north of Kapuskasing and is accessible via Highway ON-634 from Smooth Rock Falls (*see* Figure 4, no.16), between Kapuskasing and Cochrane. The Hecla-Kilmer property consists of 10 mineral claims with a total area of 6618 hectares (VR Resources, news release, December 13, 2023).

VR Resources conducted a 3-hole drilling program, totaling 1035 m, that targeted different areas of REE mineralization (Figure 12). The drilling campaign successfully intersected broad intersections of carbonate dikes and vein breccias in 2 of the 3 holes. Hole HK23-024 intersected 6 breccia vein zones with over 1% total rare earth oxides (TREO) each (VR Resources, news release, December 13, 2023).

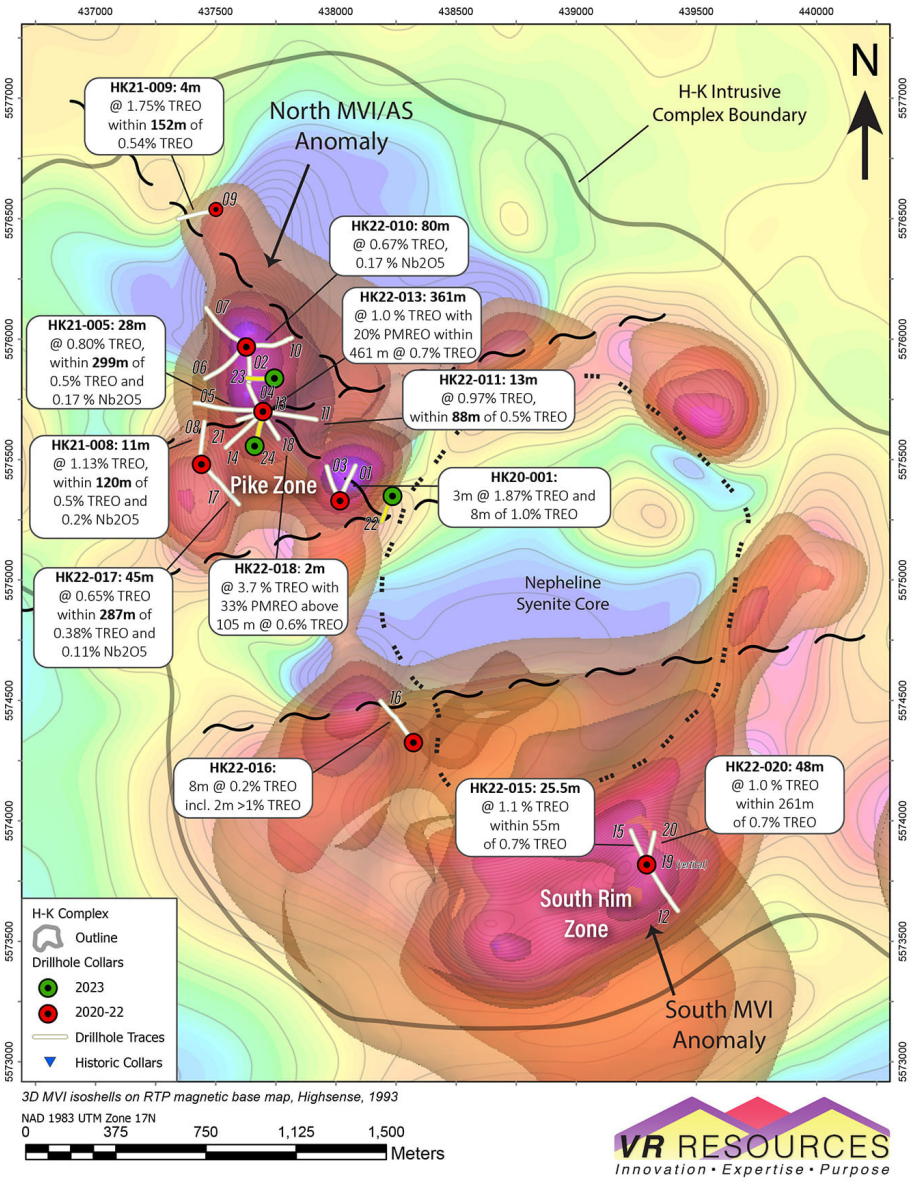

Figure 12. Summary of VR Resources 2020–2023 drilling at Hecla-Kilmer (*from* VR Resources, news release, December 13, 2023).

Additionally, 1 hole was the focus of a metallurgical study, confirming the presence of REE-enriched apatite from the Hole 13 bulk sample. The results of the bulk sample and metallurgical sampling is as follows (VR Resources, news release, December 13, 2023):

- 80% of REE mineralization at Hecla-Kilmer is contained within apatite, with an average concentration of 7.3% TREO, with up to 25% of TREO being permanent magnet REEs (PMREO)
- Over 75% of remaining REE mineralization occurs as small inclusions of monazite and parasite within apatite vein crystals and apatite-fenite wall rock alteration
- Apatite in Hole 13 averages 37% P_2O_5.

GOLD EXPLORATION PROJECTS

E2Gold Inc. – Hawkins Gold Project

E2Gold's Hawkins Project is located approximately 210 km northwest of Timmins and is accessible year-round by road from Hearst via Highway ON-583 (*see* Figure 4, no.5). The project consists of 2136 E2Gold claims and 419 optioned claims (from E2Gold Inc., www.e2gold.ca/project/hawkins-project/, website accessed January 10, 2024). The McKinnon gold deposit, situated in the east-central portion of the property, contains the past-producing Shenango Mine, which produced 66.2 oz Au intermittently between 1937 and 1945. The McKinnon deposit currently has a Resource of 6.20 Mt at 1.65 g/t Au for a total of 328 000 oz (Puritch et al. 2020).

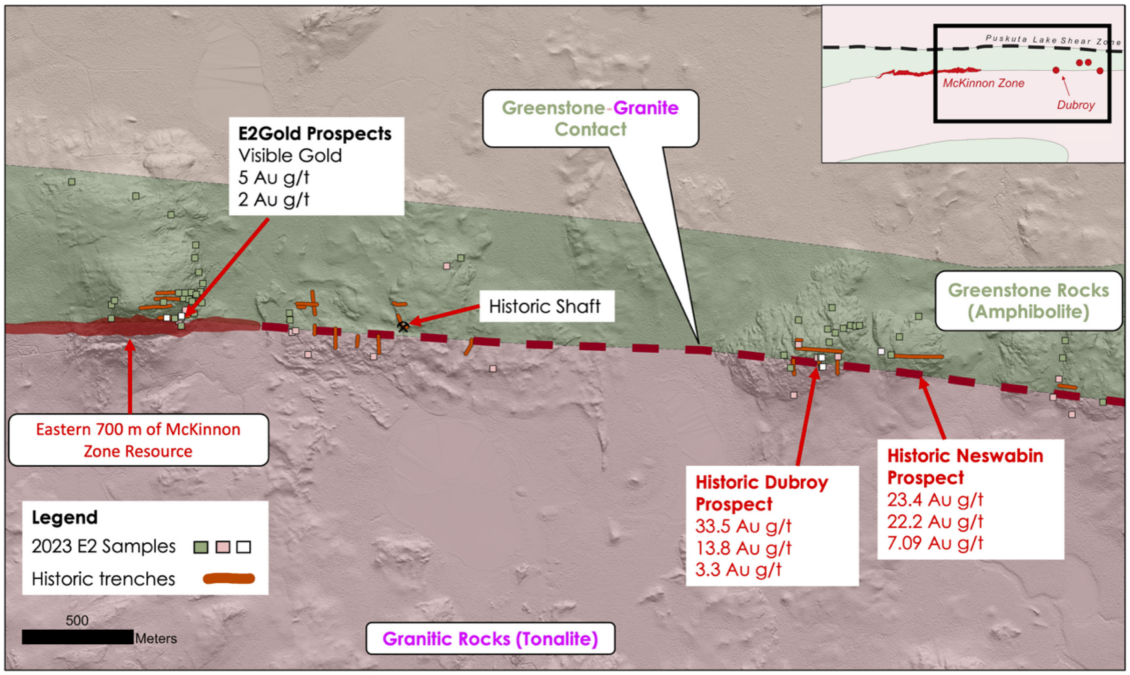

Figure 13. Location of 2023 sampling completed at the E2Gold's Hawkins Project along with historical grab sample results on the property (*from* E2Gold Inc., news release, September 7, 2023).

A 2023 soil sampling survey totaling 20 line-kilometers aimed to identify potential for east-trending mineralization on the eastern part of the Hawkins project (Figure 13). Mineralization was discovered at surface, north of the granite-greenstone contact, with bedrock samples assaying up to 5 g/t Au. The company has plans to conduct a 10 000 m drilling campaign with the aim of expanding the current Resource on the property (E2Gold Inc., news release, October 4, 2023).

EGR Exploration – Detour West Project

The Detour West property is located approximately 300 km northeast of Timmins and 20 km west of Agnico Eagle's Detour Lake Mine (*see* Figure 4, no.6) and is approximately 40 255 hectares in size (EGR Exploration, www.egrexploration.com/project/detour-west-gold/, website accessed January 15, 2024). EGR announced in 2023 that it had acquired an additional 50 claims in the Detour Lake area (Figure 14). EGR Resources was a recipient of a $200 000 Ontario Junior Exploration Program (OJEP) (EGR Exploration, news release, August 15, 2023).

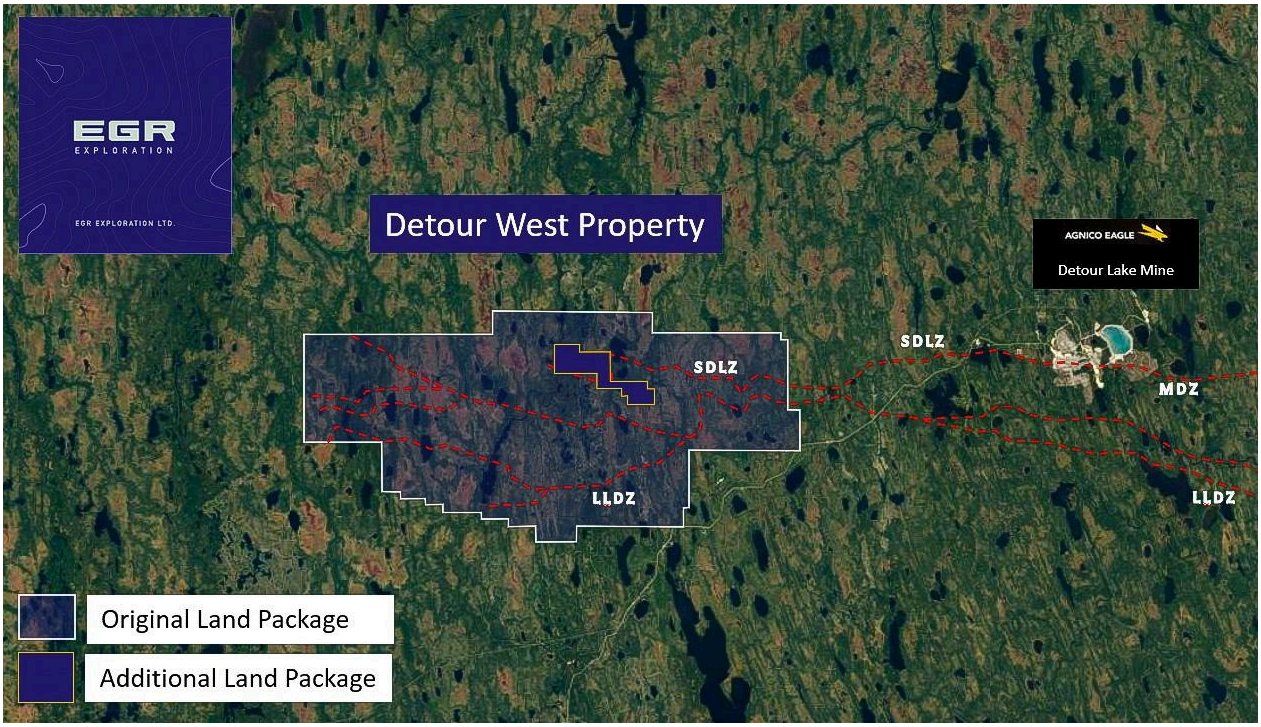

Figure 14. EGT Resources land package expansion during 2023 (*from* EGR Resources, news release, February 27, 2023).

A summer prospector program in 2023 aimed to target potential outcrops identified with LiDAR (light detection and ranging) data, in addition to a high-resolution airborne magnetic survey with 4620 km line coverage at 75 m spacing. The survey was intended to investigate the extensions of the Sunday Lake, Massicotte and Lower Detour Lake deformation zones, and will be the foundation for following till and bedrock sampling (EGR Exploration, news release, August 15, 2023).

Rockridge Resources – Raney Gold Project

Rockridge's 100% owned Raney Gold Project, spanning approximately 2800 hectares, is located approximately 110 km south of Timmins and can be accessed via Highway ON-101 and secondary roads (*see* Figure 4, no.14).

In 2023, Rockridge Resources conducted an 8-hole (2020 m) diamond-drilling program in order to assess the strike, depth and expansion potential of mineralization identified in past drilling campaigns (Rockridge Resources, news release, October 31, 2023).

Highlights from the drilling program include (Rockridge Resources, news releases, October 17 and 31, 2023)

- RN23-28: 4 m at 0.87 g/t Au, from 178 m, including 1 m at 2.71 g/t Au
- RN23-22: 7.5 m at 2.4 g/t Au, from 249 m, including 1 m at 11.7 g/t Au from 251 m
- RN23-21: 4.5 m at 1.5 g/t Au, from 145.5 m, including 2.5 m at 1.2 g/t Au from 160 m
- RN23-28: 7 m at 0.36 g/t Au, from 229 m.

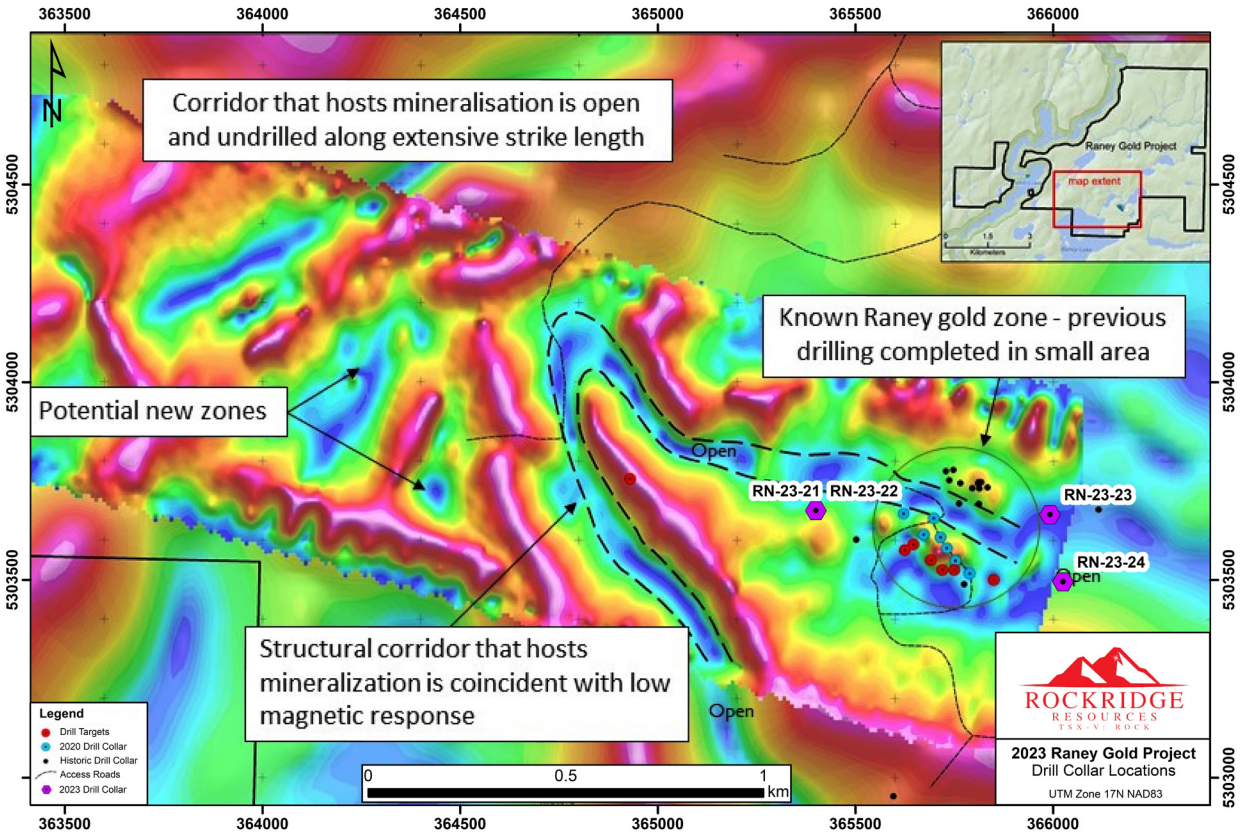

Figure 15. Magnetic survey map with 2023 drilling by Rockridge Resources on their Raney Gold Project (*from* Rockridge Resources, news release, October 17, 2023).

The drilling program discovered a new style of mineralization for the project, primarily associated with brittle structures intersected in holes RN23-21 and RN23-22. This style of mineralization is considered an important new target (Rockridge Resources, news release, October 17, 2023).

A follow-up drilling program, commenced in late 2023, aimed to fill in gaps within areas of known mineralization and support the planning of a larger drilling program to evaluate the strike, depth and expansion potential of currently known mineralized zones (Figure 15). No results have been announced thus far (Rockridge Resources, news release, October 31, 2023).

Platinex Inc. – Heenan-Mallard Property

The Heenan-Mallard property, part of the South Timmins Mining Joint Venture with Fancamp Exploration, is located in Heenan, Benton and Mallard townships in the Timmins District (*see* Figure 4, no.13). The property, approximately 110 km southwest of Timmins, can be accessed via industrial roads off of Highway ON-144.

Platinex completed a summer exploration program on the Heenan property that consisted of a prospecting and geochemical sampling program at the Camp and River zones, with the primary objective to investigate the possible extension of the 2 zones (Platinex Inc., news release, October 18, 2023).

The prospecting and bedrock sampling program produced 32 grab samples and discovered a historical trench that had previously been filled in (Figure 16). The trench contained pyrite-bearing quartz carbonate veinlets hosted by felsic to intermediate metavolcanic rocks. Two out of 8 samples returned anomalous Au values (>500 ppb) up to a 0.938 g/t Au. The highest grade grab sample from the program contained 1.52 g/t Au. Additionally, 446 B-horizon soil samples were collected to investigate along-strike of historical zones. An area southwest of the Camp Zone returned a cluster of samples ranging from 54 to 1210 ppb Au (Platinex Inc., news release, October 18, 2023).

Following the successful soil sampling campaign, Platinex conducted a mechanized stripping and channel sampling program at the Heenan-Mallard property, with a total of 618 m^2 cleared at 2 locations. Results from the 41 channel samples collected from the 2 trenches produced values up to 7.50 g/t Au, with 13 samples returning values of greater than 0.5 g/t Au (Figure 17). Mineralization within the trenches is hosted in narrow felsic to intermediate dikes within iron formation and metavolcanic rocks (Platinex Inc., news release, November 9, 2023).

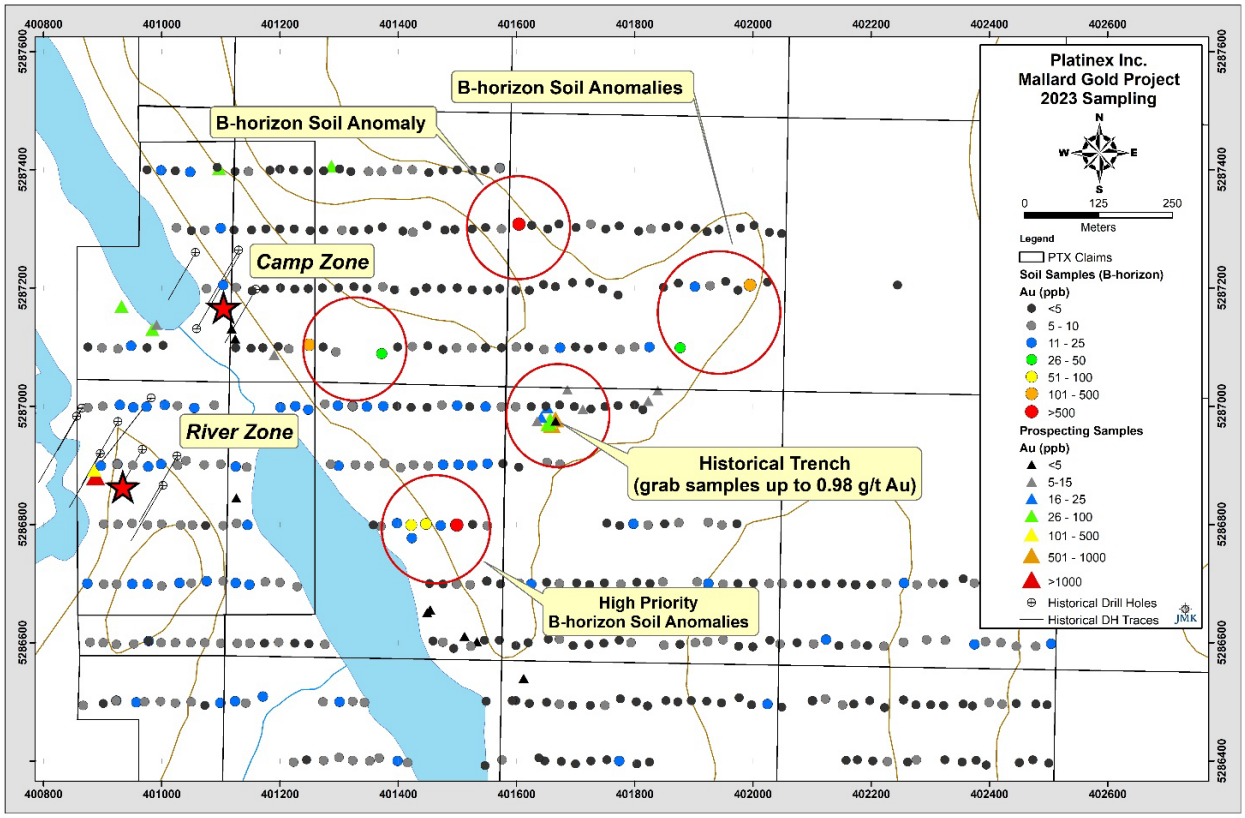

Figure 16. Location and results of 2023 B-horizon soil sampling conducted by Platinex Inc. on their Heenan-Mallard gold property (*from* Platinex Inc., news release, October 18, 2023).

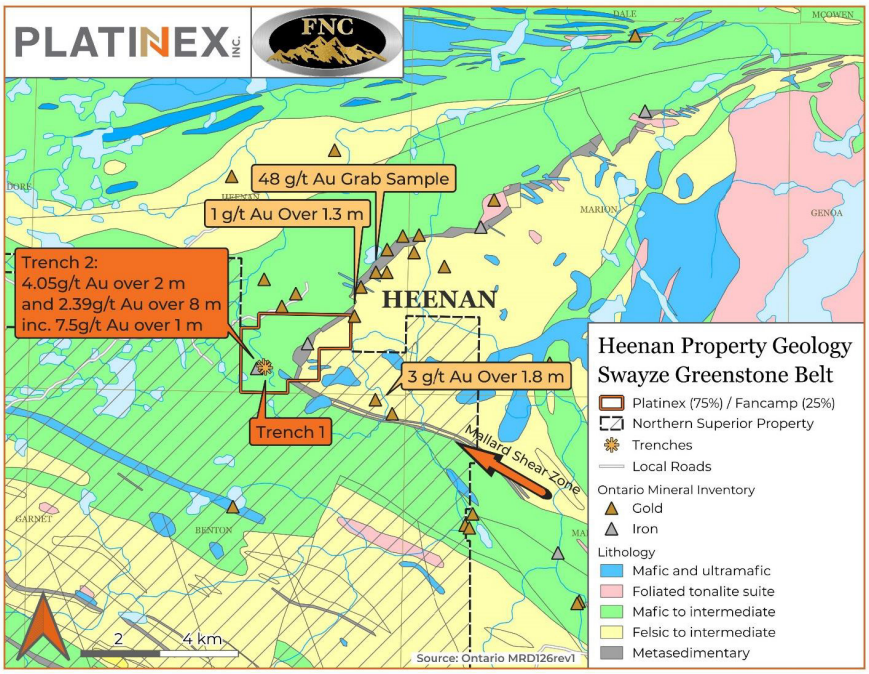

Figure 17. Location of 2023 sampling results on the Hennan portion of the Heenan-Mallard property owned by Platinex Inc. (*from* Platinex Inc., news release, November 9, 2023).

A follow-up drilling program consisting of 5 drill holes (950 m total) was commenced in late November with the intent to target the mineralization in Trench 1 and Trench 2 and to follow up on IP anomalies that coincide with the Mallard shear zone (Platinex Inc., news release, November 27, 2023). Results from this program have not been released as of the writing of this report.

Torr Metals – Fillion Gold Project

The Fillion Gold Project is located approximately 30 km northwest of Kapuskasing and is accessible via Hwy ON-11 and adjacent logging roads (*see* Figure 4, no.15). The property is 100% owned by Torr Metals and has a large land package (approximately 261 km^2) (Torr Metals, www.torrmetals.com/projects/filion-gold-project/, website accessed January 15, 2024). Torr Metals acquired the Fillion Gold Project in 2023 and subsequently conducted a systematic soil and bedrock sampling program (Torr Metals, news release, October 26, 2023). Initial field work identified abundant quartz-carbonate veining within metasedimentary host rocks proximal to quartz-feldspar porphyry contacts. A total of 318 humus samples and 83 bedrock samples were collected from the Miller East and Taran occurrences on the property (Torr Metals, news release, October 26, 2023).

Highlights from the soil sampling program include (Torr Metals, news release, January 15, 2023)

- Identification of multiple gold-in-soil anomalies across a structural corridor 2.5 km wide
- Anomalous gold values along-trend of this Oscar occurrence, defining an extension to the previously identified system that is 2.5 km long
- Of the 318 soil samples collected, 39 returned results with greater than 10 ppb Au and 13 of those return values of greater than 20 ppb Au, with values up to 1320 ppb Au.

Torr Metals announces they are in the process of applying for a permit to conduct a drilling program to test the targets that were produced from the 2023 field work (Torr Metals, news release, January 15, 2023).

POLYMETALLIC EXPLORATION PROJECTS

Aston Minerals – Edleston Project

Aston Minerals completed significant work at its Edleston Project, located approximately 60 km south of Timmins, proximal to the border with the Kirkland Lake District and is accessible via Hwy ON-144 (*see* Figure 4, no.2).

Aston announced a JORC 2012 Edition Guidelines-compliant maiden mineral Resource of 48.1 Mt at 1.00 g/t Au for a total of 1.5 million ounces Au (Indicated and Inferred). The Resource focuses on the Edleston Main Zone and the Sirola prospects. A total of 226 drill holes (76 743 m of drilling) were used in the preparation of the Resource and the company is working on optimization of the open pit models (Aston Minerals, news release, January 19, 2023). Metallurgical testing for the Edleston Main Zone resulted in recoveries between 89.1 and 93.3% at head grades between 0.92 g/t and 1.21 g/t Au (Aston Minerals, news release, January 23, 2024). A 14-hole, 4800 m drilling program, intended to target geophysical anomalies along-strike of Edleston Main and Sirola zones, commenced during the second quarter of 2023; however, no significant gold assays were returned (Aston Minerals, news release, July 31, 2023).

A JORC 2012 Edition Guidelines-compliant maiden mineral Resource estimate of 1044 Mt at 0.27% Ni and 0.011% Co (Indicated and Inferred) was also released for the Boomerang nickel-cobalt system, also located on the Edleston land package. The Resource is based on 28 001 m of drilling and comes to within 10 to 25 m of surface with a maximum depth modelled to 847 m (Figure 18). Initial metallurgical testing returned recovery rates up to 71.8% Ni (Aston Minerals, news release, February 21, 2023).

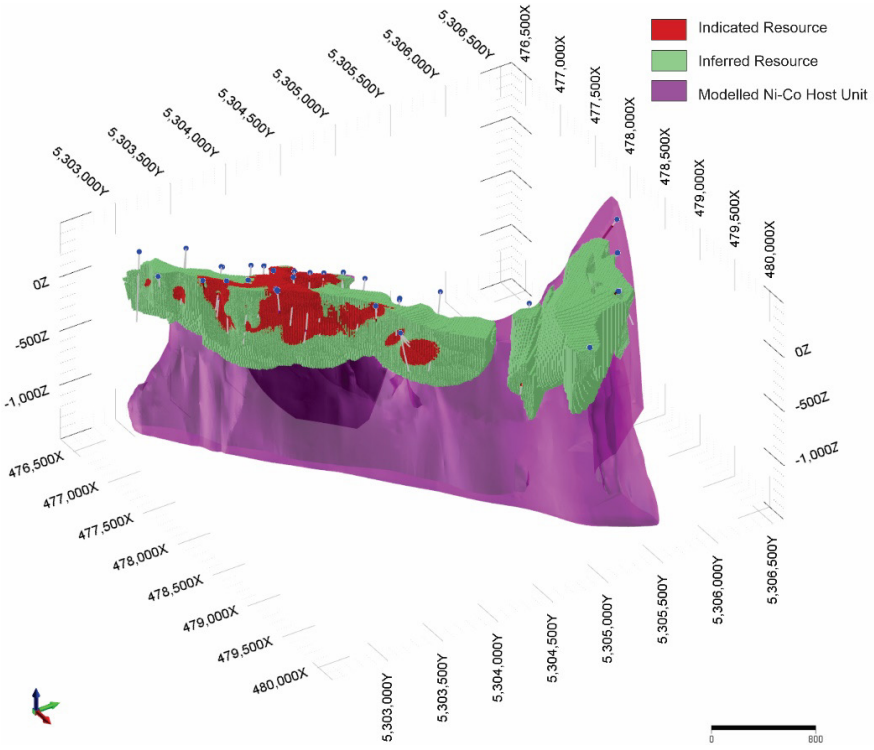

Figure 18. JORC 2012 compliant Mineral Resource Model for the Boomerang nickel-cobalt deposit (*from* Aston Minerals, news release, February 21, 2023).

Exploration drilling was also completed at the B2 and Bardwell targets. The 5-hole drilling program at B2 focused on upper and lower extensional drilling of high-grade intersections found in previous drilling, and extended the strike continuity of the deposit by 500 m. Assays for the last 2 holes of the program are still pending as of the writing of this report (Aston Minerals, news release, January 31, 2024).

Highlights from the B2 drill campaign are

- DDED23-129: 225 m at 0.28% Ni and 0.011% Co from 134 m
- DDED23-130: 164.81 m at 0.25% Ni and 0.011% Co from 158.5 m
- DDED23-131: 158.5 m at 0.30% Ni and 0.012 at Co from 157.5 m, including 7.5 m at 0.40% Ni and 0.014% Co from 231 m and 0.41% Ni and 0.016% Co from 258 m.

At Bardwell, a 10-hole drilling program (totaling 2550 m), which aimed to increase confidence and continuity of mineralization along a 1 km strike length of near surface sulphide mineralization, commenced on September 20, 2023 (Aston Minerals, news release, October 31, 2023). All 10 holes in the program intersected disseminated to interstitial sulphides within peridotite (Aston Minerals, news release, January 31, 2024); however, assays for the program have not been released as of the writing of this report.

Melkior Resources – Genex Project

Melkior Resources Inc's Genex Project is located 20 km west of Timmins and is accessible via an all-weather road (*see* Figure 4, no.8). The project area consists of 70 claims, 6 patents and 1 partial lease for a total of 1616 hectares. The Genex property has a historical resource of 1 Mt Cu at a 1% cut off grade, and was in production between 1966 and 1967, having produced 2040 tons of Cu concentrate at a grade of 21.45 to 27.25% (Melkior Resources, https://www.melkior.com/gexex-project/, accessed January 10, 2024) and is currently under option from International Explorers & Prospectors, Inc. (Melkior Resources, news release, April 21, 2022).

An aggressive prospecting, trenching and channel sampling program, which intended to investigate the surface footprint of the Genex deposit, yielded positive results. The first phase of the program included bedrock and float sampling on historical trenches located outside the mine perimeter in the historical "claim post" trend, where past drilling and trenching reported copper-gold-zinc mineralization. A total of 103 samples (chip and grab) were collected and highlights include (Melkior Resources, news release, October 4, 2023) the following:

Chip samples from outcrop and trench walls:

- 10 samples with >1% Cu and 4 samples >2% Cu
- 9 samples with >1% Zn and 3 samples with >2% Zn.

Grab samples from float:

- 5 rock samples with >1% Cu and 2 samples above 5% Cu
- 10 samples with >1% Zn and 2 samples with >10% Zn
- 5 samples with 1 g/t Au, including 1 sample with 43.9 g/t Au.

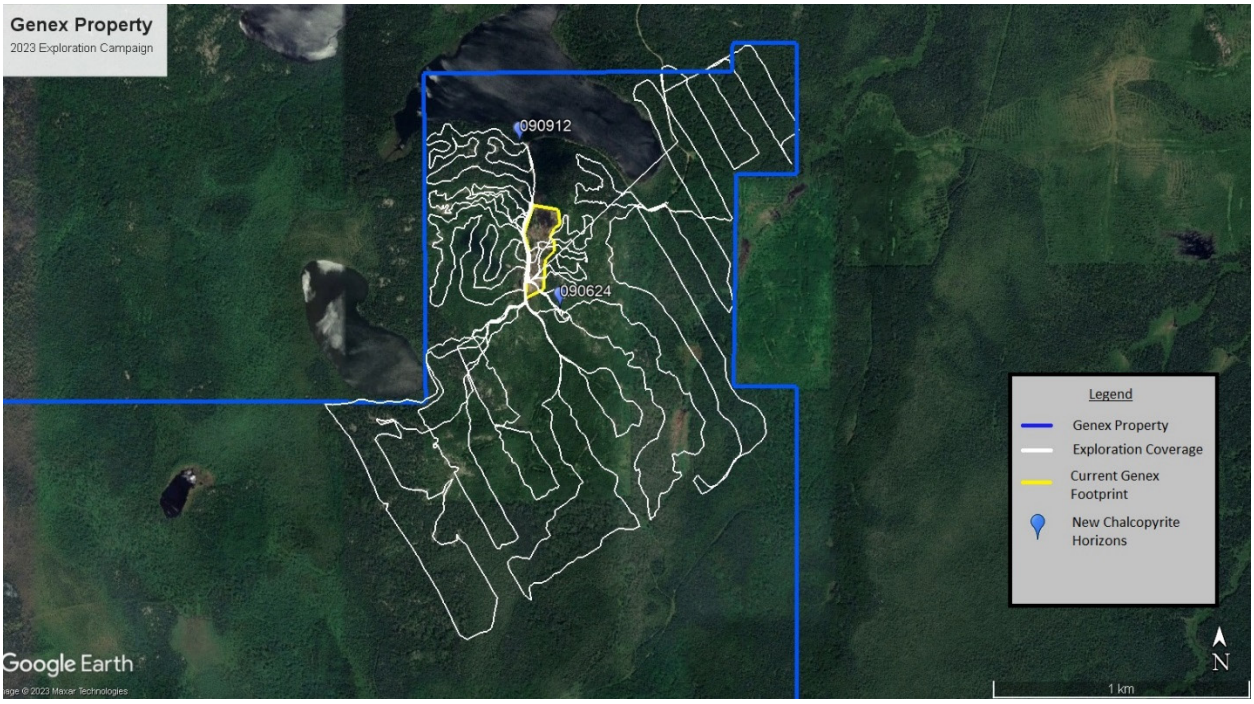

Figure 19. Summary of exploration coverage for the 2023 prospecting and Beep Mat survey performed by Melkior on their Genex Project (*from* Melkior Resources, news release, November 7, 2023).

Following the first phase of prospecting, Melkior conducted a large 59-line km Beep Mat survey (Figure 19) (roughly 2.6 km^2) which successfully outlined 2 new conductive horizons, with the potential to expand the footprint of the Genex deposit a further 125 m to the south and 300 m to the north. Preliminary outcrop mapping validated the IP anomalies defined with the Beep Mat and added additional exploration targets on the northeast part of the property.

The southern anomaly has been named "Resonant" and mineralization was observed to consist of dense chalcopyrite stringers ranging in width up to 15 cm, hosted in chloritized siliceous metavolcanic rocks. Preliminary sampling from this zone returned values of 6.55% Cu, 0.1% Co, 1.55 g/t Au and 11.7 g/t Ag. Further work conducted at the Resonant showing include trenching and channel sampling, with assay results pending (Melkior Resources, news release, November 7, 2023).

The second anomaly, approximately 300 m north of the Genex deposit, returned values of 1.05% Cu, 0.81 g/t Au, 18 g/t Ag (Melkior Resources, news release, November 7, 2023). Sampling highlights from the Beep Mat and sampling program are

- 10 grab samples >0.1% Cu with 5 samples over 1% Cu
- 5 grab samples with >0.2 g/t Au, with 2 samples >1 g/t Au.

Canada Nickel Company – Mann Project

The Noble Mann property, currently under option to Canada Nickel Company, is located 20 km south of Cochrane and 45 km northeast of Timmins (*see* Figure 4, no.4). An 8-hole diamond-drilling program was conducted in the Northwest Zone of the property, all of which intersected mineralized sections of serpentinized peridotite and minor dunite (Canada Nickel Company, news release, August 22, 2023).

Highlights from the program include the following:

- MAN23-041 intersected 23.5 m of pyroxenite with a grade of 0.44 g/t Pt+Pd with varying quantities of heazelwoodite and pentlandite
- MAN23-02 intersected 348.5 m of 0.23% Ni in peridotite including 28.9 m at 0.52 g/t Pt+Pd in pyroxenite
- MAN23-03 intersected mineralized pyroxenite and dunite, with an average grade of 0.23% Ni over 291.5 m
- MAN23-04 intersected 301.5 m of peridotite with 0.18% Ni and 16 m of 0.41 g/t Pt+Pd
- MAN23-05 intersected 366.5 m of 0.2% Ni including 11.0 m at 0.44 g/t Pt + Pd.

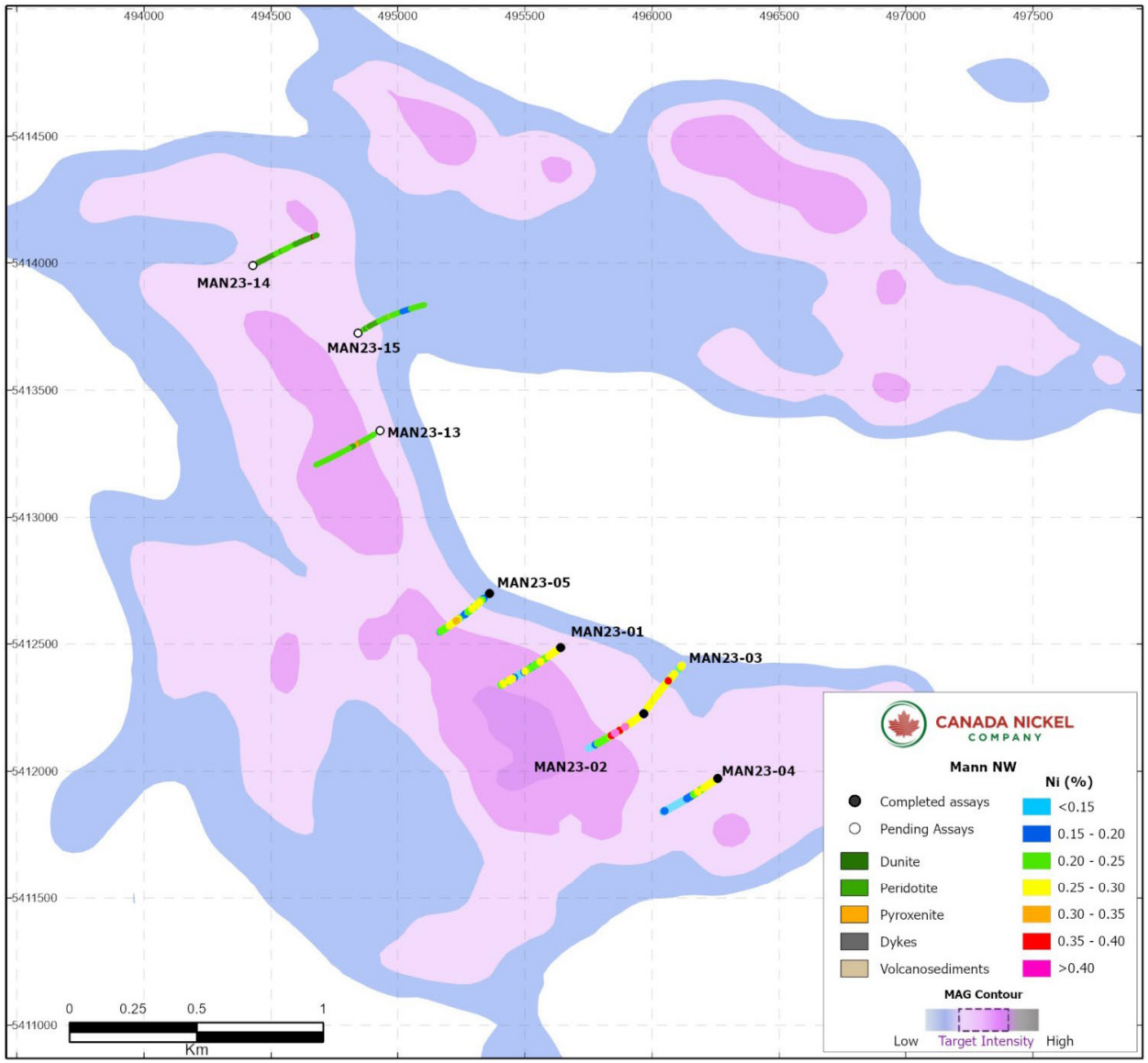

Figure 20. Plan view of Mann Northwest magnetic anomaly showing 2023 drilling locations and results (Canada Nickel Company, news release, August 22, 2023).

MAN23-01 to MAN23-05 delineate mineralization along 1150 m of strike length and all intersected mineralized sections of serptentinized peridotite and minor dunite (Figure 20). The geophysical footprint of the target area is approximately 6.0 km^2 and represents a significant discovery at the Mann property (Canada Nickel Company, news release, August 22, 2023).

DIAMOND EXPLORATION PROJECTS

VR Resources – Northway Project

The Northway property is located north of VR Resources Ltd.'s Hecla-Kilmer property (*see* Figure 4, no.17) and consists of 1567 claims over 16 properties for a total of 32 238 hectares of land (VR Resources, https://vrr.ca/projects/northway, website accessed January 15, 2024). Exploration on the Northway property began in late 2022 with a high resolution magnetic survey over the core of the property. Results from this program were used in the planning of a 2022–2023 drilling program which started in November of 2022 and was completed in 2023. Two of the 3 holes were drilled in 2023, and hole NW23-002, intended as a follow-up to Hole NW22-001, intersected kimberlite at the same depth as NW22-001. Hole NW23-003 was drilled from the same collar as NW23-002 and intersected the centre of the magnetic anomaly and ended in xenolith-rich kimberlite breccia (VR Resources, news release, June 21, 2023). All 3 holes in the 2022–2023 program intersected kimberlite breccia phases below the Paleozoic limestone and sandstone bedrock cover (VR Resources, news release, February 22, 2023; Figure 21).

Detailed mineralogical analysis from hole NW23-003 confirms the presence of titanium-potassium richterite, a mantle-sourced amphibole, as well as the presence of diopside containing up to 0.15 wt% Cr. Phlogopite xenocrysts and mineral grains within xenoliths plot within the kimberlite fields on Ti-Al plots and in kimberlite-orangeite fields on Al-Fe plots. Holes NW23-001 and NW23-003 (Figure 22) both returned microdiamonds; however, Hole NW23-002 did not (VR Resources, news release, September 28, 2023).

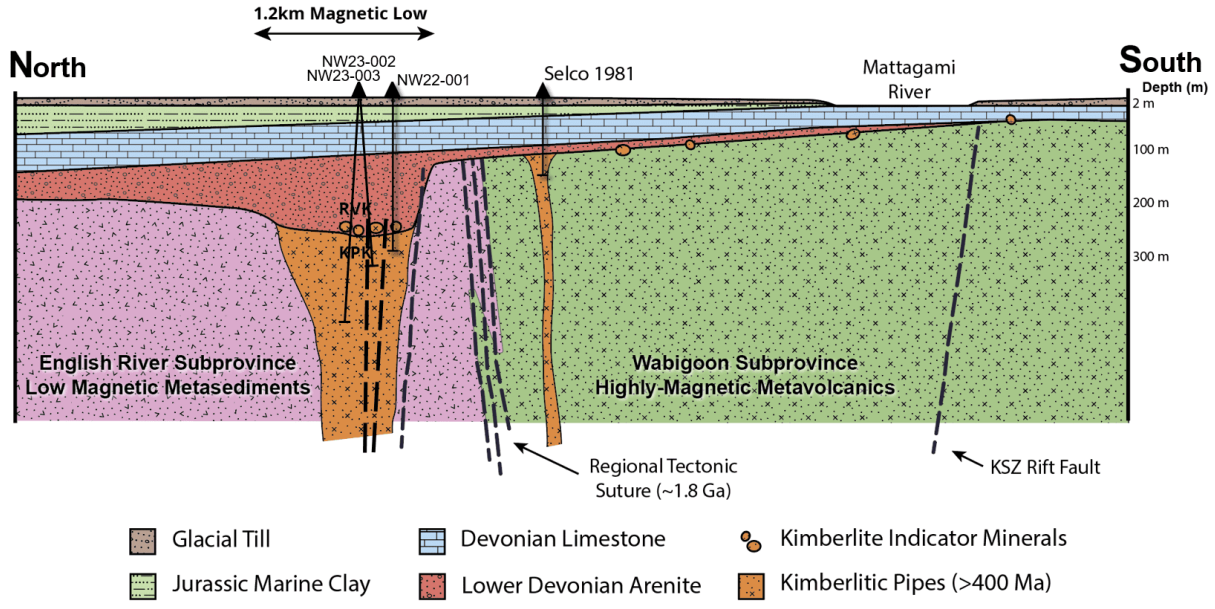

Figure 21. Cross section of geology at VR Resources Northway Project showing 2022–2023 drilling (VR Resources, https://vrr.ca/projects/northway, website accessed January 15, 2024).

Figure 22. Photo of kimberlite intersected in hole NW23-003 during VR Resources 2023 drilling program (VR Resources, https://vrr.ca/projects/northway, website accessed January 15, 2024).

LITHIUM EXPLORATION PROJECTS

Brunswick Exploration – Hearst Project

Brunswick Exploration's Hearst Project consists of 1418 cell claims and 226 claim blocks for a total surface area of 29 805 hectares. It is located approximately 15 km south of Hearst and can be accessed by forestry roads via Highway ON-583 (*see* Figure 4, no.1).

A surface stripping and 5-hole (565 m total) drilling program in 2023 intended to assess the depth and strike extent of the Decoy pegmatite. Two holes were drilled beneath the surface expression of the spodumene zone of the pegmatite, followed by 25 m, 50 m and 100 m step-outs to the east and along strike of the pegmatite. Drilling results indicate that the Decoy pegmatite strike length is not significantly larger than the surface expression of the pegmatite (65 m in length) and tapers at depth. Hole 23-Decoy-02 intersected 13.4 m of pegmatite, but did not yield any significant lithium results (Brunswick Exploration, news release, August 28, 2023).

Additional work on the property focused on the Firefly and Mantis pegmatites and consisted of a surface stripping program and portable XRF (pXRF) analyses. No spodumene mineralization was noted at either pegmatite. Additional work in the area includes the improvement of road access to allow for more efficient prospecting as well as the evaluation of historically mapped pegmatites and the mapping of new targets identified with LiDAR (Brunswick Exploration, news release, August 28, 2023).

DISTRICT STAFF AND ACTIVITIES

In 2023 the Timmins Resident Geologist Office was staffed by Z. Azadbakht, *P.Geo.* (January to October), Acting Regional Resident Geologist; V. D'Angelo, *P.Geo.* (November to December), Acting Regional Resident Geologist; M. Krukowski, *P.Geo.* (February to December), District Geologist; J. Tessier (April to November), District Geological Assistant; S. Hinz, *P.Geo.*, Mineral Inventory Geoscientist; C. Daniels, *P.Geo*., Land Use Planning and Policy Coordinator; and P. Bousquet, *P.Geo.*, Regional Land Use Geologist.

In 2023, the District and Regional Resident Geologist of the Timmins Resident Geologist Program (RGP) office delivered over 840 services to clients, predominantly through electronic correspondence such as the telephone, email and video conferencing. A total of 70 services were completed through face-to-face interactions by scheduled appointments at the Timmins office located at 5520 Highway ON-101 East, South Porcupine. The historical drill core kept at the 2 drill core libraries in the Timmins District was accessed 11 times throughout the year at the request of clients. These viewings were supervised and facilitated by RGP staff. A summary of the Timmins RGP Client Requests from 2023 can be seen in Table 12 provided below.

Table 12. Timmins RGP office client requests, 2023.

Date	Client Requests Completed	In-person Office Visits	Drill Core Library Visits
Jan	55	4	0
Feb	56	2	0
Mar	60	4	0
Apr	100	2	1
May	105	6	0
Jun	112	7	5
Jul	53	9	0
Aug	97	10	4
Sep	76	8	0
Oct	46	8	0
Nov	49	6	0
Dec	31	4	1
Total	**840**	**70**	**11**

The Timmins Resident Geologist's office maintained its role in producing monthly reports on mining and exploration activities, specifically for inclusion in the Ontario Geological Survey's OGSEarth *Activity Reports Mineral Exploration* application. The office further extended professional consultancy to governmental entities, exploration corporations and independent prospectors concerning geological survey endeavors in the district. Additionally, it reaffirmed its commitment to public education through the provision of rock identification services, which are made available both through direct personal engagement and online platforms.

In 2023, the Timmins Resident Geologist office organized a diverse array of educational activities, including field trips, seminars and rock identification sessions, specifically designed for its clientele. The District and the Regional Resident geologists in Timmins facilitated several geological tours, informative presentations and community outreach events across the region, sharing their expertise and insights. Collaborative efforts with the Porcupine Prospectors Association resulted in a very well-received 2-day prospecting short course and a well-attended geological field trip tour around the Timmins and Porcupine mining camp.

Z. Azadbakht and M. Krukowski presented a series of talks throughout 2023. Z. Azadbakht discussed rare earth elements, pegmatites and the mining history of Timmins at various events, including the Prospectors & Developers Association of Canada (PDAC), Porcupine Prospectors and Developers Association (PPDA) and the Canadian Mining Expo. M. Krukowski presented on magmatic deposits and mining activities updates for the Timmins and Sault Ste. Marie districts, presenting at the Northeastern Ontario Mines and Minerals Symposium, and the OGS Virtual Showcase. These presentation are summarized in Table 13 below:

Table 13. Timmins RGP presentations in 2023.

Date	Topic	Venue	Presenter
March 7	Rare Metals and Rare Earth Elements in LCT Pegmatites and Carbonatites - Highlighting Investment Opportunities in Ontario	Prospectors & Developers Association of Canada (PDAC)	Z. Azadbakht
April 28	Let's Talk About Pegmatites	Porcupine Prospectors and Developers Association (PPDA)	Z. Azadbakht
May 25	Exploring the Origins of Magmatic Nickel Deposits	Porcupine Prospectors and Developers Association (PPDA)	M. Krukowski
June 7	Highlights of Northeastern Ontario's Critical Minerals Advancing Projects	Canadian Mining Expo	Z. Azadbakht
September 10	Introductory Prospecting Course by the Porcupine Prospectors and Developers Association (PPDA)	Timmins White Pine Board Room	M. Krukowski
September 14	Mining History of Timmins; Why are we here?	Timmins Public Library	Z. Azadbakht
September 20	Current State of Activities in Timmins; Insights from Exploration and Mining Industries	Timmins Public Library	Z. Azadbakht
October 2	Future of Mining in Timmins	Timmins Public Library	Z. Azadbakht
October 4	Exploration and Mining Activity Update for the Timmins and Sault Ste. Marie Districts	Northeastern Ontario Mines and Minerals Symposium (NEOMMS)	M. Krukowski
November 29	Exploration, Mining and Resident Geologist Program Activity Update for the Timmins and Sault Ste Marie Districts	OGS Virtual Showcase 2023	M. Krukowski

The Timmins RGP staff actively participated in multiple educational efforts by conducting 3 school outreach sessions and 10 public presentations to spread knowledge of geology. Additionally, it organized the Mineral Development Advisors (MDA) session, an important occasion for education and networking of First Nation representatives. Resident Geologist Program staff also participated in the Mine Opportunity Challenge at Timmins Northern College by setting up a booth for over 150 high school students to interact with.

The cataloging of the onsite (drill core library) mineral collection, started in 2022, was completed. Clean-up efforts took place in the drill core libraries at both the main and secondary locations, involving the removal of several dumpsters filled with old core boxes and debris. Administrative duties included overseeing the logistics of shipping and receiving 20 boxes of physical assessment reports and donated files for the scanning initiative. These tasks ensured proper documentation and preservation of the files, which will be accessible online in the future and will be compliant with the Accessibility for Ontarians with Disabilities Act (AODA).

In May the Timmins RGP team participated in an extensive multi-day training and orientation program held at the Thunder Bay office. This comprehensive session included safety training and geological tours of the surrounding area, enhancing the teams safety, skills and knowledge. In September, the first time since the onset of the pandemic, the entire division convened for an in-person meeting in Sudbury, where all members of the Mines and Minerals Division of the Ministry of Mines engaged in a full day of learning, knowledge exchange and team-building activities. In addition to this meeting the Ontario

Geological Survey conducted an in-person branch meeting the following day, optimising travel expenses and the opportunity to meet in person.

Drill Core Storage Site

Timmins RGP staff maintained the Drill Core Storage facilities throughout the field season. One dumpster load of material (trash, rotten core boxes, broken equipment) was removed from each onsite and offsite core facilities as a summer work project. The Remote Drill Core Storage Site and the Onsite Drill Core Storage Site in Timmins was used by clients 11 times in 2023. No core was reboxed in 2023.

PROPERTY EXAMINATIONS

In 2023 the Timmins Regional Resident Geologist, District Geologist and District Geological Assistant went on 11 property site visits at the requests of clients.

Table 14 lists the property visits conducted by staff in 2023 in the Timmins District. Locations of these property visits are shown in Figure 23.

Table 14. Property visits conducted by the Timmins District Geologist and staff in 2023 (keyed to Figure 23).

Number	Property, Occurrence or Area	Client	Commodity	OMI Number	Township / Area
1	Vienneau Claim Block	Paul Vienneau	Ni		Paudash
2	Tzur Patients	Judy Tzur	Au, Ni	MDI42A10NW00009	Dundonald
3	Clay Howells Carbonatite	Trent Potts	REE		Hopkins
4	Giordani Patients	Gail Giordani	Au		Shaw
5	Texmont Historic Mine	Canada Nickel	Ni	MDI42A03NE00002	Bartlett
6	Texmont Historic Mine	Canada Nickel	Ni	MDI42A03NE00002	Bartlett
7	Polk Claim Block	Brian Polk	Cu		Murphy
8	Shenango Alkalic Suite	OGS	REE		Shenango
9	Pustina Claim Block	Joe Pustina	Au		Pharand
10	De Santis Historic Mine	Canadian Gold Miner	Au	MDI42A06NW00025	Ogden
11	Kam Kotia Historic Mine	Ed Van Hees	Ni	MDI42A12SE00005	Robb

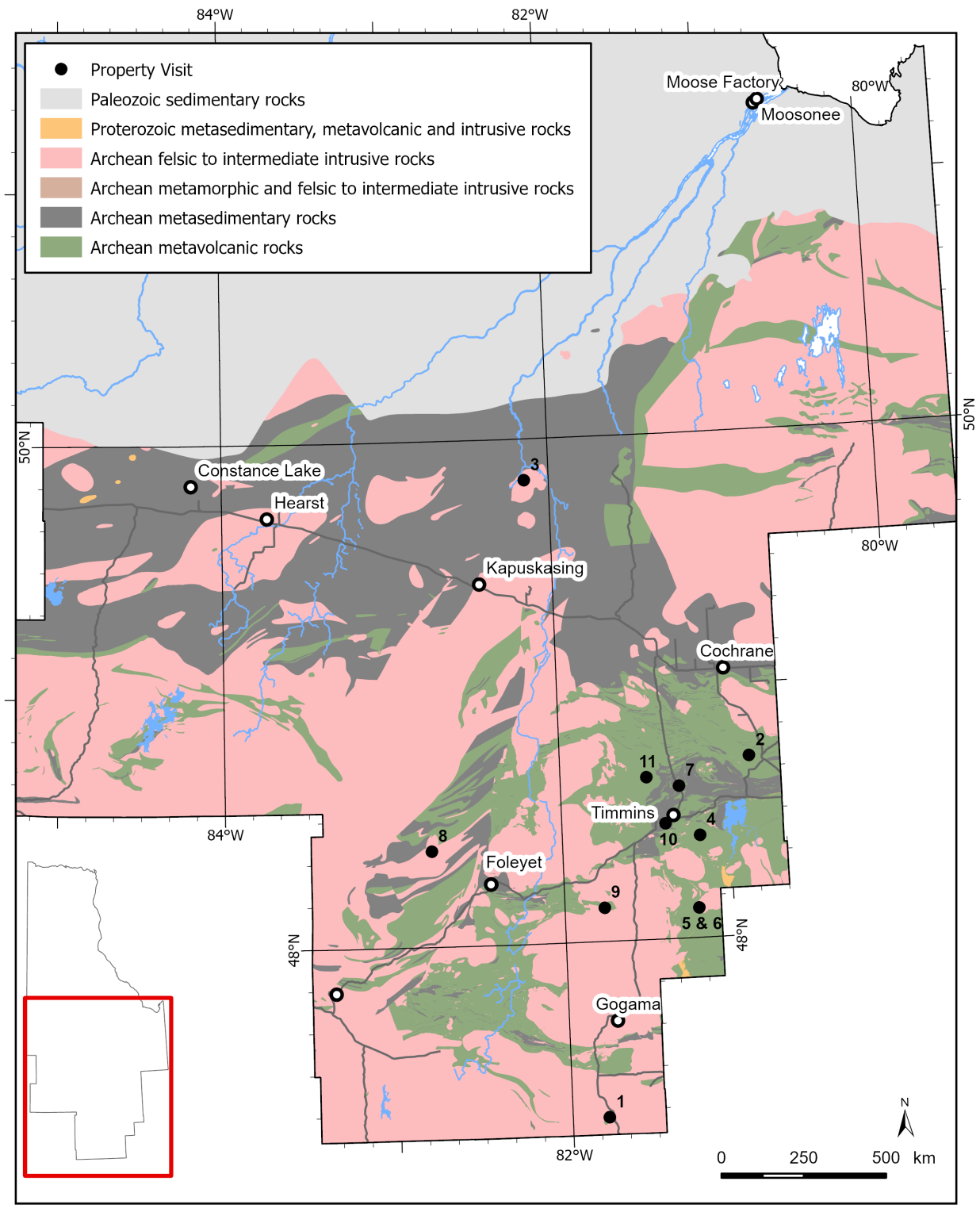

Figure 23. Property visits conducted by the Timmins District Geologist office in 2023. Numbers keyed to Table 14.

RECOMMENDATIONS FOR EXPLORATION

Note: This Recommendation for Exploration is *from* Krukowski (2024).

Enhancing Exploration Efficiency: Unmanned Aerial Vehicle Magnetic Surveying in the Timmins District

The Timmins Resident Geologist Program (RGP) District is currently experiencing a surge in the acquisition of mining claims. To stay active, these claims require financial expenditures in the form of exploration programs which promote project development, mineral discovery and contribute to public-domain geoscience knowledge. Technological advances have enabled substantial improvements to this mandatory expenditure and revolutionized the way geological data is collected. One significant innovation is using unmanned aerial vehicles (UAVs, also referred to as "drones") with magnetometers capable of performing higher resolution airborne magnetic surveys than has been previously offered. This technology is quickly becoming one of the most effective tools available for both prospectors and exploration companies and is setting a new standard for low-cost detailed geophysical surveys. The push towards green batteries and decreased reliance on fossil fuels has led to increased interest in critical minerals exploration in the Timmins District and presents more opportunities for the use of airborne geophysical surveys utilizing drones. It is crucial for exploration professionals seeking to be part of Ontario's fast-advancing exploration industry to be aware of these drone-based technologies, as well as their effectiveness for returning detailed results.

Over the past decade, remarkable advancements in drone technology have been achieved. Originally driven by military applications, technological innovations have paved the way for widespread adoption of drones in various industries, including mining, exploration and prospecting. These developments include significant improvements in drone battery efficiency, operational range, size and payload capacity. A normal magnetic survey drone today can cover 150 to 200 survey-line kilometres per day (Dai et al. 2019). The utilization of helicopter and airplane-borne surveys has been a practice dating back to the 1930s. Although these methods offer distinct advantages over terrestrial surveys, they are hampered by challenges such as high mobilization costs and limitations in resolution, particularly when it comes to examining localized targets (Porras et al. 2021). Conversely, terrestrial surveys promise superior survey resolution; however, the time and costs required for covering expansive areas render them less competitive and prohibitively expensive in comparison (Zheng et al. 2021). Some terrain in the Timmins District also makes terrestrial surveys more challenging due to swamps and muskeg limiting traverse paths.

The use of drones has emerged as the optimal solution for achieving good survey results, with resolution levels that are typically between terrestrial and conventional airborne geophysics surveys. Drone-collected magnetic surveys can produce exceptionally high-resolution data sets by flying at lower altitudes and at reduced speeds. Moreover, their survey flights are fully automated, ensuring consistent flight speeds and spacing between survey lines (Zheng et al. 2021). This results in high spatial data resolution in all directions. Conducting manned aerial surveys can become prohibitively costly, given the expenses associated with personnel, fuel and maintenance. Furthermore, most manned aerial surveys cannot achieve an equivalent level of precision compared to drone-based surveys. The use of drones comparatively has lower resource expenses and limited downtime. Hot-swapping lithium batteries allows for continuous use, and modular replacement parts keep repair costs low. Drones also excel in performing terrain-following flight missions, adeptly navigating rugged terrain, and circumventing the undesirable terrain-induced effects typically found with magnetic data collection. As an added benefit, the environmental impact of drone use in geophysical data collection is minimal and far more ecofriendly than both terrestrial and manned airborne methods. This is largely because of their reduced reliance on fossil fuels, as well as their limited ground disturbances during operation.

Figures 24 and 25, supplied by Pioneer Exploration Consultants Ltd. (M. Burns, CEO Pioneer Exploration Consultants Ltd., personal communication, 2023), demonstrate how drone-collected magnetic data is far more detailed than conventional manned airborne magnetic data. Figure 24 displays the results of a helicopter-flown magnetic survey done at 80 m elevation using 100 m line spacing. This survey was able to delineate a regional fold hinge with related shear zones and structures but was unable to detect many of the individual magnetic anomalies evident on Figure 25. Figure 25 shows a detailed UAV-MAG™ drone survey of the same area completed by Pioneer Exploration Consultants Ltd. and reveals higher resolution of individual magnetic anomalies. Compared to the helicopter, the drone could fly at 25 m elevation, with 15 m line spacing. The result is a high-resolution data set of magnetic signatures showcasing individual anomalies, which allows for more detailed interpretation of rock types and structures, such as bedding, folds and shear zones. With the drone's data, individual rock types of the fold hinge can be traced much more accurately, and discrete units can be mapped with greater detail. Additionally, individual magnetic anomalies, which may correspond to ore bodies, are visible within this data set and can be targeted for further exploration and field work.

The base metal showings of the Jefferson, Stackpool and Vencan prospects in the Timmins District are excellent examples of how a high-resolution drone magnetic survey could have vastly improved exploration efforts and reduced costs. These base metal prospects are associated with the Woman River iron formation, located in Marion and Genoa townships within the Swayze area of the Abitibi greenstone belt and are recorded in the Ontario Mineral Inventory (OMI) as MDI41O16SE00010, MDI41O16SW00022 and MDI000000001529, respectively (Ontario Geological Survey 2023). The area around the Jefferson showing was originally explored for iron in the 1900s but the potential for other mineralization types was not recognized until deeper exploration efforts penetrated past the iron formation and significant intercepts of base metals were discovered (Mowbray et al. 2018). Evidently, the Woman River iron formation masked the geophysical signature of more localized sphalerite, galena and chalcopyrite, as well as the base metal stockworks stratigraphically below the iron formation in the underlying felsic to intermediate volcanic rocks (Mowbray et al. 2018).

Had drone magnetic survey technology been readily available at the time, then the exploration program that resulted in the discovery of the Vencan showing could have taken a much different approach. It was discovered in 2006 by employing various exploration methods including manned airborne electromagnetic, ground gravity, induced polarization and ground magnetic surveys, as well as diamond drilling (Mowbray et al. 2018). Had the results of a higher-resolution magnetic survey conducted by drones been accessible at the outset of the exploration program, the Woman River iron formation would have easily been distinguished from the base metal mineralization. This would have expedited the discovery of the Vencan showing with fewer surveys needing to be completed, reducing costs for the company. The lower resolution results of the manned airborne magnetic survey shown in Figure 26, from Simon et al. (2006), did not present enough information to target the showing, which then prompted the additional exploration expenditures of the ground magnetic survey prior to discovery. Figure 27 (the ground-based total magnetic intensity survey from Grant (2006)) delineates the Woman River iron formation well but was cumbersome to execute, requiring days of line cutting, multi-person field crew expenses, and days spent conducting the survey. The high-resolution of a tightly spaced drone magnetic survey (*see* Figure 25), would have enabled more precise mapping of the iron formation, saving time, money and exploration efforts. Such a data set could have potentially pinpointed specific drilling targets along the strong magnetic signature of the iron formation, unveiling the underlying base metal mineralization (*see* Figure 27) earlier in the exploration program.

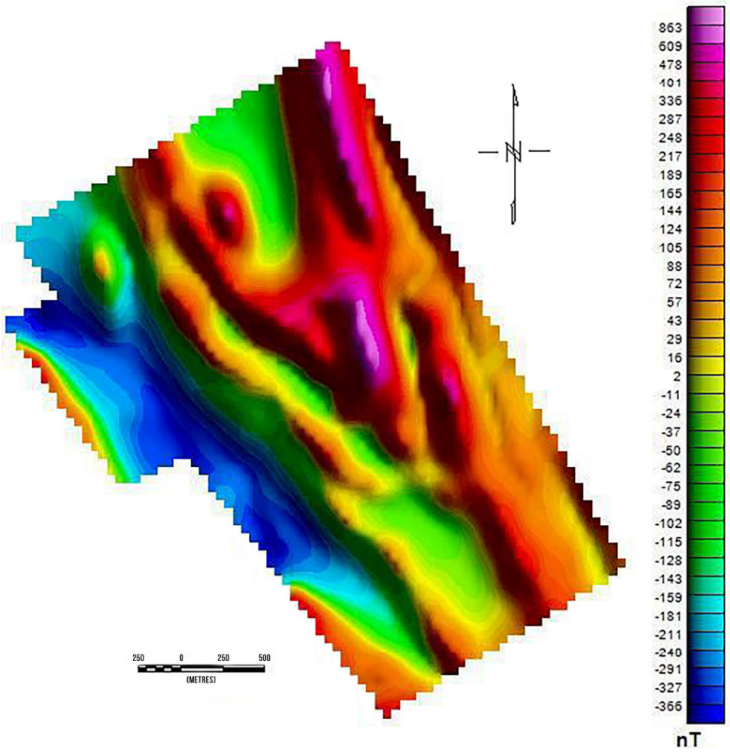

Figure 24. Helicopter-borne magnetic geophysical survey map. Total residual magnetic field data (M. Burns, CEO Pioneer Exploration Consultants Ltd., personal communication, 2023).

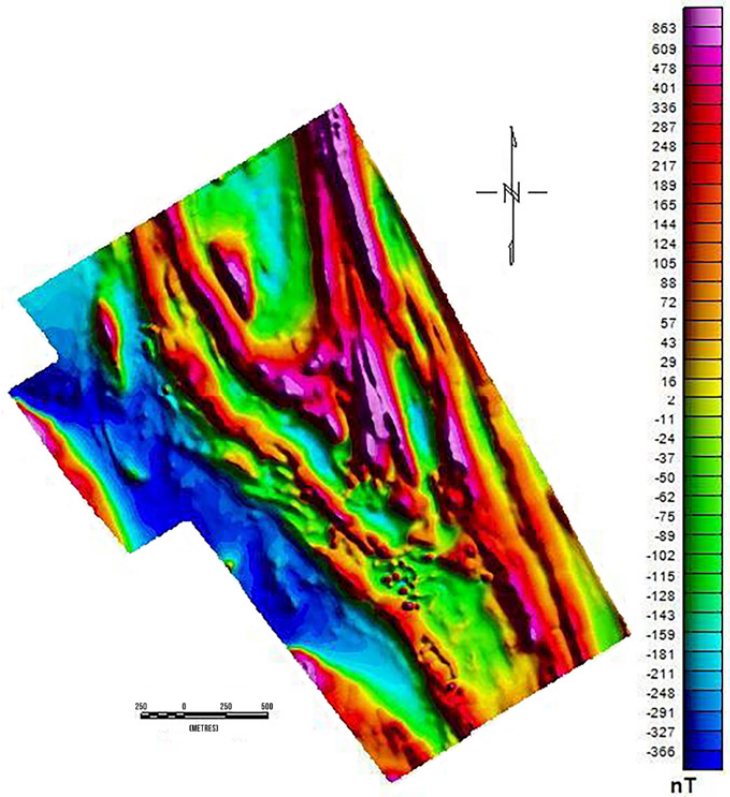

Figure 25. Drone-based magnetic survey map for same area shown in Figure 24. Residual total magnetic field data. Note the greater resolution compared with Figure 24 (M. Burns, CEO Pioneer Exploration Consultants Ltd., personal communication, 2023).

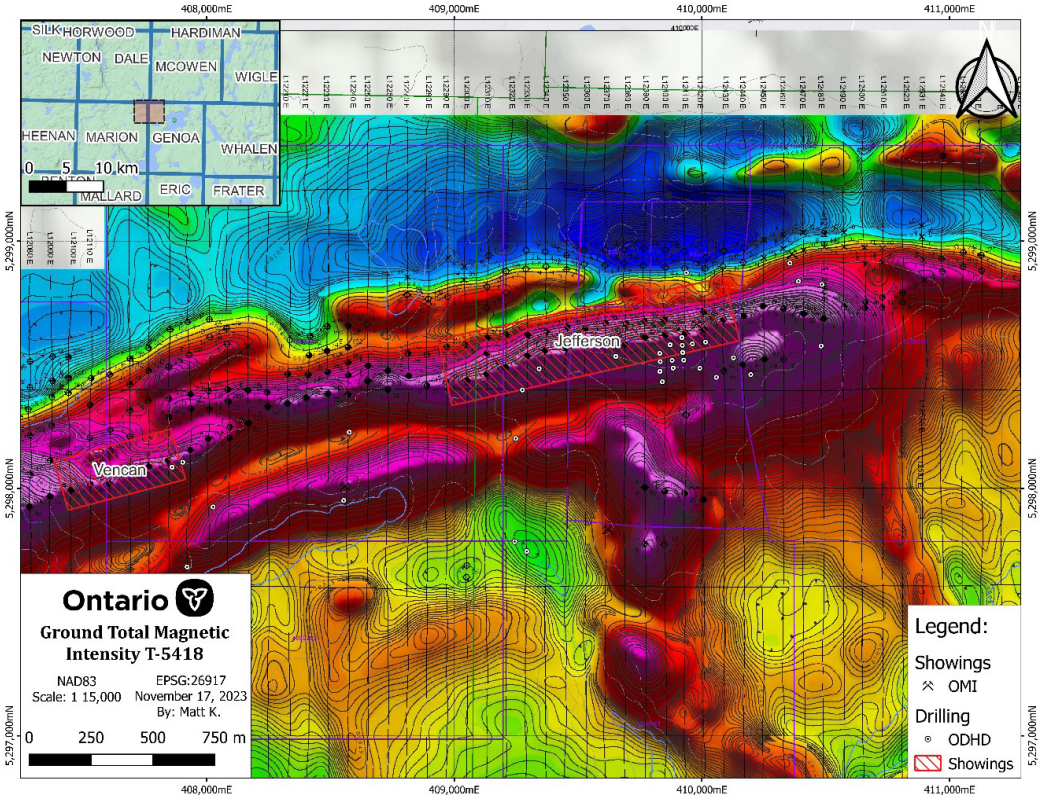

Figure 26. Airborne total magnetic intensity survey from assessment file T-5418 (Simon et al. 2006).

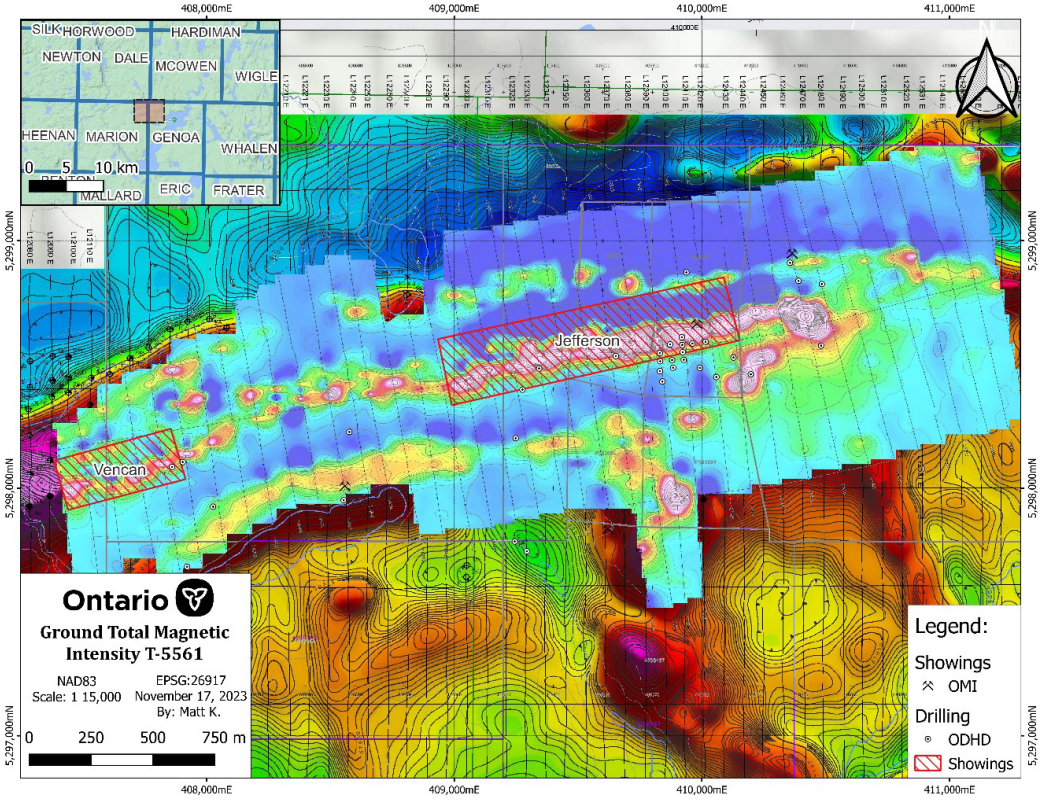

Figure 27. Ground based total magnetic intensity survey from assessment file T-5561 (Grant 2006), illustrating more detailed resolution than the manned airborne survey shown in Figure 26.

Today, high-resolution drone magnetic surveys have advanced to the point where they can play an integral role in advancing grassroots mineral exploration programs. Consequently, they are now being incorporated as standard practice in numerous early-stage exploration projects. They have been instrumental in not only improving the accuracy of geological data collection but also in significantly reducing exploration costs and aiding in decision making for new exploration targets. As technological developments continue, the application of drones within mineral exploration will only expand. Many drone companies are now offering high-resolution LiDAR (light detection and ranging), as well as orthophotography surveys, and are developing new hyperspectral and radiometric sensors for future implementation. Drones such as the one shown in Figure 28 are now commonplace, but the technology is constantly evolving, with competition driving innovation of new services, drone types and techniques.

Figure 28. Drone with a magnetic sensor in tow (photo by Matt Krukowski).

There are many opportunities in the Timmins District for using this drone technology on existing and newly acquired claim blocks. There is also a great potential for properties within the Timmins District, and elsewhere in Ontario, to be re-flown and re-interpreted with higher resolution drone magnetic surveys to potentially identify new targets missed by older exploration techniques. With the integration of cost-effective and efficient high-resolution drone magnetic surveys into exploration programs, exciting new mineral discoveries are right around the corner.

OGS ACTIVITIES AND RESEARCH BY OTHERS

There were 27 publications received by the Timmins District Geologist office in 2023 (Table 15). Of these, 9 were written reports, 7 were presentations and 1 was a recorded video. Timmins office staff contributed directly to 5 of them.

Table 15. Publications received by the Timmins District Geologist office in 2023.

Title	Author	Type and Year of Publication
Report of Activities 2022, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	Z. Azadbakht, M. Krukowski, B.K. Maity, P. Bousquet, C.M. Daniels, S.L.K. Hinz, C.J. Adrianwalla, G. Dorland, N. Sabiri, C. Patterson	Ontario Geological Survey, Open File Report 6402 (2023)
Recommendations for Exploration, 2022–2023	Resident Geologist Program, Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration (2023)
Indicator Mineral and Bulk Geochemistry Data of the Till and Other Surficial Samples Collected in the Pickle Lake–Cat Lake Area, Northern Ontario	C. Gao, D.C. Crabtree, S.A. Clarke and K.H. Yeung	Miscellaneous Release—Data 388 (2023)
Indicator Mineral and Geochemistry Data of Till and Other Surficial Samples in the Sandy Lake Area, Northwestern Ontario	C. Gao and K.H. Yeung	Miscellaneous Release—Data 400 (2023)
Ambient Groundwater Geochemistry Project Field Methods and Procedures	C.N. Bocking, S.M. Hamilton and K.M. Dell	Groundwater Resources Study 21 (2023)
Summary of Field Work and Other Activities, 2023	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6405 (2023)
Specific articles/reports of interest:		
Regional-Scale Groundwater Geoscience in Southern Ontario: The 2023 Ontario Geological Survey, Geological Survey of Canada, and Conservation Ontario Geoscientists Open House	A.K. Burt, D. Ford, S. Holysh, K.J.J. Kalmo and H.A.J. Russell	Open File Report 6387, 61p.
Discovering the Abitibi Gold Belt: A Geological Guidebook	S. Perrouty, R.L. Sherlock and J.M. Simmons	Open File Report 6392, 42p.
Exploring Differential Metal Endowment: A Comparison of the Western (Swayze) and Eastern (Rouyn-Noranda) Abitibi Greenstone Belt: A Geological Guidebook	H.L. Gibson, T.P. Gemmell, T.R.C. Jørgensen, E.C.G. Hastie, M.D. Schofield, R. Haugaard, A.R. Smith, B. McKinley, M.I. Rees, B. Lafrance, R.L. Sherlock and B. Chapon	Open File Report 6395, 100p.
OGS Showcase	Ontario Geological Survey	Ontario Geological Survey Virtual Showcase 2023, November 28–30, 2023
Specific presentations of interest:		
Ontario Geological Survey Virtual Field Trip: Geology of the Sudbury Impact Structure	C.A. Gordon, A.S. Péloquin and P. Gervais	Ontario Geoscience Video 1 (2023)
Peperites in the McKim Formation of the Huronian Supergroup, Northeastern Ontario	C. Gordon	presentation SHOWCASE-23-204 (2023)
Reconnaissance Mapping in Van Hise, Haultain and Nicol Townships, Abitibi Greenstone Belt, Northeastern Ontario	J. Walker	presentation SHOWCASE-23-205 (2023)
Ramsey–Algoma Granitoid Complex, Northeastern Ontario: An Update on Geochronology and Lithogeochemisty	S. Préfontaine	presentation SHOWCASE-23-206 (2023)

Title	Author	Type and Year of Publication
More Than Just Cold Hard Science: Applications of New Quaternary Investigations in Central and Eastern Ontario	R. Mulligan	presentation SHOWCASE-23-210 (2023)
Methods for the Multi-Element Analysis of Vegetation by Acid-Digestion/ICPMS at the Geoscience Laboratories	M. Burnham	presentation SHOWCASE-23-110 (2023)
Investigation of Biogeochemical Exploration Techniques to Aid in the Exploration for Lithium-Cesium-Tantalum Pegmatite Dikes: Results	E. Amyotte	presentation SHOWCASE-23-111 (2023)
The New GeologyOntario: A Demonstration of the Spatial and Text Search Tools	G. Dorland	presentation SHOWCASE-23-302 (2023)
Aggregate Resources of Ontario: Past, Present and Future Updates	L. Handley	presentation SHOWCASE-23-303 (2023)
The Role of Geophysics at the Ontario Geological Survey	J. Evangelatos and S. Biswas	presentation SHOWCASE-23-304 (2023)
Critical Minerals in Gold Deposits: Exploration Insights and By-Product Potential	E. Hastie	presentation SHOWCASE-23-305 (2023)
Determination of Indicator Minerals in Archived Fine-fraction Non-magnetic Heavy Mineral Concentrate Samples Using Scanning Electron Microscope Energy Dispersive Spectrometry	C. Gao, G. Hagedorn, D. Crabtree, S. Clarke, E. Hastie, G. Launay, C. Beckett-Brown	presentation SHOWCASE-23-306 (2023)
Hazards Below Your Feet: Land Use Planning Considerations near Historical Mine Sites	P. LeBaron, P. Bousquet, C. Daniels and C. Kurcinka	presentation SHOWCASE-23-307 (2023)
The Ambient Groundwater Geochemistry Project: Summary and Updates	L. Colgrove and K. Dell	presentation SHOWCASE-23-308 (2023)
Keeping it Simple: Recording Geological Information on Water Well Records	A. Burt, K. Yeung, D. Grant, R. Mulligan	presentation SHOWCASE-23-309 (2023)
Building Relationships Through Geoscience Collaboration	D. Bennett, M. Levesque	presentation SHOWCASE-23-310 (2023)
OGS Virtual Field Trip: Highlights of the Proterozoic Geology in the Thunder Bay Area	D. Campbell, C. Kurcinka, S. Kissin, S. Churchley, M. Levesque, A. Brush, P. Gervais	presentation SHOWCASE-23-311 (2023)
Exploration, Mining and Resident Geologist Program Activity Update for the Timmins and Sault Ste. Marie Districts	M. Krukowski	presentation SHOWCASE-23-202 (2023)

MINERAL DEPOSITS NOT BEING MINED

As of 2023, there are 57 mineral deposits in the Timmins District that are not being mined (Table 16). The most common commodity is gold (Au); however, the Timmins Districts has base metal, rare earth element (REE), graphite and other industrial minerals deposits that are not actively being mined.

Table 16. Mineral deposits not currently being mined in the Timmins District in 2023 (OGS 2023).

Abbreviations

AF ..... Assessment Files
AR ..... Annual Report
CAMH ..... *Canadian and American Mines Handbook* [*since* 2004–2005]
CMH ..... *Canadian Mines Handbook* [*up to and including* 2003–2004]
GR ..... Geological Report
MD&A ..... Management Discussion and Analysis
MDC ..... Mineral Deposit Circular [No.15–] [formerly Mineral Resources Circular, No.1–14]
MDIR ..... Mineral Deposit Inventory record
MLS ..... Mining Lands, Sudbury
MR ..... Mining Recorder
NM ..... *The Northern Miner*
OFR ..... Open File Report
PC ..... Personal Communication

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Albany graphite deposit, Pitopiko River area MDI000000001484	graphite	Total Indicated Resource: 25.1 Mt at 3.89% Cg; Total Inferred Resource: 20.1 Mt at 2.2% Cg	Zenteck	NI 43-101 Rpt. 9/07/2015	Diamond drilling in 2019
Augdome property Tisdale Tp. MDI42A06NE00086	Au	Historical resource: 140 000 tons at 0.15 oz/t Au	McLaren Resources Inc.	CMH 1986–87 p.50 McLaren Resources Inc. January 4, 2018	Last active 1987 Diamond drilling, 2017
Block A property west of Sunday Lake MDI32L04SW00012	Au	Measured and Indicated Resource estimate: 180.9 Mt grading 0.89 g/t Au (5 111 000 oz Au); Inferred Resource estimate: 20.8 Mt at 0.42 g/t Au (146 000 oz Au)	Agnico Eagle	NI 43-101 Rpt. 26/07/2021	Active
Paymaster Project, advanced exploration project (past producer) Whitney Tp. MDI42A11SE00021	Au	Indicated Resources (2013): 5 135 000 tons average 0.047 oz/t gold for 242 000 oz gold. Inferred Resource (2013): 1 781 000 t, averaging 0.065 oz/t gold for 115 000 oz/t	Newmont	Tahoe Resources Inc. 14/01/2014	Diamond drilling 2009–2014; Technical Report filed; Past producer 1915–1965.
Buffalo Ankerite property (past producer) Deloro Tp. MDI42A06NW00011 MDI42A06NW00015	Au, Ag	Indicated Resource (open pit and underground): 3.82 Mt at 2.37 g/t Au (292 800 oz) underground; 3.27 Mt at 4.76 g/t Au; Inferred Resource (open pit): 2.74 Mt at 2.31 g/t (203 400 oz); Inferred Resource (underground): 2.81 Mt at 4.05 g/t Au for 367 100 oz Au	McEwen Mining Inc.	NI 43-101 Rpt. 05/06/2014	Past producer 1939–1953. Diamond drilling 2007–2014
Carshaw property Shaw Tp. MDI42A06NE00016	Au	145 250 t at 5.17 g/t Au (Proven and Probable)	Carshaw Gold Mines Inc.	CMH 2001, p.234	Inactive

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Clay–Howells Fe-REE Project Clay and Howells Tp. MDI42G16SE00006	Fe, REE	Inferred Resource: 8 477 000 t at 0.73% total rare earth oxides, 0.13% Nb_2O_5, 44.17% Fe_2O_3	Canada Rare Earth Corporation	NI 43-101 Rpt. 26/09/2011	Purchase and corresponding sale of 16 500 t of rare earth concentrate over a 3-year period
Côté Lake deposit Chester Tp. MDI41P12SW00036	Au	Indicated Resource: 213 400 000 t at 0.80 g/t Au (5 480 000 contained oz); Measured Resource: 152 100 000 t at 0.97 g/t Au (4 720 000 contained oz)	IAMGOLD Corporation (64.75%) Sumitomo Metal Mining Co., Ltd. (35.25%)	NI 43-101 Rpt. 26/11/2021	Construction of the mine began on September 11, 2021
Clavos gold mine (past producer) Stock and German Tps. MDI42A10SW00046	Au	Indicated Resource: 1 258 400 tonnes at 4.81 g/t (194 600 oz) Inferred Resource: 796 000 tonnes at 4.7 g/t (120 000 oz)	Grace Gold	NI 43-101 Rpt 12/04/2013	
Davidson Tisdale Tisdale Tp. MDI42A11SE00011	Au	Open pit resources Measured: 452 000 t at 2.44 g/t Au (35 500 oz); Indicated open pit: 0.12 Mt at 2.43 g/t Au (9300 oz) Underground resources Indicated: 3 356 000 t at 4.91 g/t Au (4400 oz) Underground resources Inferred: 0.05 Mt at 4.0 g/t Au (6600 oz) Open pit Indicated 0.12 Mt averaging 2.43 g/t Au for 9300 oz Underground Indicated Resources: 30 Kt; averaging 4.91 g/t Au for 9300 oz Underground Inferred Resource: 50 Kt averaging 4.2 g/t Au for 6600 oz	McEwen Mining Inc.	NI 43-101 Rpt. 01/06/2014	Diamond drilling 2010–2014
De Santis Mine Ogden Tp. MDI42A06NW00025	Au	Albitite Zone: 72 212 tons at 0.229 oz/t Au (Probable; non-NI 43-101 compliant); Hydrothermal Zone: 334 308 tons at 0.19 oz/t Au (estimated non-NI 43-101 compliant)	Transition Metals	Lateegra Gold Corp. press release 08/02/2010	Diamond drilling 2012–2013 (DD-18-6686 m)
Detour Lake West Gold Project west of Sunday Lake area MDI32L04SW00016	Au	Measured Resource: 0.3 Mt at 0.89 g/t Au (7 000 oz) Indicated Resource: 22 700 000 t at 0.88 g/t Au (644 000 oz)	Agnico Eagle	Kirkland Lake Gold NI 43-101 Rpt. 31/12/2020	Active
Dundonald South deposit Dundonald Tp. MDI42A10NW00039	Ni	Inferred Resource: 116 000 t at 3.16% Ni (3658 t Ni)	Class1Nickel	NI 43-101 Rpt. 30/01/2009	Diamond drilling 2021

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Ravena (past producer) Penhorwood Tp. MDI42B01SE00004	Ba	Historical resource: 100 000 t at 95% barite	Extender Minerals of Canada Ltd.	AF	Inactive
Fuller Project Tisdale Tp. MDI42A06NW00030	Au	Total Indicated (open pit): 6 239 000 t at 0.056 oz/t Au (351 000 oz); Total Inferred (open pit): 3 911 000 t at 0.063 oz/t Au (247 000 oz); Underground Indicated Resource: 0.33 Mt at 5.77 g/t Au (61 000 oz Au); Inferred: 0.82 Mt at 4.97 g/t Au (135 000 oz)	McEwen Mining Inc.	NI 43-101 Rpt. 05/06/2014	Diamond drilling Tisdale and Deloro Tps. 2011–2014; Jan 2014 – filed technical report; June 2011–2014: diamond drilling. Dec 31, 2014 – McEwen Mining Inc. May 2006, technical report. 2011–2014 drilling, filed technical report Open pit Indicated: Resource of 5.33 Mt averaging 1.68 g/t Au for 290 000 oz; Underground Indicated: 0.33 Mt, average 5.76 g/t Au for 61 000 oz gold. Open pit Inferred Resource: 2.7 Mt averaging 1.3 g/t Au for 112 000 oz gold
144 Gap deposit Thorneloe Tp. MDI42A05NE00121 MDI42A05SE00065	Au	Indicated Resource: 1 734 000 t at 5.41 g/t Au (301 700 oz) Inferred Resource: 1 914 000 t at 5.19 g/t Au (1 027 800 oz)	Pan American Silver	CMH 2014–2015 p.407	Infill drilling 2021
Goose Lake Iron prospect Shaw Tp. MDI42A06NE00038	Fe	100 000 000 t at 68.8% Fe (historical resource)	Timnor Iron Ore	AF	Diamond drilling 2013
Hart prospect Eldorado Tp. MDI42A06SE00065	Ni, Cu	Total Indicated Resource: 1 546 000 t at 1.40% Ni, 0.10% Cu (47 779 000 lb Ni); Total Inferred Resource: 322 000 t at 1.26% Ni, 0.08% Cu (899 000 lb Ni)	2812794 Ontario Inc.	CMH 2016–2017 p.358	Diamond drilling 2012
James Bay Niobium Project (Argor Carbonatite) west of Marberg Creek area MDI42I15SE00004	Nb_2O_5	Total Indicated Resource: 29 700 000 t at 0.53 Nb_2O_5 (305 000 000 lb Nb_2O_5) Total Inferred Resource: 33 800 000 t at 0.52 Nb_2O_5 (285 000 000 lb Nb_2O_5)	Niobay Metals Inc.	NI 43-101 Rpt. 24/08/2021	Active-Advanced exploration project
Part of Côté Gold Project Jerome gold mine (past producer) Osway Tp. MDI41O09SE00005	Au	Inferred Resource: 18 737 000 t at 1.71 g/t Au (1 030 489 oz)	IAMGOLD Corporation	Augen Gold Corp. NI 43-101 Rpt. 18/07/2011	Diamond drilling 2010

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Kabinakagami Lake occurrence Lizar Tp. MDI42C16NW00004	Fe	10 100 000 t at 66.5% Fe	Bear Creek Gold Ltd.	MDC 11	Alienated Land
Alexo–Dundonald property	Ni, Cu, Co	Alexo–Dundonald Indicated Resources (open pit and underground): 1 250 000 t averaging 0.99% Ni, 0.03% Cu, 0.02% Co for 27. 35 million lb Ni, 1 million lb Cu and 0.66 million lb Co Alexo–Dundonald Inferred Resource: 2 010 000 t averaging 1.01% Ni, 0.03% Cu, 0.02% Co for 44.51 million lb Ni, 1.29 million lb Cu and 0.89 million lb Co	Class 1 Nickel	NI 43-101 Rpt. 01/12/2020	Past producer. Re-logging of old core since 2019
Kenilworth (Naybob) Mine Ogden Tp. MDI42A06NW00022	Au	North Zone unclassified: 138 900 tons in 13 areas, grades up to 0.25 oz/t Au; South Zone unclassified: 600 000 tons at 0.23 oz/t Au	Newmont and Metals Creek Resources Corp. JV	AF	Diamond drilling in 2022
Kenty Mine Swayze Tp. MDI41O15SE00029	Au	Historical resource: #9 vein has possible resource of 43 300 t at 4.7 g/t Au	Joshua Gold Resources Inc.	AF	Inactive
Kidd #3 Zone Chester Tp. MDI41P12SW00122	Au	Historical resource: 408 000 t at 9.9 g/t Au	IAMGOLD Corporation	OGS OFR 5912	Inactive
Kipling Kaolin Kipling Tp. MDI42J01NE00005	kaolin, silica sand, ball clay	Historical resource: 30 000 000 t	Great Lake Kaolin Inc	OGS OFR 5918	Inactive
Langmuir deposit Langmuir Tp. MDI42A06SE00099	Ni, Cu, PGE	Indicated Resource (W4 deposit, open pit and underground): 677 000 lb averaging at 1.00% Ni, 0.06% Cu, for 14 813 000 lb Ni and 989 000 lb Cu; Inferred Resource: 3 360 000 lb Ni and 210 000 lb Cu.	EV Nickel	NI 43-101 Rpt. 30/04/2021	Past producer
Langmuir #2 North deposit Langmuir Tp. MDI42A06SE00006	Ni, Cu	Indicated Resource: 8 324 000 t at 0.40% Ni, Inferred Resource: 1 017 000 t at 1.38% Ni	EV Nickel	NI 43-101 Rpt. 30/04/2021	Past producer
Loveland Nickel property Formerly known as: Loveland property Loveland Tp. MDI42A12NE00028	Cu, Ni, PGE	Cominco Zone: 130 000 tons at 0.68% Ni, 0.73% Cu (historical resource) Hollinger Zone: 422 000 tons at 0.71% Ni, 0.42% Cu (historical resource)	Moneta Porcupine Mines Inc.	Amador Gold Corp. website 19/01/2011	Diamond drilling 2017

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Project 81 Formerly known as: Lucas Gold Project Lucas Tp. MDI42A14SE00005	Au	136 077 t at 3.4 g/t Au (drill indicated)	Noble Mineral Exploration Inc.	AF	Down hole geophysics in 2020
Martison Lake deposit South of Ridge Lake MDI42J06SW00004	phosphate, REE	Indicated Resources (Anomaly A): 53 800 000 t at 22.99% P_2O_5, 0.49% Nb_2O_5 Inferred Resource: 128 300 000 t at 17.9% P_2O_5, 0.42% Nb_2O_5 Indicated Resources (Anomaly A lateritic material): 6 200 000 t at 7.97% P_2O_5, 1.13% Nb_2O_5 Inferred Resource: 5 300 000 t at 6.40% P_2O_5, 0.69% Nb_2O_5	Fox River Resources Corporation	NI 43-101 Rpt. 06/06/2022	Active
Multi Minerals Zones 3 and 4 McNaught Tp. MDI41O14SE00024	phosphate, niobium	Historical resource: 37 000 000 t at 0.17% Nb_2O_5 and 21.3% apatite	6378366 Canada Inc., 6070205 Canada Inc.	OGS Study 32	Sampling 2010
Multi Minerals Zone 6 McNaught Tp. MDI41O14SE00011	iron, phosphate, niobium	Historical resource: 4 557 000 t at 69.9% magnetite, 21.88% apatite, 0.12% Nb	6378366 Canada Inc., 6070205 Canada Inc.	OGS Study 32	Sampling 2010
Côté Gold Project Formerly known as: Murgold–Chesbar property (Chester 1 property) Chester Tp. MDI41P12SW00073	Au	Measured Resource: 152 100 000 tons at 0.97g/t Au Indicated Resource: 213 400 000 tons at 0.80 g/t Au	IAMGOLD Corporation	NI 43-101 Rpt. 26/11/2021	Active
Nemegosenda property Chewett Tp. MDI42B03SE00005	Nb_2O_5	Inferred Resource: 11 000 000 tons at 0.46% Nb_2O_5 (non-NI 43-101 compliant)	Sarissa Resources Inc. (Nio-Star Corp.)	Sarissa Resources Inc. NI 43-101 Rpt. 21/07/2009	Diamond drilling 2017
Nighthawk Lake property Cody Tp. MDI42A10SW00059	Au	Historical resource: 91 729 t at 6.06 g/t Au	Moneta Porcupine Mines Inc.	OGS OFR 6006	Diamond drilling 2017
North Rundle property Newton Tp. MDI41O16NW00002	Au	Historical Estimated Resource: 16 830 t at 7.1 g/t Au	First Mining Finance Corp.	NI 43-101 Rpt. 01/02/2011	Inactive
Onakawana Lignite Dyer Tp. MDI42I11SW00002	lignite	21 Mt at 5246 BTU	Onakawana Development Ltd.	OGS OFR 5111	Inactive
Owl Creek (East) Hoyle Tp. MDI42A11SE00006	Au	Historical assay resource: 3 019 685 t at 7.17 g/t Au	Newmont	OGS OFR 5985	Diamond drilling 2016
Owl Creek (West) Hoyle Tp. MDI42A11SE00006	Au	Inferred Resource: 327 230 t at 7.14 g/t Au	Newmont	OGS OFR 5985	Diamond drilling 2016

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Paymaster Project Tisdale Tp. MDI42A06NW00002	Au	Total Indicated Resource (open pit) 5 135 000 tons at 0.047 oz/t Au (242 000 oz) Total Inferred Resource: 1 781 000 tons averaging at 0.065 oz/t Au for 115 000 oz Au	McEwen Mining Inc. 61% and Goldcorp Canada Inc. 39%	NI 43-101 Rpt. 05/06/2014	Diamond drilling 2009–2014
West Cache Gold Project Formerly known as: Porcupine West property Bristol and Ogden Tps. MDI42A06NW00200	Au	Total Indicated Resource: 13 398 000 t at 1.52g/t Au (657 000 oz) Total Inferred Resource: 11 670 000 t at 1.71 g/t Au (640 000 oz)	Galleon Gold	NI 43-101 Rpt. 09/03/2021	Diamond drilling 2022
Radio Hill iron property Penhorwood Tp. MDI42B01NE00026	Fe	Historical Resource: 296 000 t raw magnetite at 25.58% Fe	Canada Nickel Company	NI 43-101 Rpt. 30/04/2010	Diamond drilling and metallurgical testing 2012
Redstone Mine Eldorado Tp. MDI42A06SE00080	Ni	Inferred Resource: 737 000 t at 1.57% Ni (25 519 000 lb Ni)	Northern Sun Mining Corp	MD&A 31/12/2012	Property under care and maintenance
Rundle Mine Newton Tp. MDI41O16SW00003	Au	Measured and Indicated: 349 000 t at 7.88 g/t Au Inferred Resource: 267 000 t at 6.68 g/t Au	First Mining Finance Corp.	NI 43-101 Rpt. 01/02/2011	Inactive
Sangold Gold Project Keith Tp. MDI42B01NE00012	Au	126 515 t at 12.78 g/t Au; 1 616 770 g (51 986 oz) Au	Gail Resources Inc.	CMH 2001	Diamond drilling 2005
Shunsby property Cunningham Tp. MDI41O10NE00056	Cu, Pb, Zn	Total mineral inventory 4 000 000 tons at 0.59% Cu and 2.56% Zn	BWR Exploration Inc.	AF	Diamond drilling 2014
Sothman Nickel property Sothman Tp. MDI41P14SE00005	Ni	317 515 t at 0.89% Ni (0.5% cut-off)	Canada Nickel Company		Active
Texmont deposit Bartlett Tp. MDI42A03NE00002	Ni	Historical Measured and Indicated: 2 893 000 tons at 0.92% Ni at 0.70% Ni cut off (26 757 contained tons)	Canada Nickel Company	Fletcher Nickel Inc. prospectus 14/05/2007	Diamond drilling 2009
TTM-Timmins talc-magnesite deposit Adams and Deloro Tps. MDI42A06SW00024	magnesite, talc	A Zone Core, Indicated Resource: 12 728 000 t at 52.1% magnesite, 35.4% talc; Inferred Resource: 18 778 000 t at 53.1% magnesite, 31.7% talc; A Zone Fringe, Indicated Resource: 5 003 000 t at 34.2% magnesite, 33.4% talc	Globex Mining Enterprises Inc.	NI 43-101 Rpt. 16/04/2012	Infill and geotechnical drilling (DD-46-7000 m) 2013
Thunderwood JV Hoyle Tp. MDI42A11SE00113	Au	327 230 t at 7.14 g/t Au (assay)	Newmont	OGS OFR 5985	

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Timmins North Tully Tp. MDI42A11NE00034	Au	Indicated Resource to 350 m: 362 090 t at 8.0 g/t Au (93 140 oz) Total Inferred Resource: 592 070 t at 7.3 g/t Au (139 880 oz)	SGX Resources Inc.	NI 43-101 Rpt. 19/10/2010	Diamond drilling 2013
Upper Whitney deposit Whitney and Price Tp. MDI42A11SE00019	Au	Total Measured and Indicated Resource: 3 219 000 t at 6.85 g/t Au (708 600 oz); Inferred Resource: 995 000 t at 5.34 g/t Au (170 700 oz)	Pan American Silver and Newmont	Temex Resources Corp. NI 43-101 Rpt. 14/01/2014	Diamond drilling DD-13-1600 m, 2016. Hosts former producing mines Hallnor, Broulan Reef, Bonwhit and Hugh Pam. Produced a total of 2.4 million oz gold
Bell Creek Complex (Vogel-Schumacher property) Hoyle Tp. MDI42A11SE00124	Au	Indicated Resource: 2 219 000 t at 1.75 g/t Au (125 000 contained oz) Inferred Resource: 1 459 000 t at 3.6 g/t Au (168 800 oz)	Pan American Silver	NI 43-101 Rpt. 14/06/2011	Diamond drilling 2010; 2015 – 39 700 oz; 2014 – 43 400 oz
Warren Township anorthosite Warren Tp. MDI42B02NW00001	anorthosite	858 504 t at 30.92% Al (drill indicated)	Enviromine	AF	Permitted 2012
Watershed gold property Chester Tp. MDI000000001866	Au	Measured and Indicated Resources: 365 500 000 t at 0.87 g/t Au Inferred Resource: 189 600 000 t at 0.63 g/t Au	IMAGOLD	NI 43-101 Rpt. 26/11/2021	Active
Whitney talc-magnesite deposit Whitney Tp. MDI000000000349 MDI42A06NE00020	magnesite, talc	Measured and Indicated Resource: 54 076 357 t Inferred Resource: 43 000 000 t, grades from 43.5 to 51% talc; 25 to 38% magnesium minerals	General Magnesium Corp.	OGS Study 28	Surface mining test 2015

Note: *This table contains tonnage and grade estimates referred to as Reserves (Indicated, Possible, Probable), which were determined at various times by methods largely unreported. Except where noted, none of these estimates are known to conform to the standards required for National Instrument 43-101 and should be considered Inferred mineral resources not reserves.*

Unit abbreviations used*: lbs = pounds; Mt = million tonnes; opt = ounces per ton; oz = ounce(s); t = tonnes.*

Note: *DD-18-6686 m =18 diamond-drill holes totalling of 6686 m.*

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHEAST REGION

Land Use Planning Activities

The northeast Regional Land Use Geologist (RLUG), based in Timmins, co-ordinates input into land-use planning activities in the Sault Ste. Marie, Timmins and Kirkland Lake Resident Geologist districts and the part of the Sudbury District that is north of the French River. In 2023, the northeast Regional Land Use Geologist position was staffed from January through December by Pierre Bousquet, *P.Geo*. The Land Use Planning and Policy Co-ordinator is the province-wide lead of the land use geology program. That position was held in 2023 by Catherine Daniels*, P.Geo.*

The boundaries of the Regional Land Use Geologists' regions are indicated on Figure 29.

Figure 29. Extent of the Regional Land Use Geologists' ("RLUG") areas of responsibility (red lines indicate the regional boundaries; grey lines indicate the municipal boundaries).

The objective of the position is to ensure that geoscience information is considered in policy and land-use planning decisions. The geoscience information relates to

- mineral-related values and economic opportunities
- natural geological and mining-related hazards
- renewable and non-renewable energy sources
- groundwater resources

Program activities that support this objective include helping develop, deliver and administer provincial policies, practices and procedures; and providing advice and guidance to municipalities, agencies and others involved in or affected by land-use planning regarding geoscience-related matters.

In 2023, the Regional Land Use Geologist dealt with a variety of land-use planning issues throughout the northeast region. The following sections summarize the work that was done.

CROWN LANDS

The Ministry of Mines (MINES) is responsible for all geoscience mapping within the province through the Ontario Geological Survey (OGS) and administers mineral exploration and development under the *Mining Act*. The Ministry of Natural Resources and Forestry (MNRF) is responsible for mineral aggregate extraction under the *Aggregate Resources Act*, in addition to being responsible for mapping and regulating many other natural resource features and activities.

The Ministry of Mines, through the Regional Land Use Geologist, engages with the other Ministries when Crown land-use planning activities have the potential to impact provincial mineral interests, or to expose those using Crown lands to natural geological or mining-related hazards. These activities relate to forest management planning; energy and other major infrastructure projects; Far North land-use planning; proposals to modify existing parks or create new ones; and various other initiatives related to Crown land use.

Crown Land Disposition

The northeast Regional Land Use Geologist provided support to multiple ministries in the evaluation of potential lands for agricultural disposition in northeastern Ontario, such as proposed Claybelt Agriculture Project. Geoscience information was prepared and delivered for this initiative.

Forest Management Planning

The forest management planning process involves consideration of a wide range of values, including mineral values, in the context of forestry activities, and the relevance of legislation other than the *Crown Forest Sustainability Act*, such as the *Mining Act*.

In 2023, there were no new Forest Management Plans submitted to the Northeast Regional Land Use Geologist for comments and input.

Approved Forest Management Plans, with detailed information about annual operations, including plans for creating new access routes or decommissioning existing routes, and maps showing forest access roads are posted on the MNRF Natural Resources Information Portal (https://nrip.mnr.gov.on.ca/s/fmp-online).

Far North Land Use Planning

The Far North Land Use Planning Initiative is about working with First Nations to identify where development may occur and where land will be designated for protection in the Far North of Ontario. The Far North encompasses 42% of Ontario's land mass in an area generally north of the areas where forest management planning is done (for the planning area boundary, *see* www.ontario.ca/rural-and-north/far-north-ontario). For detailed information about Far North Land Use Planning and the *Far North Act*, *see* www.ontario.ca/page/far-north-land-use-planning-initiative.

Across the Far North, many First Nation communities are engaged with Ontario in community-based land-use planning. Together, the planning teams composed of First Nations and Ontario representatives are working on a range of land-use planning activities, although they are not all at the same stage in the planning process. In northeastern Ontario, in 2023, MINES provided information to support the Community Based Land Use Planning Teams for Constance Lake and Moose Cree First Nations.

Withdrawal Orders

Other work related to Crown land use in the northeast region may include reviews of applications for withdrawal of lands from claim registration under Section 35 of the *Mining Act*. Applications may be for mining rights only, surface rights only and for both mining and surface rights. Reviews by the northeast Regional Land Use Geologist ensure that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions are made. In 2023, 4 applications to withdraw Crown mining rights in the northeast region were received and reviewed.

Approved withdrawals are posted on the MINES Web site (Land Notices, Withdrawals and Reopenings (gov.on.ca)).

Aggregates

The northeast Regional Land Use Geologist ensures that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions are made regarding aggregate permit applications under the *Aggregate Resources Act* (administered by MNRF). No aggregate application was received for review in 2023 for the northeast region.

Parks and Protected Areas

The northeast Regional Land Use Geologist did not review any requests relating to the modification of existing parks or the creation of new ones in 2023.

MUNICIPAL AND PRIVATE LANDS

The Ministry of Mines supports municipal and private land-use planning through the One Window Planning Service, led by the Ministry of Municipal Affairs and Housing (MMAH), and through the Municipal Plan Review process where a municipality has approval authority. When requested, the northeast Regional Land Use Geologist provides input into, and reviews, draft Official Plans, Official Plan Amendments, draft plans of subdivision and consent (severance) applications to ensure that provincial mineral interests, natural geological hazards and mining-related hazards are appropriately considered in the planning process.

Municipal Planning

The Provincial Policy Statement (PPS), which guides municipal planning in Ontario, is issued under the provisions of the *Planning Act*. The PPS helps to ensure that municipal Official Plans recognize mining operations and areas with significant mineral potential, so that they can be protected from incompatible land uses. The PPS was last modified in 2020. There were no revisions in 2020 directly applicable to the review process of the Regional Land Use Geologist. All municipalities in Ontario were required to update their Official Plans to conform with the 2020 version of the PPS by July 2022.

As a participant in MMAH's One Window Planning Service for Official Plans and their amendments, the Regional Land Use Geologist provides comments, mineral values mapping, and other input as required for Official Plans and Official Plan Amendments. Where a municipality has approval authority, the Regional Land Use Geologist participates in the Municipal Plan review directly with the municipality for Official Plan amendments and related planning initiatives.

In addition, reviews are completed, and information provided for pre-consultation for consent applications and formal consent applications, and plan of subdivision and/or condominium applications. Although such decisions are normally made by municipal governments, most of the area of the northeast region is outside of towns and cities. In the absence of a municipal government to manage planning decisions related to private land in those areas, decisions are made by the MMAH, with the support of partner ministries, including MINES.

In 2023, the northeast Regional Land Use Geologist provided maps, comments and other input as required for municipal planning activities that included

- 24 consent (severance) and plan of subdivision and/or condominium applications in 6 single-tier municipalities and 16 unorganized geographic townships or areas
- 11 Official Plans and related planning initiatives (such as Offical Plan amendments, zoning by-laws, and minor variances) in 5 communities
- 2 new draft Official Plans or Official Plan updates

The municipalities involved in these planning initiatives are listed below in Table 17.

Table 17. Municipal planning initiatives with MINES input, northeastern Ontario, 2023.

Consent (Severance) and Subdivision Applications
Consent, Barber, Unincorporated Township
Consent, Benoit, Unincorporated Township
Consent, Cane, Unincorporated Township
Consent, Eby, Unincorporated Township
Consent, Greater Sudbury, City of
Consent, Harris, Unincorporated Township
Consent, Henwood, Unincorporated Township
Consent, Johnson Township, Desbarats to Echo Bay Planning Board (2)
Consent, Knox, Unincorporated Township
Consent, Marquis, Unincorporated Township
Consent, Mongowin, Unincorporated Township
Consent, Phelps, Unincorporated Township
Consent, Plummer Additional, Township of
Consent, Rioux, Unincorporated Township
Consent, Sables-Spanish Rivers, Township of
Consent, Savard, Unincorporated Township (2)
Consent, Timmins, City of

Consent (Severance) and Subdivision Applications
Consent, Truman, Unincorporated Township
Consent, Tudhope, Unincorporated Township
Subdivision, Timmins, City of

Completed Official Plans
Iroquois Falls, Town of
Sudbury East, Planning Area

Official Plan–Related Initiatives
Zoning by-law amendment, City of Timmins (7)
Zoning by-law amendment, Municipality of Bruce Mines
Zoning by-law amendment, Nairn Centre

Additional Municipality Related Activities Undertaken in 2023
Municipality of Temagami
City of Timmins, information request (2)

Exemptions from Mining Tax

Section 189 (1) of the *Mining Act* allows owners of patented land to apply for exemption from paying mining tax. Key factors that are considered when applications are reviewed include whether or not the lands are being used for mining-related purposes, and whether or not there would be third-party interest in using the lands for mining-related purposes (e.g., the surrounding lands are being explored or the sites in question have provincially significant mineral potential).

During 2023, 1 such application, covering a total of 1 mining patent in Evelyn Township, was reviewed for the northeast region. Comments were provided to the Ministry of Mines Mining Lands Section to be consolidated with other information for the Ministry's consideration and decision.

FIRST NATIONS

In addition to doing work related to Far North land-use planning, the northeast Regional Land Use Geologist provided information on mineral occurrence sites, past or present mining and exploration activity, geology and mineral potential for 2 Aboriginal Title Claim areas.

Other Activities

The northeast Regional Land Use Geologist accompanied other RGP staff on 2 general interest field trips in 2023.

The northeast Regional Land Use Geologist also undertook a number of additional activities in 2023, as outlined in the following sections.

CLASS ENVIRONMENTAL ASSESSMENTS

Class Environmental Assessments ("Class EAs") are documents that set out a standard environmental assessment process to evaluate the potential environmental effects of a project. There are currently 11 Class EAs in effect in Ontario (www.ontario.ca/page/class-environmental-assessments-approved-class-ea-information), relating to the development of new infrastructure, such as dams, transmission lines, pipelines, highway corridors, commuter rail stations and bus terminals, and sewer and water facilities; the establishment of new parks and conservation reserves; forest management plans; and Crown land dispositions.

In 2023, no Class EA projects were received for comment.

SITE READINESS PROGRAM

The Ministry of Economic Development, Job Creation and Trade (MEDJCT) launched the Site Readiness Program in 2021 to provide municipalities and industrial landowners an opportunity to increase the development readiness of their industrial sites. The program complements the Investment Ready: Certified Site Program, providing a more streamlined process with a focus on smaller sites.

No requests for comments were received for 2023, but 1 item from 2022 was commented on again for the City of Greater Sudbury.

ENVIRONMENTAL REGISTRY

The Environmental Registry (ERO) is an online resource that contains public notices about environmental matters being proposed by all Ontario government ministries covered by the Environmental Bill of

Rights. The public notices contain information about proposals including new acts, regulations, policies and programs; plans to change or eliminate existing ones; and plans to issue permits for a wide range of activities across Ontario.

The northeast Regional Land Use Geologist sifts through the Environmental Registry and creates a spreadsheet for other workers of the ministry and other ministries for any items that would regard land-use planning under the geology lens on a monthly basis.

In 2023, most of the ERO postings relevant to northeastern Ontario were related to aggregate licences issued under the *Aggregate Resources Act*, notices of approval or amendments to Municipal Official Plans, Minister's Zoning Orders, and Provincial Park management, not requiring comments by the Regional Land Use Geologist.

Other province-wide items included postings regarding amendments to the *Mining Act*: the proposed "Building More Mines Act" and amendments regarding Closure Plans, Recovery of Minerals, and Decision-Making Authorities. The amendments are intended to allow more flexibility and decrease regulatory overlap, primarily regarding advanced exploration, mine development and mine closure.

POLICY AND GUIDANCE

In October 2022, the Ministry of Municipal Affairs and Housing (MMAH) began a housing-focussed policy review of the Growth Plan for the Greater Golden Horseshoe: A Place to Grow (APTG) and the Provincial Policy Statement (PPS). MMAH requested input from partner Ministries on how to create a streamlined province-wide land use planning policy framework that enables municipalities to approve housing faster and increase housing supply.

Into 2023, the Land Use Planning and Policy Co-ordinator continued to be engaged in work toward the proposed changes to APTG and PPS. MINES interests identified include retaining policies that protect mineral and mineral aggregate supply, as well as retaining policies that require the identification and mitigation of mine hazards prior to any development within 1 km are essential.

Together, the Regional Land Use Geologist and the Land Use Planning and Policy Co-ordinator had the opportunity in 2023 to provide feedback for the Hobby and Mineral Collection Guide.

In 2023, the Land Use Planning and Policy Co-ordinator had the opportunity to continue to work on the MINES interests toward the implementation for the Caribou Conservation Agreement.

The Land Use Planning and Policy Co-ordinator was able to participate in the OPS Biodiversity Network and learn more about the development and progress of the Ontario Biodiversity Council in renewing a biodiversity strategy for 2020–2030 and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. While the Ontario Biodiversity Strategy is not government policy, it is a landmark product of the Ontario Biodiversity Council that guides a whole-of-society approach to biodiversity management and helps to co-ordinate actions from all sectors.

CONFERENCES AND OUTREACH ACTIVITIES

In 2023, the northeast Regional Land Use Geologist attended or participated in the following events.

In person:

- Mineral Development Advsior session in Timmins – presented an introduction to First Nations Mineral Development Advisors regarding Land Use Geology

- 2023 Resident Geologist Program Health and Safety and Field Training Week in Thunder Bay, including an introduction to the geology of the Thunder Bay area
- Timmins Land Use tour – co-led the trip with the Land Use Planning and Policy Co-ordinator for RLUG staff
- Canadian Land Reclamation Association, Ontario Chapter, conference in Sudbury

Virtual meetings and conferences:

- Ontario Geological Survey, Critical Minerals Strategy – Recovery of Minerals
- Ontario Geological Survey Virtual Showcase 2023 – a series of technical presentations over 3 days featuring results of geoscience projects in progress by the Ontario Geological Survey, summaries of activities in all districts of the Resident Geologist Program, and updates on OGS data sets and online applications. A presentation titled "Hazards Below Your Feet: Land Use Planning Considerations near Historical Mine Sites" was created and presented by the Regional Land Use Geologists.
- Kawartha Region Earth Sciences, Engineering and Metallurgy Network (KREEM) – monthly presentations and discussions on various aspects of geoscience, environment and engineering

MINERAL INVENTORY GEOSCIENTIST ACTIVITIES—NORTHEASTERN AND SOUTHERN ONTARIO

The Ontario Mineral Inventory (OMI), previously known as the Mineral Deposit Inventory (MDI), database is a dynamic compilation of over 19 100 records describing most of the known mineral occurrences in Ontario. It is an important reference tool for explorationists interested in exploring and acquiring mining properties in Ontario. When used in conjunction with other spatial databases generated by the Ontario Geological Survey (OGS), it provides additional tools for making mineral discoveries in Ontario.

The Mineral Inventory Geoscientists (MIG) investigate and document mineral deposits and occurrences across the province. Through field visits, comprehensive literature research and personal research, they work with regional and district Resident Geologist Program staff to ensure that the OMI database is regularly updated. Regular updates are required to ensure that the Ministry of Mines is using the most up-to-date information in making land-use planning and policy decisions and that mineral industry clients have access to comprehensive and up-to-date records. Records for certain areas are reviewed and updated in support of bedrock mapping and other field work conducted by the Earth Resources and Geoscience Mapping Section (ERGMS) of the Ontario Geological Survey (OGS).

Several targeted OMI data improvement projects were completed throughout the year, including rectifying assessment file data and adding Abandoned Mine Inventory System (AMIS) numbers to corresponding OMI records. Both data improvement projects will provide better linkages between the various OGS data sets. In the spring of 2023, a group of ministry staff came together to review—and update—the OMI category definitions and associated "threshold grades" (or cut-off values) because these were last reviewed and revised by Wilson et al. (2008). With the implementation of the updated grades, more than 2000 OMI records (2022) were identified and examined to determine if they still met the requirements as an OMI "Occurrence". To date, the following commodities have been reviewed and completed: aluminum, antimony, beryllium, cesium, gallium, germanium, indium, lithium, niobium, rubidium, scandium, tantalum, rare earth elements and yttrium. In 2024, the following commodities are planned to be reviewed: barite, bismuth, chromium, platinum group elements, selenium, tellurium, thorium, titanium, vanadium and zirconium. The updated OMI category definitions document ("OMI Definitions and cut-off values.pdf") is part of the Ontario Mineral Inventory GIS data that can be downloaded from GeologyOntario.

For 2023, Sheree Hinz was the northeastern and southern Ontario MIG.

Total contributions to the OMI database for northeastern and southern Ontario in 2023 included 3728 updated records, 26 records deleted and 7 new records. A breakdown of the northeastern and southern Ontario records revised by district is provided in Table 18.

Table 18. Ontario Mineral Inventory records revision in northeastern and southern Ontario in 2023.

Resident or District Office	Updates	Deletions	New
Kirkland Lake	1651	11	0
Sault Ste Marie	122	0	0
Southern Ontario	854	13	0
Sudbury	371	2	0
Timmins	730	0	7
Total	**3728**	**26**	**7**

GEOGRAPHIC INFORMATION SYSTEM DATA SPECIALISTS ACTIVITIES—NORTHWESTERN AND NORTHEASTERN ONTARIO

The Resident Geologist Program's Geographic Information System (GIS) Data Specialist positions are currently based in the Thunder Bay and Tweed offices and serve the northwest RGP region and northeast and southern RGP regions, respectively. During 2023, the Thunder Bay position was staffed by Genevieve Meyer (formerly Dorland); and the Tweed position was staffed by Nazha Sabiri. The GIS Data Specialists create maps and graphics, manage geospatial data and conduct data analysis for land-use planning purposes, geoscience compilations, reports, posters and presentations. They provide ongoing GIS support to the Resident Geologist Program (RGP) and respond to client requests for assistance with accessing geoscience data.

Existing Data Products

ONTARIO ASSESSMENT FILE DATABASE, ONTARIO DRILL HOLE DATABASE AND ONTARIO MINERAL INVENTORY

The Ontario Assessment File Database (OAFD), Ontario Drill Hole Database (ODHD) and Ontario Mineral Inventory (OMI) are updated on a continual basis by RGP staff using the Ontario Mineral Exploration Information System (OMEIS). An intranet-based application, OMEIS was launched in 2018 and is used by RGP and Mining Lands staff to maintain and update assessment file and drill-hole data. New assessment files and related drill-hole data are added to the database as soon as the files are received from Mining Lands. Updates to existing data are made on an ongoing basis. These updates can include corrections to address errors reported by clients or other Ministry of Mines (MINES) staff, or improvements, such as the addition of details that had not been captured for older files. Updated information and new files are accessible through the GeologyOntario search tool within 24 hours. Most of the data entry is carried out by the District Geological Assistants. The GIS Data Specialists are responsible for the administration of OMEIS, the creation of GIS data for the new files and drill holes, as well as corrections to existing assessment file polygons.

The GIS Data Specialists extract the tabular and spatial data at the beginning of each month and compile it for release as both 1) a graphical interface or data layer (keyhole mark-up language (*.kml*) file) through OGSEarth (www.ontario.ca/ogsearth) which can be viewed using geographic information applications, such as Google Earth™ mapping service; and 2) a compressed (*.zip*) downloadable file on GeologyOntario (www.hub.geologyontario.mines.gov.on.ca). A summary of new items added and existing items updated in 2023 is provided in Table 19.

Table 19. Ontario Mineral Exploration Information System (OMEIS) data entry statistics for assessment files and diamond-drill hole data for 2023.

File Type	New Files Added	Existing Files Updated	New Drill Holes Added	Existing Drill Holes Updated
Approved Assessment	800	17 314	3037	15 538
Non-Assessment Exploration Work	0	223	0	61
Total	**800**	**17 537**	**3037**	**15 599**

**Data cleanup was conducted on a large number of assessment file and drill-hole records.*

Projects

NEW GEOLOGYONTARIO

A new GeologyOntario portal was launched at the 2023 PDAC convention on March 7, 2023. The redesigned portal features new geospatial and text search tools making it easier to search for, discover and download Ontario's geoscience data and information.

The new GeologyOntario Spatial Search tool (Figure 30) displays OGS data sets, such as the Ontario Mineral Inventory (OMI), Assessment File Database (OAFD), Drill Hole Database (ODHD), publication boundaries, bedrock and surficial geology, and geophysics. The OMI, OAFD and ODHD layers are updated nightly. There are search tools to allow users to locate features and files with specific criteria and in a chosen area of interest on the map.

The GeologyOntario Hub page can be accessed on a computer or mobile device at www.hub.geologyontario.mines.gov.on.ca.

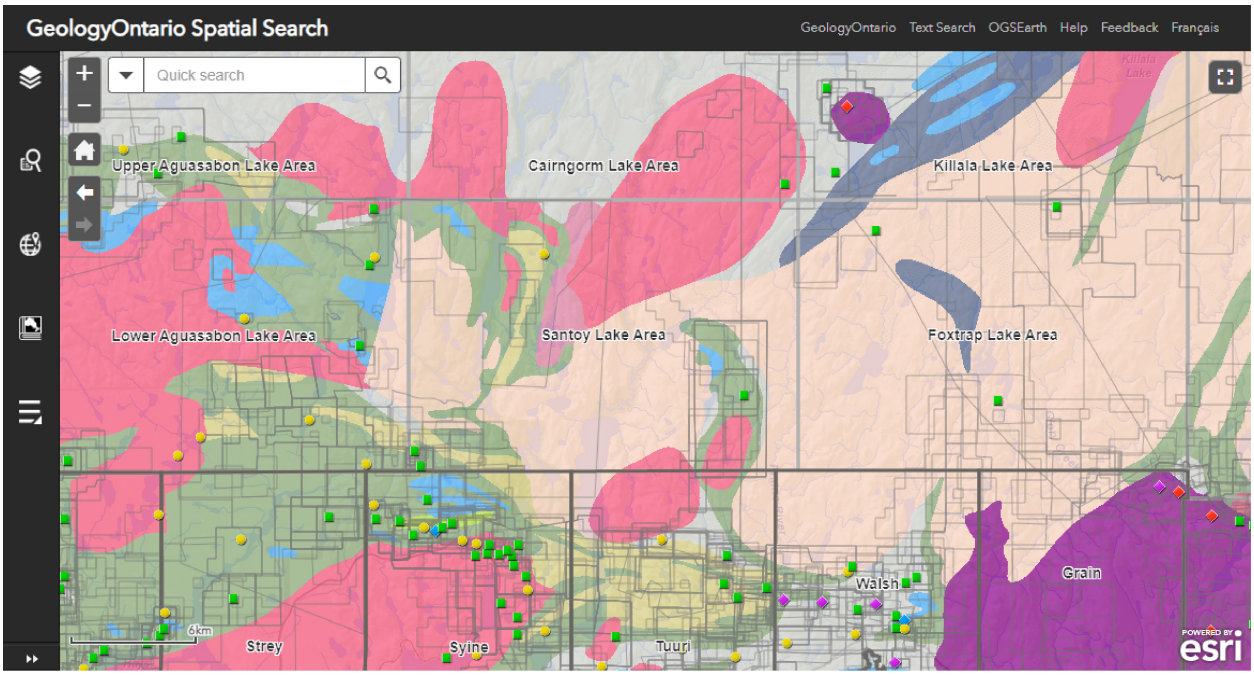

Figure 30. Image showing the GeologyOntario Spatial Search tool.

New Data Products

The new RGP Site Visits layer and Exploration Activity layer are now available online through GeologyOntario Spatial Search, under the Layers section, at www.hub.geologyontario.mines.gov.on.ca. These layers will be updated on a monthly basis.

RGP SITE VISITS IN GEOLOGYONTARIO SPATIAL SEARCH

Dating back to the 1960s, the Ontario Geological Survey's Resident Geologist Program (RGP) has included property examination articles in its annual *Reports of Activities*. These articles serve as valuable point-source summaries for mineral exploration and development properties in Ontario. Although the format and level of detail provided in property examination articles have varied over the years, they are all based on field visits by RGP geologists. Almost all of these articles capture exploration history, significant assay results and geological summaries for specific properties and/or mineral occurrences. Most notably, these articles provide third-party geological interpretations and assay results from the field visit, thus giving the mineral rights holder and potential investors an objective evaluation of the geology and mineral potential of the property. Additionally, property examination articles often provide recommendations to guide further exploration work.

The RGP Site Visits layer has been developed to serve as a tool that will allow users to discover RGP property examination articles. These articles are currently easy to overlook, as they are included as relatively brief articles embedded within the annual *Report of Activities* (ROA) reports that have been published in various formats over the years. From 1967 to 1996, the respective Resident Geologists' reports were compiled within single volumes covering the entire province (as Miscellaneous Papers until 1992 and Open File Reports from 1993 to 1996), while individual Open File Reports have been published for each district since 1997. Resident Geologist District boundaries have also changed numerous times over the years, adding to the challenge of locating articles for specific areas of interest.

The RGP Site Visits layer simplifies the process of locating property examinations by providing a spatially referenced point for each article, presented as a layer in GeologyOntario Spatial Search (Figure 31).

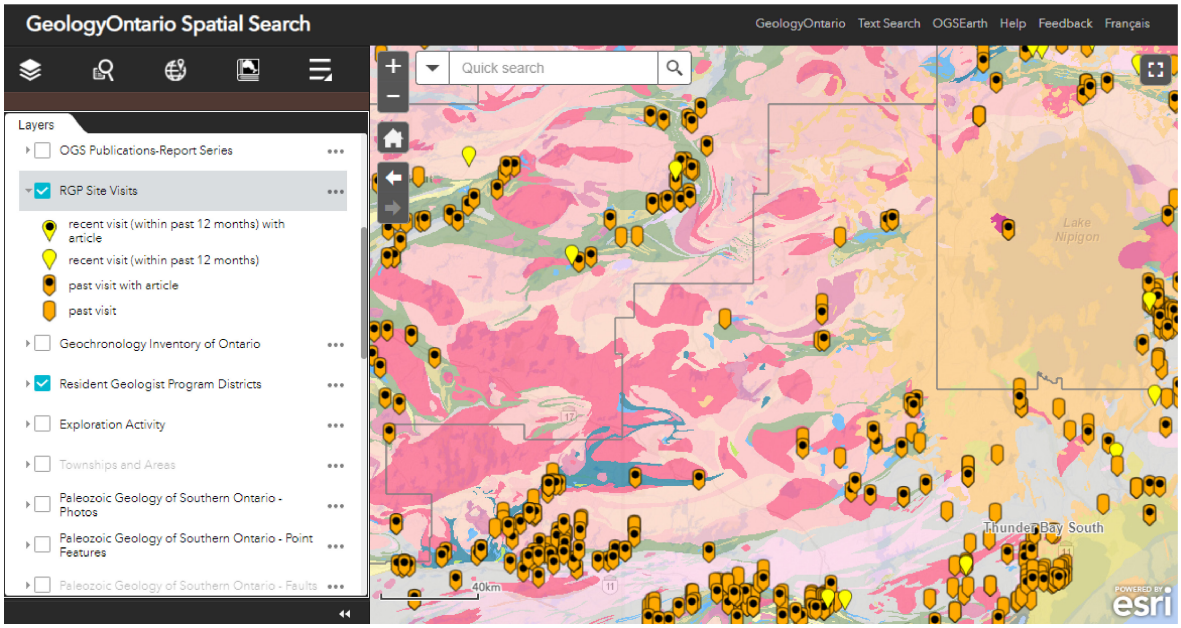

Figure 31. Map showing the RGP Site Visits layer in the GeologyOntario Spatial Search tool, with a selection of site visits.

A "pop-up" window for each record displays metadata that include a link to the article, location information, report references, availability of assay data and information on associated Ontario Mineral Inventory occurrences and Assessment Files (Figure 32). The layer also includes information about recent property visits carried out by RGP staff that may not have a related article in an OGS publication.

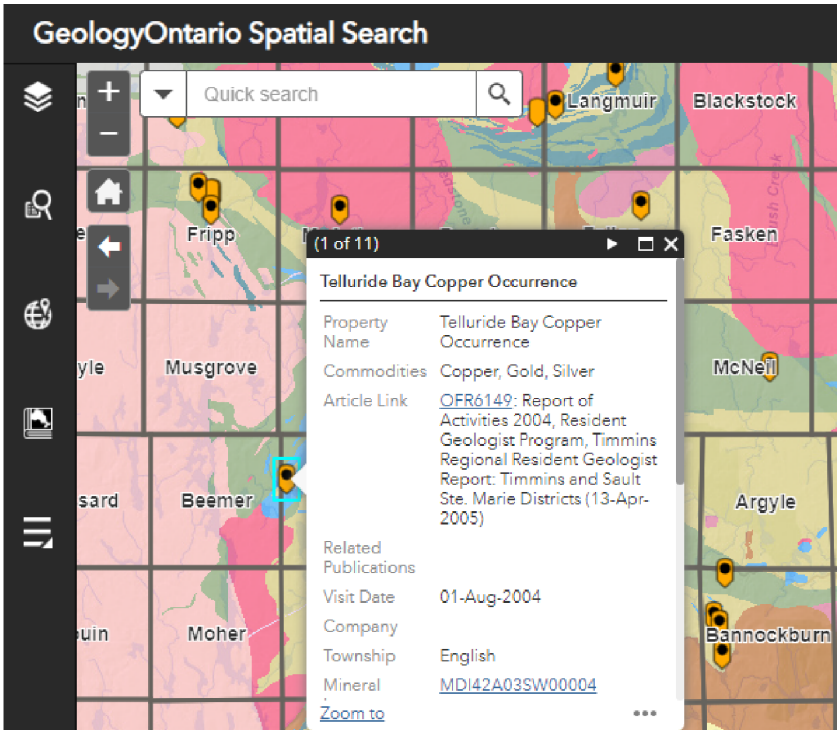

Figure 32. Map in the RGP Site Visits layer with a "pop-up" window that displays the metadata for a specific site visit record.

EXPLORATION ACTIVITY IN GEOLOGYONTARIO SPATIAL SEARCH

The Exploration Activity layer was created to provide a comprehensive view of mineral exploration work being reported across the province. The layer displays the location of mineral exploration projects where physical exploration and development work, property transactions (claim acquisitions and option deals) and financings have occurred in the past 12 months (Figure 33). Information includes company name, project name, commodity, activity type and links to corporate news releases. These activities are tracked by RGP based on exploration company news releases and personal communication with claim holders.

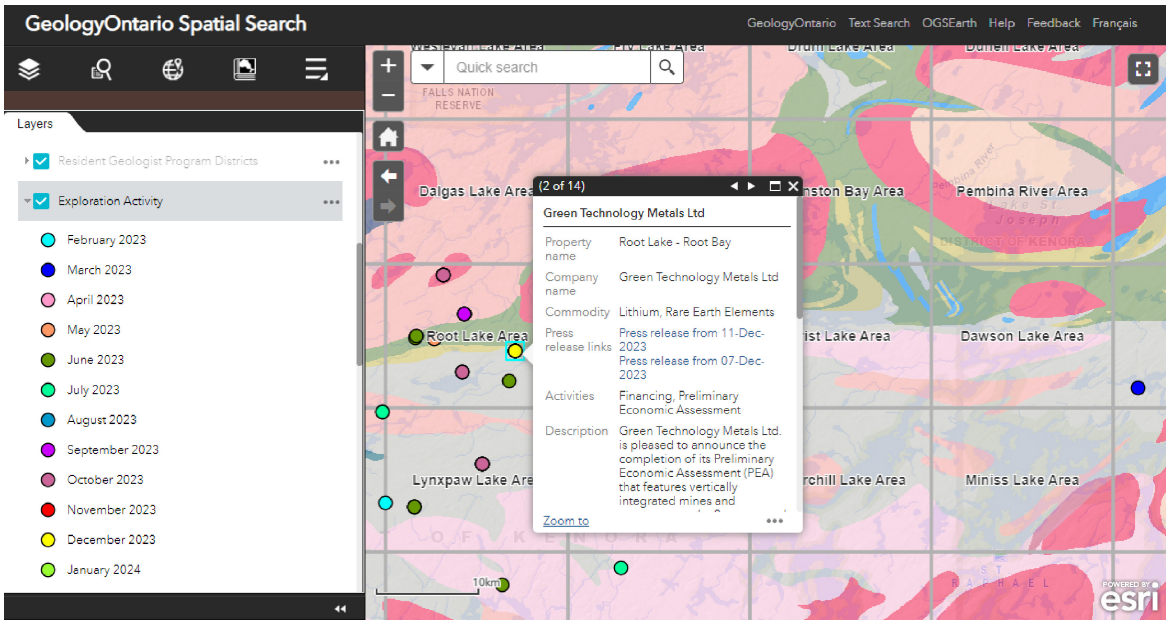

Figure 33. Map showing the Exploration Activity layer in the GeologyOntario Spatial Search tool, with a "pop-up" window that displays attributes of an exploration project.

ACKNOWLEDGMENTS

The text contains information on past activities from files in the Timmins Resident Geologist Office, unless stated otherwise. Current mining and exploration information came from prospectors and company personnel, assessment files, public sources, company websites and SEDAR®.

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Ontario

Ontario Geological Survey
Resident Geologist Program

Timmins Regional Resident Geologist
(Sault Ste. Marie District)—2023

by

B.K. Maity, J. Swiercz and C.J. Adrianwalla

2024

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Timmins Regional Resident Geologist (Sault Ste. Marie District)—2023

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INTRODUCTION

The Sault Ste. Marie Resident Geologist Program (RGP) District comprises part of the Archean Superior Province to the north and the Paleoproterozoic Southern Province to the south, with a localised area of Ordovician rocks at the southern extremity of the District (Figure 1). The Archean Superior Province within the District includes the Wawa Subprovince, encompassing several greenstone belts, supracrustal rocks and granitoid-gneiss intrusive complexes that are separated from the southern Abitibi Subprovince to the east by the Kapuskasing Structural Zone. The Southern Province consists mainly of the Paleoproterozoic Huronian Supergroup (metasedimentary and associated metavolcanic rocks) and intrusive dikes and sills. Additionally, the western part of the District has outcrops of the Late Mesoproterozoic to Early Neoproterozoic Keweenawan Supergroup of supracrustal and associated intrusive rocks, related to the Midcontinent Rift, that are exposed along the eastern flank of Lake Superior. All the major geologic units in the District have a rich history of mineral exploration and mining activities that continue to this day. The Early to Middle Ordovician sedimentary sequences exposed in St. Joseph Island to the south of Sault Ste. Marie do not currently have any mineral exploration activity.

During 2023, gold was produced from 3 mines in the Archean greenstone belts in the Sault Ste. Marie District. Orogenic gold, volcanogenic massive sulphides (VMS), magmatic nickel-copper-platinum group element (PGE) deposits, banded iron formation (BIF)-hosted gold, and vein-hosted silver-lead were the major mineralizing systems targeted by exploration in 2023. As of January 5, 2024, a total area of 340 880 ha (Table 1; Figure 2) was covered by active mining claims in the Sault Ste. Marie RGP District, a decrease of 38 ha from the previous year, as recorded in the Mining Lands Administration System (MLAS). The claims were mostly for precious and base metals.

Table 1. Total land area covered by active mining claims in the Sault Ste. Marie RGP District from January 6, 2020, to January 4, 2024.

RGP District	Total area (ha) covered by claims January 5, 2024	Total area (ha) covered by claims January 4, 2023	Total area (ha) covered by claims January 4, 2022	Total area (ha) covered by claims January 4, 2021
Sault Ste. Marie	340 880	340 918	301 733	243 390

Note: *Data are from MLAS, compiled by G. Meyer, Northwest Geographic Information System Data Specialist, Resident Geologist Program.*

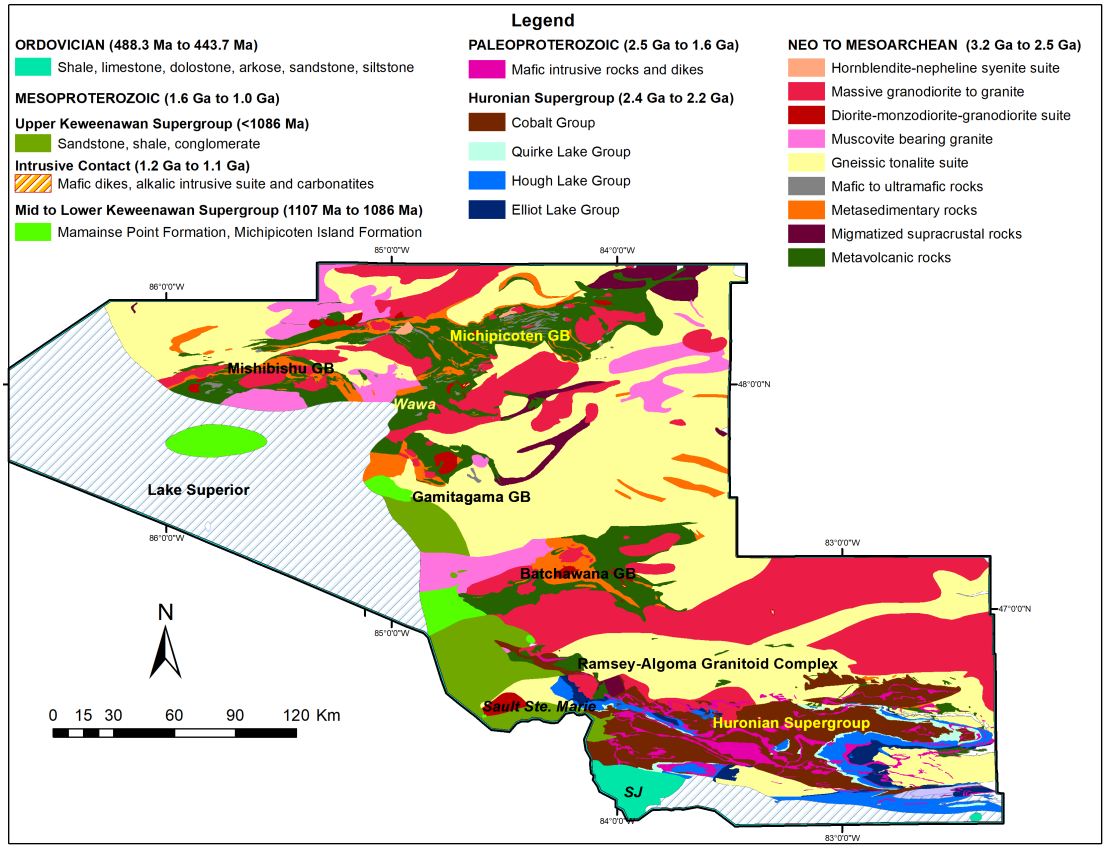

Figure 1. Geological map of the Sault Ste. Marie Resident Geologist District showing major bedrock units (map *modified after* Ontario Geological Survey 2011). Abbreviations: GB, greenstone belt; SJ, St. Joseph Island.

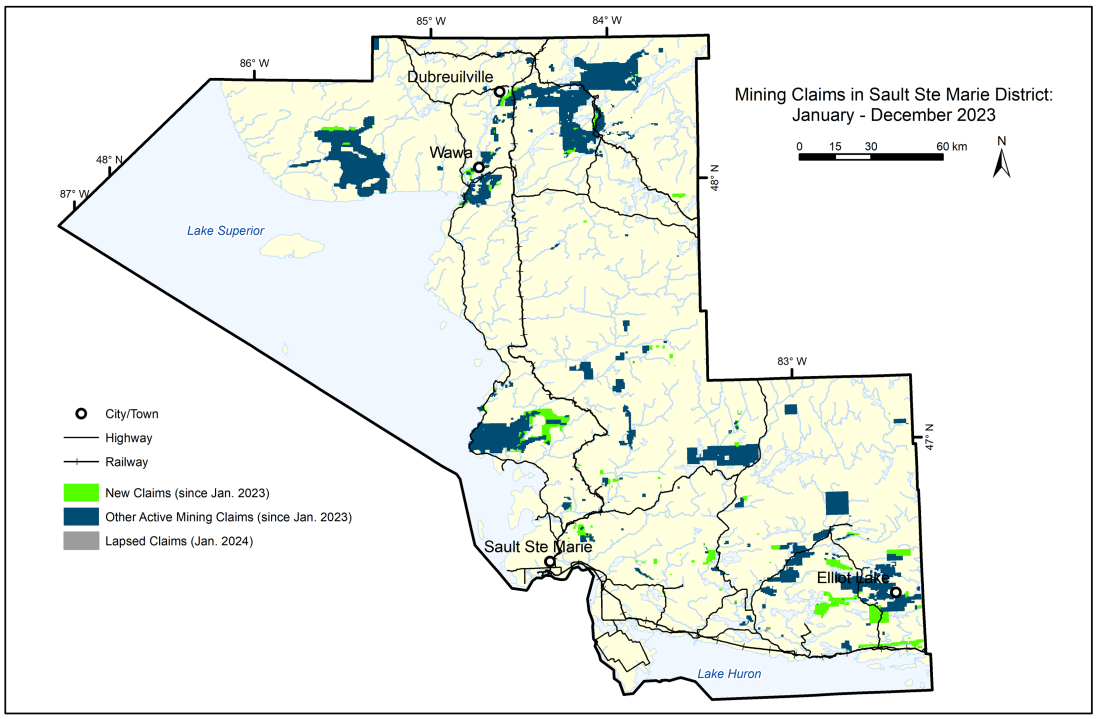

Figure 2. Mining claims map for 2023 in Sault Ste. Marie District.

MINING ACTIVITY

Gold production in the Sault Ste. Marie District came from 3 operating mines in 2023 (Figure 3): the Island Gold Mine operated by Alamos Gold Inc., the Eagle River Mine operated by Wesdome Gold Mines Ltd, and the Magino Mine operated by Argonaut Gold. Total gold production was 255 214 oz Au at an average head grade of 7.58 g/t Au (Table 2).

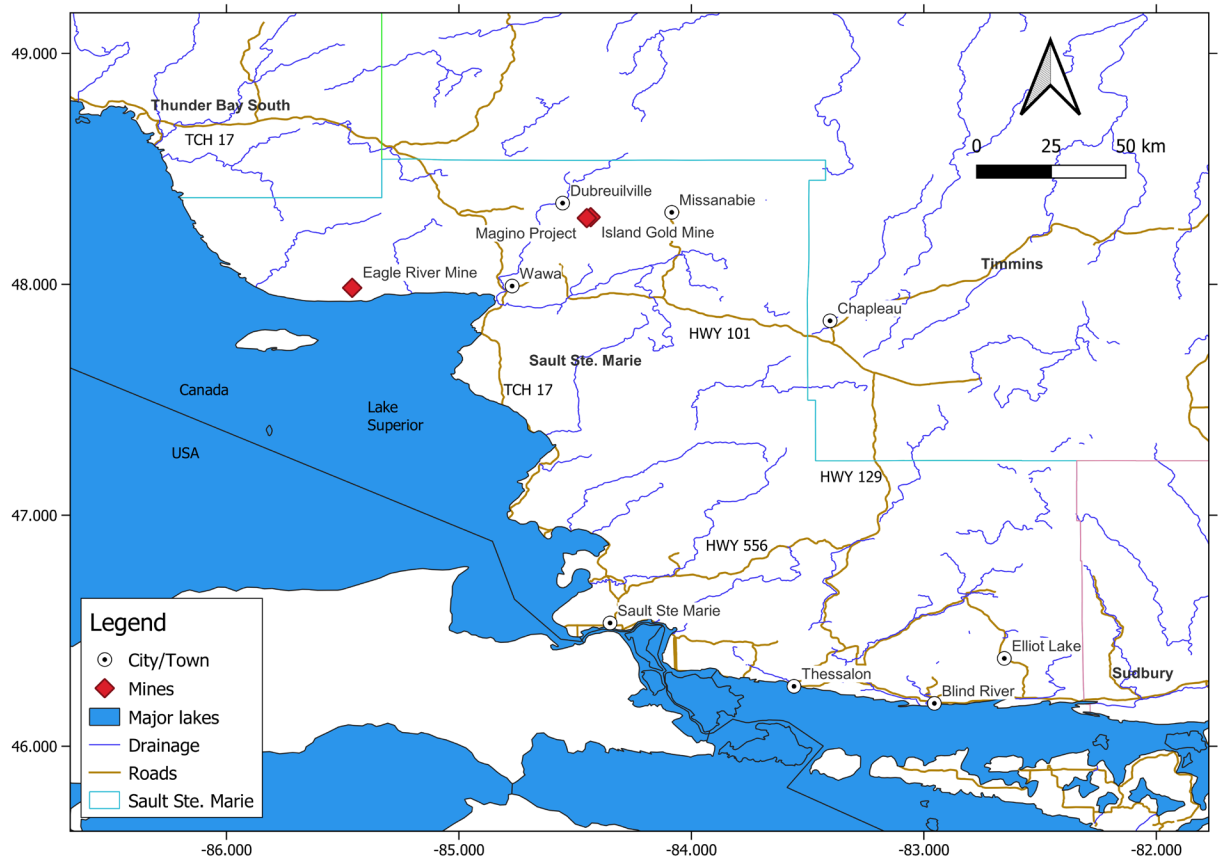

Figure 3. Map showing locations of operational mines in Sault Ste. Marie District (*see* Table 2). *Abbreviation:* TCH, Trans-Canada Highway.

Table 2. Total gold production in the Sault Ste. Marie District, 2023 (Alamos Gold Inc., news release, January 10, 2024, Wesdome Gold Mines Ltd., news release, January 15, 2024, and Argonaut Gold, news release, January 18, 2024).

Mines	Ore Milled (tonnes)	Average Head Grade (g/t Au)	Production (oz)	Township or Area (Commodity)
Alamos Gold Inc.				
Island Gold Mine	439 008	9.48	131 400	Finan (*gold*)
Wesdome Gold Mines Ltd.				
Eagle River Mine	228 777	12.4	87 799	Point Isacor (*gold*)
Argonaut Gold				
Magino Mine*	1 506 000	0.854	36 015	Finan (gold)
Total	2 173 785	7.58	255 214	

**source: Chuck Hennessey, Argonaut Gold, personal communication.*

Alamos Gold Inc. – Island Gold Mine

The Island Gold Mine is an underground mine located in Finan and Jacobson townships, approximately 83 km northeast of the town of Wawa (*see* Figure 3), and consists of 831 mining tenures covering approximately 14 930 ha. It is accessible via Goudreau Road, which connects to Highway 519 and the Trans-Canada Highway 17 (Bourgeault et al. 2022). Underground operations at the mine are currently accessed by a ramp system, and longitudinal retreat long hole stopes are used as the primary mining method. Ore is processed onsite through the conventional Kremzar gold mill using a carbon-in-pulp process.

In 2023, total ore mined was 437 541 tonnes at an average grade of 9.43 g/t of Au. Total reported gold production was 131 400 oz Au from a total of 439 008 tonnes of ore milled at an average head grade of 9.48 g/t of Au (Table 3; Alamos Gold Inc., news releases, February 21, 2024). The revised guidance for gold production for the next 3 years at the Island Gold Mine is 145 000 to 160 000 ounces for 2024, 170 000 to 185 000 ounces for 2025, and 220 000 to 235 000 ounces for 2026 (Alamos Gold Inc., news release, January 10, 2024).

Table 3. Gold production data from the Island Gold Mine between 2020 and 2023 (Alamos Gold Inc., news release, February 21, 2024).

	2023	**2022**	**2021**	**2020**
Ore mined (tonnes)	437 541	420 801	438 731	412 169
Head grade (g/t)	9.43	10.03	10.27	11.18
Ore milled (tonnes)	439 008	456 592	435 297	386 591
Head grade (g/t)	9.48	9.64	10.35	11.62
Production (oz)	131 400	133 700	140 900	139 000

The property is within the Michipicoten greenstone belt and consist of mainly greenschist to amphibolite facies volcanic and metasedimentary rocks that form a homocline sequence younging to the north. Regionally, tight to isoclinal folds exhibit axial planar foliation trending 070 to 095º. The mine is situated within felsic metavolcanic rocks including tuffs and lavas, and is positioned on the northern limb of the Goudreau anticline (Bourgeault et al. 2022; Sage 1994).

In 2023, updated Measured and Indicated Resources as of December 31, 2022, were estimated to be 1 276 000 tonnes with a head-grade of 7.09 g/t Au producing a total of 291 000 oz of Au, whereas the Inferred Resource was 8 066 000 tonnes with a gold production of 3 529 000 oz of Au at a head-grade of 13.61 g/t Au (Alamos Gold Inc., news release, February 21, 2023). The total Proven and Probable Reserve estimate as of December 31, 2022, was 4 225 000 tonnes with a gold production of 1 464 000 oz at a head-grade of 10.78 g/t Au (Alamos Gold Inc., news release, February 21, 2023).

Exploration activities focused on both surface and underground drilling, extending high-grade gold mineralization at depth and parallel to the existing gold-bearing structures in Island West, Island East and Island Main zones, and defining additional mineral resources near the Island Gold mine across the subparallel zones C, 1E and E1EN, as well as advancing and evaluating several regional targets (Alamos Gold Inc., news release, June 15, 2023; Figure 4).

In early 2023, Alamos announced acquisition of 100% shares of Manitou Gold, thereby tripling the land package adjacent to Island Gold Mine (Alamos Gold Inc., news release, February 28, 2023). The acquisition expanded land package and mineral tenure along strike to the east within the Goudreau Lake deformation zone, incorporating 2 major gold belts—Island Gold Mine and Renabie Gold Mine—and

6 deformation zones: Craddle Lake–Emily Bay, Loch Lomond, Missinaibi, Easy Lake, and Renabie deformation zones (Alamos Gold Inc., news release, February 28, 2023). Exploration drilling within hanging wall and footwall zones of existing mine infrastructures at Island West indicated mineralization extended outside Mineral Reserve and Resources within the main C-zone, where results include 146.33 g/t Au over 2.2 m and 38.92 g/t Au over 2.10 m (*see* Figure 4; Alamos Gold Inc., news release, June 15, 2023). At Island West, high-grade gold mineralization in the hanging wall and newly defined NS1 zone included 89.31 g/t Au over 2.4 m to 14.5 g/t Au over 3.10 m (Alamos Gold Inc., news release, June 15, 2023). Extension of high-grade gold mineralization across Island Gold deposit and 2 regional exploration targets at Pine Zone and adjacent Vein Arrays returned drilling results of 118.59 g/t Au over 2.31 m and 95.41 g/t Au over 3.02 m at Island East, and 40.12 g/t Au over 2.02 m at Island West (Alamos Gold Inc., news release, November 9, 2023).

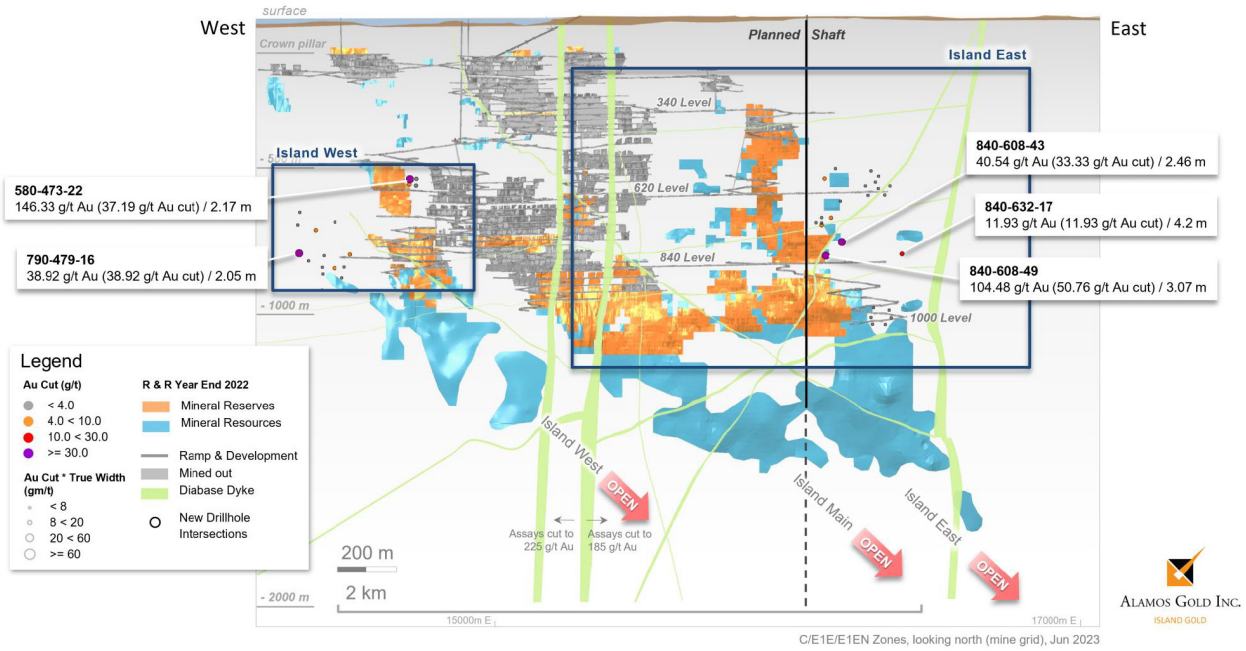

Figure 4. Exploration and drilling activity at the Island Gold Mine. Longitudinal section through C/E1E/E1EN/E1D, new C and E1E-Zone showing underground exploration drilling results (*from* Alamos Gold Inc., news release, June 15, 2023).

Wesdome Gold Mines Ltd. – Eagle River Mine

Wesdome Gold Mines Ltd. operates the Eagle River underground mine, hosted in the Mishibishu greenstone belt, Point Isacor area, approximately 50 km west of Wawa (*see* Figure 3). Ore is processed at the Mishi mill, which has a processing capacity of 1200 t per day. The Q1 2023 production data included 48 133 tonnes of ore milled, producing 20 159 oz at a grade of 13.5 g/t Au (Wesdome Gold Mines Ltd., news release, April 10, 2023). In Q2 2023, Eagle River Mine milled 64 672 tonnes of ore at 11.4 g/t Au resulting in 22 845 oz of Au, which was 13% higher than Q1, 2023 (Wesdome Gold Mines Ltd., news release, July 13, 2023). The Q3 production results included 55 153 tonnes of ore milled and 20 391 oz Au produced at a head grade of 11.9 g/t Au (Wesdome Gold Mines Ltd., news releases, October 16 and November 9, 2023). Total production from the Eagle River Mine in 2023 was 87 799 oz of Au from 228 777 tonnes of ore milled at an average grade of 12.4 g/t Au, the highest in the mine's history of production (Wesdome Gold Mines Ltd., news release, January 15, 2024).

In March 2023, an updated Mineral Resources and Mineral Reserves for the Eagle River Mine was released (Wesdome Gold Mines Ltd., news release, March 13, 2023). The latest Proven plus Probable mineral reserve estimate for the Eagle River Mine is 762 000 tonnes of ore producing 400 000 oz of gold at a head grade of 16.3 g/t Au (Table 4). The Measured and Indicated mineral resources for the Eagle River underground mine is 466 000 tonnes of ore producing 186 000 oz gold with a grade of 12.4 g/t Au, and Inferred mineral resources is 586 000 tonnes of ore producing 281 000 oz gold with a grade of 14.9 g/t Au (*see* Table 4). Production guidance for 2024 for Eagle River Mine is set at 80 000 to 90 000 oz of gold at a head grade of 12.2 to 13.4 g/t Au (Wesdome Gold Mines Ltd., news release, January 15, 2024). Gold production data from the Eagle River Mine between 2020 and 2024 are shown in Table 5.

Table 4. Eagle River Mine Proven and Probable mineral reserves and Inferred, Indicated and Measured mineral resources as of December 31, 2022 (Wesdome Gold Mines Ltd., news release, March 13, 2023).

Mine	Category	Tonnes ('000s)	Grade (g/t gold)	Contained Au (oz)
Eagle River	Proven	148	14.5	69 000
	Probable	614	16.8	331 000
	Proven + Probable	762	16.3	400 000
	Measured	176 000	14.2	80 000
	Indicated	290 000	11.3	106 000
	Measured + Indicated	466 000	12.4	186 000
	Inferred	586 000	14.9	281 000

Table 5. Gold production data from the Eagle River mine between 2020 and 2024 (Wesdome Gold Mines Ltd., news release, January 15, 2024).

	2023	2022	2021	2020
Ore milled (tonnes)	228 777	246 887	228 759	196 441
Head grade (g/t Au)	12.4	10.7	13.8	14.2
Production (oz Au)	87 799	82 002	99 120	87 560

The Eagle River underground mine has been in production since 1996, where operations are currently accessed by a ramp system, and the primary mining method is long-hole stoping, with a typical sublevel interval of 15 m between levels. The mine is associated with steep, northerly dipping sequences of tholeiitic basalts and calc-alkalic andesites with minor clastic sedimentary rocks, including chert-magnetite-bearing iron formation. Gold is primarily hosted in quartz veins emplaced along the regional deformation zones that follow a volcano-sedimentary contact along the south limb of a fold system (*see* Maity and Adrianwalla 2023).

Exploration at the Eagle River underground mine in 2023 included possible extension of Eagle River Mine to the west along the strike-parallel Falcon Zone and to the east down-dip at 300 Zone (Wesdome Gold Mines Ltd., news release, March 13, 2023). Exploration drilling at 300 East Zone down-plunge returned 40.7 g/t Au over 6 m core (true width), 42.3 g/t Au cut over 1.7 m (true width), and 51.7 g/t Au cut over 1.6 m (true width) (Wesdome Gold Mines Ltd., news release, June 14, 2023). Surface drilling returned high-grade 64.4 g/t Au over 0.4 m core and 7.0 g/t Au over 2.6 m core from the west side of mine diorite in the metavolcanic rocks, whereas underground drilling indicated mineralization down-plunge with 33.4 g/t Au over 0.4 m core (Wesdome Gold Mines Ltd., news release, October 23, 2023). Additional drilling results from the west side of mine diorite expanded the newly discovered Falcon 311

Zone, where drilling intersections returned 15.1 g/t Au over 8.7 m core, 9.5 g/t Au over 7.1 m core, and 18.4 g/t Au over 1.6 m core, whereas drilling east of mine diorite returned 122.5 g/t Au over 1.7 m core, 32.1 g/t Au over 1.7 m core, and 29.2 g/t Au over 1.7 m core (Wesdome Gold Mines Ltd., news release, December 11, 2023).

Magino Mine – Argonaut Gold

The Magino Project consists of 18 patented mining claims, 61 leased mining claims and 14 unpatented mining claims covering an area of 2213 ha in Finan Township, approximately 40 km northeast of the town of Wawa (*see* Figure 3). The project is located within the Michipicoten greenstone belt of the Archean Superior Province, adjacent to Alamos Gold Inc.'s Island Gold project, and is accessible via Chemin Goudreau Road, which connects to Highway 519 and Trans-Canada Highway 17 (Marek et al. 2022). The mining project moved from construction to production phase, with its first throughput in June 2023 and first commercial sale in November 2023 (Argonaut Gold, news release, November 2, 2023; Figure 5).

The property is underlain by intermediate to felsic meta-pyroclastic rocks capped by pyrite-bearing ironstone and pillowed, massive to schistose, mafic to intermediate metavolcanic rocks intercalated with minor mafic pyroclastic rocks, and intruded by several medium- to coarse-grained quartz diorite sills and dikes. An intrusion-related gold deposit on the property is primarily hosted by the Webb Lake stock, a felsic intrusion that dips steeply to the north, and strikes east to northeast (Marek et al. 2022).

In 2023, the company announced an increase in Mineral Resources for the Magino Project, resulting in a combined increase of 14% of Mineral Resources (Argonaut Gold, news release, March 30, 2023). Production was scheduled to start in the second half of May in 2023 with an updated resource estimate of 4.6 million oz of Measured and Indicated resources, 0.9 million oz of Inferred Resources, including 2.4 million oz in the Reserves category (Argonaut Gold, news release, May 5, 2023). In June, the first pre-commercial gold production of 3295 oz and sale of 72 oz were reported (Argonaut Gold, news release, August 11, 2023; *see* Figure 5). Pre-commercial production in Q3 was 10 693 gold equivalent ounces (GEOs) from the Magino Mine followed by commercial production beginning November 1, 2023. (Argonaut Gold, news release, November 2, 2023). Since the beginning of Q4, the Magino Mine produced 9200 tonnes/day throughput, which was lower than expected as a result of a delay in plant ramp up for 20 days in Q3 and a total production of 10 661 oz Au and sell of 11 454 oz Au in Q3 (Argonaut Gold, news release, November 14, 2023). The reserve development drilling of 63 000 m started on August 1, 2023, towards increasing the Proven and Probable reserves by between 500 000 to 1.0 million oz Au and was set to be completed in mid-2024 (Argonaut Gold, news release, November 14, 2023). The Magino Mine has increased gold production close to the rate shown in the updated 2022 National Instrument (NI) 43-101 report, as a result of implementation of key technical and operational improvements (Argonaut Gold, news release, December 18, 2023). The total gold production in 2023 is given in Tables 2 and 6.

Table 6. Summary of production results in 2023 at Magino Mine (Argonaut Gold, news release, January 18, 2024).

2023 Production					
Production	Q1	Q2	Q3	Q4	Total
GEOs	0	3296	10 639	22 112	36 101

Abbreviations: GEOs, gold equivalent ounces.

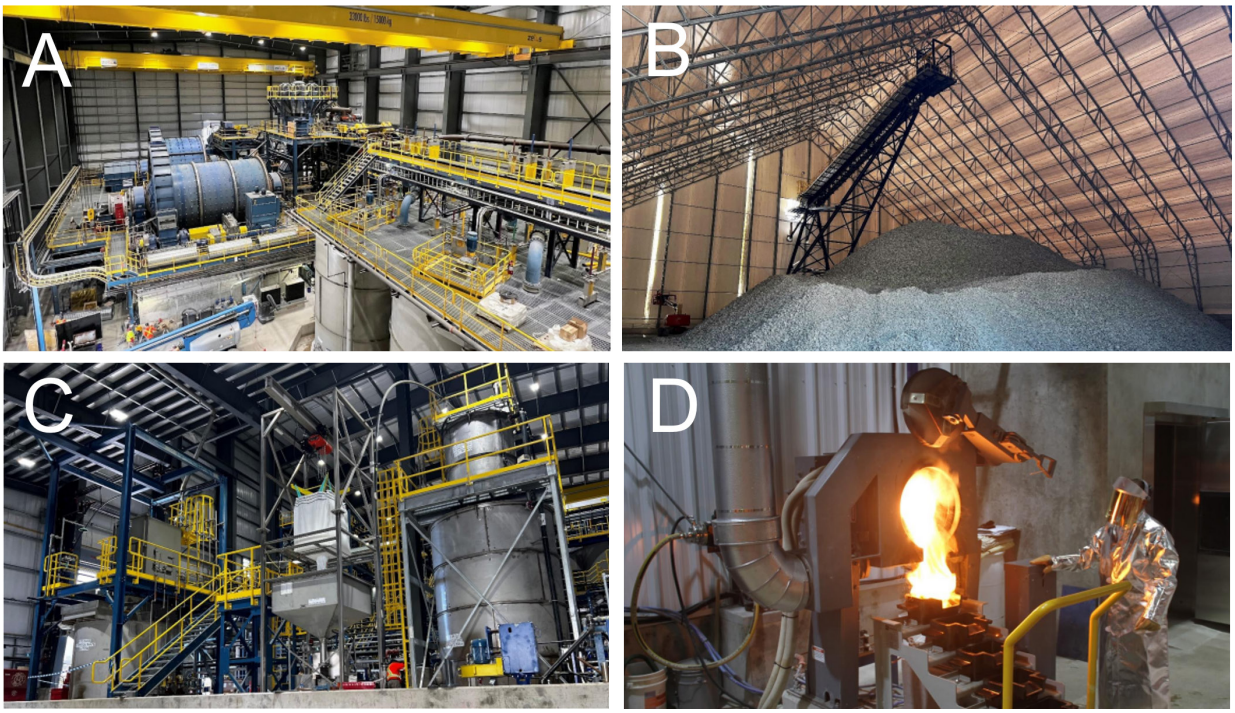

Figure 5. Magino Mine. **A)** Processing plant, **B)** crushed ore stockpile, **C)** reagent addition in-progress, and **D)** first produced gold pour (*from* Argonaut Gold, news releases, June 1 and 15, 2023).

Historical Mineral Production in the Sault Ste. Marie District

Historical mineral production of iron, gold, copper, lead, silver and zinc in the Sault Ste. Marie District is presented below in Tables 7, 8 and 9.

Table 7. Historical iron production in the Wawa area of the Sault Ste. Marie Mining District.

Mine - Owner	Township	Years of Production	Production (tons)
Old Stobie Mine – Mr. James Stobie Ltd.	Aberdeen Additional	1874–1878	No data
Breitung Mine – Breitung Iron Co.	Deroche	1900–1905	2000–3000
Williams Iron Mines Co. Ltd. – Williams Iron Mines Co. Ltd.	Hodgins	1902–1905	500
Rand Consolidated Mines Ltd. – Algoma Steel Corp. Ltd.	Aguonie	1918–1919	3000
Morrison No.4 – Algoma Steel Corp. Ltd.	Aguonie	1958–1959	67 000
Goudreau “C” – Algoma Steel Corp. Ltd.	Aguonie	1962–1963	375 000
Bear Claim – Algoma Steel Corp. Ltd.	Aguonie	1959–1961	350 000
Goudreau “A” – Algoma Steel Corp. Ltd.	Aguonie	1960–1961	250 000
Ruth and Lucy Mine – Algoma Steel Corp. Ltd.	Esquega	1967–1970	1 219 989
Josephine Mine – Michipicoten Iron Mines Ltd.	Corbiere	1945–1946	61 637
Old Helen – Algoma Steel Corp. Ltd.	Chabanel	1900–1918	52 000 (pyrite) + 2 700 000
Helen Mines, Alexander – Algoma Steel Corp. Ltd.	Chabanel	1939–1969	20 076 963
Victoria Open Pit – Algoma Steel Corp. Ltd.	Chabanel	1945–1960	10 202 089
George W. MacLeod Mine – Algoma Steel Corp. Ltd.	Chabanel	1960–1998	59 662 710
Sir James Mine (Eleanor Range) – Algoma Steel Corp. Ltd.	Chabanel	1958–1967	72 151 285
Magpie Mine – Algoma Steel Mine Corp. Ltd.	LeClaire	1913–1921	1 212 866

Table 8. Historical gold production in the Wawa area of the Sault Ste. Marie District to the end of 2023.

Mine	Township or Area	Years of Production	Tons Milled	Production (oz. gold)	Grade (oz/ton)
Alden–Goudreau	Cowie	1937, 1940, 1943, 1945	13 479	3220	0.24
Centennial	Naveau	1939–1940	8612	610	0.07
Cline	Jacobson	1938–1940, 1947–1948	331 842	63 328	0.19
Darwin/Grace	McMurray	1902–1903, 1907–1908, 1910, 1923, 1925, 1930, 1935, 1937, 1940, 1943–1944	45 528	15 191	0.33
Deep Lake	McMurray	1936–1938, 1943	2790	1633	0.59
Eagle River	Point Isacor	1995–2023	5 112 523	1 651 013	0.32
Edwards	Jacobson	1938	1537	485	0.32
		1997–2002	389 550	139 692	0.36
Holdsworth prospect	Corbiere	1933	60	10	0.17
Island Gold	Finan	2007–2023	5 053 789	1 505 186	0.30
Kremzar	Finan	1988–1990	392 858	37 678	0.10
Magino/Algoma Summit	Finan	1930–1940, 1988–1992, 2023	>2 274 679	149 329	0.07
Magnacon	Mishibishu Lake	1989–1990	165 000	15 356	0.09
Minto (includes Jubilee and Cooper)	McMurray	1929–1942	184 600	37 678	0.20
Mishi	Mishibishu Lake	2002–2007, 2012–2022	935 096	67 006	0.07
Murphy/Algold/Amherst	Abotossaway	1926–1932, 1936–1938, 1940	23 211	2450	0.11
Norwalk/Manxman	Naveau	1904, 1910	820	60	0.07
Parkhill	McMurray	1902, 1929, 1930–1938, 1940–1944	125 778	54 301	0.43
Ranson	Rabazo	1939	774	156	0.20
Renabie	Leeson	1947–1970, 1981–1991	5 583 895	1 100 000	0.20
Smith/Van Sickle	McMurray	1935–1936	9228	536	0.06
Stanley	McMurray	1936	1963	84	0.04
Surluga	McMurray	1968–1969, 1988–1989	87 460	8898	0.10
		Total	20 498 185	4 598 600	0.20

(Resident Geologist Program Files, Sault Ste. Marie District, Sault Ste. Marie)

Table 9. Historical copper, lead, silver and zinc production in the Sault Ste. Marie District.

Mine	Township	Years of Production	Ore Milled (tons)	Grade
Copper Corp Mine – C Zone	Ryan	1965–1972	1 021 358	1.16% Cu, 0.22 oz/t Ag, 0.0002 oz/t Au
Tribag Mine (Breton Breccia)	Nicolet	1972	190 949	1.22% Cu
Jardun Mine	Jarvis	1954–1957	145 029	3.43% Pb, 2.44% Zn, 0.02% Cu, 1.5 oz/t Ag, 0.0007 oz/t Au
Bruce Mines	Plummer Additional	1854–1876, 1905–1908	300 000	4.5%
Pater Mine	Spragge	1960–1968	2 000 621	1.76% Cu

(Resident Geologist Program Files, Sault Ste. Marie District, Sault Ste. Marie)

EXPLORATION ACTIVITY

Introduction

In 2023, the Sault Ste. Marie District hosted a total of 7 exploration programs. Most activities in the District focussed on exploration of orogenic gold, volcanogenic massive sulphide (VMS) systems, and magmatic-hydrothermal breccia-hosted copper-molybdenum, and intrusive-related gold-silver-copper-molybdenum systems that mainly occur in the Michipicoten, Mishibishu and Batchawana greenstone belts. A summary of exploration activities in the District is reported in Table 10 and Figure 6, and is described in the next section.

Table 10. Exploration activity in the Sault Ste. Marie District in 2023. Location of properties shown on Figure 6.

Abbreviations

AEM ..... Airborne electromagnetic survey	IP .....Induced polarization
AM ..... Airborne magnetic survey	MMI..... Mobile Metal Ion™ soil sampling survey
ASD ..... Assay data	MRE ..... Mineral Resource Estimate (NI 43-101)
CC ..... Channel cutting	NR ..... News release
DD ..... Diamond drilling	Other ..... Other study
GL ..... Geological survey	Pr ..... Prospecting

Company **Project / *Property Name***	**Township or Area** ***(Commodity)***	**Exploration Activity**
Angus Gold/ IAMGOLD *Golden Sky Project*	Mishibishu Lake *(gold)*	GL, DD, CC, NR, other
Bold Ventures Inc. *Farwell Project*	Pukaskwa River Area (*gold, battery metals*)	AEM, AM, GL, Pr, NR
Copper Road Resources *Coppercorp - Glenrock Project*	Ryan, Palmer, Kincaid, Nicolet (gold, copper, silver, molybdenum, tungsten, rhenium)	GL, DD, ASD, MMI, NR, other
Kingsview Minerals Wawa Gold Properties *Echum and Hubcap Projects*	Bruyere, Dolson, Echum, Lendrum, McMurray, Rabazo, Naveau (*gold*)	GL, ASD, IP, AEM, NR
Red Pine Exploration Inc. *Wawa Gold Project*	McMurray *(gold)*	DD, GL, ASD, NR, other

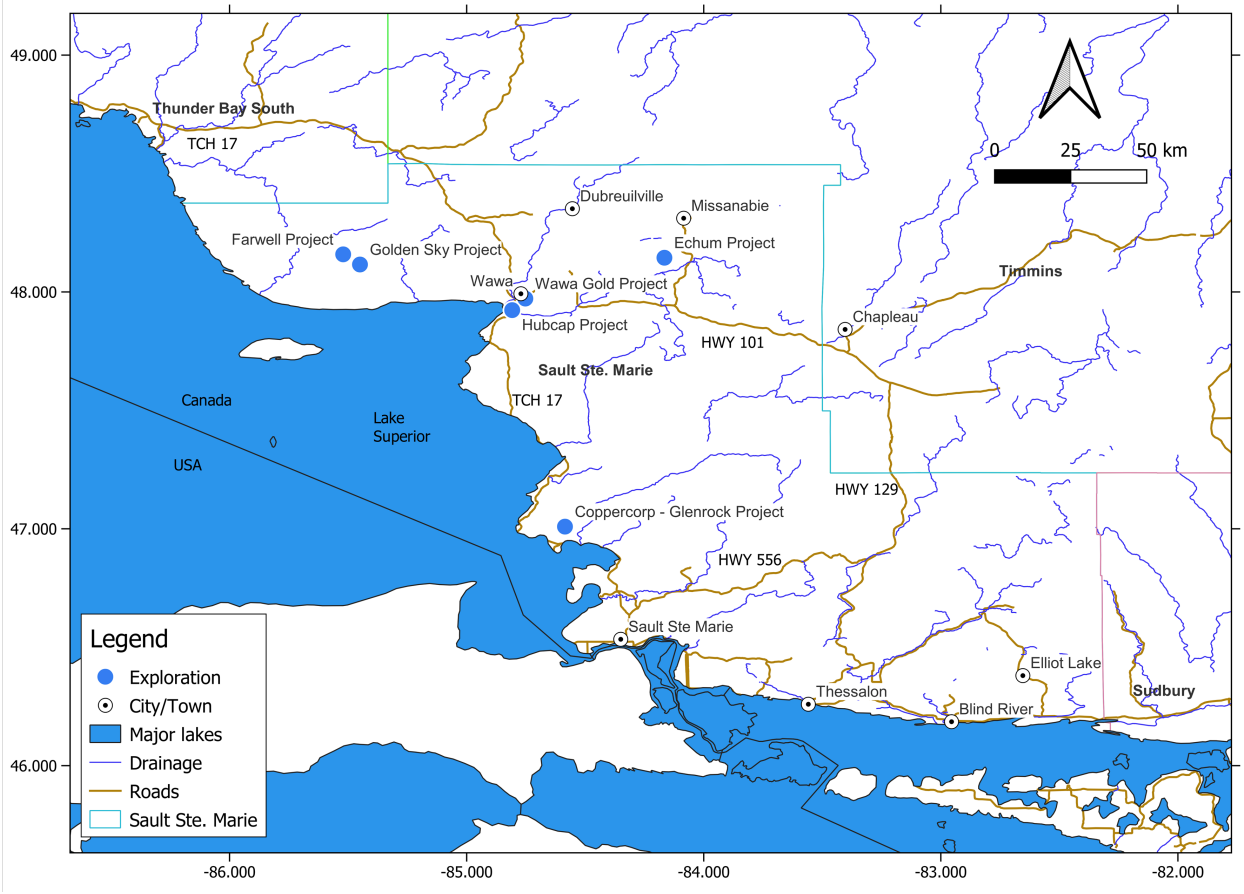

Figure 6. Map showing active exploration projects within Sault Ste. Marie District (properties listed in Table 11).

There were 7 active Exploration Plans (Table 11) and 55 Exploration Permits (Table 12) received in the Sault Ste. Marie District in 2023.

Table 11. Exploration plans in the Sault Ste. Marie District in 2023.

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PL-23-000059	Angus Gold Inc.	Golden Sky	Mishibishu Lake Area, St. Germain
PL-22-000121	Golden Goliath Resources Ltd.	Wish Ore	Palmer, Wishart
PL-22-000064	Angus Gold Inc.	Golden Sky Project	Mishibishu Lake Area, Point Isacor Area
PL-22-000003	Angus Gold Inc.	Golden Sky Project	Mishibishu Lake Area
PL-22-000023	Stephen Skjonsby	South Wawa Property	Rabazo
PL-22-000026	Stephen Skjonsby	Chabanel Property	Bailloquet, Chabanel
PL-22-000010	Golden Goliath Resources Ltd.	Wish Ore	Palmer, Wishart

Table 12. Exploration permits in the Sault Ste. Marie District in 2023.

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PL-23-000059	Angus Gold Inc.	Golden Sky	Mishibishu Lake Area, St. Germain
PR-23-000198	Precambrian Ventures Ltd.	Pecors Gaiashk Drilling	Gaiashk, Joubin
PR-23-000240	Rich Copper Exploration Corp.	Rapid River	Rioux
PR-23-000265	Angus Gold Inc.	Golden Sky	Mishibishu Lake Area, St. Germain
PR-23-000126	2663200 Ontario Inc.	Island Gold Regional Exploration	Jacobson
PR-23-000132	Alamos Gold Inc.	Island Gold Regional Exploration	Jacobson
PR-23-000128	Trillium Mining Corp.	Island Gold Regional Exploration	Jacobson
PR-23-000129	Trillium Mining Corp.	Island Gold Regional Exploration	Bird, Jacobson
PR-23-000130	Trillium Mining Corp..	Island Gold Regional Exploration	Finan, Jacobson
PR-23-000131	Alamos Gold Inc.	Island Gold Regional Exploration	Dunphy, Finan
PR-23-000004	Copper Road Resources Inc.	Copper Creek	Ryan
PR-23-000005	Copper Road Resources Inc.	Orion	Ryan
PR-23-000006	Copper Road Resources Inc.	Gimlet Lake	Palmer, Ryan
PR-23-000007	Copper Road Resources Inc.	Jogran-Richards	Palmer, Ryan
PR-23-000008	Copper Road Resources Inc.	Brant-Spider	Nicolet, Palmer
PR-22-000256	Talisker Gold Corp.	Doyle	Runnalls
PR-23-000009	Copper Road Resources Inc.	Mt. Breccia	Nicolet, Palmer
PR-23-000010	Copper Road Resources Inc.	Tribag	Nicolet, Norberg
PR-22-000263	Manitou Gold Inc.	Goudreau Project	Acton, Amik, Brackin, Bruyere, Challener, Glasgow, Leeson, Meath, Rennie, Riggs, West
PR-23-000112	Red Pine Exploration Inc.	Wawa Gold Project - West	McMurray
PR-23-000046	Jean Gaudreau	Abigo Property	Abigo
PR-22-000199	First Minerals Mining Limited	Missanabie Project	Meath, West
PR-21-000207	Alamos Gold Inc.	Island Gold Mine – Regional Exploration	Finan, Jacobson
PR-22-000033	Power One Resources Corp.	Serpent River–Pecors Anomaly	Gaiashk, Joubin
PR-22-000099	Red Pine Exploration Inc.	Wawa Gold Project East	McMurray, Naveau
PR-22-000258	Wesdome Gold Mines Ltd.	Hilltop	Point Isacor Area
PR-22-000259	Wesdome Gold Mines Ltd.	Fork Vein	Point Isacor Area
PR-22-000260	Wesdome Gold Mines Ltd.	Falcon Creek	Point Isacor Area
PR-22-000299	Angus Gold Inc.	GoldenSky	Mishibishu Lake Area, Point Isacor Area
PR-21-000097	Prodigy Gold Inc.	Highland South	Abotossaway
PR-22-000094	Talisker Gold Corp.	Buck Lake	Lunkie
PR-21-000070	Manitou Gold Inc.	Goudreau Project	Bird, Bruyere, Glasgow, Jacobson, Meath, Rennie, Riggs, Stover, West
PR-21-000319	Copper Road Resources Inc.	Copper Road Project	Nicolet
PR-21-000184	Kingsview Minerals Ltd.	Echum North	Bruyere, Dolson
PR-21-000185	Kingsview Minerals Ltd.	Echum South	Dolson
PR-21-000186	Kingsview Minerals Ltd.	Echum East	Echum
PR-21-000149	Angus Gold Inc.	Golden Sky Project	Mishibishu Lake Area
PR-21-000206	Trillium Mining Corp.	The Trillium Gold Project	Aguonie, Bird, Finan, Jacobson
PR-21-000255	Rich Copper Exploration Corp.	Dobie Lake Northern Zones	Albanel
PR-21-000322	Copper Road Resources Inc.	Copper Road Project	Nicolet, Norberg
PR-22-000034	Darien Aggregates Inc.	Nipissing Diabase	Long
PR-21-000150	Angus Gold Inc.	Golden Sky Project	Mishibishu Lake Area

Plan #	Claim Holder/Proponent	Project Name	Township/Area
PR-21-000080	Transition Metals Corp.	Island Copper	Aweres
PR-21-000099	Lester Hopkins	Drew Creek Exploration	Brule
PR-21-000092	Prodigy Gold Inc.	Rand 2	Abotossaway, Aguonie
PR-21-000093	Prodigy Gold Inc.	Selkirk Lake	Abotossaway
PR-21-000233	Rich Copper Exploration Corp.	Dobie Lake Canamiska Zone	Albanel
PR-21-000037	John Ternowesky	Farwell Gold and Base Metals	Abbie Lake Area, Pukaskwa River Area
PR-21-000091	Prodigy Gold Inc.	Aguonie	Aguonie

A total of 26 assessment files were catalogued by the District Geologist's office in 2023 (Table 13), and 672 donated files were scanned and indexed to the Ontario Assessment File Database on GeologyOntario's OGSEarth webpage (Table 14). All reports in 2023 were for work conducted during 2023 or earlier.

Table 13. Assessment files received in the Sault Ste. Marie District in 2023.

Abbreviations

ABCON.....Aboriginal consultation
ACOMP .....Airborne geophysics compilation and interpretation
AEM..... Airborne electromagnetic survey
AGRAD ..... Airborne gravity gradiometric survey
AMAG .....Airborne magnetic survey
ASSAY .....Assaying and analysis
AVLF .....Airborne electromagnetic very low frequency survey
BULK.....Bulk sampling
CHNL.....Channel sampling
DHRSMP ..... Drill core resampling
GCBIO ..... Geobotanical and biogeochemical survey
GCCOMP.....Compilation and interpretation – geochemistry
GCHEM ..... Geochemical
GCOMP ..... Compilation and interpretation – ground geophysics
GEOL.....Geological survey / mapping
IP .....Induced polarization survey
LIDAR ..... Light detection and ranging survey
MAG.....Magnetic / magnetometer Survey
MCOMP ..... Miscellaneous compilation and interpretation
PCOMP.....Compilation and interpretation – diamond drilling
PDRILL ..... Diamond drilling
PHOTO..... Photo and remote imagery interpretations
PROSP .....Prospecting by licence holder
PSTRIP .....Overburden stripping
PTRNCH ..... Pitting and trenching
RECON..... Regional or reconnaissance ground exploration
ROCK.....Rock sampling
SOIL .....Soil sampling
VLF ..... Electromagnetic very low frequency

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved ($)	Other File Identifier(s)[1]
20000020571	Chabanel, Esquega	12551110 Canada Inc.	Ghost Lake Property	2021	PHOTO, PROSP	6826	4902, 84542
20000020570	Pukaskwa River Area	Bold Ventures Inc.	The Farwell Project	2021	ASSAY, PROSP, ROCK	70 283	4973, 85407
20000020589	Finan	Prodigy Gold Inc.	Kremzar Property	2022	GCOMP, VLF	7680	5008, 86023
20000020580	Meath, Glasgow, Rennie, Stover	Manitou Gold Inc.	Manitou Property	2021	GCOMP, IP	888 759	4970, 85322
20000020590	Meath	First Minerals Exploration Ltd.	Nicholson North Property	2022	ASSAY, PROSP, ROCK	4168	5011, 86075

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved ($)	Other File Identifier(s)[1]
20000020607	Laforme, Dolson, Echum, Keesickquayash	12551110 Canada Inc.	Dalton Mill Claims and Claim #1 and #4	2020–2021	ASSAY, PHOTO, PROSP, ROCK	71 577	5050, 5052, 5053, 5054, 5055, 86720, 86724, 86726, 86730, 86735
20000020629	Aberdeen	Evgeniy Seminenko	Bass Lake (Kirk Gold) Prospect	2022	ASSAY, PROSP, ROCK	1950	5156, 88211
20000020724	Aberdeen Additional, Chesley Additional	Skead Holdings Ltd.	Q3015- Aberdeen Property	2022	PROSP, ROCK	9300	5048, 86675
20000020751	Copenace	Traxxin Resources Inc.	Copenance Nickle Property	2019	ASSAY, PROSP, ROCK	2969	5168, 88513
20000020752	Copenace	Traxxin Resources Inc.	Copenance Nickle Property	2022	ASSAY, PROSP, ROCK	4336	5169, 88514
20000020757	Long	Darien Aggregates Inc.	Nipissing Diabase Project	2022	GEOL, PDRILL	87 585	5187, 88754
20000020759	Maeck	James Ralph	Seabrook Lake	2021	ASSAY, PROSP, ROCK	2930	5191, 88801
20000020769	Jessiman	James Ralph	JR Uranium Property	2020–2022	ASSAY, PROSP, ROCK	2385	5241, 89735
20000020722	Aberdeen	Evgeniy Seminenko	Claim #612383	2022	BULK	1220	5042, 86496
20000020745	Meath, Glasgow, Rennie, Stover	Manitou Gold Inc.	Goudreau Project	2020–2021	GCCOMP, GCHEM, SOIL	1 409 100	5139, 87780
20000020794	Esten	Rich Copper Exploration Corp.	Christy Lake Property	2021–2022	GCOMP, MAG, VLF	23 537	5321, 91241, Esten-0021
20000020783	Echum	Kingsview Minerals Ltd.	Echum Gold Property	2020	ASSAY, PROSP, ROCK	8648	5286, 90621
20000020910	Point Isacor Area, Pilot Harbour Area	Wesdome Gold Mines Ltd.	Eagle River Mine	2021	ASSAY, PCOMP, PDRILL	8 253 589	5582, 5583, 5617, 94518, 94522, 95080
20000020912	Rabazo	Frank Racicot	Rabazo Property	2022	ASSAY, PROSP, ROCK	2953	5598, 94663
20000020923	Chabanel	2060014 Ontario Inc.	Mink Lake	2021	PROSP, ROCK	4860	5632, 92570
20000020919	Stover, Rennie	Manitou Gold Inc.	Goudreau Project	2020–2021	ASSAY, PCOMP, PDRILL	2 228 563	5283, 90545
20000020981	Laforme, Echum	12551110 Canada Inc.	Dalton Mill Claims	2023	DATA	13082	5711, 96577
20000021006	McMurray	Red Pine Exploration Inc.	Wawa Gold Project	2020	ASSAY, CHNL, GEOL, IP, PCOMP, PDRILL, PTRNCH, ROCK	998 172	5203, 89078
20000021005	Abbie Lake Area	Talisker Gold Corp.	Paint Lake Property	2022	GCOMP, VLF	39 879	5195, 88834
20000021018	Kamichisitit	Mark Wellstead	Copper Prince Property	2022	ASSAY, PROSP, ROCK	9536	5263, 90305
20000021061	Bouck, Buckles	Radio Fuels Resources Corp.	Quirk Lake	2022	ASSAY, GEOL, ROCK	16 568	5218, 89256

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved ($)	Other File Identifier(s)[1]
20000021066	Montgomery	Rich Copper Exploration Corp.	Potomac River	2022	GCOMP, MAG, VLF	23 280	5251, 90048
20000021063	Maeck	James Ralph	Bo Lake Property	2019–2022	ASSAY, PROSP, ROCK	6620	5231, 89528
20000021081	Copenace, Echum	Fulcrum Metals Canada Ltd.	Dog Lake Property	2022	ASSAY, PROSP, ROCK	46 083	5679, 96166
20000021077	Ryan	Thomas O'Connor	Claim #334767	2022	ASSAY, PROSP, ROCK	6274	5314, 91101
20000021100	Vankoughnet, Tupper	Don Fudge	Tupper Property	2022	ASSAY, PROSP, ROCK	8125	5509, 93890
20000021115	Gaudette	Rio Tinto Exploration Canada Inc.	Fitzpatrick Property	2022	ACOMP, AMAG, GEOL, PHOTO	21 900	5823, 98790
20000021114	Runnalls, McAughey, Raaflaub	Talisker Gold Corp.	Doyle Property	2022	LIDAR, PHOTO	45 250	5819, 98629
20000021147	Mishibishu Lake Area, Abbie Lake Area, David Lakes Area, Groseilliers, Legarde Additional, Point Isacor Area, St. Germain	Angus Gold Inc.	Mishibishu Lake	2021–2023	GCBIO, GCCOMP	705 646	5771, 5772, 5773, 5774, 97559, 97569, 97577, 97581
20000021165	Gunterman	Skead Holdings Ltd.	Gunterman Project	2023	MAG	8975	5880, 99538
20000021225	Lunkie	Advanced United Holdings Inc., Talisker Gold Corp.	Buck Lake Property	2022	ASSAY, PCOMP, PDRILL	551 643	100272, 5932
20000021272	Hughes	Skead Holdings Ltd.	Hughes Township Property	2021–2023	ASSAY, SOIL	7880	100879, 5989
20000021288	Gould	George Lucuik	Gould Property	2022	ASSAY, PROSP, ROCK	1952	100775, 5983
20000021328	Mishibishu Lake Area	Angus Gold Inc.	Golden Sky Project	2021–2023	ASSAY, PCOMP, PDRILL	1 876 179	101591, 6064
20000021361	Joubin, Gaiashk	Bear Creek Gold Ltd.	Gaiashk Property	2021	VLF	10 085	100786, 101296, 5984, 6030
20000021387	Naveau	Kingsview Minerals Ltd.	East Hubcap Property	2020–2023	ASSAY, PROSP, RECON, ROCK	15 884	103112, 6128
20000021449	Gaiashk	Bear Creek Gold Ltd.	Gaiashk Joubin Claims	2021	AVLF	8320	102083, 6084
20000021564	Rioux	Rich Copper Exploration Corp.	Rapid River Property	2022	ASSAY, LIDAR, PROSP, ROCK	38 353	107906, 6304

[1]*Other file identifiers may be work report numbers or MLAS transaction identification (ID) numbers.*

Table 14. List of scanned and indexed donated files in the Sault Ste. Marie District in 2023. Files that occur in multiple townships have been included in the total for each township.

No.	Township	Number of Files	No.	Township	Number of Files	No.	Township	Number of Files
1	Abbie Lake	4	45	Desbiens	3	89	Leeson	38
2	Aberdeen	3	46	Dolson	3	90	Lendrum	14
3	Aberdeen Add'l	7	47	Dumas	2	91	Lewis	2
4	Abotossaway	31	48	Duncan	1	92	Ley	2
5	Aguonie	13	49	Dunphy	2	93	Long	8
6	Alanen	1	50	Eaket	2	94	Lunkie	1
7	Alarie	1	51	Esquega	30	95	MacDonald	3
8	Albanel	3	52	Finan	25	96	Maeck	2
9	Allouez	1	53	Franchere	3	97	McGowan	1
10	Anderson	1	54	Gaiashk	2	98	McIlveen	1
11	Andre	1	55	Gapp	1	99	McMahon	1
12	Asselin	1	56	Gaunt	1	100	McMurray	8
13	Atkinson	1	57	Giles	2	101	Meath	3
14	Awenge	2	58	Gladstone	1	102	Moen	3
15	Aweres	4	59	Glasgow	5	103	Naveau	7
16	Baillolquet	4	60	Goodwillie	2	104	Nebonaionquet	3
17	Beange	8	61	Gould	4	105	Neill	5
18	Bird	6	62	Greenwood	3	106	Nicolet	43
19	Bolger	3	63	Gunterman	13	107	Olsen	2
20	Bouck	11	64	Havilland	1	108	Otter	1
21	Brackin	10	65	Hodgins	3	109	Peever	9
22	Bridgland	2	66	Home	1	110	Pilot Harbour	5
23	Bright	2	67	Homer	3	111	Plummer, Plummer Add'l	20
24	Brimacombe	1	68	Hughes	3	112	Poulin	3
25	Bruyere	4	69	Indian Reserve	9	113	Rabazo	16
26	Buckles	5	70	Jacobson	23	114	Rennie	15
27	Camp Lake	6	71	Jarvis	2	115	Riggs	6
28	Casson	2	72	Jessiman	2	116	Rix	5
29	Chabanel	45	73	Jocelyn	4	117	Ryan	7
30	Chapais	1	74	Jogues	3	118	Sagard	3
31	Chenard	1	75	Johnson	7	119	Sampson	1
32	Chesley Add'l	1	76	Joubin	8	120	Schembri	5
33	Cobden	1	77	Kamichisitit	6	121	Slater	2
34	Corbiere	27	78	Keating	4	122	St. Germain	2
35	Cowie	11	79	Kehoe	3	123	Stover	7
36	Dablon	2	80	Killins	6	124	Tilston	1
37	Dagle	2	81	Kincaid	7	125	Varley	3
38	Dahl	1	82	Korah	3	126	Vankoughnet	9
39	D'Ambrossio	2	83	Labelle	3	127	Waswa	1
40	Daumont	2	84	Labonte	4	128	Waswia	1
41	David Lakes	14	85	Laird	1	129	Wells	1
42	Davieaux	8	86	Lalibert	6	130	West	2
43	Debassige	5	87	Lang	2	131	Wishart	4
44	Deroche	16	88	Larson	2	132	Wlasy	11
							Total	785

Abbreviation: Add'l = Additional.

Exploration Projects

MICHIPICOTEN GREENSTONE BELT

Red Pine Exploration Inc. – Wawa Gold Project

The Wawa Gold Project in McMurray Township, approximately 2 km southeast of the town of Wawa (*see* Figure 6), consists of 164 patented mining claims and 371 unpatented mining claims that cover an area of 6800 ha, and is accessible via a gravel road that connects to Highway 101 (Thomas 2019). The property hosts 2 National Instrument (NI) 43-101–compliant resources, Surluga and Minto South, which together contain an Indicated Resource estimate of 1 307 000 tonnes with an Indicated gold resource of 230 000 oz Au grading 5.47 g/t and 2 716 000 tonnes in an Inferred resource of 471 000 oz gold grading 5.39 g/t Au, with 90% contained in the upper 300 m (Thomas, Simper and Haggarty 2021).

The geology of the property consists of greenschist-facies felsic to intermediate metavolcanic rocks that are intruded by the Jubilee stock, a mafic to felsic calc-alkalic intrusion formed of porphyritic and/or phaneritic rocks (Thomas, Simper and Haggarty 2021). The Surluga deposit is characterized by either pyrite-dominant quartz veins with accessory to absent pyrrhotite and arsenopyrite, minor to absent chalcopyrite, native gold coating iron sulphides (occasionally as inclusions or in solid solution with pyrite), sphalerite and galena, or arsenopyrite-dominant relicts of quartz veins that are variably preserved (Wehrle 2020). Gold mineralization in the Minto South deposit is associated with quartz-tourmaline veins with variable amount of pyrite, accessory pyrrhotite, minor to trace chalcopyrite, native gold, and minor gold-bismuth alloys, native bismuth and bismuthinite (Wehrle 2020). The first-generation (D_1) gold-pyrite-bearing deformation event was the principal gold-mineralization event in the Wawa gold corridor and the other gold-bearing assemblages, such as gold + second-generation (D_2) pyrite and gold + bismuth-tellurium phases + chalcopyrite, were mainly formed during secondary mobilization of the primary gold enrichment during subsequent tectonothermal events (Wehrle, Montreuil et al. 2023; Wehrle, Samson et al. 2023).

In early 2023, the company reported the thickest high-grade intersection in the hanging wall of Jubilee shear zone that contained 5.13 g/t Au over 37.47 m including 25.02 g/t Au over 3.41 m (Red Pine Exploration Inc., news release, January 6, 2023). Drilling intersection of 1.65 g/t Au over 29.17 m including 6.64 g/t Au over 5.87 m was reported in the hanging wall of the Surluga deposit, where the Minto B and Jubilee shear zones converge (Red Pine Exploration Inc., news release, February 16, 2023). Drilling in the footwall of the Surluga deposit and below the Jubilee shear zone intersected 5.07 g/t Au over 27.35 m, comparable to Surluga North vein networks, and expanded the resource significantly (Red Pine Exploration Inc., news release, February 23, 2023). Drilling in Minto B shear zone intersected 3.5 g/t Au over 25.15 m and 4.63 g/t Au over 10.80 m, whereas 1.37 g/t Au over 7 m, and 4.41 g/t Au over 4.41 m in Minto C shear zone, which extended the mineralized structure below Jubilee shear zone (Red Pine Exploration Inc., news release, March 28, 2023). Based on the 2023 drilling data, an Exploration Target Range (ETR) for an open pit mine has been evaluated, with 1.2 to 1.6 Moz Au at a grade of 1.8 to 2.0 g/t Au (Red Pine Exploration Inc., news release, March 28, 2023). Further drilling in the hanging wall returned 2.68 g/t Au over 25.22 m and 5.06 g/t Au over 13.28 m from Minto B shear zone; 5.06 g/t Au over 13.28 m in Minto C shear zone; whereas the Old Tom Vein Network in the footwall of Jubilee shear zone returned 7.67 g/t Au over 6 m (Red Pine Exploration Inc., news release, May 11, 2023).

The drilling program for the remainder of 2023 was planned to focus on 20 000 m diamond drilling at high-probability areas, of which 90% was allocated to Pit Constrained Exploration Targets around the Jubilee shear zone (Red Pine Exploration Inc., news release, June 1, 2023; Figure 7). Near-surface mineralization in the footwall of the Jubilee shear zone returned 1.32 g/t Au over 100.99 m including

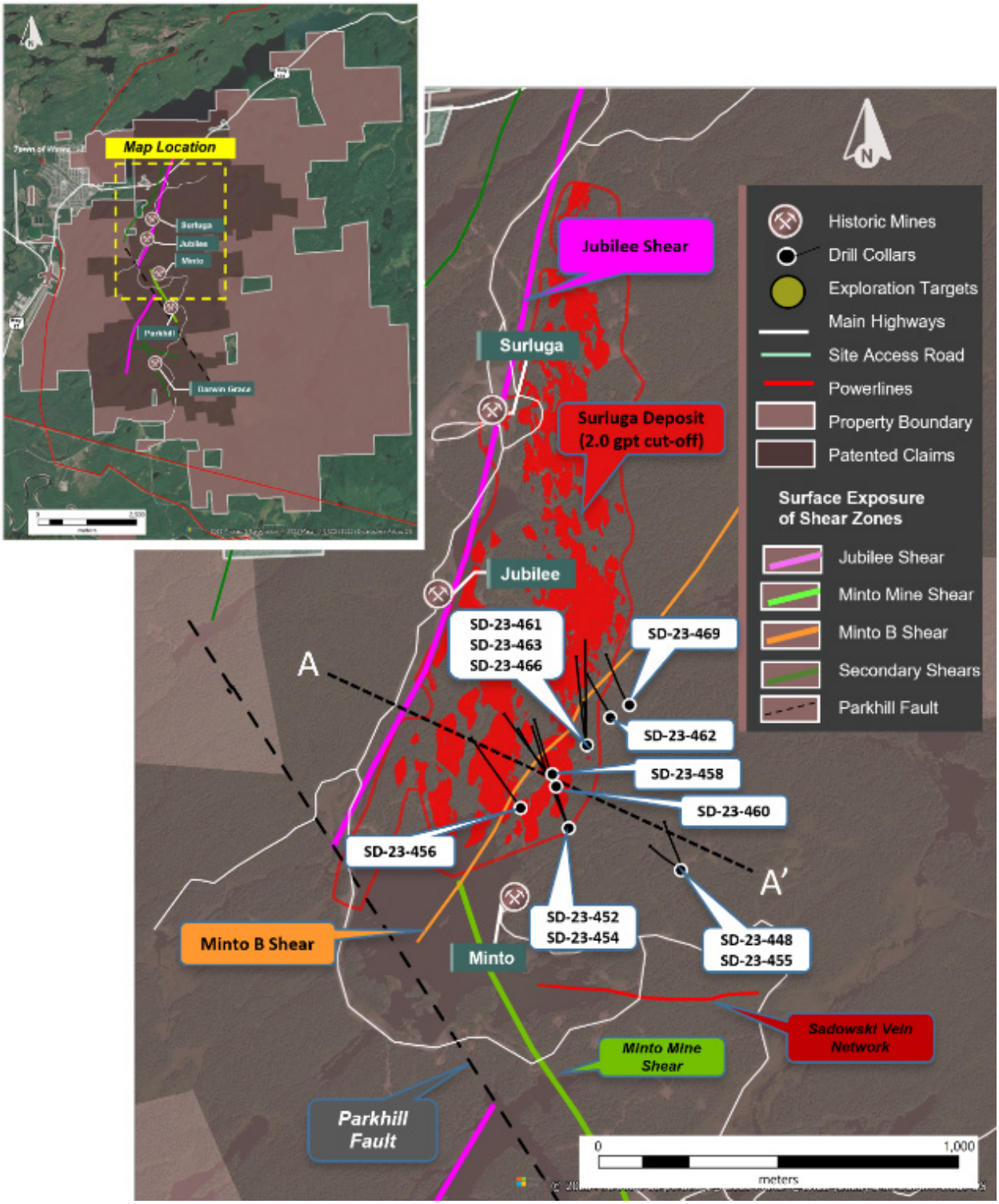

Figure 7. Plan map of 2023 drilling operations in the Wawa Gold Project (*from* Red Pine Exploration Inc., news release, December 18, 2023).

23.29 g/t over 3.52 m (Red Pine Exploration Inc., news release, June 13, 2023). A previously completed transient magnetotelluric (MT) survey on the property was reinterpreted to identify a large intrusive complex, demagnetization zones along structural corridors, intrusion-related gold systems, and the extension of the Jubilee and Hornblende shear zones at depth, greater than 1.5 km (Red Pine Exploration Inc., news release, June 15, 2023). Exploration drilling in the footwall to the west of the Jubilee shear zone returned 6.15 g/t Au over 11.67 m and 1.57 g/t Au over 26.3 m, whereas on the hanging wall side of the Jubilee shear zone, the Sadowski vein network returned 6.86 g/t Au and 6.03 g/t Au over 1.0 m, 2.64 g/t Au over 25.61 m including 34.64 g/t over 1.75 m, and 1.36 g/t over 11 m including 27 g/t over 0.5 m (Red Pine Exploration Inc., news releases, July 11 and August 17, 2023). New results confirmed 10.92 g/t gold over 28.05 m and 6.44 g/t gold over 2.17 m in Minto B shear zone (Red Pine Exploration Inc., news release, September 14, 2023; Figure 8), whereas 5.1 g/t gold over 19.76 m within a broad zone of 1.94 g/t Au over 78.9 m was reported in the Core Shack vein network located to the west of the Jubilee shear zone (Red Pine Exploration Inc., news release, September 21, 2023). Additional drilling results indicated discovery of new high-grade veins in the Jubilee shear zone that contained 8.01 g/t Au over 32.95 m including 171 g/t Au over 1.19 m, 46.9 g/t Au over 1.04 m, 9.57 g/t Au over 10.95 m including 83.71 g/t Au over 1.0 m (Red Pine Exploration Inc., news releases, October 24 and November 15, 2023). The extended mineralization in Minto B shear zone above Jubilee shear zone was further confirmed by drilling intersections of 6.03 g/t Au over 1.24 m within a mineralization halo, and 0.96 g/t Au over 10.29 m and 7.17 g/t Au over 1.02 m in Minto C shear zone (Red Pine Exploration Inc., news releases, October 24 and November 15, 2023). Subsequent drilling indicated 3.8 g/t Au over 36.94 m including 11.01 g/t Au over 5.6 m, results that closed a gap between the existing resources in the Jubilee shear zone (Red Pine Exploration Inc., news release, December 18, 2023).

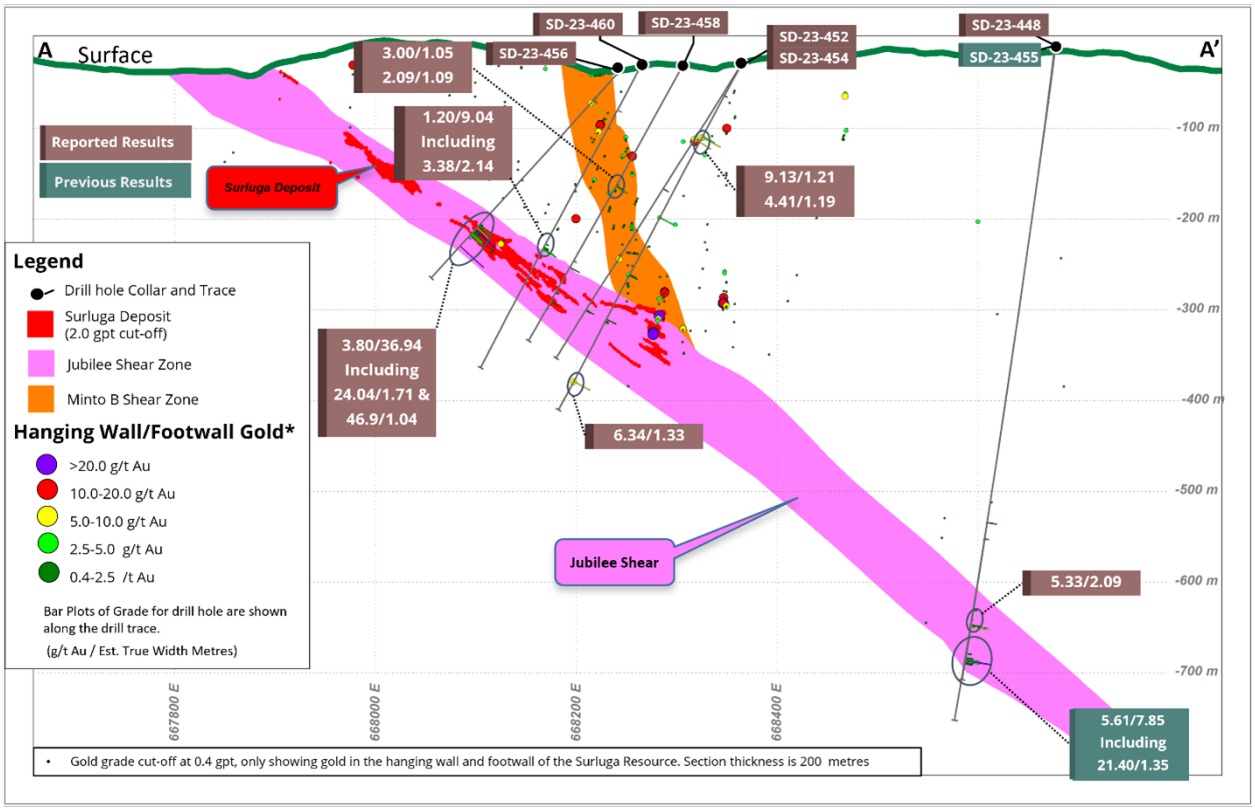

Figure 8. Cross section of Minto B shear zone in the hanging wall of the Surluga deposit (*from* Red Pine Exploration Inc., news release, December 18, 2023).

As of May 1, 2024, Red Pine announced, by a press release, that there were certain inconsistencies discovered in their assay results from the Wawa Gold Project, and as a result, all the assay data publicly released through press releases or in other documents (e.g., NI 43-101 Technical Reports) were withdrawn (Red Pine Exploration Inc., news release, May 1, 2024). Therefore, the results discussed above should not be relied upon in evaluating the mineralization of the project.

Kingsview Minerals – Wawa Gold Properties

The Wawa gold properties, covering 11 854 ha in area, are 100% owned by Kingsview Minerals and consist of the Echum and Hubcap Projects (Kingsview Minerals, news releases, February 24 and April 5, 2022; Figure 9, *see also* Figure 6). The flagship Echum Project is located 50 km northeast of Wawa within Dolson, Bruyere and Echum townships, accessible via Trans-Canada Highway 17, Highways 101 and 651 (*see* Figure 6). All three project areas have historical non-NI-43-101–compliant high-grade gold and silver assays from grab samples and drilling intersects (Kingsview Minerals, news release, February 24, 2022).

The general geology of the Wawa gold properties consists of mafic to intermediate and felsic metavolcanic and metasedimentary rocks and iron formations of the Archean Michipicoten greenstone belt, intruded by late-Archean granitic (*sensu lato*) plutons. The rocks of Michipicoten greenstone belt are polydeformed and metamorphosed to greenschist- and amphibolite-facies conditions (Sage 1994).

In March 2023, Kingsview completed a ground-based IP survey, which was a follow-up on a large conductor target identified in the airborne versatile time domain electromagnetic (VTEM) survey (Kingsview Minerals, news release, October 2021), carried out on 3 priority lines oriented perpendicular to the interpreted orientation of the VTEM conductor of the Smoke critical metal target in the Echum Project (Kingsview Minerals, news release, March 27, 2023; Figures 10, 11 and 12). Multiple priority shallow targets at Smoke were uncovered from the 2021 VTEM and 2023 induced polarization (IP) surveys, and the company performed new drilling focused on testing the targets, which returned assays of 0.07% Cu and 0.21% Zn over 19 m (Kingsview Minerals, news release, July 11, 2023). Surface sampling at the Hubcap Project, located to the south of Red Pine's Wawa Gold Project (*see* Figure 6), returned high Au, Ag and Cu values including 2.14 to 14.50 g/t Au, 34.90 to 62.80 g/t Ag, and 1.83% to 3.16% Cu (Kingsview Minerals, news release, January 31, 2023), followed by a second report including 25.00 to 62.60 g/t Au, 4.40 to 6.10 g/t Ag, and 0.14% Cu (Kingsview Minerals, news release, July 18, 2023; Figure 13).

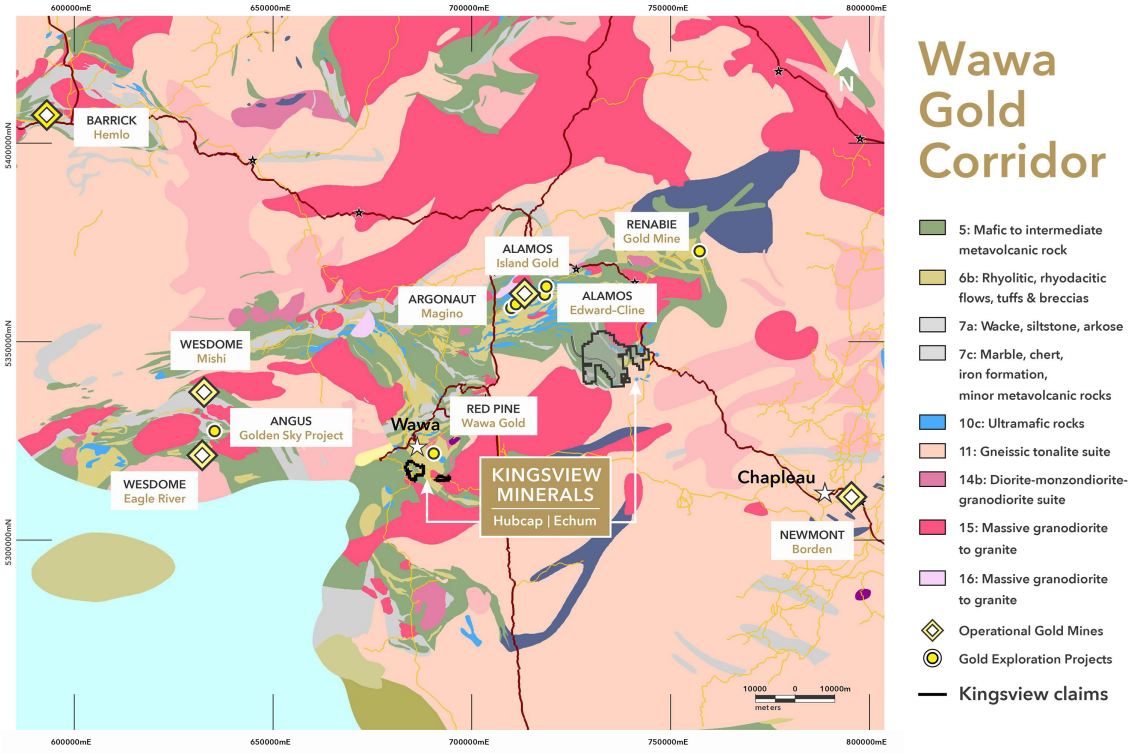

Figure 9. Location map of the Wawa gold properties showing the Hubcap and Echum Projects overlain on the regional geology of the area (*from* Kingsview Minerals, news release, June 21, 2022). Bedrock geology *from* Ontario Geological Survey (2011).

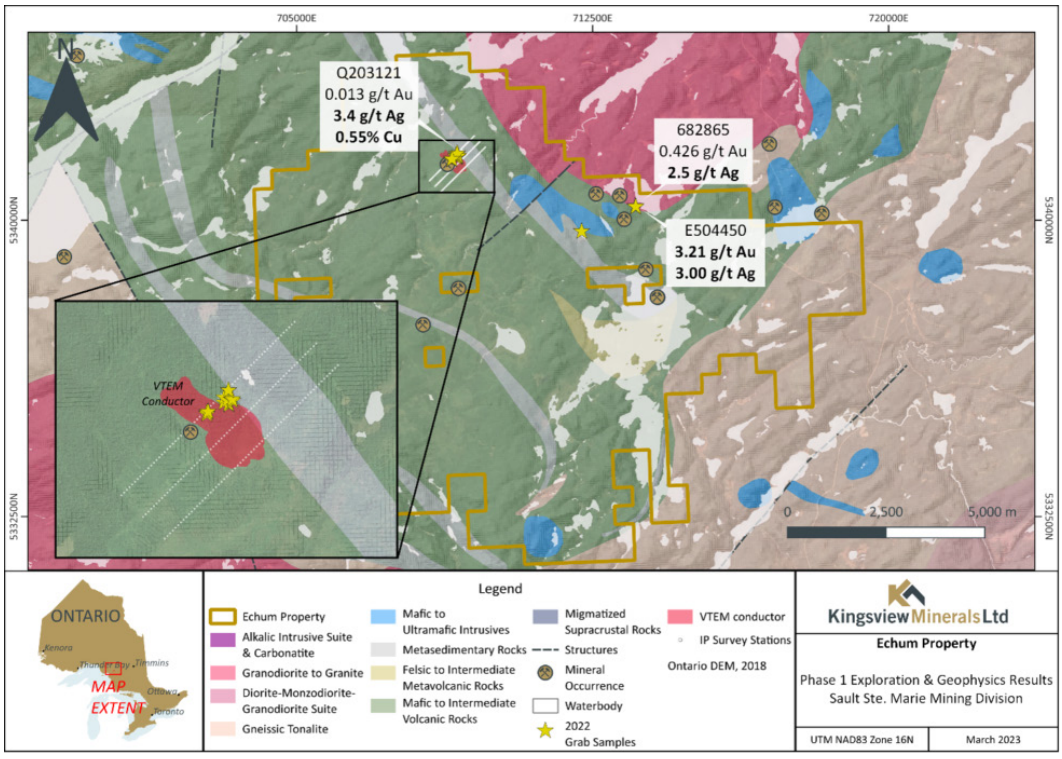

Figure 10. Plan map showing Echum Project surface sampling locations and the VTEM conductor (*from* Kingsview Minerals, news release, March 27, 2023).

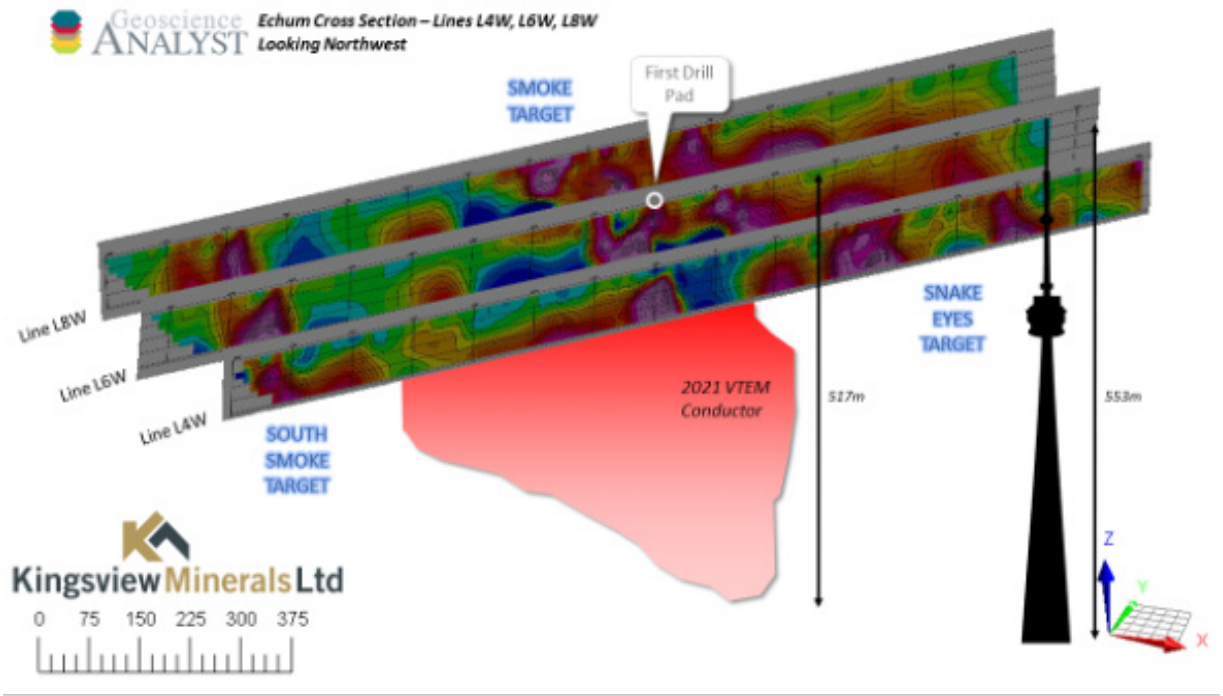

Figure 11. Three inverted IP lines displaying strong IP anomalies over the VTEM conductor at Smoke target (*from* Kingsview Minerals, news release, March 27, 2023).

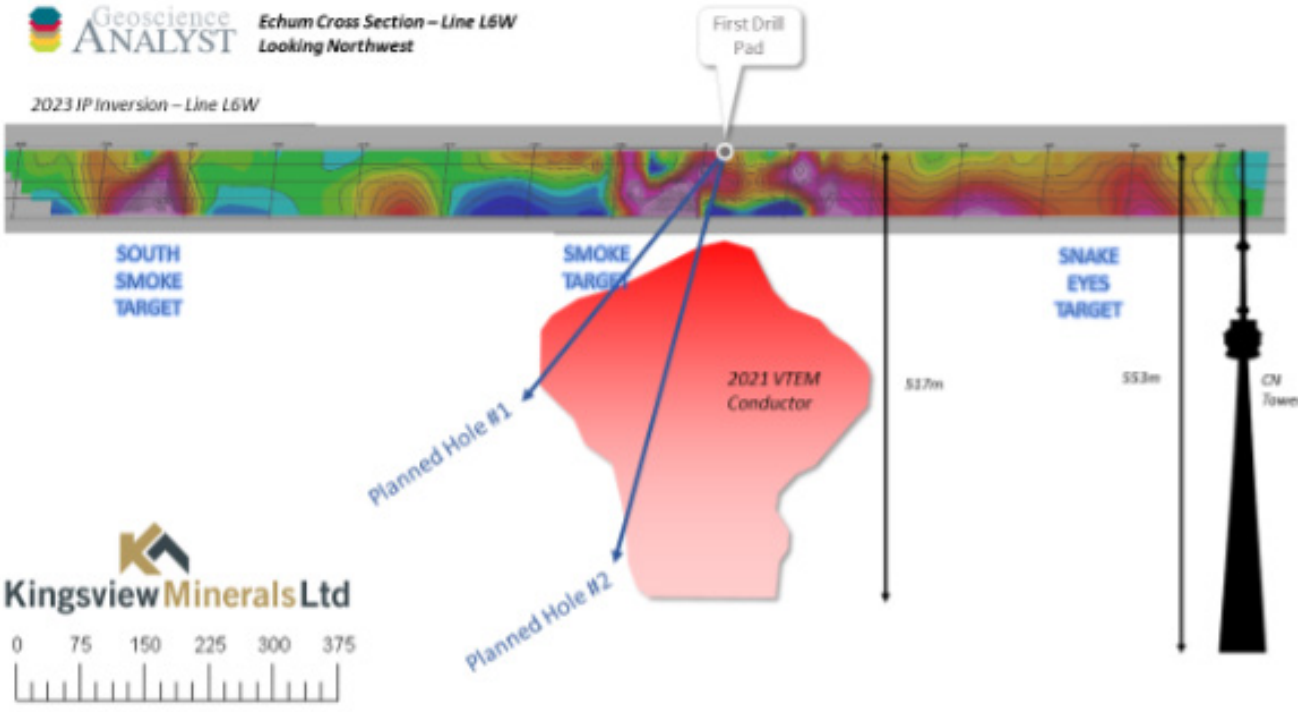

Figure 12. Echum Project planned drill holes at Smoke target on Line L6W (*from* Kingsview Minerals, news release, March 27, 2023).

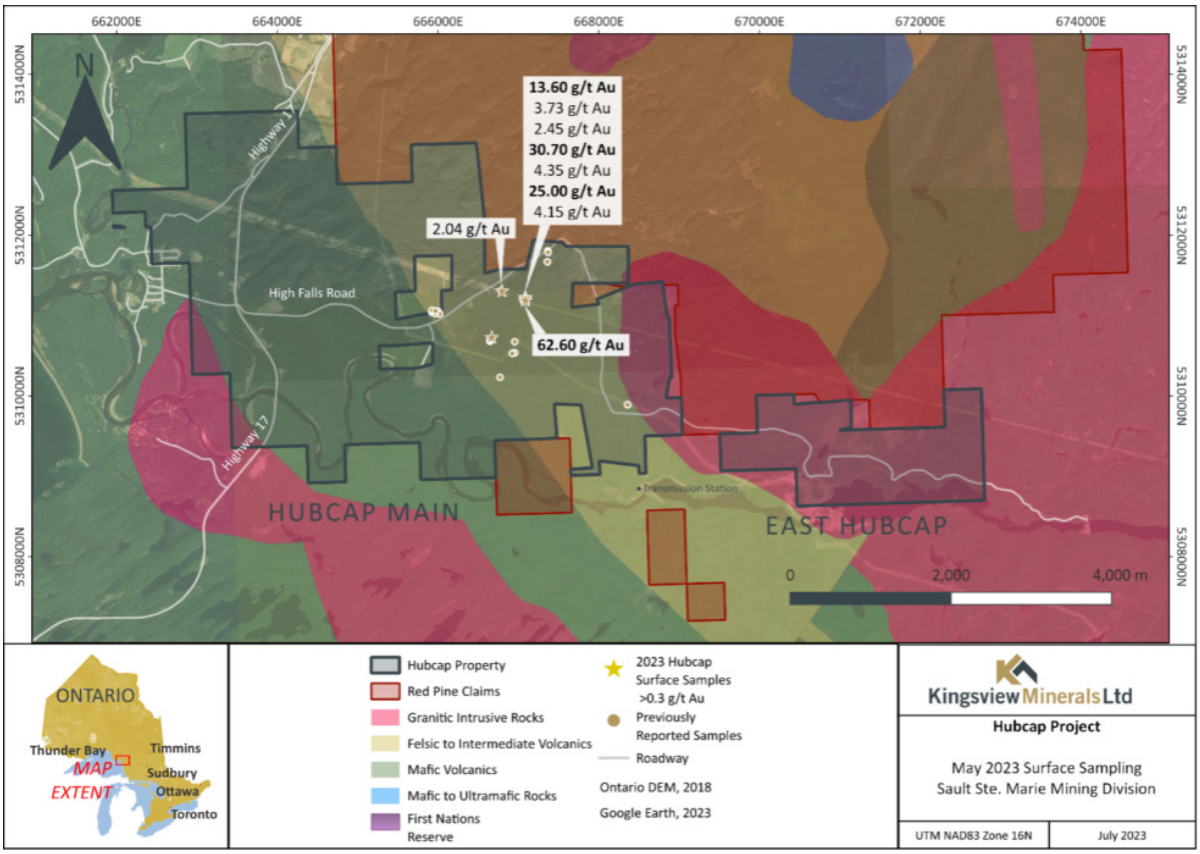

Figure 13. Surface grab sample locations collected in the Spring of 2023 at Hubcap Project (*from* Kingsview Minerals, news release, July 18, 2023).

MISHIBISHU GREENSTONE BELT

Angus Gold Inc. – Golden Sky Project

The Golden Sky Project (formerly owned by Talisker Gold Corp.) consists of over 1149 mining claims (Hamilton and Beh 2021, 2022) and covers an area of approximately 267 km^2 between Wesdome's Mishi and Eagle River mines, including a recent acquisition of the Mishi property from IAMGOLD (Angus Gold Inc., news release, January 27, 2023). Golden Sky is located 50 km due west of the town of Wawa, within the Mishibishu Lake and Point Isacor areas, and Groseilliers and St. Germain townships (*see* Figure 6). The property is accessible via Paint Lake Road, an all-weather gravel road that links the Trans-Canada Highway 17 to the Eagle River Mine (Hamilton and Beh 2021, 2022).

The property is located within the Mishibishu greenstone belt, comprising Archean metavolcanic rocks, consisting of mafic massive to pillowed flows and associated pyroclastic units, and metasedimentary rocks, all intruded by 3 granitoid bodies and diabase dikes (Hamilton and Beh 2021, 2022; Bowen 1986; Kilbourne 2020). The property hosts 2 target areas, including the Dorset deformation zone, which hosts the historical gold resource in the Dorset Gold Zone (DGZ), and the Banded Iron Formation zone (BIF), which has historical and recent high-grade gold assay results from surface and drill core sampling (*see* Maity and Adrianwalla 2023).

In 2023, exploration drilling intersected 4.1 g/t Au over 12.0 m in a step-out hole 500 m east of the DGZ (Angus Gold Inc., news release, February 1, 2023; Figure 14), followed by doubling of strike length with a 450 m step-out drilling west of the DGZ, intersecting 1.4 g/t Au over 12.6 m and 3.4 g/t Au over 5.1 m (Angus Gold Inc., news release, March 14, 2023). Exploration infill drilling at the western extension of DGZ returned 1.4 g/t Au over 23.5 m including 8.4 g/t Au over 3.0 m, up to 5 g/t over 8 m, and 3.5 g/t over 6.0 m at DGZ (Angus Gold Inc., news releases, May 10, June 07, 2023). Further drilling at the east side of DGZ intersected a high-grade zone containing up to 5.1 g/t Au over 3.8 m, including 6.83 g/t Au over 2.7 m and 1.7 g/t Au over 4.5 m, thereby defining a 1.7 km east-trending gold zone along strike (*see* Figure 14; Angus Gold Inc., news release, October 11, 2023).

At the BIF zone, exploration drilling returned 0.8 g/t Au over 104.3 m with gold mineralization over 800 m along strike and 220 m deep (Angus Gold Inc., news release, February 14, 2023; Figure 15), 61.3 m of 1.0 g/t Au, including 6.6 g/t Au over 1 m, and 2.1 g/t Au over 11.0 m along strike, thereby defining a 1.0 km long zone of mineralization (Angus Gold Inc., news release, October 3, 2023). Surface channel sampling at the BIF zone for over 21 m returned up to 4.44 g/t Au (Angus Gold Inc., news release, October 17, 2023). In Fall 2023, the company commenced their first exploration drilling program on Eagle River splay gold target areas with strong geophysical anomalies associated with fault splay of the Eagle River deformation zone, where historical surface samples returned greater than 5 g/t Au (Angus Gold Inc., news release, October 24, 2023; Figure 16).

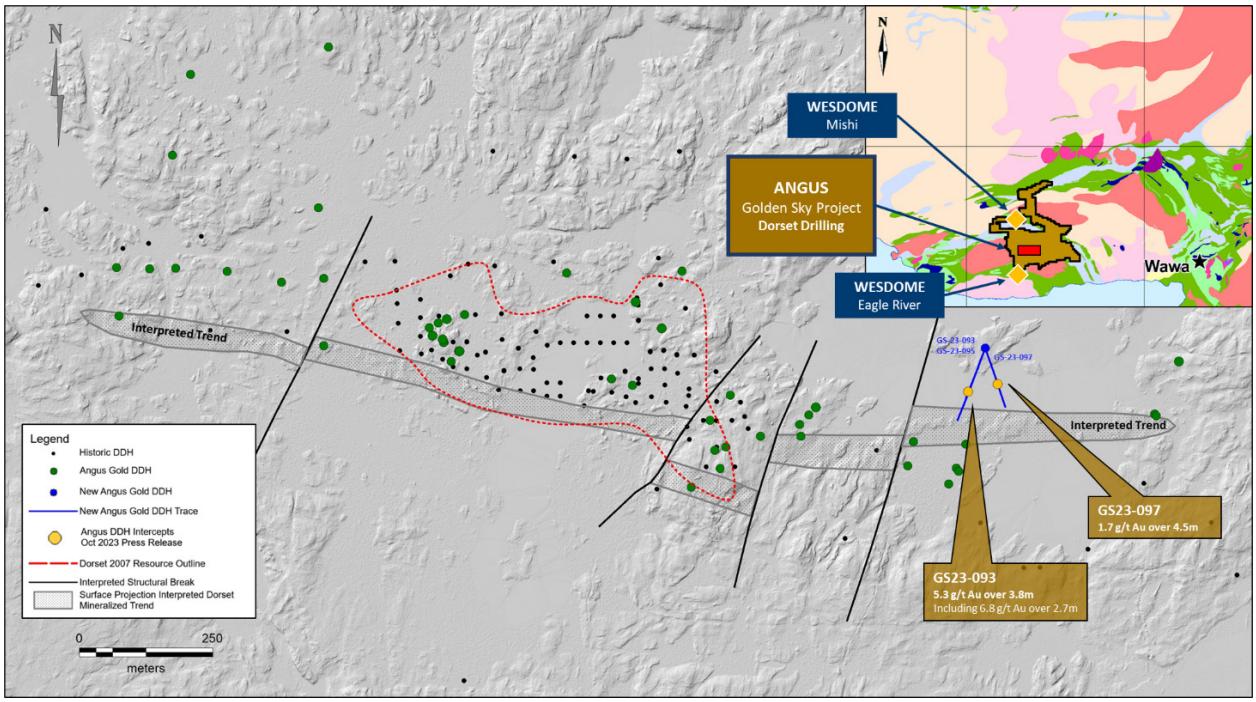

Figure 14. Plan map of Dorset Gold Zone new exploration drilling, Golden Sky Project (Angus Gold Inc., news release, October 11, 2023).

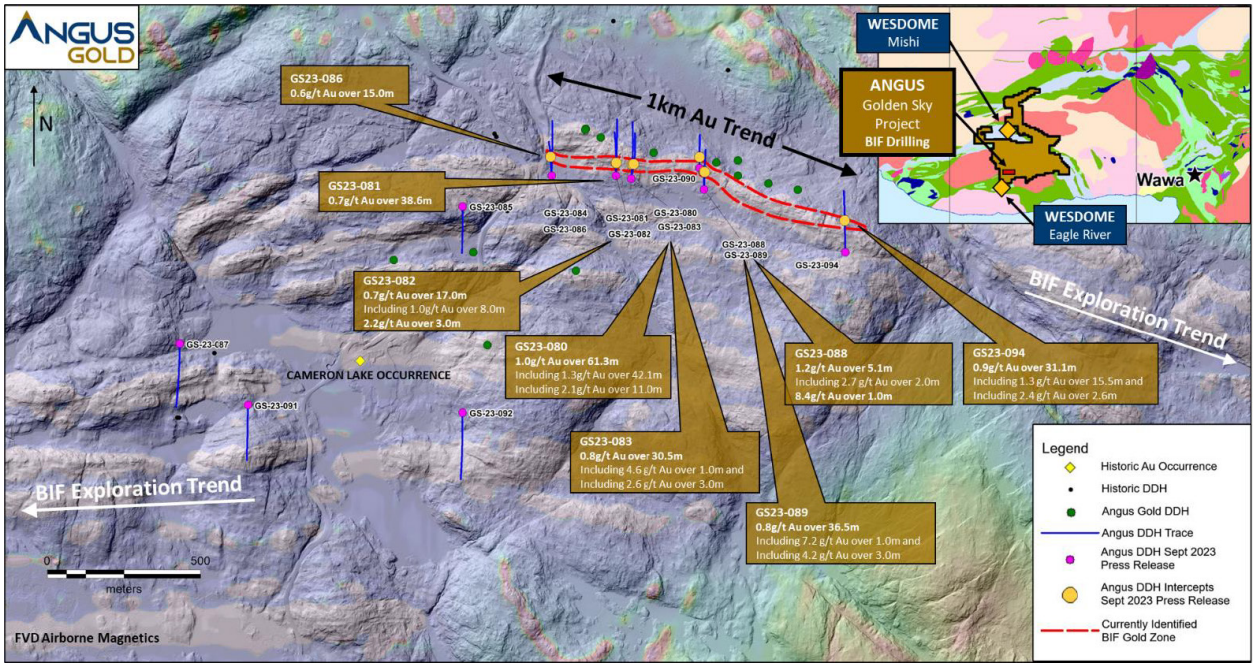

Figure 15. Plan map of new drilling in BIF zone, Golden Sky Project (Angus Gold Inc., news release, October 3, 2023).

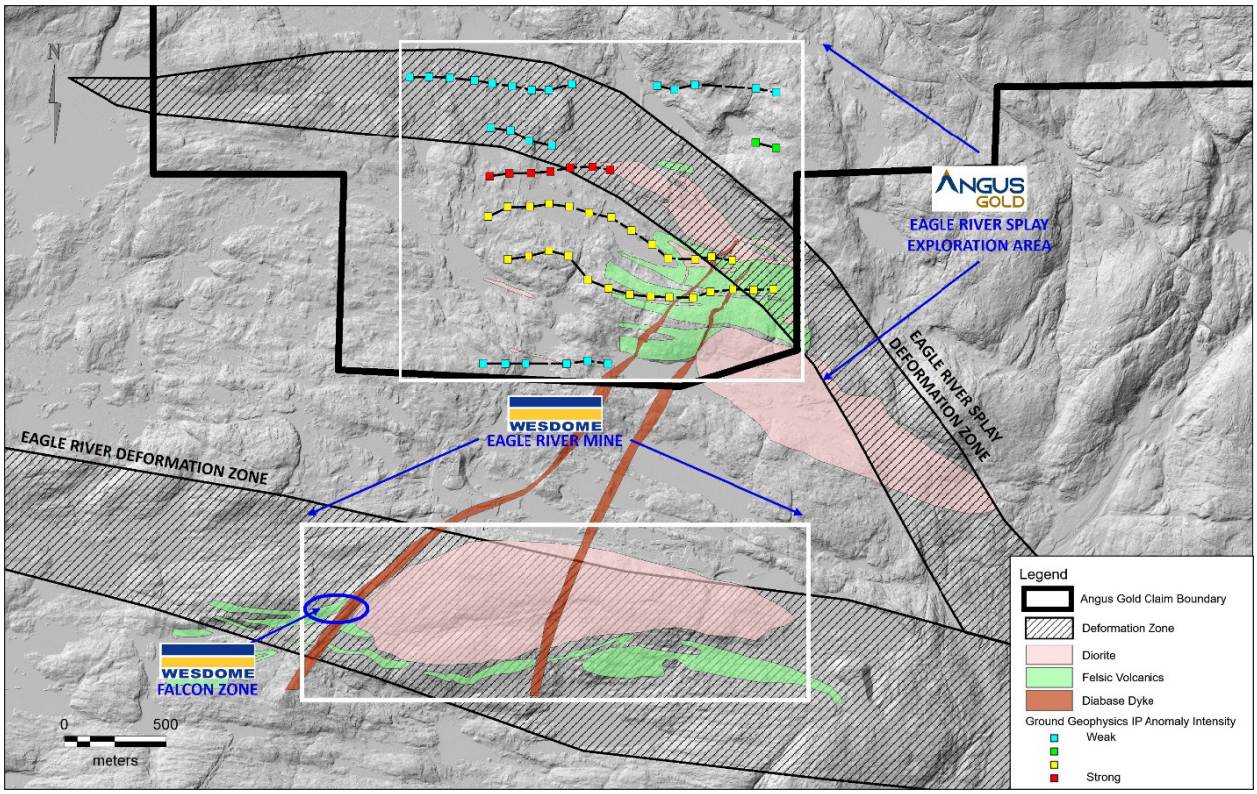

Figure 16. Plan map of Eagle River splay area identified for exploration, Golden Sky Project (Angus Gold Inc., news release, October 24, 2023).

Bold Ventures Inc. – Farwell Gold and Battery Metals Project

The Farwell Project, consisting of 143 mining claims and covering an area of approximately 7770 ha, is located 55 km northwest of Wawa, within the Pukaskwa River and Abbie Lake areas, accessible via Paint Lake Road that links to the Trans-Canada Highway 17 (*see* Figure 6; White and Thomson 2020).

The property, located within the southwest extension of the Michipicoten greenstone belt, includes the southwest extension of the Iron Lake deformation zone, which occurs along the contact between mafic to intermediate metavolcanic rocks and related clastic metasedimentary rocks, both intruded by ultramafic to mafic rocks (White and Thomson 2020). The project area comprises 3 main targets: the Farwell Sulphide Zone, the Tundra Gold Horizon, and the Koala Gold Area (Bold Ventures, news release, April 18, 2023; Figure 17).

In 2023, the company reported additional results and interpretation of VTEM and magnetic surveys, which indicated a regional northwest-trending structural feature following a magnetic low that cross-cuts the property and extends to Iron Lake Deformation Zone (Figure 18; Bold Ventures, News Release, April 18, 2023; *see* Figure 18). Geophysical anomalies associated with a copper occurrence to the west of the regional structure were also found to continue in the Farwell Sulphide Zone within the south-central part of the property. A high-resolution airborne magnetometer survey was recommended to cover magnetic lows in the project area (Bold Ventures, news release, April 18, 2023). In late Fall 2023, the company provided a year-end project overview including updates on the Farwell property, where historical and recent geophysical data were used for future exploration planning (Bold Ventures, news release, December 18, 2023).

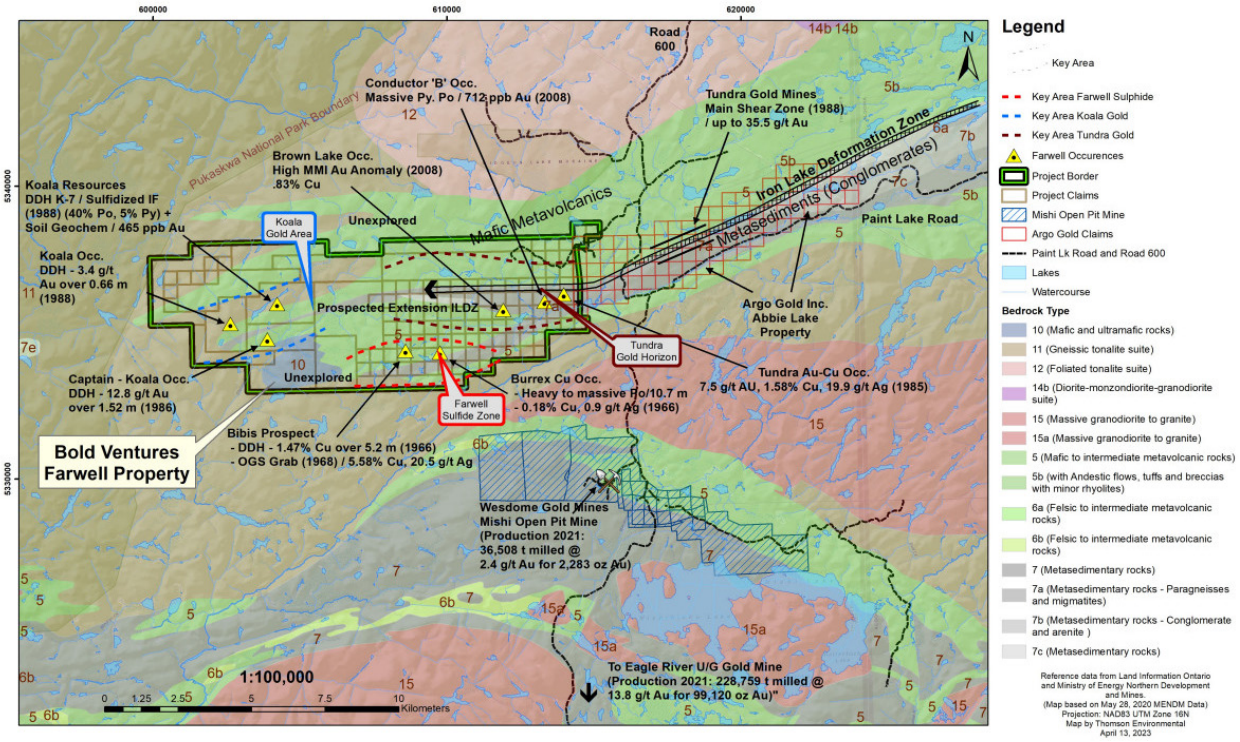

Figure 17. Plan map of Farwell Gold-Copper property showing bedrock geology and the 3 key areas of exploration (Bold Ventures, News Release, April 18, 2023).

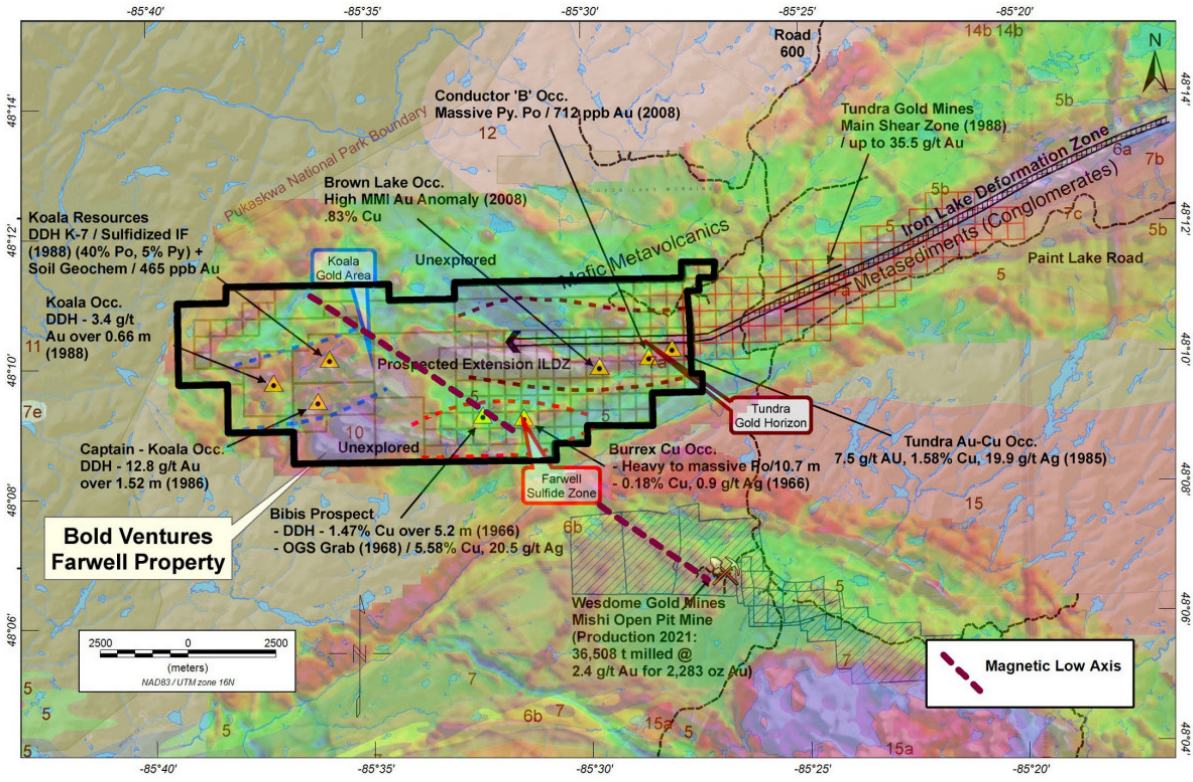

Figure 18. Plan map of the Farwell property with aeromagnetic map (OGS Dighem survey, 1988) showing a northwest-trending structure extending from Mishi Pit, Wesdome Gold Mine (Bold Ventures, news release, April 18, 2023).

BATCHAWANA GREENSTONE BELT

Copper Road Resources – Coppercorp – Glenrock Gold Project

The Coppercorp Glenrock (CG) gold project constitutes unpatented mining claims that cover an area of approximately 21 000 ha, located 85 km north of the city of Sault Ste. Marie, in Palmer, Ryan, Kincaid and Nicolet townships, and can be accessed via a network of logging and/or bush roads that connect to the Trans-Canada Highway 17 (*see* Figure 6).

The CG properties straddle the boundary between Proterozoic Keweenawan Supergroup rocks and the Batchawana greenstone belt of the Archean Superior Province, separated by a north-northwest-trending unconformity. Keweenawan felsic intrusions and breccia bodies hosting base and precious metals mineralization intrude the metavolcanic-sedimentary rocks throughout the CG property and in the vicinity of the unconformity. The geology consists of greenschist to amphibolite facies, mafic to intermediate and minor felsic metavolcanic rocks, locally intercalated by Algoma-type banded iron formation (Boyd 2017).

In early 2023, the company provided an update of 2022 exploration activities that were mainly focused on Breton and East Breccias (Figure 19). A total of 3000 m of step-out drilling was completed and notable drilling intersections returned 0.32% Cu and 2.99 g/t Ag over 100 m from Breton Breccia, and 0.22 % Cu, 2.94 g/t Ag, 0.02% Mo, 0.36% Re over 66 m from East Breccia (*see* Figure 19; Copper Road Resources, news release, March 8, 2023). The 2023 exploration drilling program targeted the Jogran Porphyry and Richards Breccia (JR Zone), approximately 10 km southeast of Tribag Mine (Copper Road Resources,

news release, March 8, 2023; Figure 20), by expanding the mineralization in the JR Zone, where previous Mobile Metal Ion (MMI) soil survey results indicated strongly anomalous copper, molybdenum, tungsten, silver and gold over known occurrences and also extended the anomalies over hundreds of metres in most directions (Copper Road Resources, news release, April 17, 2023). Drilling at Jogran Porphyry target intersected disseminated sulphide mineralization exhibited as chalcopyrite + molybdenite ± bornite + pyrite + pyrrhotite disseminations and in quartz veinlets hosted in a quartz-sericite-pyrite-(phyllic)-altered quartz monzonite porphyry, whereas at Richards Breccia target, 2 holes intersected sulphide mineralization in the form of chalcopyrite + pyrite ± pyrrhotite ± chalcocite aggregates, disseminations, and veinlet-hosted chlorite-sericite-carbonate-pyrite-altered breccia (Copper Road Resources, news release, September 19, 2023). Assay results from drilling intersections at Jogran Porphyry returned 0.23% Cu over 342 m, 0.35% Cu over 197 m, 1.04% Cu over 21 m, whereas at Richards Breccia, results included 1.17% Cu over 38.63 m and 1% Cu over 50.17 m (Copper Road Resources, news release, November 30, 2023).

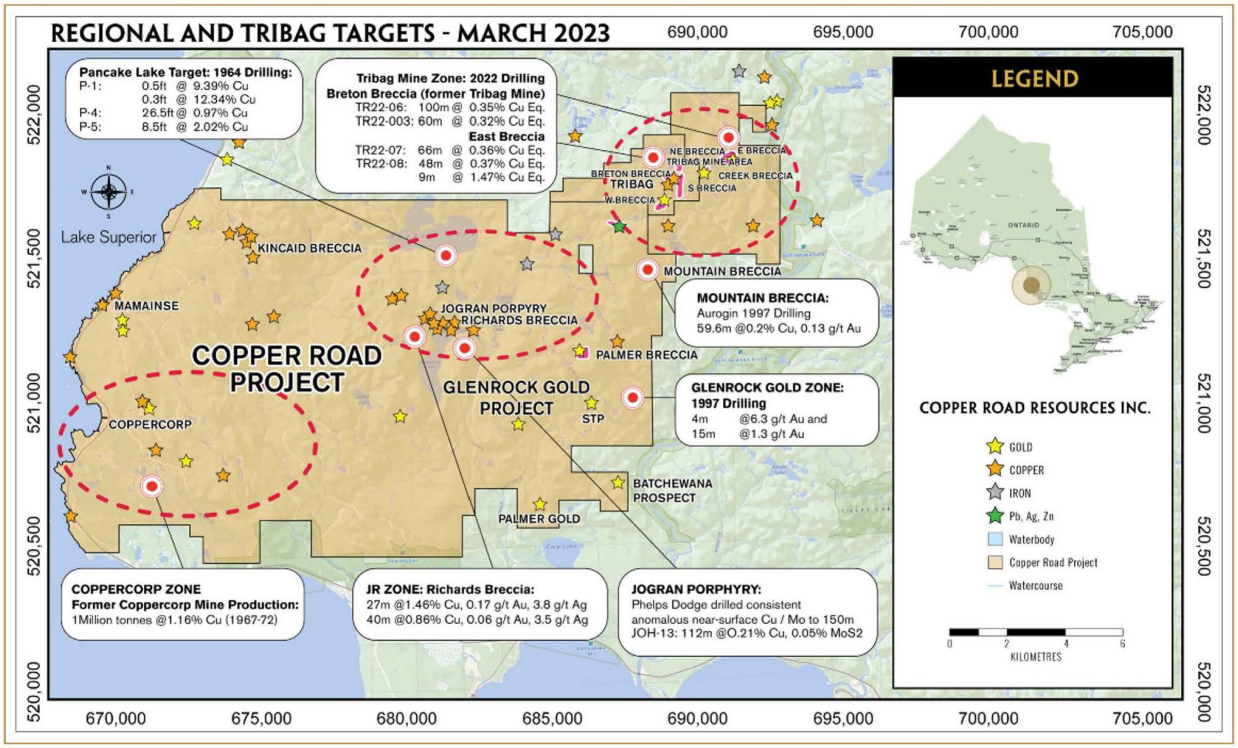

Figure 19. Exploration drilling activity summary at Copper Road Project as of March 2023 (Copper Road Resources, news release, March 8, 2023).

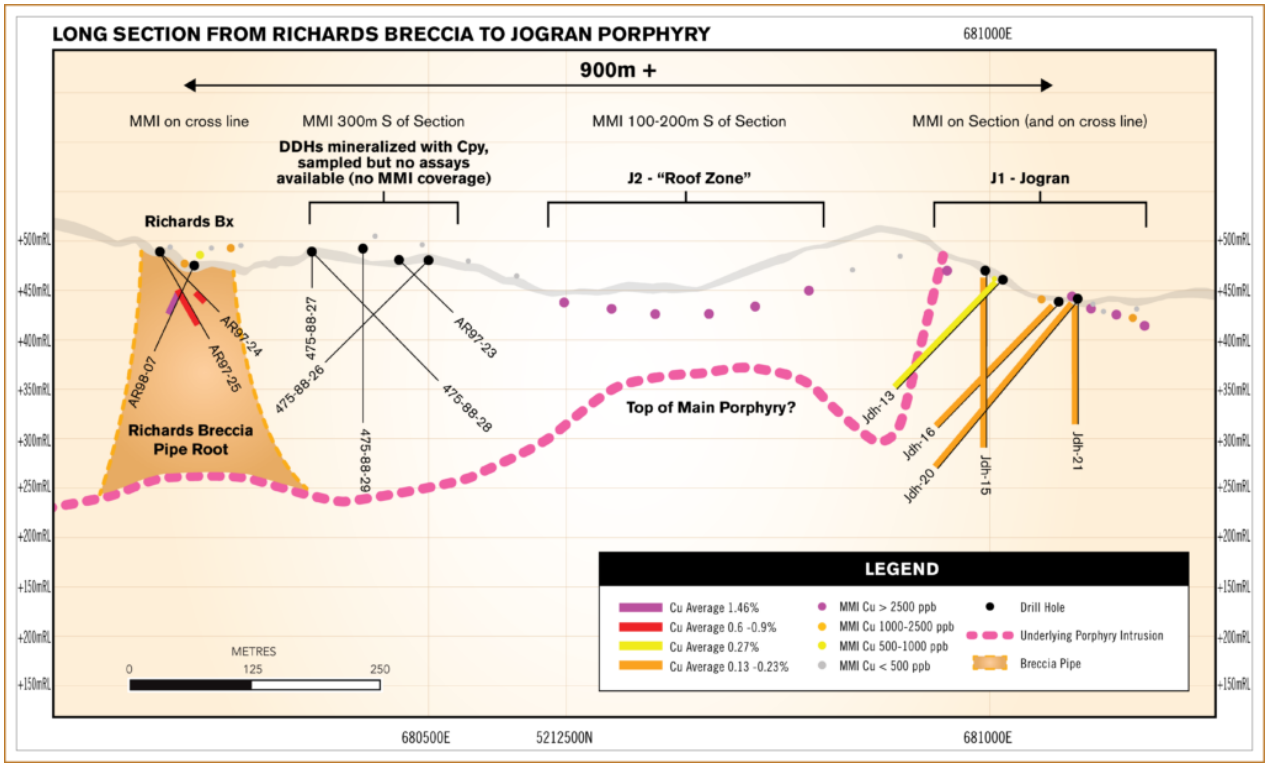

Figure 20. Section view of Jogran Porphyry and Richards Breccia at Copper Road Project (Copper Road Resources, news release, April 17, 2023).

DISTRICT STAFF ACTIVITIES

Field activities for 2023 focused on property visits, Indigenous outreach and mineral occurrence examinations. Staff continued to deliver client services from the office and remotely using electronic communication channels (e.g., telephone, email and video calls). Client requests for accessing physical documents, receiving digital documents remotely, and exploration equipment loans (e.g., Beep Mats, scintillometer) were accommodated.

The Sault Ste. Marie District Geologist office was staffed by B. Maity, District Geologist, and C. Adrianwalla (April 2022 to September 2023), District Geologist Assistant, who attended regular meetings held by the Sault and District Prospectors Association (S&DPA). The Sault Ste. Marie District Geologist's office produced monthly updates on mining and exploration activities for use in the Activity Reports and other applications on OGSEarth, provided advice to the different Branches within the Ministry of Mines, consulted with prospectors and researchers on geological exploration activities in the District, and provided rock and mineral identification services to the public. B. Maity presented a course on rock and mineral identification to the students of Algoma University on February 7, 2023, the status of ongoing mining and advanced exploration projects at a Mine Connect event on February 8, and on the mining, exploration and economic opportunities in Northern Ontario to 2 groups of industry delegates of the City of Sudbury on September 5 and November 22.

PROPERTY EXAMINATIONS AND FIELD VISITS

In February 2023, B. Maity provided an introduction to rocks and minerals to first-year students of the GEOL 1022 course at Algoma University, Sault Ste. Marie. In April 2023, B. Maity provided the students with an introductory field course on the Proterozoic Huronian Supergroup and the Archean Ramsey–Algoma granite gneiss suite exposed along Highway 556. Preliminary trips were conducted earlier in March 2023 by B. Maity to plan the route for the field course.

In April 2023, B. Maity and C. Adrianwalla visited Pronto Mine to examine the uranium-bearing Matinenda Formation and paleosol around the former mine site.

In May 2023, B. Maity and C. Adrianwalla visited Haviland Bay area to the north of Sault Ste Marie to examine the exposures of the Keweenawan-age Jacobsville Formation sandstone along the coast of Lake Superior. Later in May, a three-day visit to Thunder Bay RGP office was made to participate in field work, safety training, and internal discussions and interactions with the RGP staff and senior management.

In June 2023, B. Maity and C. Adrianwalla visited Mamainse Point areas and the Coppercorp property to determine the logistics for a field trip for the S&DPA members. A visit to the southeast side of former Kristina Copper Mines mine site was made to examine the geology and possible extension of mineralized quartz veins along strike.

In July 2023, B. Maity and C. Adrianwalla continued field visits near the Searchmont area and the Kristina Copper Mines site to the north of Sault Ste. Marie to examine currently abandoned mine sites and mineral inventory locations that were unclaimed. Later in July, a field trip to the Mamainse Point and Coppercorp sites were organized for the members of the S&DPA. A property visit was made to the Buck Lake property owned by Advanced United Exploration Inc., where Shaun Parent facilitated the District Geologist office staff visit to show the geology, mineral occurrences, channel sampling and diamond-drill hole locations, and the overall potential of the property for exploration as a volcanogenic massive sulphide (VMS)-type copper deposit.

In August 2023, B. Maity and C. Adrianwalla visited Thessalon to visit an outcrop of Livingstone Formation (Huronian Supergroup) along the shoreline of the North Channel. Later in the month, Haviland Bay area was revisited with geoscientists from the Geological Survey of Canada and University of Toronto to examine a dolostone outcrop that is supposedly a continuation of the Knob Lake Group in Michigan, and occurs as an outlier in the Haviland Bay area.

In September 2022, B. Maity and C. Adrianwalla visited Sudbury for a summit of staff and the management from the Ministry of Mines.

RECOMMENDATIONS FOR EXPLORATION

Note: the following Recommendation for Exploration is *from* Maity (2024).

Mineral Prospectivity Mapping in the Batchawana Greenstone Belt

Lithogeochemical data, comprising whole-rock major-element oxide analyses, were used for mineral prospectivity mapping using open-source geographic information system (GIS) software and the results were compared with known mineral occurrences to identify potential areas for further exploration in the Batchawana greenstone belt (BGB; Figure 21). A subset of publicly available data (MRD 250, Haus and

Pauk 2010) was used to determine multiple indexes of alteration (Table 15) from select altered samples that are assumed to reflect alteration patterns related to potential mineralization in the BGB. The resulting alteration maps (evidential themes) were weighted against the known mineral occurrences (Ontario Mineral Inventory (OMI) database, Ontario Geological Survey 2023) using the data-driven, Bayesian-theorem-based, Weights of Evidence method (WofE; Bonham-Carter, Agterberg and Wright 1989) to determine the areas of highest mineral prospectivity.

Archean rocks in the BGB in the southwestern Abitibi Subprovince, Ontario (Corfu and Grunsky 1987; and references therein), host extensive occurrences of magnetite-pyrite-chert and base and precious metals mineralization in hydrothermally altered supracrustal rocks along shear zones and proximal to felsic plutons (Grunsky 1991). Evidence of alteration in mafic rocks includes breakdown of pyroxene and olivine into amphibole and chlorite, plagioclase into saussurite and epidote, and pervasive carbonatization. Felsic rocks also exhibit evidence of sericitization and carbonatization (Grunsky 1991). Degrees of metamorphism was low- to medium-grade greenschist facies in the interior of the belt, whereas it reached hornblende-hornfels facies towards the margin along the contact with intrusive plutons (Grunsky 1991).

Table 15. Indexes of alteration used for WofE analysis in this study.

Index	Expressions and Thresholds	Application
CCPI	100 (MgO + FeO) / (MgO + FeO + Na_2O + K_2O); >85 (Large et al. 2001)	Chlorite alteration of albite, potassium feldspar, sericite; carbonate alteration, pyrite, magnetite (hematite) enrichment
ACNK	Al_2O_3 / Na_2O + CaO + K_2O (m); >1.85	Alumina mobility over alkali depletion in feldspars
Volatiles	(CO_2 + H_2O^+ + H_2O^-); > 3.8 wt %	H_2O and CO_2 locked in hydrous and carbonate minerals
LOI	>6 wt % (mf), >3 wt % (fs)	Higher modes of hydrous minerals
AI	100 (MgO + K_2O) / (MgO + K_2O + CaO + Na_2O); >65 (Large et al. 2001)	Sericite and chlorite alteration of sodic plagioclase
ISER	K_2O / (K_2O + Na_2O) (m); >46.4	Sericite alteration of feldspar

Abbreviations: fs, felsic; m, molar; mf, mafic; wt, weight. Index abbreviations are defined in the text.

Methods

The prior probability of finding a mineral occurrence by chance, defined as the expected outcome of an event in the absence of evidence, was determined by considering a very small area of 0.01 km^2 around each OMI point and dividing it by the total pixels in the study area (i.e., 83/479968 = 0.000173). A simplified geology map with 6 lithology classes was rasterized and weighted against the OMI points, resulting in 3 classes with positive weights and the remaining 3 with negative weights (Figure 22A; Table 16). These 6 lithology classes were reclassified into 2 groups based on their positive or negative weights and were weighted again as a binary raster layer (Figure 22B; *see* Table 16). Whole-rock major element oxide data were used to determine 6 indexes of alteration: loss-on-ignition (LOI), excess volatiles, Hashimoto alteration index (AI), chlorite-carbonate-pyrite index (CCPI), sericite alteration index (ISER), total volatile content, and Al-Ca-Na-K (ACNK) index (*see* Table 15). Normal probability plots or other methods were used to identify samples with anomalous concentrations or thresholds (*see* Table 15). A first set of evidence maps was produced using a 1 km buffer around each geochemical data point, where 4 indexes (AI, CCPI, ACNK and ISER *in* Table 15) were combined into a single binary raster map showing Alteration Indexes (Figure 22C), LOI (Figure 22D) and total volatiles (Figure 22E). Each of these raster maps has a value of 1 for any location within a 1 km radius of an altered sample, and 0 elsewhere within the study area. A first set of WofE modelling was performed using all 4 binary evidence maps weighted separately (Table 17), resulting in a posterior probability, or prospectivity, map (Figure 23). Another set of 6 binary raster evidence maps, one for each index (*see* Table 15), was produced using a 2.5 km buffer around each geochemical data point (not shown in figures). Each binary map was weighted independently with respect to the known OMI occurrences (Ontario Mineral Inventory database, Ontario Geological

Survey 2023), using the WofE method (Table 18). In a second set of WofE calculations, these 6 evidence maps, combined with the binary geology raster, were weighted (*see* Table 18) to produce a prospectivity map (Figure 22F), which was compared with the prospectivity map produced in Figure 23 to identify 7 prospective areas for mineral occurrences (Table 19).

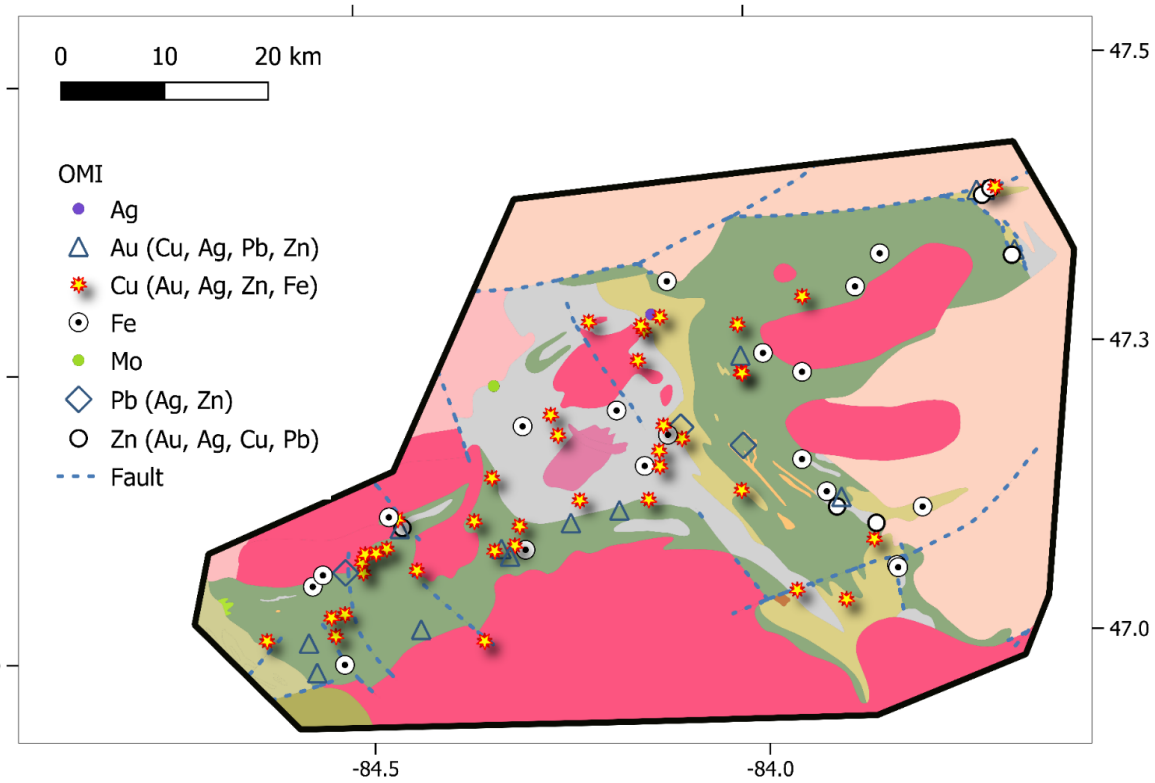

Figure 21. Geological map of Batchawana greenstone belt showing the location of known mineral occurrences (Ontario Geological Survey 2023; geology *modified after* Ontario Geological Survey 2011). Latitude and longitude co-ordinates, in degrees, are shown on the vertical and horizontal axes, respectively.

Results

The WofE statistics for the combined indexes, using a 1 km radius and the binary geology raster, are listed in Table 17 and their spatial correlation with respect to the regional geology and structure is shown in Figure 22A-E. The statistics for samples identified as being altered, with respect to all 6 indexes using a 2.5 km radius, are listed in Table 18. The general patterns of alteration zones correlate with the rock types that are positively weighted against the OMI points (*see* Table 16) and are not well-correlated with the northwest- and east-trending faults. The highest coincidence of anomalies in CCPI, LOI and total volatiles occurs in the areas of mafic metavolcanic rocks containing higher abundances of hydrous minerals. The samples with AI > 65 and CCPI > 85 indicate carbonate-chlorite-pyrite alteration (Large et al. 2001), most dominant in mafic tholeiitic and komatiitic metavolcanic units and to a lesser extent in the mafic intrusive rocks. The ACNK anomalies are observed predominantly in the mafic to felsic metavolcanic flows and to a lesser extent in the intrusive rocks, suggesting alkali depletion and alumina enrichment. The anomalies in AI and ISER also correlate mainly with the areas of exposed metavolcanic sequences. The intermediate to felsic metavolcanic flows exhibit a higher range in ISER (51-91), suggesting higher modes of sericitization compared to the mafic rocks (ISER 47-84). The felsic rocks also exhibit diagenetic alteration, as indicated by CCPI < 15 and AI < 20 (Large et al. 2001).

The statistics for the WofE method (*see* Table 18) show low to high contrast values (C) for all the indexes, ranked for their predictability of mineral occurrences. However, the 4 indexes (CCPI, AI, ACNK, ISER) combined into a single evidence raster, Alteration Indexes, show relatively high contrast and the highest studentized contrast ratio (*see* Table 17). These results reflect that the low to moderately metamorphosed supracrustal rocks, dominated by variably altered mafic rock types, contain high abundances of hydrous minerals and are also the dominant host of copper, gold, lead, silver and zinc mineralization.

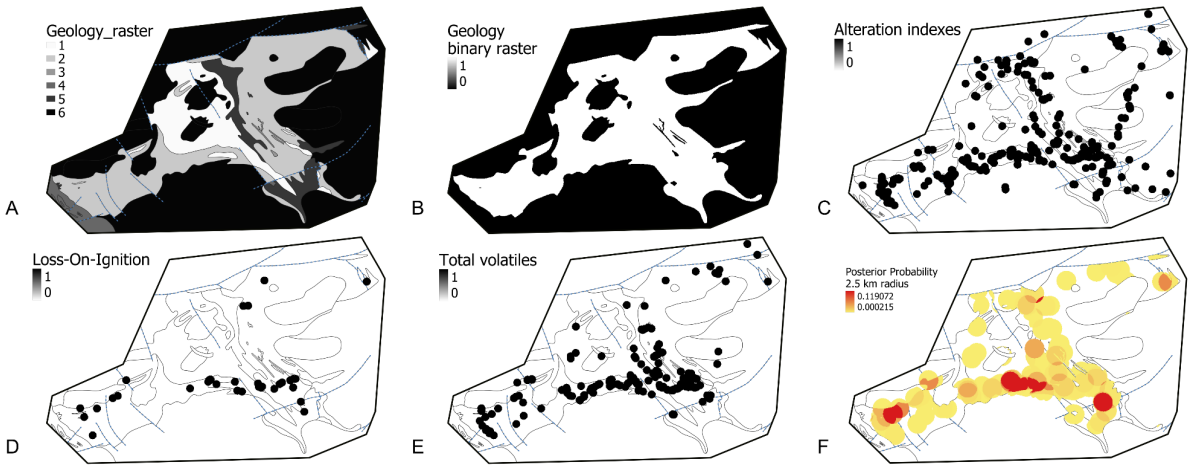

Figure 22. Binary raster evidence maps of (A) simplified geology (lithology classes in Table 16), (B) binary geology, (C) alteration indexes (AI+ACNK+ISER+CCPI; using cut-off values listed in Table 15), (D) LOI, and (E) total volatile contents, used for weighting (using WofE method, *see* Tables 16 to 17), with OMI points (*see* Figure 21) from the Batchawana greenstone belt. For calculation, a very small area of 0.01 km^2 around each OMI point and a 1 km radius around each geochemical data point (black dots in C-E) were considered. (F) posterior probability, or prospectivity, map using all 7 evidence maps (*see* Table 18), with a 2.5 km radius around each geochemical data point, showing areas of high (>60‰, in yellow) and very high (>80‰; in red) probabilities. Note the significantly higher posterior probability of finding a mineral occurrence than the prior probability, i.e., by chance.

Table 16. WofE calculation for categorized and binary geology layers (*see* text and Figure 22).

Evidence	Class	Number of OMI Points	W^+	W^-	Contrast C = W^+ - W^-	Studentized Contrast (C/SD)
Geology_categorized	2	46	0.7877	-0.5171	1.3047	5.9074
	5	16	1.3653	-0.1642	1.5295	5.4947
	1	19	0.826	-0.1547	0.9807	3.7529
	3	0	-3.0353	0.002	-3.0373	-0.0304
	4	0	-5.3012	0.0202	-5.3214	-0.0532
	6	2	-3.1744	0.8337	-4.0081	-5.5996
Geology_binary	0	2	0.001	6.9088	-6.9078	-0.1545
	1	81	0.8879	-3.2155	4.1035	5.7348

Lithology classes: 1, metasedimentary rocks; 2, mafic to intermediate metavolcanic rocks; 3, mafic intrusive rocks; 4, Keweenawan; 5, felsic to intermediate metavolcanic rocks; 6, felsic intrusive rocks.
Abbreviations: OMI, Ontario Mineral Inventory; W^+, positive weight; W^-, negative weight.

Table 17. Statistics for a 4-layer WofE model (1 km radius around each geochemical data point) ranked as per their studentized contrast values (shown *in* Figure 22A-E).

Evidence	Number of samples	Percentage of total samples	Number of OMI Point	W^+	W^-	Contrast C = W^+ - W^-	Studentized Contrast (C/SD)
Alteration indexes	489	89	35	1.1375	-0.4032	1.5407	6.9015
Volatiles	348	63	22	1.2002	-0.2245	1.4247	5.7496
Geology binary	444	81	81	0.8879	-3.2155	4.1035	5.7348
LOI	165	30	7	1.2901	-0.0645	1.3546	3.4279

Abbreviations: LOI, loss on ignition; OMI, Ontario Mineral Inventory; SD, standard deviation; W^+, positive weight; W^-, negative weight.

Table 18. Statistics for each alteration index (with 2.5 km radius) weighted separately along with the binary geology raster map in calculation of the WofE model (*see* Figure 22F).

Index	Number of samples	Percentage of total samples	Number of OMI points	W^+	W^-	Contrast C = W^+ - W^-	Studentized Contrast (C/SD)
Volatiles	422	77	58	0.9749	-0.8941	1.869	7.8281
ACNK	468	85	41	1.0471	-0.4913	1.5384	7.0353
LOI	212	38	30	1.0667	-0.3155	1.3821	6.0686
CCPI	510	93	60	0.6453	-0.8073	1.4526	5.9064
AI	281	51	23	1.0167	-0.219	1.2356	5.0166
ISER	256	46	16	0.7161	-0.1157	0.8318	2.9796
Geology binary	444	81	81	0.8879	-3.2155	4.1035	5.7348

Abbreviations: SD, standard deviation; W^+, positive weight; W^-, negative weight. Others are defined in the text.

Table 19. Geological summary of the alteration zones (*see* Figure 23).

Zones	Alteration	Geology	Area (km^2) *Mineralization*	Townships (OMI, *disc*)
1	Volatiles, LOI, AI, ACNK, CCPI	Basalt-andesite flows, tuff, breccia, chert; felsic to intermediate flows; metasedimentary rocks; north-northwest-trending fault	10.13; *Au, Zn*	Neil (Labmin Showing, *Verse Lake North Showing*)
2	Volatiles, ISER, AI, ACNK, CCPI	felsic to intermediate flows; basalt-andesite flows, tuff, breccia, chert; minor metasedimentary rocks	18.90; *Cu, Ag*	Runnalls (Doyle Lake, Doyle Lake North, Doyle Lake Northwest), Mcaughey (*Montreal River South*), Running (Vacher Creek)
3	Volatiles, LOI, AI, CCPI	Basalt-andesite flows, tuff, breccia, chert; minor metasedimentary rocks	11.09; *Au, Cu, Zn, Fe*	Gapp (Butter Tin, Hanes Lake West, Hanes Lake North)
4	LOI, ISER, AI, ACNK, CCPI	Felsic to intermediate flows; basalt-andesite flow, tuff, breccia, chert; northeast-trending fault	17.87; *Cu*	Lunkie (Private Lake-Northwest, Loggers Lake), Gapp (Teepee Lake)
5	Volatiles, LOI, ISER, AI, ACNK, CCPI	Basalt-andesite flows, tuff, breccia, chert; metasedimentary units; northwest-trending fault	41.63; *Cu, Au*	Davieux (*Mine Pond*, Harmony River, Quinlet Lake), Desbiens, Olsen (South Paquette)
6	Volatiles, LOI, AI, ACNK, CCPI	Basalt-andesite flows, tuff, breccia, chert; minor metasedimentary units; granodiorite; northwest-trending fault	8.97; *Au, Cu, Zn, Fe*	Norberg; predicts Keweenawan intrusion-related deposits within the greenstone host
7	Volatiles, LOI, ISER, AI, ACNK, CCPI	Basalt-andesite flows, tuff, breccia, chert; minor iron formation; minor granodiorite; northwest-trending fault, Keweenawan breccia and related hydrothermal alteration	24.29; *Au, Pb, Zn, Fe, Cu*	Palmer, Nicolet; predicts Keweenawan intrusion-related deposits within the greenstone host

Abbreviations: disc, discretionary occurrences; OMI, Ontario Mineral Inventory. Alteration abbreviations are defined in the text.

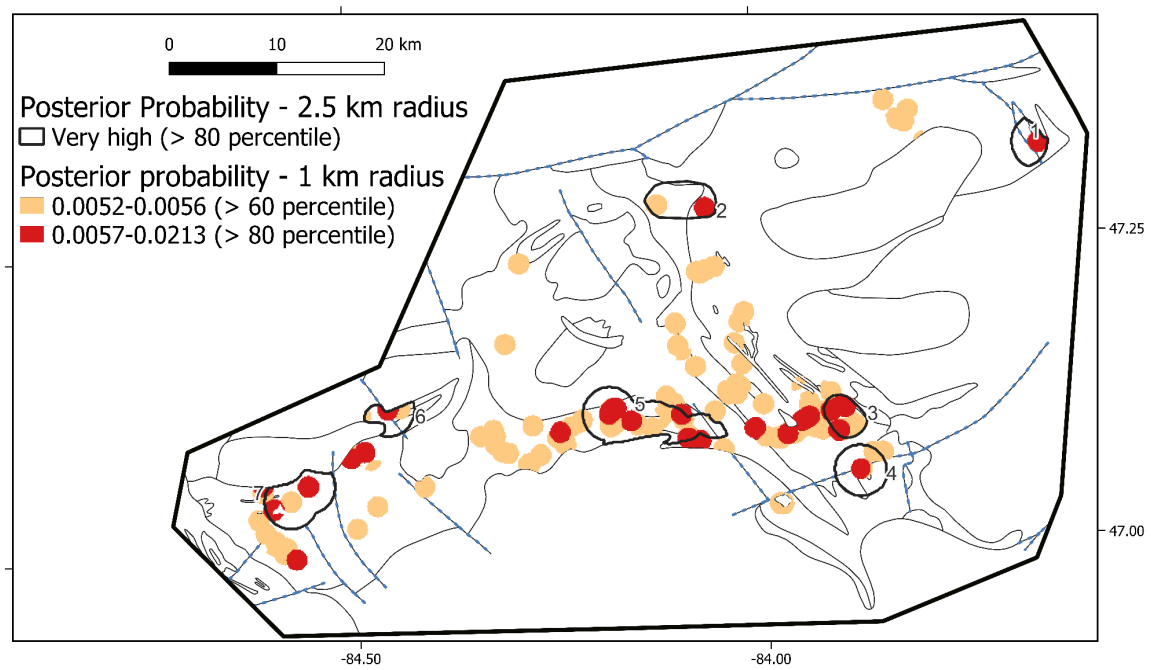

Figure 23. Posterior probability (prospectivity) map showing areas (using 1 km radius; *see* Table 17) with high (approximately 30 times higher than by chance) and very high probabilities (approximately 122 times higher than by chance; total 63.5 km^2) of finding a mineral occurrence. The thicker black outlines indicate 7 areas of very high prospectivity by comparing with Figure 22F (using 2.5 km radius; *see* Table 18). Latitude and longitude co-ordinates, in degrees, are shown on the vertical and horizontal axes, respectively.

The posterior probability (prospectivity) maps for mineral occurrences (*see* Figures 22F and 23) show the areas of highest probability for mineral occurrences in the area. Caveats of using a posterior probability map using major elements-based alteration indexes are that the individual binary alteration maps were not completely free from closure problems and conditional independence, assumptions made during calculation of the posterior probability (*see* discussions *in* Harris, Wilkinson and Grunsky 2000). Combining the 4 indexes increased conditional independence, although the posterior probability decreased, as demonstrated by comparing the 2 probability maps in Figure 23. However, each of the binary evidence maps weighted independently, one at a time (*see* Table 18), are strong indicators of their individual predictive abilities. Use of indicator trace elements or their principal components could result in better predictability. All OMI points are not well correlated to a specific deposit type, and sulphide- or oxide-facies iron formations were assumed to be extensions of ore-related stratigraphy distal to volcanogenic massive sulphide (VMS)-related hydrothermal discharge. Improvement on these caveats will result in better predictability of the posterior probability map for a particular deposit type (e.g., VMS-type vs. orogenic gold).

Recommendations

The final posterior probability map (*see* Figure 23) shows 7 favourable areas for copper, gold, silver, lead and zinc mineralization. The general geological characteristics of these prospective areas are highlighted in Table 19. Many of these occurrences were characterized as Keweenawan breccia-hosted hydrothermal deposits (zones 6 and 7 *in* Table 19), whereas others are indicative of VMS-type mineralization, the potential for which in the BGB has never been thoroughly investigated. However, the prospectivity map (*see* Figure 23) should not be used as a target map, rather an example of how the whole-rock major element oxide analyses can be used in the WofE method-based mineral prospectivity mapping as an exploration guide in a poorly explored area.

OGS ACTIVITIES AND RESEARCH BY OTHERS

The following OGS and other academic research activities were active within the Sault Ste. Marie District in 2023:

- Peak et al. (2023) have used zircon and apatite (U-Th)/He thermochronology data and paleodepth information along the Great Unconformity, defined by Middle Ordovician carbonates atop Archean–Proterozoic Canadian Shield, to show that exhumation of the Great Unconformity surface was not a primary result of glacial erosion and sea-level changes, rather was related to regional tectonic activities including isostatic rebound, mantle plume and intracontinental rifting.
- Legros et al. (2024) have investigated mantle xenoliths in a Mesoproterozoic lamprophyre dike near Elliot Lake to show post-Archean Nb-U-REE enrichment in subcontinental lithospheric mantle beneath the Superior Craton as a result of carbonated silicate melt metasomatism of previously depleted lithospheric mantle.
- Paul Wawrzonkowski (Wawrzonkowski 2023) has completed a Master of Science thesis on the geology, geochemistry, and alteration patters of gold deposit at Eagle River Complex near Wawa.
- Leif Cox and coworkers (Cox et al. 2023) have discussed mathematical inversion of airborne time domain electromagnetic (TDEM) data into electrical conductivity and induced polarization parameters using the generalized effective-medium theory of induced polarization (GEMTIP).
- Elliot Wehrle, University of Windsor, and a group of Canadian researchers published a research article (Wehrle, Samson et al. 2023) on discriminating a primary gold-forming event from secondary events in a structurally and paragenetically complex Archean lode-gold deposit currently being explored by Red Pine Exploration Inc. near Wawa. Combined petrographic, structural, and trace-element LA-ICP-MS analyses and mass balance calculations revealed that the first generation gold-pyrite-bearing deformation event was the principal gold-mineralization event in the Wawa gold corridor and that the other gold-bearing assemblages, such as Au + D_2 pyrite, Au + Bi-Te phases + chalcopyrite, were mainly formed during secondary mobilization of the primary gold enrichment. Their research (Wehrle, Monteuil et al. 2023) also revealed that the timing of gold-rich melt events across multiple gold-bearing systems is a result of fO_2-aH_2S conditions of Bi-rich polymetallic melts that are unlikely to form primary orogenic gold deposits but have significant impact of gold mobilization and enrichment at district-scale.
- Ian Campos completed a Master of Science thesis (Campos 2023) on the gold mineralization events at the Magino gold mine near Dubreuilville, Wawa. His research showed that first gold mineralization at Magino deposit was coeval with the intrusion of the Ma Webb Lake stock (ca. 2724), accompanied by phengite/muscovite-quartz-pyrite alteration and coeval formation of saccharoidal quartz veins (1231 ± 6.9 Ma; Re-Os molybdenite), whereas the subsequent mineralization event was associated with epigenetic quartz-tourmaline-carbonate veins developed during the formation of steeply dipping foliations along the Goudreau Lake deformation zone.
- Juan José Gaitán Gómez has completed a PhD dissertation (Gaitán Gómez 2023) where he conducted detailed analysis and modeling of publicly available regional gravity and aeromagnetic data sets of the Michipicoten greenstone belt, in order to explore the subsurface geometry and potential mineralization zone within the belt. The study revealed the Archean dome-and-keel structure, characterised by the intrusion of a late-Archean tonalite-trondhjemite-granodiorite (TTG) suite within the Archean greenstone upper crust of the belt.
- Julian David Melo-Gómez (Melo-Gómez 2023) has completed a Master of Science thesis on the geochemistry of gold, characterizing 242 samples from 71 gold deposits in Ontario, and

showing the geochemically distinct trace element signatures of primary and secondary gold that are variable at the craton scale but are similar within district scale, implying the variable control of ore-forming mechanisms at district-scale.

- Kendrick et al. (2023) investigated the TTG suite across the Kapuskasing Uplift within the Wawa terrane to show the distinct isotopic stratification within the entire crustal section where the upper-middle crust preserves more volumetrically dominant Neoarchean magmatism, whereas the Archean lower crust records the evidence for all 3 distinct isotopic characteristics.
- Kinney et al. (2023) investigated the Archean metabasites from the Kapuskasing Uplift within the Wawa terrane, and showed that the distribution of heat-producing elements in metabasites during anatexis plays an important role in producing the Archean TTG magmas.

A list of publications received by the Sault Ste. Marie RGP District is given in Table 20.

Table 20. Publications received by the Sault Ste. Marie Resident Geologist District in 2023.

Title	Author	Type and Year of Publication
Report of Activities 2022, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	P.M. Malegus, C.E. Kurcinka, E.G. Amyotte, K.E. Wiebe, S.A. Ferguson, T.K. Pettigrew and G. Dorland	Ontario Geological Survey, Open File Report 6399, 2023
Report of Activities 2022, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	S.V. Churchley, G.F. Paju, C.E. Kurcinka, T.K. Pettigrew, G. Dorland and S.A. Ferguson	Ontario Geological Survey, Open File Report 6400, 2023
Report of Activities 2022, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	D.A. Campbell, J.R.B. Jonsson, S.Y. Bautista, G. Dorland, T.K. Pettigrew and S.A. Ferguson	Ontario Geological Survey, Open File Report 6401, 2023
Report of Activities 2022, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	Z. Azadbakht, M. Krukowski, B.K. Maity, P. Bousquet, C.M. Daniels, S.L.K. Hinz, C.J. Adrianwalla, G. Dorland, N. Sabiri and C. Patterson	Ontario Geological Survey, Open File Report 6402, 2023
Report of Activities 2022, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	P.J. Chadwick, A.S. Péloquin, J. Suma-Momoh, R.M. Easton, P. Bousquet, P.S. LeBaron, C.M. Daniels, S.L.K. Hinz, R.M. Todd, B.B. McKinnon, G. Dorland and N. Sabiri	Ontario Geological Survey, Open File Report 6403, 2023
Report of Activities 2022, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts, and Petroleum Operations Centre	L.A. Mancini, M. Dorado-Troughton, J. Swiercz, P.S. LeBaron, S.L.K. Hinz, N. Sabiri, G. Dorland and L. Fortner	Ontario Geological Survey, Open File Report 6404, 2023
Indicator Mineral and Bulk Geochemistry Data of the Till and Other Surficial Samples Collected in the Pickle Lake–Cat Lake Area, Northern Ontario	C. Gao, D.C. Crabtree, S.A. Clarke and K.H. Yeung	Ontario Geological Survey, Miscellaneous Release—Data 388, 2023
Indicator Mineral and Geochemistry Data of Till and Other Surficial Samples in the Sandy Lake Area, Northwestern Ontario	C. Gao and K.H. Yeung	Ontario Geological Survey, Miscellaneous Release—Data 400, 2023
Ambient Groundwater Geochemistry Project Field Methods and Procedures	C.N. Bocking, S.M. Hamilton and K.M. Dell	Ontario Geological Survey, Groundwater Resources Study 21, 2023
Paleozoic Geology of Manitoulin Island and Adjacent North Channel Islands, Northeastern Ontario: A Geological Guidebook	F.R. Brunton, K.E. Hahn, C. Béland Otis and P.J. Julig	Ontario Geological Survey, Open File Report 6388, 2023

Title	Author	Type and Year of Publication
Ice on the Rocks: The Quaternary Geology of Sudbury and Surrounding Region: A Geological Guidebook	R.P.M. Mulligan, A.K. Burt, G.W. Hagedorn and A.S. Marich	Ontario Geological Survey, Open File Report 6389, 2023
Base, Critical, and Precious Metals Mineralization in the Metasomatic Iron and Alkali-Calcic Systems of the Southern Province in the Sudbury Area: A Geological Guidebook	M. Hamilton, J.-F. Montreuil, E. Adlakha, L. Corriveau and W. Bain	Ontario Geological Survey, Open File Report 6391, 2023
Discovering the Abitibi Gold Belt: A Geological Guidebook	S. Perrouty, R.L. Sherlock and J.M. Simmons	Ontario Geological Survey, Open File Report 6392, 2023
Geological Traverse of the Sudbury Impact Structure and Evolution of the Impact Melt: A Geological Guidebook	D. Peters, S. Baurier Aymat, A.S. Péloquin, C.A. Gordon and C.M. Lesher	Ontario Geological Survey, Open File Report 6393, 2023
Multiscale and Polyphase Deformation Structures in the Grenville Front Tectonic Zone near Sudbury: A Geological Guidebook	D. Jiang and C. Li	Ontario Geological Survey, Open File Report 6394, 2023
Exploring Differential Metal Endowment: A Comparison of the Western (Swayze) and Eastern (Rouyn-Noranda) Abitibi Greenstone Belt: A Geological Guidebook	H.L. Gibson, T.P. Gemmell, T.R.C. Jørgensen, E.C.G. Hastie, M.D. Schofield, R. Haugaard, A.R. Smith, B. McKinley, M.I. Rees, B. Lafrance, R.L. Sherlock and B. Chapon,	Ontario Geological Survey, Open File Report 6395, 2023
Paleoproterozoic Glacial, Microbially Induced, and Tidal Deposits of the Huronian Supergroup, Elliot Lake Region, Northeastern Ontario: A Geological Guidebook	P.L. Corcoran and C.M. Hill-Svehla	Ontario Geological Survey, Open File Report 6396, 2023
Sudbury Offset Dikes and Associated Nickel-Copper-Platinum Group Element Mineralization: A Geological Guidebook	H.V.L. Seibel and C.M. Lesher	Ontario Geological Survey, Open File Report 6397, 2023
Orogenic and Intrusion-Related Gold Deposits of the Michipicoten and Mishibishu Greenstone Belts in the Wawa Region, with an Emphasis on their Structural Timing and Setting: A Geological Guidebook	C. Ma, L.E.D. Vice, C.J.R. Nagy, Z.V. Adam, D. Shirriff, B. Lafrance and L. Robichaud	Ontario Geological Survey, Open File Report 6398, 2023
Summary of Field Work and Other Activities, 2023	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6405, 2023
Precambrian Geology of the Renfrew Area, Grenville Province, Southern Ontario	M. Duguet	Ontario Geological Survey, Preliminary Map P.3850, 2023
Geological, Geochemical and Geophysical Data Related to the Renfrew Area, Grenville Province, Southern Ontario	M. Duguet	Ontario Geological Survey, Miscellaneous Release—Data 398, 2023
Recommendations for Exploration, 2022–2023	Resident Geologist Program	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration 2022–2023
Regional-Scale Groundwater Geoscience in Southern Ontario: The 2023 Ontario Geological Survey, Geological Survey of Canada, and Conservation Ontario Geoscientists Open House	A.K. Burt, D. Ford, S. Holysh, K.J.J. Kalmo and H.A.J. Russell	Ontario Geological Survey, Open File Report 6387, 2023
OGS Showcase 2023		Ontario Geological Survey, 2023

MINERAL DEPOSITS NOT BEING MINED

Mineral deposits not currently being mined in the Sault Ste. Marie District and Wawa area in 2023 are listed in Tables 21 and 22, respectively.

Table 21. Mineral deposits not being mined in the Sault Ste. Marie District, with the exception of the Wawa area, in 2023.

Abbreviations

AF ..... Assessment Files
AR ..... Annual Report
CAMH ..... Canadian and American Mines Handbook
CMH ..... Canadian Mines Handbook
GDIF ..... Geoscience Data Inventory Folio
GR ..... Geological Report
MDC ..... Mineral Deposit Circular [No.15–] [formerly Mineral Resources Circular, No.1-14]
MDIR ..... Mineral Deposit Inventory Record
MP ..... Miscellaneous Paper
MRC ..... Mineral Resource Circular
OBM ..... Ontario Bureau of Mines
ODM ..... Ontario Department of Mines
OFR ..... Open File Report
OGS ..... Ontario Geological Survey
SMDR ..... Source Mineral Deposit Records
SSMP ..... Sault Ste. Marie Plans

Deposit/*Township*/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS ID
Pater Mine *Spragge* 41J/02NE	Cu, Au, Ag	Total production was 70 460 264 lbs Cu. Estimated 2 000 621 tons @ 1.8% Cu.	MRC 12, p.65. GR 76, p.90-94.	Past Producer 1960–1968	07955
Bar-Fin Mine *Thompson* 41J/03NE	Cu	Production of 120 000 lbs of Cu from 1500 tons of ore. 1.82% over 3 feet and 9.27% over 1.9 feet.	MRC 12, p.67 GR 17, p.62-63	Past Producer 1906	07968
Bald Dome prospect *Plummer Add'l.* 41J/05SW	Cu	80 to 100 feet true width averaging 0.25% Cu, diamond-drill core.	MRC 12, p.52 AF 0014	showing	07885
Bruce Mines *Plummer Add'l* 41J/05SW	Cu, Ag	40 000 ton @ 1.8% Cu above 155-foot level Bruce Mines Taylor site.	MDC 12	Past Producer 1915–1921	07888 - 07891
Campbell–Dukes prospect *Plummer Add'l* 41J/05SW	Cu	33 000 ton @ 1.2% Cu in a 230 by 8 by 220-foot block	MRC 12, p.54 AF 0014	Past Producer 1956	07883
Rock Lake Mine *Aberdeen* 41J/05NE	Cu, Ag	1 524 000 lbs Cu from 43 300 tons of ore	MDC 12, p.14	Past Producer 1899–1903	07781
Havilah Mine–Ophir Mine *Galbraith* 41J/05NE	Au, Ag, Cu	1 main vein, 2 – 150-foot shafts, 1 – 183-foot adit In 1911, 1030 oz Au and 214 oz Ag from 6589 tons ore milled.	MRC 13, p.18 OBM 1893, AR v.3, p.37-45	Past Producer 1892–1894, 1900, 1910 and 1911	07851
Steinberg Mine *Plummer Add'l* 41J/05SW	Cu	124 000 tons @ 1.1% Cu (drill indicated) for a length of 200 feet to a depth of 200 feet.	OGS 1969, MRC 12, p.56-57 AF Plummer-0014-0017.	Past Producer 1919	07884
Stobie Mine–Rainbow Mine *Johnson* 41J/05SW	Cu, Ni, Au	9 tons of ore shipped from 100-foot level, 280 feet of lateral work. Shaft is 160 feet deep.	MRC 12, p.34-35. MRC 2, p.74. AF Index plan	Past Producer 1899–1901	08013
Bilton option *Patton* 41J/06SE	Cu	95 160 tons @ 1.72% Cu over a width of 7.3 feet to a depth of 200 feet.	ODM 1953, GR 17, p.55-58 AF	Past Producer Pre-1956	08093
Boyea Lake Adit and East Zones *Montgomery* 41J/06NE	Cu	50 000 tons @ 2.5 to 3% Cu 135 150 tons @ 2.32% Cu across 7 feet over 1068 feet. 75 000 tons @ 1.0% Cu across 20 feet over a length of 300 feet.	Sudbury Contact Mines AR 1971 MRC 12, p.43-44 AF	Past Producer Pre-1942	08060
Crownbridge (Cannon) prospect *Kamichisitit* 41J/06NE	Cu	415 000 tons @ 1.8% Cu over a width of 6.5 feet.	MRC 12, p.94 AF	Past Producer 1966–1967	08018

Deposit/*Township*/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS ID
Glagoma Mine *Gladstone* 41J/06SE	Cu	In 1917, 2 shafts sunk to 250 feet	MRC 12, p.25-26 OGS 1963, GR 17 p.52-55	Past Producer 1917 and 1962	07865
Goulding Mine *Cobden* 41J/06SE	Cu	In 1962, 26.3 dry tons shipped @ 1.45% and 222.5 dry tons shipped @ 1.34%.	MRC 12, p.19 OGS 1964, GR 20, p.62-65	Past Producer 1962	07823
North Montgomery – Grand Portage Mine *Gould* 41J/06NW	Cu	No production or reserve data found.	OGS 1969, MRC 12, p.27-28. OGS 1899, AR v.8, pt.1, p.37-38. SMDR 00463 or MDIR A0229	Past Producer 1899	07871
Milgate (Abbican) prospect *Nouvel* 41J/06NE	Cu	105 750 tons @ 1.08% Cu (drill indicated) A Zone: Length – 600 by Width – 10 by Depth – 235 feet	OGS 1969, MRC 12, p.97. ODM 1957, MRC 2, p.71.	1936–1955, 1956 Development work	08076
Principle Strategic Minerals prospect *Gladstone* 41 J/06SE	Cu	112 300 tons containing 3 128 196 lbs Cu	MRC 12, p.26, GR 17, p.50-51. AF	Pre-1957	07864
Sheba prospect *Nouvel* 41J/06NE	Cu	Length – 1000 feet by Width – 3 feet on surface @ 0.59% Cu, weighted diamond-drill assays.	MRC 12, p.98	1956–1957 Development work	08077
Twin Lakes prospect *Esten* 41J/07SE	Cu	Probable - 76 900 tons @ 1.73% Cu over 8-foot width, drill indicated.	MRC 12, p.23 AF Esten 0010-D1	1957 Trenching and diamond drilling	07841
Bi-Ore Mine *Sagard* 41J/10NW	Cu	2726 tons of concentrate containing 1 647 079 lbs of Cu.	ODM 1951, AR. v.60, pt.2, p.2. MRC 12, p.70-71	Past Producer 1947–1949	07931
Cheney Mine *Gould* 41J/11SW	Cu	39 405 tons @ 3.97% Cu (drill-indicated) 3500 tons mined in 1967.	MRC 12, p.26-27 ODM, 1929, v.38, pt.7, p.10-15	Past Producer 1966–1967	07874
Copper Prince Mine *Kamichisitit* 41J/11SE	Cu, Au	4 shoots 310 by 6.3 feet averages 3% Cu 60 by 9.7 feet averages 1.9% Cu 45 by 6.6 feet averages 2.3% Cu 110 by 9.6 feet averages 0.9% Cu Weighted average of 4 diamond-drill holes, 2.7% Cu over 7 feet and 0.03 oz/ton Au.	MRC 12, p.93-94 GR 178, p.66-67 SMDR File 00823 MP 57, p.87	1928–1929 Diamond drilling, trenching and grabs. 1973 mining operations suspended after shipping small quantity of Cu concentrate.	08019
Jardun Mine *Jarvis* 41K/09NE	Pb, Zn, Ag, Cu, Au	No.1 and 4 zone reserves are 20 000 tons averaging 7.25% Pb, Zn and 1.52 oz/ton Ag. No.3 zone reserve estimate is 19 367 tons averaging 9.56% Pb and Zn with 1.10 oz/ton Ag.	MRC 12, p.32-33 AR v.67, pt.2. p.108-109.	Past producer 1954–1957	08007
Kerr Scott (Algoma Galena) *Deroche* 41K/09NE	Pb, Zn, Ag, Au	1859 tons of hand-cobbed ore recovered. Deposit reserves have not been calculated.	MRC 12, p.21-22 AR v.49, pt.1, p.223 ODM 1928, AR v.37, pt.3, p.72-73	Past Producer 1939	07833
Goulais River, Doughty, Eagle Mine, Tribag, Edwards. *Vankoughnet* 41K/16SW	Cu, Ag	250 000 tons @ 2.35% Cu, 0.26 oz/ton Ag in 3 zones (drill-indicated).	GDIF #75, OBM 1905, AR v.14, pt.1 OGS 1970, MP 46, p.92-93 AR 1973, MP 57, p.86.	Past Producer 1900	07974
Kristina Mine (Supercrest) (Superior) *LaVerendrye* 41K/16NE	Cu	369 350 tons @ 1.95% Cu in No.4 and No.6 Shaft Zone, 10 000 tons @ 4% Cu and 200 000 tons @ 2.53 % Cu.	MRC 12, p.75 MRC 1, p.43 OBM 1902, AR v.11, p.274 OBM 1908, AR v.17, p.79	Past Producer 1903–1907 1952–1957: 22 000 feet of diamond drilling.	08040

Deposit/*Township*/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS ID
Prace–Sill Lake Mine *Vankoughnet* 41K/16SW	Pb, Zn, Ag	20 000-60 000 tons @ 12 oz/ton Ag, and 20 000 tons @ 41.65 oz/ton Ag, and 33.7% Pb over 1.13 feet width.	AF SSMP Vankoughnet 16, 17.	Past Producer 1975, 1979, 1981, 1983–1984 and 1985–1987	07976
Caputo–Just (Caputo-Thompson, Ontex) *Wishart* 41N/01SW	Cu	475 tons @ 1.18 % Cu recovered from 3 zones	MRC 12, p.78 MP 25, p.5	Past Producer 1968	07985
Coppercorp Mine *Ryan* 41N/02SW	Cu, Ag, Au	1.02 million tons @ 1.16% Cu production.	MRC 12, p.45-46 ODM 1953, AR 62, pt.4, p.18-24 AF – Montreal Mining Co. SSMP-0012 AF SSMP Ryan -15, p.30 AF SSMP Ryan -37 (cd). 2.47257, p.3.	Past Producer 1965–1972	07937, 07938, 07939, 08061
Glenrock (Rockdale) *Palmer* 41N/02SE	Co, Au, Cu	Several zones. Main zone Length – 250 by Width – 3.5 feet (drill indicated) 1953, 11 diamond-drill holes, failed to show continuity with depth, best assay 16% Co.	MRC 12, p.103 MRC 10, p.20	Glenrock 1952 Rockdale 1958	08081
Jogran prospect *Ryan* 41N/02SE	Cu, Mo	Reserve estimate 18 M tons @ 0.19% Cu and 0.05% MoS_2	MRC 12, p.60-61 MRC 7, p.11 AF RYAN SSMP -15, p.30	1965–1966: diamond drilling	07924
Mamainse Mine *Ryan* (A.McDonell Location - west of *Ryan*) 41N/02SW	Cu	Vein Length – 1500 by Width – 13 feet 3 shafts sunk to depths 60, 280 and 320 feet. No production recorded.	MRC 12, p.57 AR v.62, pt.4, p.23 MRC 2, p.79	Past Producer 1882–1884	08050
Maricona prospect (Rankin Location - Point Aux Mines) *Slater* 41N/02NE	Cu	295 405 tons @ 1.17% Cu (1098 by 345 by 8.1 feet)	MRC 12, p.58 AF Rankin Mnrl 1964, 0013-A1 AF Rankin Mnrl 1956, 0012 AF Rankin Mnrl 1949, 0017A	Past Producer 1865–1966 and 1949, 1955–1956	07902 Same as 07899
Pancake Lake (Richards) *Kincaid* 41N/02SE	Cu	310 by 21.5 by 310 feet @ 0.76% Cu developed prospect.	MRC 12, p.38	1952 intermittent until 1964	08026
Tribag Mine *Nicolet* 41N/02SE	Cu, W, Ag, Au	4 zones (Breton, West, East and South) Reserve estimate 2004: Breton, 40 M tons @ 0.2% Cu above 300 m. East Breccia, 125 M tons @ 0.13% Cu and 0.04% MoS_2 West Breccia, 0.1 M tons @ 0.6-1.0% Cu.	MRC 12, p.80 AF SSMP Ryan -15, p.30	Past Producer 1967–1973 Production from Breton and West Breccia zones.	08068
Goulais River *Nahwegezhic* 41O/04SW	Fe	Algoma Ore Division Iron Range: 25-40% total iron. Estimated reserves 30 480 000 tons of iron pellets in Cowie Lake Section. McPhail deposit (southern extension): 31% total iron, est. Reserves 5 080 000 tons of iron pellets.	MRC 11, p.41-42 OGS GR 192, p.49-56	1910–1944 Development work 1963–1966 diamond drilling, trenching, metallurgical studies.	08065

Note: *This table contains tonnage and grade estimates, referred to as "reserves" (indicated, possible, probable), which were determined at various times by methods largely unreported. Unless specifically indicated, it must be assumed that these estimates are not in compliance with the reporting standards required by National Instrument 43-101.*
Abbreviations: AMIS = Abandoned Mine Information System; NTS = National Topographic System; Add'l=Additional.
Unit abbreviations used: *lbs = pounds; M = million; oz = ounce(s).*

Table 22. Mineral deposits not being mined in the Wawa area in 2023.

Abbreviations

CMH.....Canadian Mines Handbook
GR.....Geological Report
NM.....The Northern Miner
OFR.....Open File Report
RGF.....Resident Geologist Files

Deposit Name/ *Township*	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS ID
Alden–Goudreau (past producer) *Cowie*	Au	170 000 tons @ 0.50 oz Au per ton	CMH 1937–1943	Diamond drilling 2011	00867
Betty Lake Iron Range *Knicely*	Fe	1 570 140 t @ 39.5% Fe	RGF	Inactive. Bulk sampled 1999	
Big Lake Iron Range *Corbiere*	Fe	302 150 tons per 100 feet @ 36.6% Fe	GR 153	Last active exploration 1955	
Braminco prospect *Brackin*	Au	100 000 tons @ 0.15 oz Au per ton (#21 Vein); 23 000 tons @ 0.31 oz Au per ton (#7 Vein); 5000 tons @ 0.26 oz Au per ton (B Vein)	RGF	Last explored 2004	00911
Cline gold mine (past producer) *Jacobson*	Au	204 000 tons @ 0.221 oz Au per ton (88-60 Zone)	NI 43-101 Rpt. 30/11/2009	Diamond drilling 2008	00901
Edwards Mine (past producer) *Jacobson*	Au	96 000 t @ 11.3 g/t Au (at the end of 2000)	RGF	Dewatering and diamond drilling 2011	00898
Ego Mines Claims *Abotossaway*	Au, Cu	7 mineralized zones; W-8 Zone hosts 442 080 t @ 2.6 g/t Au, 1.91% Cu	OFR 5587	Inactive	00011
Goudreau Zone *Finan*	Au	Indicated resource: 220 667 t @ 12.0 g/t Au (85 262 ounces); Inferred resource: 169 027 t @ 10.3 g/t Au (55 730 ounces)	RGF	Diamond drilling 2010	00302
G.W. Macleod Mine (past producer) *McMurray/ Chabanel*	Fe	18 700 000 t (blocked out) @ 31% Fe	OFR 5990	Mine closed in 1998	03068
Josephine–Bartlett Iron Range *Corbiere*	Fe	7 555 788 t @ 58.36% Fe	OFR 5578	Diamond drilled 1946	00297
Josephine Mine (past producer) *Corbiere*	Fe	3 965 00 tons @ 51.65% Fe, 14.92% Si, 1.88% S	RGF	Mine cave-in in 1946 Inactive.	00304
Jubilee–Surluga property (past producer) *McMurray*	Au	Inferred resource: 32 200 000 t @1.14 g/t Au	NI 43-101 Rpt. 21/11/2011	Past producers (8) 1902–1991. Diamond drilling 2011.	00860
Kremzar Mine (past producer) *Finan*	Au	229 777 t @ 7.65 g/t Au	RGF	Active exploration 2000	00905

Deposit Name/ *Township*	**Commodity**	**Tonnage-Grade Estimates and/or Dimensions**	**Reserve References**	**Status**	**AMIS ID**
Lakemount property *Esquega*	Ni, Cu	Inferred resource: 3 048 000 t @ 0.35% Ni, 0.20% Cu, 0.13 g/t Pt, 0.09 g/t Pd	NI 43-101 Rpt. Platinum Group Metals 21/01/2005	Diamond drilling 2003–2004	04139
Lochalsh Zone (past producer) *Finan*	Au	Probable reserves: 185 450 t @ 5.6 g/t Au (33 161 ounces); Indicated resource: 252 755 t @ 5.3 g/t Au (42 875 ounces); Inferred resource: 210 160 t @ 6.4 g/t Au (43 083 ounces)	RGF	Diamond drilling 2010	00903
Lucy Iron Range (past producer) *Chabanel*	Fe	13 780 000 t @ 33.2% Fe	RGF	Mine closed 1970	03065
Magino Mine (past producer) *Finan*	Au	Indicated resource: 67 555 000 t @ 1.00 g/t Au (2 176 300 ounces @ 0.35 g/t cut-off) Inferred resource: 54 242 000 t @ 0.99 g/t Au (1 721 200 ounces @ 0.35 g/t cut-off)	NI 43-101 Rpt. 2/11/2011	Diamond drilling 2011	00904
Magnacon Mine (past producer) *Mishibishu Lake area*	Au	1.47 million tons average 0.19 oz Au per ton (drill-indicated). Past producer 1990, 19 397 oz from 163 366 tons	CMH 1997–1998, p.204	Underground exploration 2004. Drifting westward toward Mishi Mine.	00847
Magpie Iron Range (past producer) *Leclaire*	Fe	332 400 t @ 36% Fe	RGF	Mine closed 1921. Underground mine.	00299
Markes occurrence *Jacobson*	Au	65 000 t @ 5.75 g/t Au	RGF	Diamond drilling 2010	08719
Minto Mine South property *McMurray*	Au	Indicated resource: 105 000 t @ 7.5 g/t Au (25 000 ounces @ 3.5 g/t cut-off) Inferred resource: 354 000 t @ 6.6 g/t Au (75 000 ounces @ 3.5 g/t cut-off)	NI 43-101 Rpt. 31/12/2018	Diamond drilling 2018	04132
Murphy–Algold–Amherst gold mine (past producer) *Abotossaway*	Au	248 800 tons @ 0.305 oz Au per ton	RGF	Diamond drilling 2003	00884
Nudulama prospect *Leeson*	Au	579 325 t @ 0.194 oz Au per ton	RGF	Inactive	00912
No.8 Zone *Finan*	Au	90 700 t @ 6.9 g/t Au	RGF	Exploration 1997	00905
Pine Zone *Finan*	Au	70 000 t @ 6.4 g/t Au	RGF	Inactive	
Ranson Mine *Rabazo*	Au	30 300 t @ 12.4 g/t Au	RGF	Diamond drilling 2001	00876

Deposit Name/ *Township*	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS ID
Renabie Mine (past producer) *Leeson*	Au	1 million t @ 0.2 g/t Au. Past producer 1 100 000 oz Au	RGF	Rehabilitated	01013
Ruth Iron Range (past producer) *Chabanel*	Fe	34 608 000 t @ 30.9% Fe	RGF	Diamond drilling 1967 by Algoma Ore Company Ltd.	03072
Shenango Mine *Hawkins*	Au	37 440 t @ 4.3 g/t Au	RGF	Inactive	00916
Shihan VMS property/ Conboy Lake, Meath and Rennie	Zn, Pb, Cu	Indicated resource: 199 699 t @ 3.81% Zn, 0.21% Pb, 0.09% Cu, 91.82 g/t Ag, 0.30 g/t, 0.30 g/t Au Inferred resource: 44 362 t @ 4.30% Zn, 0.20% Pb, 0.09% Cu, 72.82 g/t Ag, 0.30 g/t Au	NI 43-101 Rpt. 14/11/2011	Inactive	00915
Sir James Dunn Mine (past producer) *Chabanel*	Fe	65 454 545 t @ 34% Fe, 7% SiO_2	RGF	Inactive	03064
Surluga Mine/ Citadel Mine (past producer) *McMurray*	Au	Inferred resource: 19 824 000 t @ 1.71 g/t Au (1 088 000 ounces @ 0.5 g/t cut-off)	NI 43-101 Rpt. 06/05/2015	Diamond drilling 2018	00851

Note: *This table contains tonnage and grade estimates referred to as reserves (indicated, possible, probable), which were determined at various times by methods largely unreported. Except where noted, none of these estimates are known to conform to the standards required for National Instrument 43-101 and should be considered inferred mineral resources not reserves.*
Unit abbreviations used*: g = grams; lbs = pounds; oz = ounce(s); t = tonnes.*

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHEAST REGION AND SOUTHERN REGIONS

The activities of the northeast Regional Land Use Geologist are described *in* "Regional Land Use Geologist Activities—Northeast Region" in the Timmins District report of this volume.

In addition, the southern Regional Land Use Geologist co-ordinates input into land-use planning activities in part of the Sault Ste. Marie District (St. Joseph Island). No requests for input were received in 2023.

MINERAL INVENTORY GEOSCIENTIST ACTIVITIES—NORTHEASTERN AND SOUTHERN ONTARIO

The activities of the Mineral Inventory Geoscientist are described *in* "Mineral Inventory Geoscientist Activities—Northeastern and Southern Ontario" in the Timmins District report of this volume.

GEOGRAPHIC INFORMATION SYSTEM DATA SPECIALISTS ACTIVITIES—NORTHWESTERN AND NORTHEASTERN ONTARIO

The activities of the Geographic Information System Data Specialists are described *in* "Geographic Information System Data Specialists Activities—Northwestern and Northeastern Ontario" in the Timmins District report of this volume.

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Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton(short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 9**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy) / ton (short)	1 ounce (troy) / ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights / ton (short)	1 pennyweight / ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

*Note: Conversion factors in **bold** type are exact. The conversion factors have been taken from or have been derived from factors given in the* Metric Practice Guide for the Canadian Mining and Metallurgical Industries*, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.*

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