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Open File Report 6374

Report of Activities, 2020 Resident Geologist Program

Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts

2021

Ontario

ONTARIO GEOLOGICAL SURVEY

Open File Report 6374

Report of Activities, 2020
Resident Geologist Program

Timmins Regional Resident Geologist Report:
Timmins and Sault Ste. Marie Districts

by

Z. Azadbakht, P. Bousquet, K. Zammit, C.M. Daniels, S.L.K. Hinz, P. Sword,
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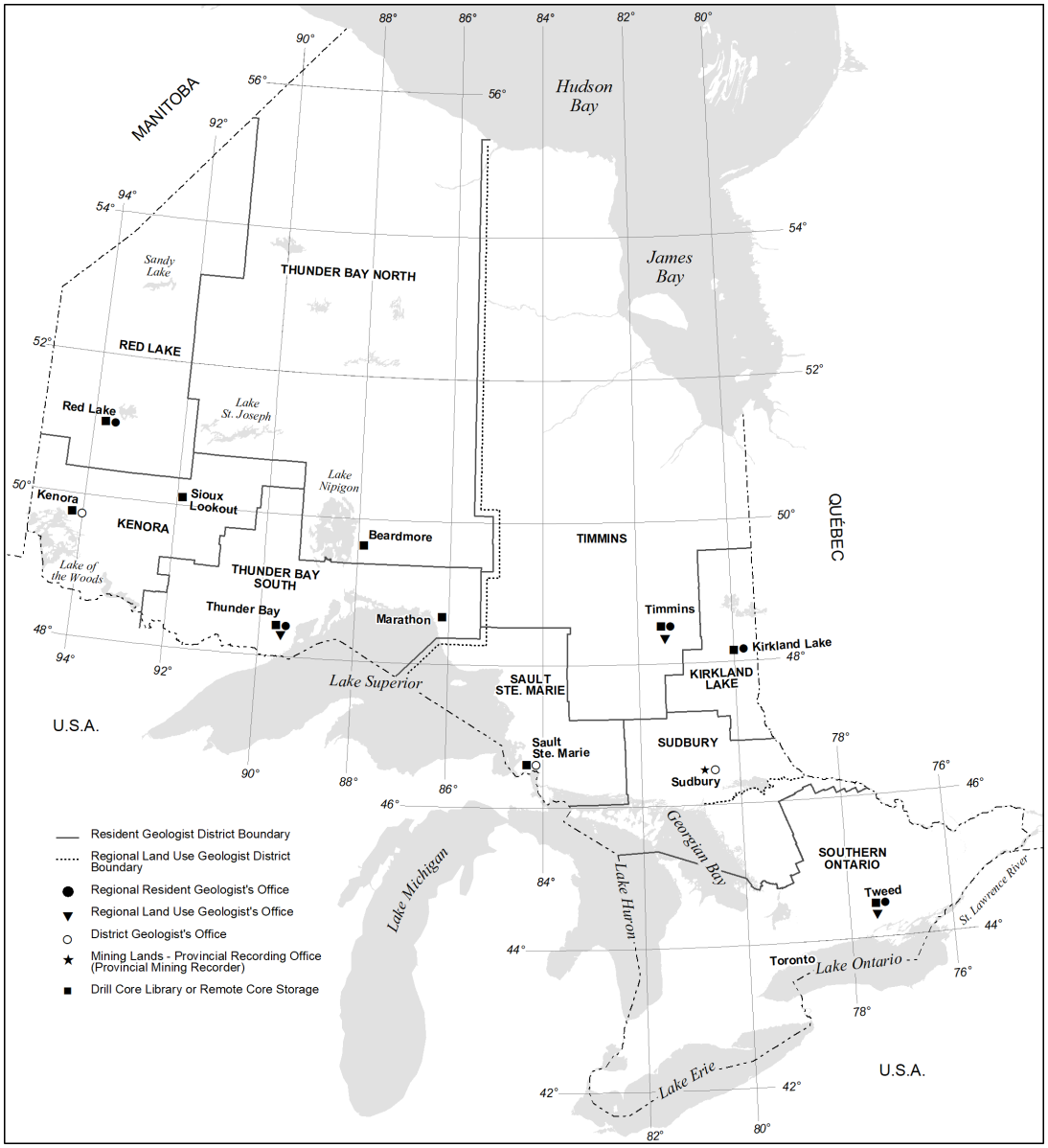

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ONTARIO GEOLOGICAL SURVEY

RESIDENT GEOLOGIST PROGRAM

REPORT OF ACTIVITIES—2020

TIMMINS
REGIONAL RESIDENT GEOLOGIST REPORT

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Ontario Geological Survey
Resident Geologist Program

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by

Z. Azadbakht, P. Bousquet, C. Boucher, C.M. Daniels, S.L.K. Hinz, G. Dorland and C. Patterson

2021

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Timmins Regional Resident Geologist (Timmins District)—2020

Z. Azadbakht[1], P. Bousquet[2], C. Boucher[3], C.M. Daniels[4, 8], S.L.K. Hinz[5], G. Dorland[6] and C. Patterson[7]

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INTRODUCTION

The Timmins District (Figure 1) has 7 producing gold mines, 1 base metal mine and 1 industrial mineral producer (Figures 2, 3, 4 and 5).

Recent mineral discoveries, known mineralized showings, as well as former and operating mines, again attracted significant exploration investment and effort in 2020. Detour Gold Corporation was taken over by Kirkland Lake Gold Ltd. (Kirkland Lake Gold Ltd., news release, January 31, 2020).

IAMGOLD Corporation acquired all the necessary approvals to start construction at the Côté Gold Project. The Côté Gold Project will be an open pit gold mine with an 18 year potential mine life (IAMGold Corporation, press release, July 21, 2020). Mine construction started in September 2020.

At least 30 companies and individuals continued to explore on 39 projects for a wide variety of metals and minerals, of which gold remains the most sought-after commodity in the district (Figures 2, 3, 4, 5; Table 8, *see* "Exploration Activity").

Gold traded in at US$1550 (± US$50) in January 2020 and then climbed up to reach US$1700 in February. The price then leveled off at US$1750 (± US$50) between February and June before climbing again to reach about US$2000 (± US$50) by the end of July. The price then level off at US$1900 (± US$100) between September to December 2020 (https://www.kitco.com).

Mining claim activity in the Timmins Mining District over the past 6 years is listed in Table 1. The total number of claim units recorded during 2020 increased by 54.08% compared to 2019 and the total number of active claim units increased by 35.14% to 65 703 at the end of 2020 from 50 100 at the end of 2019 (R. Shamedova, Mining Lands, ENDM, email communication, January 22, 2021).

The active claims in the Porcupine camp account for 21% of all active claims in Ontario and is second only to the Thunder Bay Mining District, with 24.8% of all active claims. The value of assessment work filed in the Timmins District in 2020 increased by 248.02% compared to the value of assessment work filed in 2019. The total area covered by claims in the Timmins District is 1 158 607 hectares as of January 4, 2021, indicating that it is still one of the most active exploration destinations in Ontario.

Table 1. Summary of claims information in the Porcupine Mining Division, 2015–2020.

Year	Active Units	Recorded Units	Cancelled Unites	Assessment Work ($)
2020	67 703	14 341	21 094	43 415 618
2019	50 100	5552	n/a	12 474 887
2018	53 899	6084	1593	n/a
2017	49 882	4593	7508	28 177 358
2016	51 905	4620	9150	19 056 056
2015	55 153	3273	10 885	22 417 049
Δ 2019–20	+35.14%	+158.30%	n/a	+248.02 (2019–20)

Δ 2019–20 = change between annual totals from 2019 to 2020.

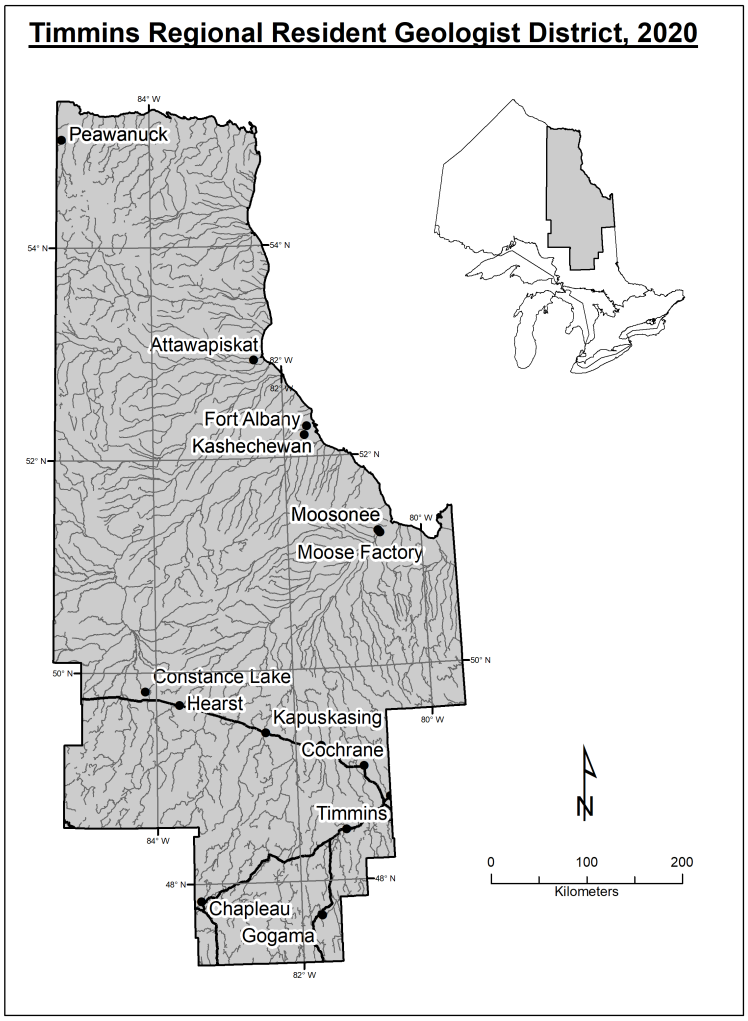


Figure 1. Timmins Resident Geologist District.

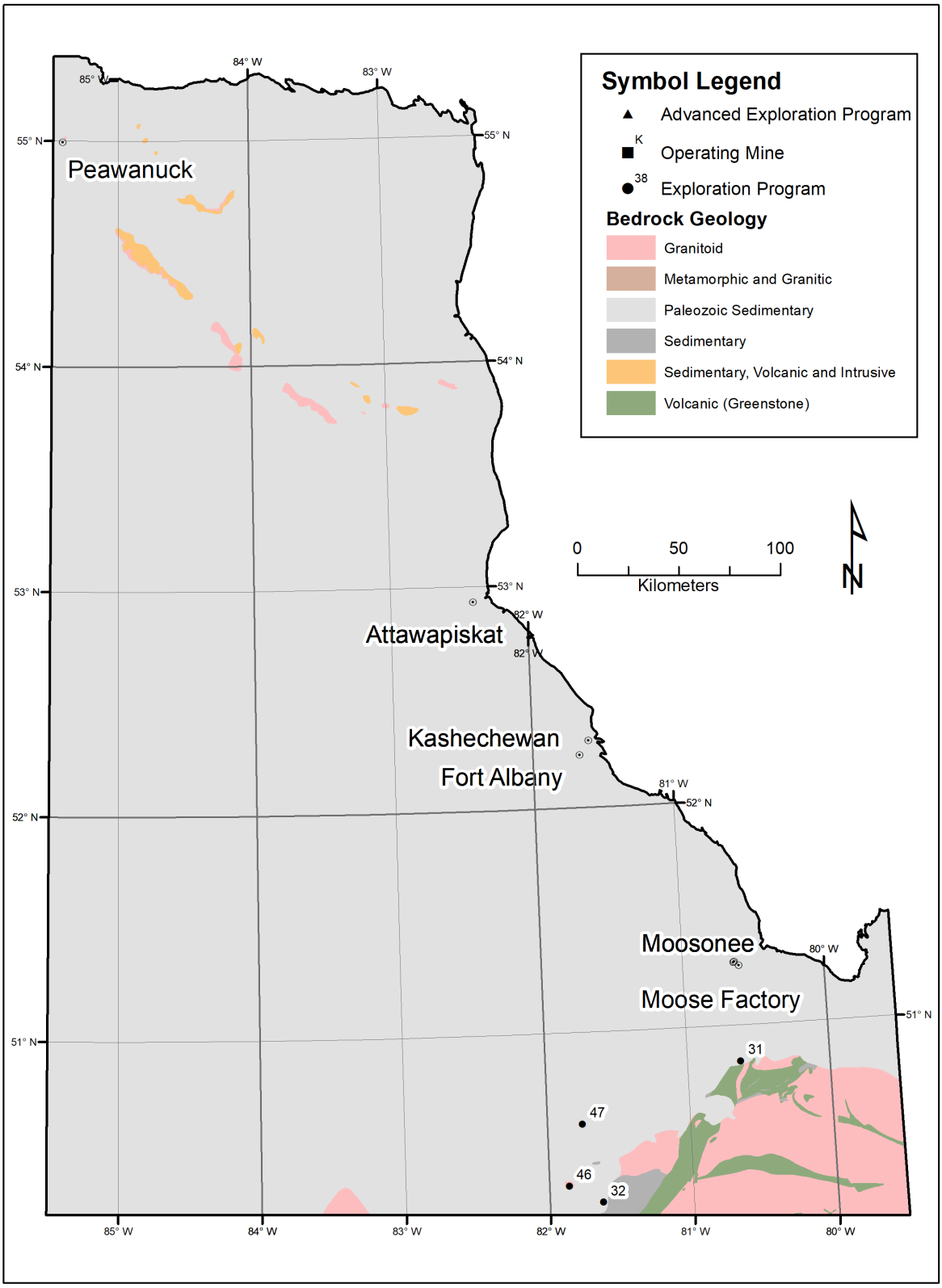


Figure 2. Exploration programs, advanced exploration and operating mines in the Timmins Regional Resident Geologist District (north part). Numbers are keyed to Table 8 (*see* "Exploration Activity"). Bedrock geology *from* Ontario Geological Survey (2011).

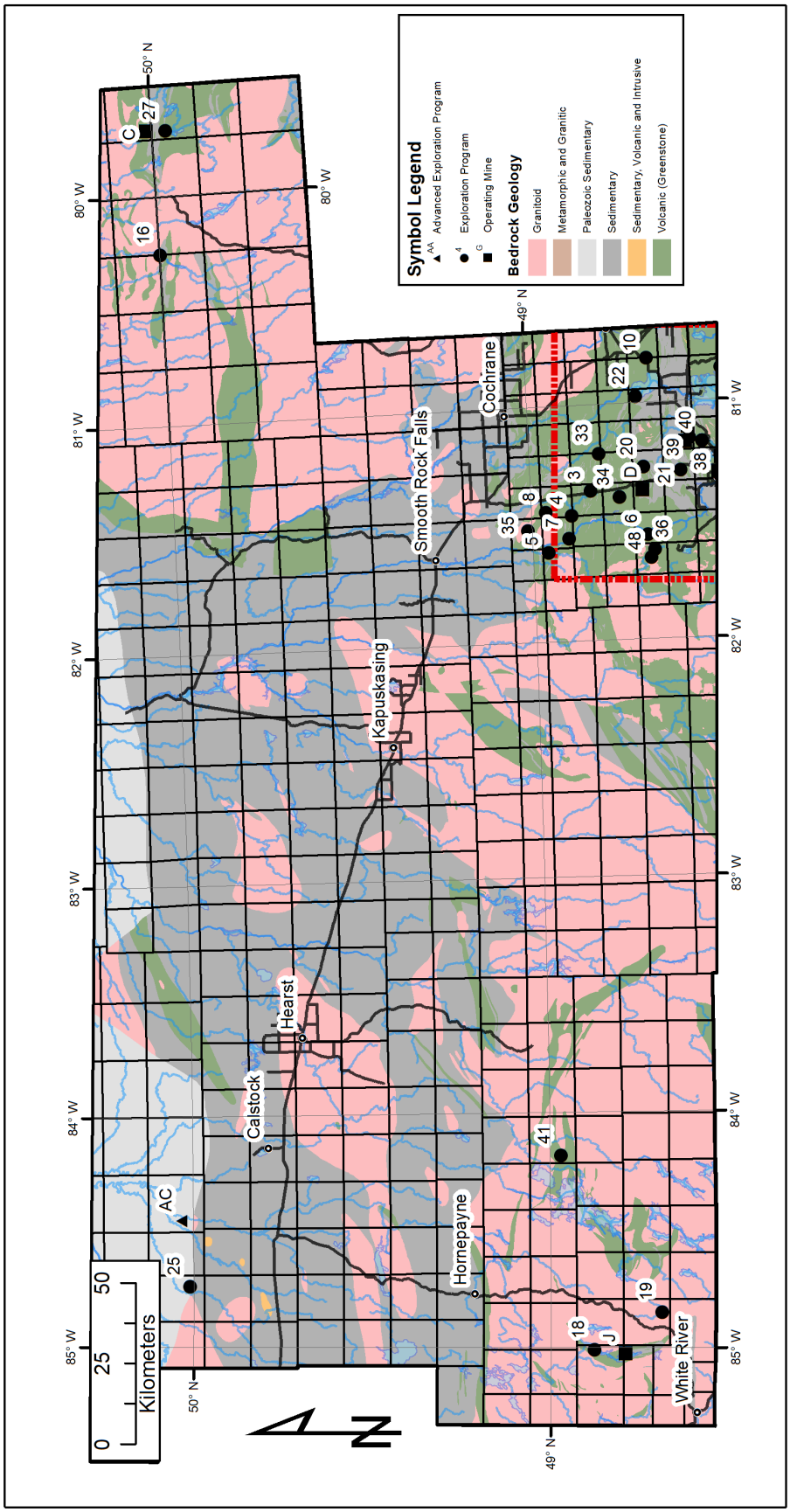


Figure 3. Exploration programs, advanced exploration and operating mines in the Timmins Resident Geologist District (central part). The area outlined by the red dashed line indicates the area shown in Figure 5. Letters are keyed to Table 2 and numbers are keyed to Table 8 (see "Exploration Activity"). Bedrock geology *from* Ontario Geological Survey (2011) .

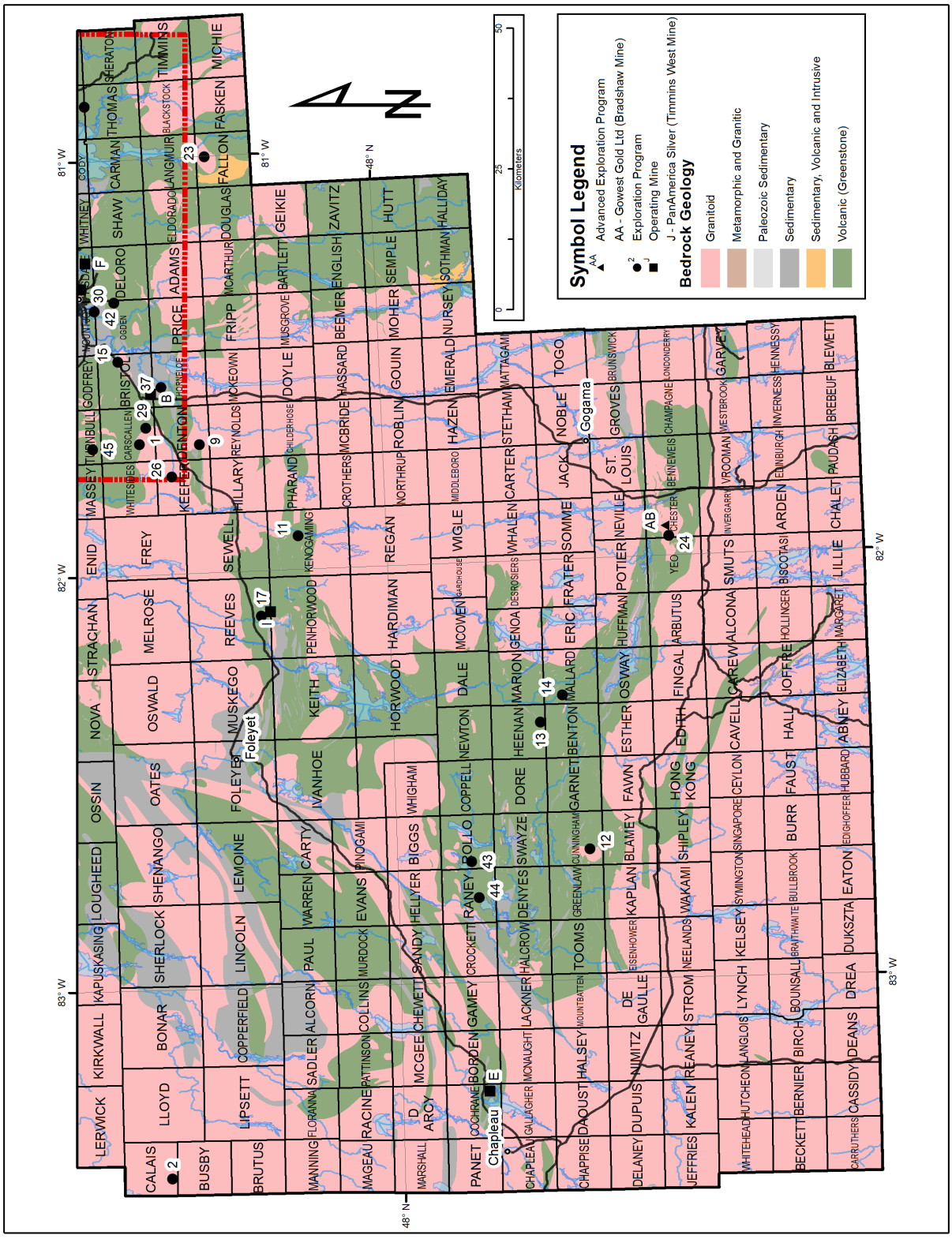
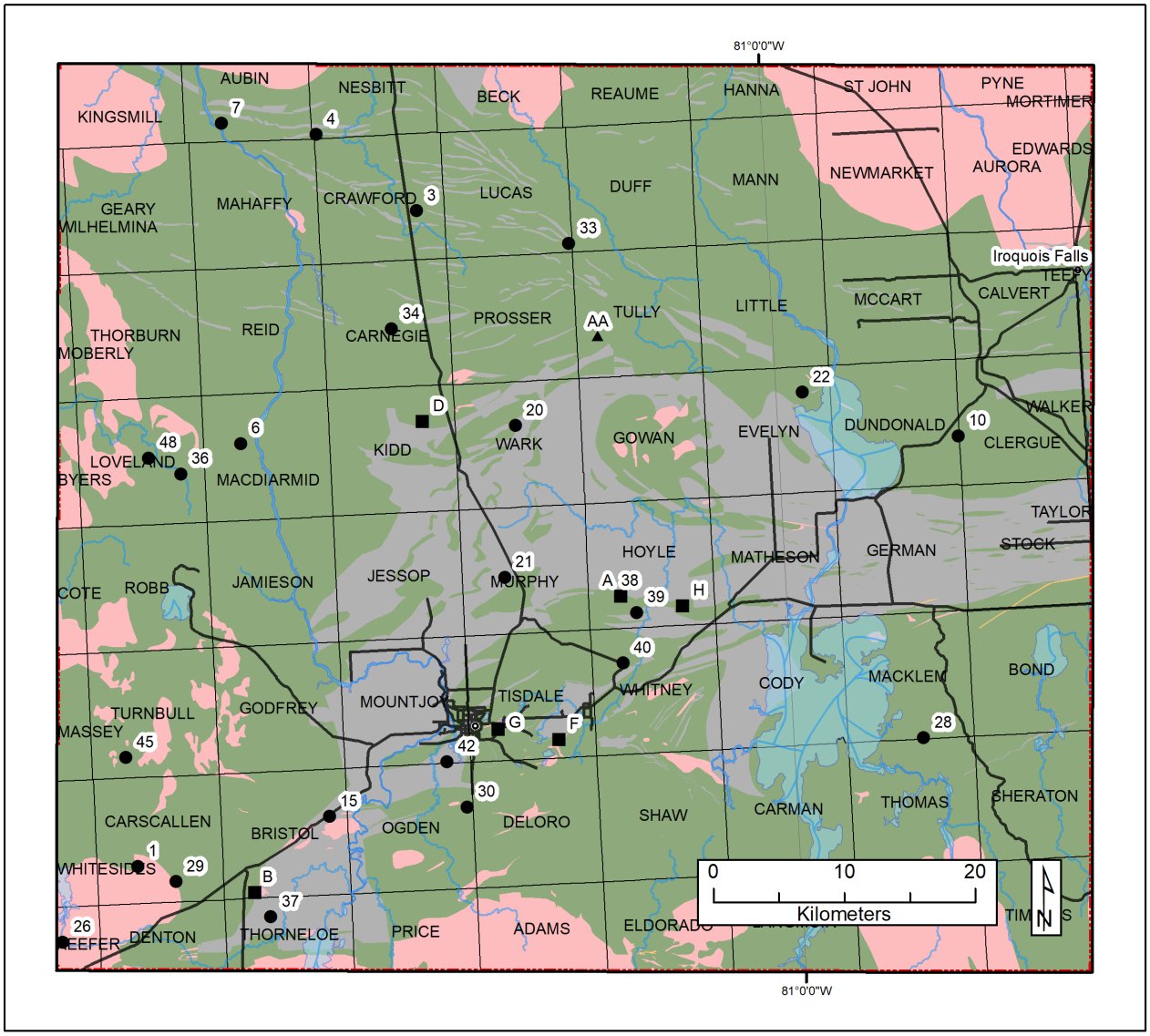


Figure 4. Exploration programs, advanced exploration, and operating mines in the Timmins Resident Geologist District (south part). Letters are keyed to Table 2 and numbers are keyed to Table 8 (*see* "Exploration Activity"). The area outlined by the red dashed line indicates the area shown in Figure 5. Bedrock geology *from* Ontario Geological Survey (2011).



Symbol Legend

- AA Advanced Exploration Program
- 4 Exploration Program
- G Operating Mine

Bedrock Geology

- Granitoid
- Metamorphic and Granitic
- Paleozoic Sedimentary
- Sedimentary
- Sedimentary, Volcanic and Intrusive
- Volcanic (Greenstone)

Figure 5. Exploration programs in the Timmins District. Inset for Figures 3 and 4. Letters are keyed to Table 2 and numbers are keyed to Table 8 (*see* "Exploration Activity"). Bedrock geology *from* Ontario Geological Survey (2011).

MINING AND QUARRYING ACTIVITY

Timmins District saw production from 7 gold mines (Bell Creek Mine, Borden Mine, Detour Lake Mine, Hollinger Mine, Hoyle Pond Mine, Sugar Zone Mine and the West Timmins Mine), 1 base metal and silver mine (Kidd Creek Mine), and 1 industrial talc mine (Penhorwood Mine). The 2020 production figures for these operating mines are tabulated in Table 2. Historical gold, base metal and diamond production up to December 31, 2020, for all the mines in the Timmins District are listed in Tables 3 and 4, respectively.

Table 2. Operating mine production and reserve information for 2020. Letters in first column are keyed to Figures 3, 4 and 5.

	Mine	Production in 2020		Reserves (Proven + Probable) at end of 2020	
		Tonnage @ Grade	Total Commodity	Tonnage	Grade
A	Kirkland Lake Gold Ltd. – Detour Mine	21.0 Mt @ 0.83 g/t Au	516 757 oz Au	516 900 000 t	0.98 g/t Au
B	Glencore Canada Corporation – Kidd Creek Mine	1 091 000 t @ 1.81% Cu, 3.69% Zn, 75 g/t Ag	34 000 t Cu 62 500 t Zn 2 125 000 oz Ag	5 000 000 t	1.8% Cu, 3.6% Zn, 44 g/t Ag
C	Newmont Corporation, Borden Mine	521 086 t @ 6.670 g/t Au	104 648 oz Au (93.7% recovery)		
D	Newmont Corporation, Dome Pit (Blueberry Hill)				
E	Newmont Corporation, Hollinger Mine	2 720 449 t @ 1.446 g/t Au	114 760 oz Au (90.7% recovery)		
F	Newmont Corporation, Hoyle Pond Mine	327 160 t @ 9.667 g/t Au	94 986 oz Au (93.4% recovery)		
G	Harte Gold – Sugar Zone Mine	134 360 t @ 6.3 g/t Au	25 649 oz Au	3 454 000 t 7.18 g/t Au	797 000 oz Au
H	Imerys – Penhorwood Mine	330 000 t @ 45.7% talc	83 200 t (25.2% yield)		
I	Pan American Silver, Bell Creek Mine	698 196 t @ 3.06 g/t Au	68 517 oz Au		
J	Pan American Silver, Timmins West Mine	944 866 t @ 2.69 g/t Au	79 887 oz Au		

Table 3. Historical gold production of mines in the Timmins Regional Resident Geologist District to December 31, 2020.

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	2011–2020	4 336 638	3 934 136	480 655	0.11
Bonetal	Whitney	1941–1951	352 254	319 559	51 510	0.15
Bonwhit	Whitney	1951–1954	200 555	181 940	67 940	0.34

Mine	Township	Years of Production	Total milled (Tons)	Total milled (Tonnes)	Production (oz Au)	Grade[1] (oz/t)
Borden	Cochrane	2018–2020	1 067 222	968 168	175 003	0.19
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	2013–2020	152 980 997	154 493 838	4 043 158	0.028
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
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	2014–2020	16 057 070	14 566 688	503 567	0.04
Hoyle (Falconbridge)	Whitney	1941–1944, 1946–1949	725 494	658 157	71 843	0.10
Hoyle Pond	Hoyle	1985–2020	11 815 112	10 748 864	4 196 462	0.35
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

Mine	Township	Years of Production	Total milled (Tons)	Total milled (Tonnes)	Production (oz Au)	Grade[1] (oz/t)
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	2017-2020	509 303	430 999	75 727	0.19
Timmins West (incl 144 Gap + Thunder Creek)	Bristol	2009–2020	9 831 041	8 918 581	1 107 504	0.11
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	567 866 564	530 871 076	77 551 574	

***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 4. Mining production in the Timmins District to the end of 2020.

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 Creek	Kidd	1966–2020	164 348 000 t	2.24% Cu, 5.81% Zn, 0.22% Pb , 77 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

Mine	Township	Years of Production	Ore Milled	Grade
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
Victor	BMA 527 834	2008–2019	31 636 t	8355 carats of diamond

Base Metal Mining

GLENCORE CANADA CORPORATION – KIDD OPERATIONS

Glencore Canada Corporation operated the Kidd Creek Mine in 2020. With a depth of 3440 m below sea level, it is the deepest base-metal mine in the world. The mine is located 25 km north of Timmins, in Kidd Township. In 2020, mine production was estimated at 1 091 000 t, grading 3.69% Zn, 1.81% Cu and 75 g/t Ag (Glencore – Resources & Reserves Report 2020, accessed at www.glencore.com, under Investors, Reports & Results, February 3, 2021). Total historical production for the mine is 164 348 000 t, grading 2.24% Cu, 5.81% Zn, 0.22% Pb and 77 g/t Ag (2020 production and historical production numbers to December 31, 2020 (*see* Table 4) (2020 production and historical production numbers to December 31, 2020, received from Benoit Drolet; email communication, February 3, 2021).

Total ore reserves at the end of 2020 were reported at 3 300 000 t, grading at 3.4% Zn, 1.9 % Cu and 47 g/t Ag. The Measured and Indicated Resources were reported to total 9 700 000 t, grading 4.2% Zn, 1.7% Cu and 50 g/t Ag. Mining is anticipated to continue for another 2 years and end in 2023. (Glencore – Resources & Reserves Report 2019, accessed at www.glencore.com, under Investors, Reports & Results, February 3, 2021).

Glencore employs 699 people at its Kidd Creek Mine and mill complex (543 at the mine; 156 at the mill). Mark Furlotte is the General Manager, Iain Mckillip is the Mine Technical Services Manager and Benoit Drolet, Senior Resources Geologist (Benoit Drolet, email correspondence, February 3, 2021).

Gold Mining

KIRKLAND LAKE GOLD LTD – DETOUR LAKE MINE

Kirkland Lake Gold acquired Detour Gold Corporation on January 31, 2020. The company operated the Detour Lake Mine, located in the Sunday Lake area, 160 km northeast of Cochrane. It produced 516 757 oz of gold in 2020 from 21.0 Mt of ore milled at an average head grade of 0.83 g/t Au (91.3% recovery; Kirkland Lake Gold, news release, January 12, 2021). The mine produced a total of 4 043 158 oz of gold from 154 493 838 t milled between 2013 and 2020, inclusive (*see* Table 3).

Kirkland Lake Gold received the Tom Peters Memorial Mine Reclamation Award in recognition of Detour Lake Mine's progressive reclamation program aimed at reclaiming 10 hectares of land per year commencing in 2019 (Kirkland Lake Gold, news release, January 12, 2021).

A drilling program with 19 523 m in 25 holes and one wedge hole (1110 m) was completed in the Saddle Zone, located between the Main Pit and West Pit locations, to collect information for an updated and

potentially expanded Mineral Reserve as well as to support the completion of a new production plan. The drilling was a part of a planned 250 000 m exploration program, which the company aims to complete by the end of 2021. The drilling showed wide, high-grade intersections in the Saddle zone, supporting potential underground mining operations extending mineralization 200 m to the west. Results provide increasing evidence that a much larger and higher grade deposit exists than is currently included in Mineral Reserves (Kirkland Lake Gold, news release, January 12, 2021).

Kirkland Lake Gold undertook multiple projects in support of future production growth, including the construction of an assay lab, investments in mill improvements, expansion of tailings capacity, and improvements to other site infrastructure at the Detour Lake Mine (Kirkland Lake Gold, news release, January 12, 2021).

The mine and process plant complex has a workforce of approximately 1200 employees. Larry Lazeski is the Mine General Manager, Andre Leite is the Technical Services Manager, Steve Gray is the Exploration Superintendent, and John Florek is the Geology Superintendent (John Florek, email correspondence, February 3, 2020).

HARTE GOLD CORP. – SUGAR ZONE MINE

Harte Gold published an updated Mineral Resource Estimate (current to September 31, 2020) containing an Indicated Mineral Resource of 2 803 000 tonnes grading 11.37 g/t for 107 000 ounces contained gold (Harte Gold, Management's Discussion and Analysis, January 20, 2020).

The company also completed a feasibility study to examine an expansion for the current infrastructure to increase overall mine production. The company is presently developing the Middle Zone and expects initial access to this zone by mid-2021. Once the Midde Zone is sufficiently developed, the company will have the flexibility to be mining concurrently from 3 independent zones: Sugar Zone North, Sugar Zone South and Middle Zone. These 3 zones combined can provide enough stoping areas to support 1200 t per day mine production (Harte Gold, Management's Discussion and Analysis, January 20, 2020).

The mine had a workforce of 215 employees (214 Harte full time, 1 contractor) at the end of December 2020 (Darlene Bilec, email correspondence, February 23, 2021). Dan Gagnon is the Vice President of Operations, Shane Cockle and Brian Harding are Mine Superintendents, Michael Glendenning is the Chief Mine Geologist. Todd Archer is the Senior Geologist, David Stevenson is the Chief Exploration Geologist, and Dave Schonfeldt is the Vice President of Exploration (Dan Gagnon, email correspondence, February 23, 2021).

NEWMONT CORPORATION – PORCUPINE GOLD MINES

Newmont Goldcorp Corporation mined and milled ore from the Borden, Hollinger and Hoyle Pond Mines in the Chapleau (Borden) and Timmins areas. These operations recovered a total of 314 394 ounces of gold from 3 568 695 t with an average mill head grade of 2.962 g/t and a recovery of 92.50% during 2020. The Porcupine deposits were calculated to have Proven and Probable gold reserves of 47 333 360 tonnes grading 2.00 g/t for 3 049 170 ounces contained gold and Measured and Indicated gold resources of 85 324 220 tonnes grading 1.43 g/t for 3 921 020 ounces contained gold on December 31, 2020 (Gertjan Bekkers, email communication, March 29, 2020). Data for the Hollinger pits, Borden and Hoyle Pond underground mines were supplied by the company and is reported in Tables 2 and 6 (Gertjan Bekkers, email communication, March 29, 2020).

No production occurred from the Blueberry Hill open pit in 2020.

The mines and mill complex had a workforce of 952 employees (704 full time; 248 contractors) in 2020. Patrick Chabot is the Mine General Manager, Gertjan Bekkers is the Manager of Mine Technical Services, and Chris Osiowy is the District Exploration Manager. (Gertjan Bekkers, email correspondence, March 29, 2020.)

The Borden Mine had a workforce of 293 (45 employees and 248 contractors) included in Newmont employee total at the end of December 2020. Patrick Chabot is the General Manager, Craig Green is the Senior Mine Geologist, and Chris Osiowy is the Regional Manager of Exploration. (Gertjan Bekkers, email correspondence, March 29, 2020.)

Table 5. Newmont mines production for 2020 (G. Bekkers, email correspondence, March 29, 2021).

Mine	Tonnes	Grade (g/t)	Head Ounces	Recovery (%)	Recovered Ounces
Borden	521 086	6.670	111 742	93.7%	104 648
Hollinger Pit	2 720 449	1.446	126 479	90.7%	114 760
Hoyle Pond	327 160	9.667	101 678	93.4%	94 986
Total	3 568 695	2.962	339 899	92.50%	314 394

PAN AMERICAN SILVER CORP. – LAKE SHORE GOLD DIVISION

Lake Shore Gold, a division of Pan American Silver Corp., produced a total of 148 404 ounces of gold in 2020. This total includes 68 517 ounces of gold recovered from 698 196 tonnes of Bell Creek Mine ore and 79 887 ounces of gold recovered from 944 866 tonnes of Timmins West Mine ore. The Bell Creek ore had a head grade of 3.06 g/t Au and the Timmins West Mine ore had a head grade of 2.69 g/t Au (Al Mainville, email correspondence, February 18, 2021). The results are reported along with those for all the other operating mines in Table 2.

The Timmins mines have Reserves of 3 000 000 t containing 295 800 ounces of gold (at 3.05 g/t) and resources of 7 100 000 t containing 665 500 ounces of gold (at 2.93 g/t) at June 30, 2020 (Pan American Silver, news release, August 5, 2020).

Pan American Silver Corp. also reported Indicated Resources for the Gold River property of 700 000 t containing 117 400 ounces of gold at 5.29 g/t; the Marlhill property of 400 000 t containing 57 400 ounces of gold at 4.52 g/t; the Vogel property of 2 200 000 t containing 125 000 ounces of gold at 1.75 g/t; the Fenn-Gib property of 40 800 000 t containing 1 298 600 ounces of gold at 0.99 g/t; and Measured Resources for the Whitney property of 800 000 t containing 134 900 ounces of gold at 7.02 g/t at June 30, 2020. The sale of the Juby exploration property was completed in June 2020, which led to a subsequent reduction in the indicated and inferred gold mineral resources in Timmins (Pan American Silver, news release, August 5, 2020).

The company had a work force of 715 employees (662 full time, 53 contract employees) on December 31, 2020 (Al Mainville, email communications, February 18, 2021). Bill Shand is the Country Manager – Canada, Courtney Nunn is the Mine Manager for Timmins West Mine, Rick Blakey is the Mine Manager for Bell Creek Mine, Dave Flesher is the Mill Manager for the Bell Creek Mill, Eric Lachapelle is the Manager, Technical Services, Ivan Langois is the Chief Mine Geologist at Timmins West Mine, Chris Albert is the Chief Mine Geologist at Bell Creek Mine and Al Mainville is the Geology Manager. (Al Mainville, email communication, February 18, 2021.)

Industrial Mineral Mining

IMERYS TALC – PENHORWOOD MINE

Production of talc continued at the Penhorwood Mine in 2020, with 330 000 t of ore grading 45.7% talc being extracted from the open pit and processed through the mill on-site to produce 83 200 t of talc concentrate (*see* Table 2). The talc concentrate was shipped for further processing to the company micronizing (grinding) plant in Timmins (Jackie Ladouceur, email correspondence, February 2, 2021).

The mine, mill and micronizing facility had a total workforce of 65 employees, including 18 salaried in 2018 (J. Ladouceur, email correspondence, February 2, 2021). Daniel Demers is the Mill and Concentrator Manager, Estian Coetzer is the Mine Manager, Mike Kerr is the Timmins Micronizing Plant Manager, and Benoit Melancon is the Canadian Operations Manager (Jackie Ladouceur, email correspondence, February 2, 2021).

EXPLORATION ACTIVITY

Active Exploration Plans and Permits Received in 2020

Exploration plans and permits in the Timmins District in 2020 are shown in Tables 6 and 7, respectively.

Table 6. Exploration plans in the Timmins District in 2020.

Abbreviations

GEOPH ..... Geophysical
LC ..... Line cutting
PDRILL ..... Mechanized drilling
PSTRIP ..... Mechanized stripping
PTRNCH ..... Pitting and trenching

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PL-19-000010	Yvan Labonte	Yvan Claims Project	Agate	LC	05/26/2019
PL-20-000113	2254022 Ontario Ltd.	C1 JV Property Project	Coppell, Dore, Rollo, Swayze	PDRILL, GEOPH	11/07/2020
PL-19-000123	1537763 Ontario Inc.	A7	Cunningham, Garnet	LC, PSTRIP, PTRNCH	10/05/2021
PL-18-010958	Goldcorp Inc. & Goldcorp Canada Ltd. Goldcorp	Bowtie – Geophysics	Deloro	LC	11/30/2018
PL-18-010985	Central Timmins Exploration Corp.	CTEC Deloro Grid	Deloro	LC, GEOPH	01/06/2019
PL-18-010997	Goldcorp Inc, Goldcorp Canada Ltd.	Century 2019 – Geotech Project – active claim outside closure	Deloro	LC, PSTRIP	01/07/2019
PL-18-011000	Goldcorp Inc, Goldcorp Canada Ltd.	Century Geotech 2018 Project – active claim outside closure	Deloro	LC, PSTRIP, GEOPH	01/07/2019
PL-20-000093	Goldcorp Inc, Goldcorp Canada Ltd.	Dome Geotech Line Cutting	Deloro, Shaw	LC	09/27/2020
PL-20-000108	C. Cox	Hills Reef Project	Duff, Mann	LC, GEOPH	10/14/2020
PL-18-010981	Ashley Gold Mines Limited	Fawn Project	Fawn, Hong Kong	LC, GEOPH	01/05/2019
PL-19-000008	Norbert Reichert	Mosquito Nest Project	Geary, Wilhelmina	PDRILL, PSTRIP, PTRNCH, LC, GEOPH	04/25/2019
PL-18-010921	2522962 Ontario Inc.	Gowan Project	Gowan	LC	10/13/2018

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PL-18-010922	Amex Exploration Inc.	Gowan Project	Gowan	LC	10/13/2018
PL-19-000016	Pavey Ark Minerals Inc.	Hawkins Project – Shenango Project	Hawkins	PDRILL, PSTRIP, PTRNCH, LC, GEOPH	06/05/2019
PL-20-000124	VR Resources Ltd.	HK Project	Hecla, Kilmer	LC, GEOPH	11/22/2020
PL-19-000129	Fancamp Exploration Ltd.	Heenan Block Project	Heenan	LC, GEOPH	10/27/2019
PL-19-000105	IAMGOLD Corporation, SMM Gold Cote Inc.	TAAC West Project	Huffman, Osway	LC, GEOPH	08/30/2019
PL-18-010963	Explor Resources Inc.	Kidd Carnegie	Jessop, Murphy, Kidd, Wark	LC, GEOPH	01/04/2019
PL-19-000142	John Grant	Keefer Lake Area Project	Keefer	LC, GEOPH	12/20/2019
PL-18-010996	GFG Resources Inc.	Pen Gold Project	Kenogaming, Penhorwood	LC, GEOPH	02/17/2019
PL-18-010964	Explor Resources Inc.	Kidd Carnegie	Kidd	LC, GEOPH	01/13/2019
PL-18-010965	Explor Resources Inc.	Kidd Carnegie	Kidd	GEOPH	01/05/2019
PL-18-010968	Explor Resources Inc.	Kidd Carnegie	Kidd, Wark	LC, GEOPH	01/13/2019
PL-19-000143	David Carter, Lynne Mccarthy, David Carter, Lynne Mccarthy	Hiawatha Project	Lizar	LC, GEOPH	01/15/2020
PL-19-000137	International Explorers & Prospectors Inc.	Loveland Nickel	Loveland, MacDiarmid	LC, GEOPH	10/16/2019
PL-19-000146	David Meunier	Loveland	Loveland, Robb	LC, GEOPH	01/15/2020
PL-19-000126	Fancamp Exploration Ltd.	Mallard Gold Project	Mallard	PSTRIP, GEOPH	10/11/2019
PL-19-000127	Fancamp Exploration Ltd.	Mallard Gold Project	Mallard	LC, GEOPH	10/11/2019
PL-18-010925	Andrew Garvie & Gino Fournier	Goat Lake Project	Minnipuka	LC, PDRILL	12/28/2018
PL-18-010923	2522962 Ontario Inc.	Montcalm Project	Montcalm	GEOPH	10/12/2018
PL-19-000116	Central Timmins Exploration Corp.	CT-M9-B1	Mountjoy	GEOPH	09/18/2019
PL-19-000117	Central Timmins Exploration Corp.	CT-M9-A1	Mountjoy	GEOPH	09/18/2019
PL-19-000118	Central Timmins Exploration Corp.	CT-M12-A1	Mountjoy	GEOPH	09/18/2019
PL-19-000119	Central Timmins Exploration Corp.	CT-M3-A1	Mountjoy	LC, GEOPH	09/18/2019
PL-19-000120	Central Timmins Exploration Corp.	CT-M4-A1	Mountjoy	GEOPH	09/20/2019
PL-19-000134	Jonathan Camilleri	Camilleri Mallard Grid	Osway	LC, GEOPH	11/10/2019
PL-19-000106	Darcy Ungar	Fred Flat Project	Pearce, Teetzel	LC, PSTRIP, PTRNCH	08/28/2019
PL-19-000002	VR Resources Ltd.	Ranoke Project	Pickett, Morrow, Mulholland	LC, GEOPH	04/05/2019
PL-18-010998	Goldcorp Inc, Goldcorp Canada Ltd.	Century Geotech 2018 Project – active claim outside closure	Shaw, Whitney	LC, GEOPH	02/07/2019
PL-18-010982	Ashley Gold Mines Limited	Shipley Project	Shipley	LC, GEOPH	01/05/2019
PL-19-000077	Robert Laviolette, Apryl Oster	Gold Rush Property Project	Turnbull	PDRILL	07/12/2019
PL-18-010962	Explor Resources Inc.	Kidd Carnegie	Wark	LC, GEOPH	12/29/2018
PL-18-010999	Goldcorp Inc, Goldcorp Canada Ltd.	Century Geotech 2018 Project – active claim outside closure	Whitney	LC, PSTRIP	01/07/2019

Table 7. Exploration permits in the Timmins District in 2020.

Abbreviations

GEOPH ..... Geophysical
LC ..... Line cutting
PDRILL ..... Mechanized drilling
PSTRIP ..... Mechanized stripping
PTRNCH ..... Pitting and trenching

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-18-11273	Harte Gold Corp.	Sugar Zone Project – Highway Zone	Abraham, Cooper	PDRILL	09/12/2018
PR-19-000344	David Meunier	Golden Perimeter West Project	Adams, Deloro, Ogden, Price	PDRILL	02/18/2020
PR-20-000141	The Claim Group Inc.	Tomorrow Lake – Atkinson Lake Area Claims Project	Atkinson Lake Area	PDRILL	09/09/2020
PR-20-000227	Aurelius Minerals Inc.	Northeast	Atkinson Lake Area	PDRILL	09/08/2020
PR-20-000142	The Claim Group Inc.	Tomorrow Lake – Kingroy Lake Area Claims Project	Atkinson Lake Area, Kingroy Lake Area	PDRILL	09/09/2020
PR-19-000025	Gordon Henriksen	K-39	Bartlett, English	PDRILL, LC	04/05/2019
PR-18-000300	Harte Gold Corp.	Sugar Zone Property – Hambleton Areas 5 to 8	Bayfield, Gourlay	PDRILL, LC	05/10/2019
PR-18-000299	Harte Gold Corp.	Sugar Zone Property – Hambleton Areas 2 to 4	Bayfield, Gourlay, Hambleton, Matthews	PDRILL, LC	05/10/2019
PR-19-000011	DH Exploration Inc.	Muskasenda Lake Project	Beemer, English	PDRILL, PSTRIP, PTRNCH, LC	06/26/2019
PR-19-000343	David Meunier	Golden Perimeter Project	Blackstock, Douglas, Fallon, Fasken, Langmuir, Thomas	PDRILL	02/19/2020
PR-18-000131	Alain Vallee	420 Mining Exploration Project	Blount	PDRILL, PSTRIP, PTRNCH, LC	05/17/2019
PR-19-000267	Central Timmins Exploration Corp.	Bonar Project	Bonar	PDRILL	12/12/2019
PR-19-000093	Kraken Gold Corporation	Bond West Zone Project	Bond	PDRILL, PSTRIP, LC	07/23/2019
PR-19-000092	Kraken Gold Corporation	Bond–Currie Main Zone Project	Bond, Currie	PDRILL, PSTRIP, LC	07/23/2019
PR-19-000174	Pelangio Exploration Inc.	Poirier Gold Project	Bristol	PDRILL, LC	09/04/2019
PR-19-000175	Pelangio Exploration Inc.	Thunder Gold Project	Bristol	PDRILL, LC	09/04/2019
PR-19-000307	Lake Shore Gold Corp, Goldcorp Borden Limited	Timmins West Permit #13 Project	Bristol, Carscallen, Denton, Thorneloe	PDRILL	02/04/2020
PR-19-000043	Explor Resources Inc.	Timmins Porcupine West	Bristol, Ogden	PDRILL, LC	04/16/2019
PR-20-000331	Explor Resources Inc.	West Cache Project	Bristol, Ogden	PDRILL	12/30/2020
PR-17-11147A1	International Explorers & Prospectors Inc.	Half Moon	Byers, Loveland, Robb	PDRILL	02/09/2018
PR-19-000265	Nobel Mineral Exploration Inc.	Project 81	Calder	PDRILL	12/17/2019
PR-17-11150	International Explorers & Prospectors Inc.	Reid Township	Carnegie, MacDiarmid, Mahaffy, Reid	PDRILL	08/24/2017
PR-17-11097	Glenn Galata	Ariel Project	Carscallen	PDRILL	02/20/2018
PR-17-11228	International Explorers & Prospectors Inc.	Carscallen	Carscallen	PDRILL	02/26/2018
PR-20-000049	Melkior Resources Inc.	Carscallen Project	Carscallen	PDRILL	07/06/2020
PR-20-000263	South Shore Partnership Inc.	Gold Rush	Carscallen, Turnbull	PDRILL, PSTRIP, PTRNCH, LC	10/16/2020

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-19-000338	Robert Sedore	Trying My Luck Project	Cassidy	PTRNCH	06/25/2020
PR-19-000017	Arvo Salo	Clergue–Corner Project	Clergue, Dundonald, Stock	PDRILL	03/21/2019
PR-19-000312	Harte Gold Corp.	Sugar Zone Property – TT8 Zone Project	Cooper, Nameigos, Strickland	PDRILL, LC	01/24/2020
PR-18-000291	Harte Gold Corp.	Sugar Zone Property – K7 South Areas 2-4	Cooper, Odlum, Strickland, Tedder	PDRILL	05/10/2019
PR-17-11121	2254022 Ontario Ltd.	Kenty	Coppell, Dore, Rollo, Swayze	PDRILL, PSTRIP	07/14/2017
PR-20-000053	Goldcorp Canada Ltd.	Area A Project	Copperfield, Lincoln	PDRILL, PSTRIP, LC	08/27/2020
PR-19-000286	Central Timmins Exploration Corp.	Robb – Turnbull Project	Cote, Massey, Robb, Turnbull	PDRILL	12/19/2019
PR-20-000097	Nobel Mineral Exploration Inc.	Crawford Nickel–Cobalt Sulphide Project	Crawford	PDRILL, LC	09/22/2020
PR-20-000098	Nobel Mineral Exploration Inc.	Crawford Nickel–Cobalt Sulphide Project	Crawford	PDRILL, LC	09/22/2020
PR-20-000103	Nobel Mineral Exploration Inc.	Crawford Nickel–Cobalt Sulphide Project	Crawford	PDRILL, LC	09/22/2020
PR-19-000235	David Brunne	Swayze Huycke Gold Project	Cunningham	PDRILL, PSTRIP, PTRNCH	11/04/2019
PR-19-000277	Fancamp Exploration Ltd.	Cunningham Project	Cunningham	PDRILL, LC	12/10/2019
PR-20-000127	Jean Gaudreau	Dale Property Project	Dale	PDRILL, PSTRIP, PTRNCH, LC	09/25/2020
PR-18-000081	Goldcorp Canada Ltd.	Century Cond 2018	Deloro		09/10/2018
PR-18-000128	Goldcorp Inc. & Goldcorp Canada Ltd.	Century COND 2018 – active claims outside closure	Deloro	PDRILL, PSTRIP	09/19/2018
PR-18-000172	Goldcorp Canada Ltd.	Century 2018 COND	Deloro	PDRILL	11/02/2018
PR-18-000238	Central Timmins Exploration Corp.	CT-D-A1	Deloro	PDRILL	01/19/2019
PR-18-000239	Central Timmins Exploration Corp.	CT-D-A2	Deloro	PDRILL	12/13/2018
PR-18-000241	Central Timmins Exploration Corp.	CT-D-01	Deloro	PDRILL	12/05/2018
PR-18-11279	Central Timmins Exploration Corp.	Lynx Project	Deloro	PDRILL	04/04/2018
PR-19-000012	DH Exploration Inc.	Deloro Project	Deloro	PDRILL, PSTRIP, PTRNCH, LC	11/01/2019
PR-19-000266	Central Timmins Exploration Corp.	Deloro Project	Deloro	PDRILL	12/12/2019
PR-20-000253	Goldcorp Canada Ltd.	Dome Geotech Drilling	Deloro	PDRILL, PSTRIP	10/07/2020
PR-18-000123	Goldcorp Inc. & Goldcorp Canada Ltd.	Century COND 2018 – Goldcorp active claims outside closure boundary	Deloro, Shaw	PDRILL, PSTRIP	09/19/2018
PR-18-000122	Goldcorp Inc. & Goldcorp Canada Ltd.	Goldcorp Century COND 2018	Deloro, Tisdale	PDRILL, PSTRIP	09/10/2018
PR-20-000304	Pavey Ark Minerals Inc.	Goldfields Project	Derry, Hawkins	PDRILL, PSTRIP, PTRNCH, LC	11/26/2020
PR-17-11095	Pavey Ark Minerals Inc.	Hawkins Project	Derry, Hawkins, Walls	PDRILL, PSTRIP, PTRNCH, LC	09/15/2017

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-20-000078	C. Cox	Hill's Reef Project	Duff, Mann	PDRILL, PSTRIP, PTRNCH, LC	09/18/2020
PR-20-000140	The Claim Group Inc.	Tomorrow Lake – East of Kesagami Lake Area Project	East Of Kesagami Lake Area	PDRILL	09/10/2020
PR-19-000010	Gowest Gold Ltd, Transition Metals Corp.	NTP-Little Project	Evelyn, Gowan, Little, Tully	PDRILL, LC	03/18/2019
PR-19-000345	Epica Gold Inc.	Golden Mile Project	Evelyn, Matheson	PDRILL	02/18/2020
PR-20-000169	Ashley Gold Mines Limited	Fawn Project	Fawn	PSTRIP	09/04/2020
PR-18-000008	Denis Leduc	Shawmere Fire Tower	Foleyet	PDRILL, PSTRIP, PTRNCH, LC	09/10/2018
PR-18-000143	Denis Leduc	Shawmere Fire Tower Project	Foleyet	PSTRIP	01/07/2019
PR-20-000320	GFG Resources Inc.	Pen Gold Project	Foleyet, Keith, Ivanhoe, Muskego	PDRILL	12/16/2020
PR-18-000138	Denis Leduc	Shawmere Fire Tower Project	Foleyet, Lemoine	PSTRIP	11/23/2018
PR-19-000226	Enviromine Inc.	Shawmere	Foleyet, Lemoine	PDRILL, PSTRIP, PTRNCH	10/16/2019
PR-18-000020	Mark Brazeau	Faultline Minerals	Fripp	PDRILL, PSTRIP, PTRNCH	10/29/2018
PR-20-000084	Randall Salo	German Tp Project	German	PDRILL, PSTRIP, PTRNCH, LC	09/18/2020
PR-17-11133	International Explorers & Prospectors Inc.	Steep Lake	Godfrey	PDRILL	08/08/2017
PR-19-000287	Central Timmins Exploration Corp.	Four Corners Project	Godfrey, Jamieson, Robb, Turnbull	PDRILL	12/30/2019
PR-18-11278	Central Timmins Exploration Corp.	Caron Project	Godfrey, Mountjoy	PDRILL	07/16/2018
PR-19-000049	Central Timmins Exploration Corp.	CT19-G1-01 Project	Godfrey, Mountjoy	PDRILL	05/17/2019
PR-19-000057	Central Timmins Exploration Corp.	CT19-M11-01 Project	Godfrey, Mountjoy	PDRILL	05/17/2019
PR-19-000198	Harte Gold Corp.	Sugar Zone Property – TNT Area Project	Gourlay, Hambleton	PDRILL, LC	09/20/2019
PR-18-000062	5007223 Ontario Inc.	Gowan Project	Gowan	PDRILL	08/22/2018
PR-18-000063	Amex Exploration Inc.	Gowan Project	Gowan	PDRILL	08/22/2018
PR-19-000005	Gowest Gold Ltd, Transition Metals Corp.	NTGP – Gowan Project	Gowan	PDRILL, LC	03/18/2019
PR-18-000297	Harte Gold Corp.	Hambleton North, East & West Grids	Hambleton	PDRILL, LC	05/10/2019
PR-18-000298	Harte Gold Corp.	Sugar Zone Property – Hambleton Area 1	Hambleton	PDRILL, LC	05/10/2019
PR-20-000030	Harte Gold Corp.	Sugar Zone Property – Near Mine A Project	Hambleton, Odlum	PDRILL, LC	03/25/2020
PR-20-000290	Pavey Ark Minerals Inc.	Hawkins Project	Hawkins, Walls	PDRILL, PSTRIP, PTRNCH, LC	11/20/2020
PR-20-000217	VR Resources Ltd.	HK	Hecla, Kilmer	PDRILL	09/23/2020
PR-19-000253	Fancamp Exploration Ltd.	Heenan Block Project	Heenan	PDRILL	11/18/2019
PR-19-000308	Lake Shore Gold Corp.	Bell Creek Project 1	Hoyle, Tisdale, Murphy, Whitney	PDRILL	01/30/2020

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-19-000184	IAMGOLD Corporation, SMM Gold Cote Inc.	TAAC West Project	Huffman, Osway	PDRILL, PSTRIP, PTRNCH	09/17/2019
PR-17-11243	Argo Gold Inc.	Hurdman	Hurdman	PDRILL, PSTRIP, PTRNCH, LC	04/06/2018
PR-18-000244	Central Timmins Exploration Corp.	CT-FC-02	Jamieson	PDRILL	12/12/2018
PR-18-000243	Central Timmins Exploration Corp.	CT-FC-01	Jamieson, Robb	PDRILL	01/19/2019
PR-19-000024	Harte Gold Corp.	Sugar Zone Property – Eagle West – Area 3	Johns	PDRILL, LC	05/10/2019
PR-20-000139	The Claim Group Inc.	Tomorrow Lake – West of Sunday Lake Area Claims Project	Kattawagami River Area, West Of Sunday Lake Area	PDRILL	09/10/2020
PR-19-000083	Moon Energy Corp. Foundation Canada	Stargate 1 Project	Keefer	PDRILL	06/25/2019
PR-18-11288	Gail Resources Inc.	Sangold Drilling Program	Keith	PDRILL	04/12/2018
PR-17-11166	Frederick Ross	Pen Gold	Kenogaming	PSTRIP	10/03/2017
PR-18-000199	Rapier Gold Inc.	Pen Gold	Kenogaming, Penhorwood, Reeves	PDRILL	12/18/2018
PR-20-000193	GFG Resources Inc.	Pen Gold Project	Kenogaming, Penhorwood, Reeves, Sewell	PDRILL	09/14/2020
PR-19-000244	GFG Resources Inc.	Pen Gold Project	Kenogaming, Penhorwood, Reeves, Sewell	PDRILL	11/04/2019
PR-18-000159	GFG Resources Inc.	Pen Gold Project	Kenogaming, Sewell	PDRILL	11/09/2018
PR-19-000197	GFG Resource Inc.	Pen Gold Project	Kenogaming, Sewell	PDRILL	10/03/2019
PR-18-000005	Denis Leduc	Shawmere Fire Tower	Lemoine	PDRILL, PSTRIP, PTRNCH, LC	09/10/2018
PR-19-000041	David Carter, Christopher Partrie, Dan MacDougall and Lynne McCarthy	Hiawatha Property	Lizar	PDRILL, PTRNCH, LC	05/15/2019
PR-19-000112	Western Kidd Resources Inc.	lov-2 Project	Loveland	PDRILL	07/12/2019
PR-17-11131	International Explorers & Prospectors Inc.	Raspberry Road	Loveland, MacDiarmid, Reid, Thorburn	PDRILL	08/29/2017
PR-19-000008	Gowest	Gold	Ltd	PDRILL	03/18/2019
PR-19-000009	Gowest	Gold	Ltd	PDRILL	03/18/2019
PR-19-000095	Kraken Gold Corporation	Macklem Zone Project	Macklem, Thomas	PDRILL, PSTRIP, LC	07/23/2019
PR-17-11227	International Explorers & Prospectors Inc.	Mahaffy	Mahaffy, Reid	PDRILL	02/09/2018
PR-18-000265	Fancamp Exploration Ltd.	Mallard Gold	Mallard	PDRILL	01/28/2019
PR-20-000138	The Claim Group Inc.	Tomorrow Lake – Newnham Creek Area Claims Project	Ministik Creek Area, Marquis Lake Area, Newnham Creek Area	PDRILL	09/09/2020
PR-18-000167	5007223 Ontario Inc.	Montcalm	Montcalm	PDRILL	10/16/2018
PR-19-000181	5007223 Ontario Inc.	Montcalm Project	Montcalm	PDRILL	09/19/2019
PR-18-000301	Harte Gold Corp.	Sugar Zone Property – Nameigos Areas 1 to 5	Mosambik, Nameigos	PDRILL, LC	05/10/2019
PR-18-000245	Central Timmins Exploration Corp.	CT-MJ-RG	Mountjoy	PDRILL	01/24/2019

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-19-000001	Central Timmins Exploration Corp.	CT-MJ-M4	Mountjoy	PDRILL	03/19/2019
PR-19-000002	Central Timmins Exploration Corp.	CT-MJ-03	Mountjoy	PDRILL	03/21/2019
PR-19-000048	Central Timmins Exploration Corp.	CT19-M12-01 Project	Mountjoy	PDRILL	05/17/2019
PR-19-000050	Central Timmins Exploration Corp.	CT19-M8-01 Project	Mountjoy	PDRILL	05/17/2019
PR-19-000314	Central Timmins Exploration Corp.	Mountjoy M9 NE Project	Mountjoy	PDRILL	01/20/2020
PR-19-000315	Central Timmins Exploration Corp.	Mountjoy M9 SW Project	Mountjoy	PDRILL	01/20/2020
PR-19-000324	Central Timmins Exploration Corp.	Mountjoy M12 Project	Mountjoy	PDRILL	01/27/2020
PR-19-000336	VR Resources Ltd.	Ranoke Project	Mulholland, Pickett	PDRILL	02/07/2020
PR-19-000205	VR Resources Ltd.	Ranoke Project	Mulholland, Pickett	PDRILL	10/01/2019
PR-18-000302	Harte Gold Corp.	Sugar Zone Property – Nameigos Area 1A	Nameigos	PDRILL, LC	05/10/2019
PR-18-000290	Harte Gold Corp.	Sugar Zone Property – Nameigos Area 6	Nameigos, Strickland	PDRILL, LC	05/10/2019
PR-18-000189	5007223 Ontario Inc.	Nova	Nova	PDRILL	11/02/2018
PR-18-000190	Pancontinental Resources Corporation	Nova	Nova, Oates, Oswald	PDRILL	01/14/2019
PR-17-11209	Harte Gold Corp.	Sugar Zone	Odlum	PDRILL	04/28/2018
PR-19-000023	Harte Gold Corp.	Sugar Zone Property – Eagle West Areas 1 and 2	Odlum	PDRILL, LC	05/10/2019
PR-20-000031	Harte Gold Corp.	Sugar Zone Property – Near Mine B Project	Odlum, Strickland, Tedder	PDRILL, LC	03/25/2020
PR-18-000242	Central Timmins Exploration Corp.	CT-OG-01	Ogden	PDRILL	01/15/2019
PR-19-000271	Central Timmins Exploration Corp.	Odgen Project	Ogden, Price	PDRILL	12/23/2019
PR-19-000236	Maurice Valliere	Upper Deception Project	Ottaway	PDRILL	10/22/2019
PR-20-000218	Imerys Talc Canada Inc.	Pen Gold Project	Penhorwood	PDRILL	09/11/2020
PR-18-000203	Zenyatta Ventures Ltd. Zenyatta	Albany Graphite Project	Pitopiko River Area	PDRILL	01/10/2019
PR-19-000192	Randall Salo	Hydro Bay	Price, Thorneloe	PSTRIP	09/18/2019
PR-19-000229	Rockridge Resources Ltd.	Raney Gold Project	Raney	PDRILL, LC	10/24/2019
PR-20-000192	Rockridge Resources Ltd.	Raney Project	Raney	PDRILL, PSTRIP, PTRNCH	08/18/2020
PR-20-000250	Richmond Minerals Inc.	Ridley Lake	Raney, Rollo	PDRILL, PSTRIP, PTRNCH, LC	11/03/2020
PR-20-000325	Richmond Minerals Inc.	Ridley Lake Project	Raney, Rollo	PDRILL, LC	12/18/2020
PR-20-000070	GFG Resources Inc.	Pen Gold Project	Reeves, Sewell	PDRILL	07/08/2020
PR-19-000157	Steven Anderson	Rolandson Township Project	Rowlandson	PDRILL, LC	09/04/2019
PR-19-000203	Brian Beyer	Radisson Project	Sheraton, Thomas	PSTRIP, PTRNCH	10/02/2019
PR-18-000292	Harte Gold Corp.	Sugar Zone Property – K7 South Area 1	Strickland	PDRILL, LC	05/10/2019
PR-20-000285	Harte Gold Corp.	Sugar Zone Property – TT8-Kabi Area (Trenching)	Strickland	PSTRIP	11/02/2020
PR-17-11144	Lake Shore Gold Corp.	Timmins West Permit #11	Thorneloe	PDRILL	09/11/2017

Permit #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-18-11274	Eric Kallio	TW Permit #12	Thorneloe	PDRILL	11/01/2018
PR-19-000204	Kevin Cool, 6398651 Canada Inc.	Dome West Project	Tisdale	PDRILL, LC	09/27/2019
PR-18-000139	Goldcorp Canada Ltd.	Century COND 2018 – Goldcorp active claims outside boundary	Tisdale, Whitney	PDRILL	09/27/2018
PR-16-10977	Niobay Metals Inc.	James Bay Niobium	West of Flinch Lake Area, West of Marberg Creek Area	PDRILL	01/29/2019
PR-19-000268	Central Timmins Exploration Corp.	Whitesides Project	Whitesides	PDRILL	12/11/2019
PR-18-000140	Goldcorp Canada Ltd.	Century COND 2018 – Goldcorp Active claims outside closure boundary	Whitney	PDRILL	09/27/2018
PR-18-000303	Goldcorp Inc.	Century 2018 Geotech Project – active claims outside closure	Whitney	PDRILL	02/13/2019
PR-19-000190	IAMGOLD Corporation, SMM Gold Côté Inc.	Chester – Watershed Project	Yeo	PDRILL, PSTRIP	09/24/2019

Table 8. Exploration activity in the Timmins District in 2020, keyed to Figures 2, 3, and 4.

Abbreviations

AEM ..... Airborne electromagnetic survey
AGrav ..... Airborne gravimetric survey
AMAG ..... Airborne magnetic survey
Assays ..... Assay data
DD ..... Diamond drilling
DGP ..... Down-hole geophysics
ENV ..... Environmental study
EM ..... Ground electromagnetic survey
GC ..... Geochemical survey
GL ..... Geological survey
Interp ..... Interpretation
IP ..... Induced polarization survey
Lc ..... Line cutting
Mag ..... Ground magnetic survey
Met ..... Metallurgical testing
Pr ..... Prospecting
Rcalc ..... Resources calculation
Rept ..... Technical report
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr ..... Trenching

No.	Company/Individual (Property Name)	Township/Area (Commodity)	Exploration Activity
1	Affinity Metals Corp. (Carscallen Extension)	Carscallen, Denton (Au)	Assays, DD
2	Affinity Metals Corp. (Timmins West)	Carscallen, Denton (Au)	Assays, DD
3	Canada Nickel Company Inc. (Crawford)	Crawford (Ni, Cu, Co, PGE)	Assays, AMAG, AGrav, DD, Interp, Rept
4	Canada Nickel Company Inc. (Crawford-Nesbitt-Aubin)	Crawford, Nesbitt, Aubin	AGrav, AMAG, Interp
5	Canada Nickel Company Inc. (Kingsmill)	Kingsmill	AGrav, AMAG, Interp
6	Canada Nickel Company Inc. (Macdiarmid)	Macdiarmid	AGrav, AMAG, Interp
7	Canada Nickel Company Inc. (Mahaffy-Aubin)	Mahaffy, Aubin	AGrav, AMAG, Interp
8	Canada Nickel Company Inc. (Nesbitt North)	Nesbitt	AGrav, AMAG, Interp
9	Canadian Silver Hunter Inc. (Lost Dog)	Denton (Au)	GC
10	Class 1 Nickel and Technologies Inc. (Alexo)	Dundonald (Ni, Cu, PGE)	AEM, AMAG, Rcalc
11	DSB Capital Corp. (Kenogaming)	Kenogaming	EM
12	Fancamp Exploration Ltd. (Cunningham)	Cunningham	Pr
13	Fancamp Exploration Ltd. (Heenan)	Heenan (Au)	Pr
14	Fancamp Exploration Ltd. (Mallard)	Mallard (Au)	DD, Pr

No.	Company/Individual (Property Name)	Township/Area (Commodity)	Exploration Activity
15	Galleon Gold Corp. (West Cache)	Bristol, Ogden (Au)	Assays, DD, ENV
16	Gambier Gold Corp. (Detour West)	Newnham Creek Area, Marquis Lake Area, Ministik Creek Area, Kesagami River Area (Au)	Interp
17	GFG Resources Inc. (Pen Gold)	Keith, Reeves, Penhorwood, Kenogaming (Au)	Assays, DD, GC, GL, IP, Mag, Pr
18	Harte Gold Corp. (TNT)	Hambleton, Gourlay, Bayfield, Matthews	Assays, DD, EM, Samp
19	Harte Gold Corp. (TT8)	Strickland (Au)	DD
20	Herman Daxl (Murphy)	Murphy	Assays, GC, Pr
21	Herman Daxl (Wark)	Wark	Assays, GC, Pr
22	HighGold Mining Inc. (Golden Mile)	Evelyn, Matheson, German, Dundonald (Au)	DD
23	HighGold Mining Inc. (Golden Perimeter)	Thomas, Blackstock, Fallon, Douglas, Langmuir (Au)	Assays, DD
24	IAMGOLD Corporation, Sumitomo Corporation (Clam Lake)	Chester, Yeo (Au)	Assays, GL, Pr, Samp, Str
25	IM Exploration Inc. (Mulloy)	Rowlandson, Feagan Lake Area (graphite)	EM, Lc, Mag
26	John Charles Grant (Star Lake)	Keefer	IP
27	Kirkland Lake Gold (Zone 58N)	Lower Detour Lake Area (Au)	Assays, DD
28	Kraken Gold Corporation (Macklem-Thomas)	Macklem, Thomas (Au)	EM, IP
29	Melkior Resources Inc. (Carscallen)	Carscallen, Denton (Au)	Assays, DD, DGP
30	Metals Creek Resources Corp. (Ogden)	Ogden (Au)	GC
31	NioBay Metals Inc. (James Bay Niobium)	West of Marberg Creek Area (Nb)	AEM, AMAG, Assays, DD, Met, Rcalc, Rept
32	NioBay Metals Inc. (Valentine)	Valentine (Nb)	AEM, AMAG
33	Noble Mineral Exploration Inc. (Calder Gold)	Calder (Au)	DD
34	Noble Mineral Exploration Inc. (Carnegie)	Carnegie (Cu, Zn)	Assays, DD
35	Noble Mineral Exploration Inc. (Dargavel Gold)	Dargavel (Au)	AMAG, DD
36	North American Nickel Inc. (Loveland Nickel)	Loveland (Ni, Cu, PGE)	Assays, DD, DGP
37	Pan American Silver Corporation (Gold River)	Thorneloe (Au)	Rcalc
38	Pan American Silver Corporation (Marhill)	Hoyle (Au)	Rcalc
39	Pan American Silver Corporation (Vogel)	Hoyle (Au)	Rcalc
40	Pan American Silver Corporation (Whitney)	Whitney (Au)	Rcalc
41	E2Gold Inc. (Hawkins Gold)	Hawkins (Au)	Assays, IP, Samp, Tr
42	Pelangio Exploration Inc. (Dalton)	Ogden, Mountjoy (Au)	DD, GC, Mag, IP
43	Richmond Minerals Inc. (Ridley Lake)	Rollo (Au)	DD
44	Rockridge Resources Ltd. (Raney Gold)	Raney (Au)	Assays, DD
45	Sanatana Resources Inc. (Gold Rush)	Carscallen, Turnbull (Au)	Assays, Pr, Samp, Mag
46	VR Resources Ltd. (Hecla-Kilmer)	Hecla, Kilmer (Au, Cu, Nb, REE)	DD, AEM, AMAG
47	VR Resources Ltd. (Ranoke)	Pickett, Morrow, Mulholland (Au, Cu)	DD
48	Western Kidd Resources Inc. (Loveland)	Loveland	DD

Advanced Projects

GOWEST GOLD LTD. – BRADSHAW MINE

The Bradshaw gold deposit (formerly named Frankfield East) is located approximately 32 km north-northeast of Timmins. The company completed a diamond-drilling program at the deposit in the spring of 2020 to assist with developing a vent raise to allow the continuation of the bulk sampling program. Best intercepts include 12.24 g/t Au over 2.2 m (hole BGMGT-01) and 1.89 g/t Au over 2.5 m (hole BGMGT-03) (Gowest Gold Ltd., press release, June 1, 2020).

Gowest Gold Ltd. received official notice from the Ontario's Ministry of Energy, Northern Development and Mines (ENDM) in October that the company's Mine Production Closure Plan has received a final review and filing in accordance with the Ontario *Mining Act*. Gowest has also received all environmental permits required to bring the mine into commercial production (Gowest Gold Ltd., press release, October 28, 2020). In December 2020, Gowest Gold Ltd. reported that ore dug for the bulk sampling was being processed at the Redstone Mill. The ore had been collected and stockpiled on-site at Bradshaw Mine (Gowest Gold Ltd., press release, December 9, 2020).

Greg Hart is the Mine Manager; Greg Romain, CEO; and Greg Taylor, Head of Investor Relations.

IAMGOLD CORPORATION – CÔTÉ GOLD PROJECT

The Côté gold project is located in Chester and Yeo Townships, approximately 20 km southwest of Gogama, 130 km southwest of Timmins, 200 km northwest of Sudbury, and roughly 5 km west of Highway 144. IAMGOLD Corporation provided a review of their 2019 activities at the Côté Lake deposit in February 2020. The company cited a proven reserves estimate of 139 253 kt at 1.0 g/t gold, and a probable reserves estimate of 93 747 k/t at 0.9 g/t gold. The company planned 14 000 m of diamond drilling in 2020 to resume the evaluation of the resources potential at the Gosselin Zone as well as evaluate other identified targets on the property (IAMGOLD Corporation., press release, February 19, 2020). The company then received a key federal approval in June and announced the completion of 4700 m of drilling at the Gosselin Zone, a potential satellite pit 1.5 km northeast of Côté (IAMGOLD Corporation., press release, June 29, 2020). IAMGOLD hosted a ground-breaking ceremony symbolizing the start of construction of the Côté gold project on September 11, 2020 (IAMGOLD Corporation., press release, September 11, 2020). Al Smith is the exploration manager.

Exploration Projects

BASE METAL MINING

Canada Nickel Company Inc. – Crawford Property

Canada Nickel Company Inc., a spin-off of Noble Minerals Exploration Inc., was extremely active on the Crawford property in 2020. The exploration diamond-drilling campaign extended the resources in the Main Zone and the new East Zone. It defined a platinum group metal (PGM) zone, which trended parallel to the nickel structures in the Main and East Zones, at the contact between the peridotite and pyroxenite layer north of the nickel structure. It identified nickel mineralization in the West and North Zones (Canada Nickel Company Inc., Management's Discussion and Analysis, January 25, 2021).

Noble Mineral Exploration Inc. and Partner JV – Carnegie Property

Noble Mineral Exploration and an Option JV Partner drilled 10 holes totaling 2889.45 m on the Carnegie property. The holes were drilled to test conductive trends identified from a 2017 airborne electromagnetic and magnetic survey and a gravity survey flown in 2018. Four holes intersected anomalous zinc and copper mineralization. Results include 0.64% zinc over 12 m from 219 to 231 m, including 1.38% zinc over 3 m from 223 to 226 m (hole CG19-01); 0.72% zinc and up to 0.25 copper over 2.75 m from 282.6 to 285.35 m (hole CG19-09). Hole CG19-03 intersected up to 20 m of massive to semi-massive sulphide containing anomalous low-grade zinc. Additional drilling and downhole geophysics are planned for 2021 (Noble Mineral Exploration Inc., press release, December 21, 2020).

North American Nickel Inc. – Loveland Nickel Property

North American Nickel Inc. completed a four-hole diamond-drilling program with borehole geophysics on the Loveland Nickel property to test a series of conductors identified by a VTEM (versatile time-domain electromagnetic helicopter borne) Max survey in 2017. Hole LN25-20-002 intersected gabbroic rocks of the Enid Creek Gabbroic Complex and narrow mineralized intervals with up to 0.18% copper, 0.13% nickel, and 0.23 g/t palladium over 0.7 m. A following borehole electromagnetic (EM) survey indicated the center of conductivity was located up-dip towards the known mineralization (North American Nickel Inc., Management's Discussion and Analysis, August 19, 2020).

RARE METAL MINING

NioBay Metals Inc. – James Bay Niobium Project

Niobay Metals Inc. announced the successful completion of its 2019–2020 winter drilling program at its James Bay Niobium Project in March 2020 (Niobay Metals Inc., press release, March 25, 2020). Seven holes totaling 3090 m were drilled to test the high-grade zone at depth, which all intersected visually with mineralized carbonatite rocks (Figure 6). The assay results returned from the first 3 holes in April showed high-grade intersections at the James Bay Niobium Project (Niobay Metals Inc., press release, April 8, 2020):

- Hole NBY-20-E1 intersected 69% Nb_2O_5 over 185 m, including 1.02% Nb_2O_5 over 61.8 m.
- Hole NBY-20-E2 intersected 66% Nb_2O_5 over 190 m, including 0.97% Nb_2O_5 over 62.5 m.
- Hole NBY-20-E3 intersected 58% Nb_2O_5 over 105 m, including 0.80% Nb_2O_5 over 15.5 m.

The company published a new NI 43-101-compliant report in August that states a resource estimate of 29.7 Mt at 0.53% Nb_2O_5 in the indicated category and 33.8 Mt at 0.52% Nb_2O_5 in the inferred category. A positive Preliminary Economic Assessment (PEA) was filed dated effective October 13, 2020 (Niobay Metals Inc., press release, November 14, 2020).

NioBay Metals Inc. completed an airborne high-resolution magnetic survey in December and announced the final preparation of a 12 000 m infill drilling program on its James Bay project that would start in January 2021 (Niobay Metals Inc., press release, December 17, 2020).

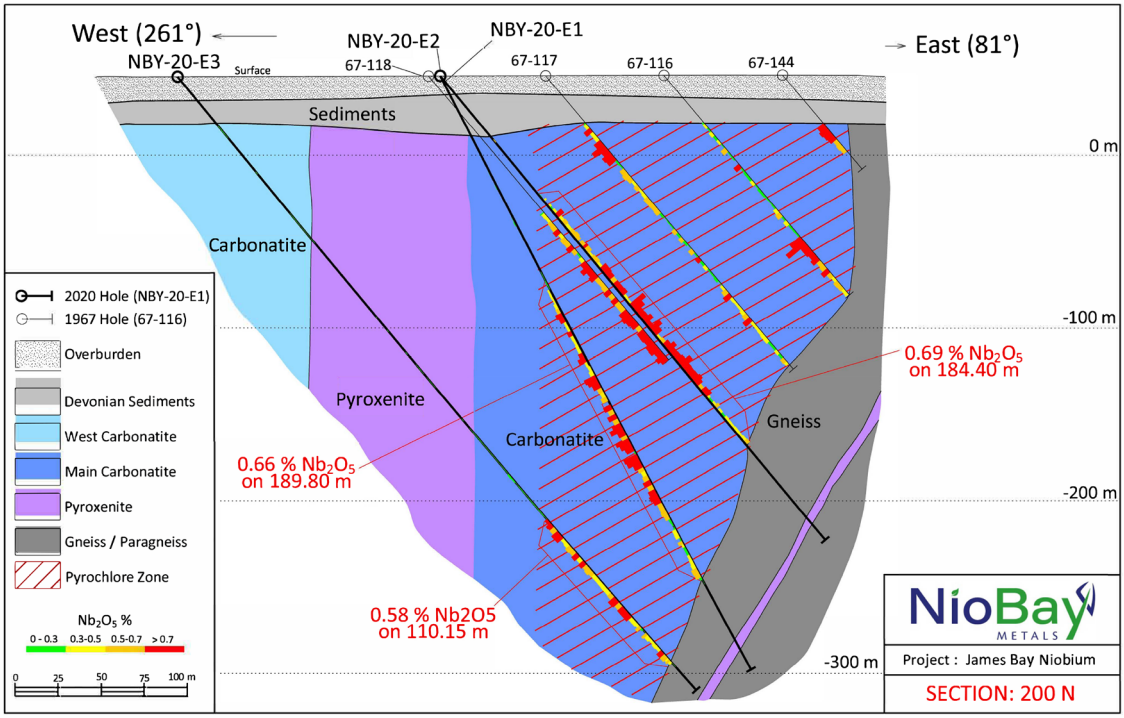


Figure 6. Vertical section (200N) of the first 3 holes at the James Bay Niobium Project (Niobay Metals Inc., press release, April 8, 2020).

GOLD MINING

E2Gold Inc. – Hawkins Property

E2Gold Inc. completed geological mapping, an induced polarization survey, and trenching on the optioned Hawkins property. Sixteen trenches were dug over a 13 km trend. Channel sampling at the Goldfields showing, located approximately 10 km west of the McKinnon Zone, yielded 3.61 g/t gold over 3 m, including 9.65 g/t gold over 1 m. The mineralization host consisted of a cherty, oxidized-quartz carbonate layer. The trenches dug along the McKinnon Zone have been essential for locating the surface trace of the inferred mineral resource. The channel sampling yielded results similar to the historic Falconbridge trenches: 0.55 g/t gold over 12 m and 0.85 g/t gold over 7.2 m (TR20-03 and TR20-04, Taylor); 0.67 g/t gold over 6 m (TR20-10, Irving Rd), and 0.63 g/t gold over 128 m (TR20-09, Shenango) (E2Gold Inc., Press Release, January 13, 2021).

Galleon Gold Corp. – West Cache Property

Galleon Gold Corp. completed a 15 000 m diamond-drilling program on its West Cache project in 2020. The drilling focused on infill drilling of the known mineralization for the open pit as well as extending the open pit mineralization to the east and west for strike extensions. High-grade gold intercepts were identified in holes WC-20-30, and WC-20-42 in a zone referred to as Zone #9. Intercepts include the following: 7.16 g/t gold over 9.7 m (hole WC-20-030) and 14.75 g/t gold over 3 m (hole WC-20-42). The mineralization is sediment-hosted, similar to what was encountered in hole TPW-10-30, where an intersection of 9.22 g/t gold over 11 m was reported. These intercepts are suspected to be related to the West Deep (Galleon Gold Corp., press releases, September 9 and 29, 2020; Explor Resources Inc., press release, November 23, 2020).

The company added a second phase program of diamond drilling (15 000 m) following the positive results from Zone #9. The program focused on Zone #9 and infill drilling the mineable open pit and underground areas. From that program, additional intercepts are reported in Table 9. The positive results prompted the company to start baseline studies over the West Cache property (Galleon Gold Corp., press release, November 17, December 3 and 9, 2020, January 12, 2021).

Table 9. Select assay results for the second phase of drilling at West Cache Property (drill intercepts average 90% true thickness).

Drill Hole (Area Drilled)		
WC-20-041 (East Area)	4.16 g/t Au over 4.5 m	
WC-20-072 (West Area)	3.27 g/t Au over 5.2 m	9.4 g/t Au over 1 m
	includes:	
WC-20-075 (Zone #9)	6.6 g/t Au over 4m	
	includes:	10.87 g/t Au over 2 m
WC-20-076 (Zone #9)	1.61 g/t Au over 2.3 m	
WC-20-077 (Zone#9)	1.16 g/t Au over 2.6 m	
WC-20-078 (Zone #9)	1.19 g/t Au over 2 m	
WC-20-079 (Zone #9)	3.37 g/t Au over 5 m	
	includes:	6.43 g/t Au over 1 m
WC-20-080 (Zone #9)	5.8 g/t Au over 14 m	
	includes:	8.25 g/t Au over 9 m
	includes:	10.27 g/t Au over 5 m
WC-20-081 (Zone #9)	8.68 g/t Au over 10 m	
	includes:	12.04 g/t Au over 2 m
	includes:	12.25 g/t Au over 2 m

GFG Resources Inc. – Pen Gold Property

GFG Resources Inc. realized 2 phases of diamond drilling on its Pen Gold Project. The Phase I drilling program, consisting of 8 holes with a combined total length of 3600 m, tested targets at the Nib, HGM and Slate Rock East prospects. A hole drilled at the Nib prospect, hole PEN-20-47, intersected 71.27 g/t gold over 8.5 m from 52 to 60.5 m, including 511 g/t gold over 1.15 m from 56.35 to 57.5 m. Hole PEN-20-47 was planned to test for the extension at a depth of the zones intersected in hole PEN-18-017, as well as subparallel sets. The intersection consisted of moderately to strongly silica-carbonate-chlorite-biotite altered and variably quartz-carbonate-veined diorite with 5 to 8% disseminated pyrrhotite and arsenopyrite as vein halos and dissemination. The mineralized interval consists of 20% quartz veining (GFG Resources Inc, Management's Discussion and Analysis, November 12, 2020).

The Phase II drilling program consisted of 30 holes totaling a combined length of 8900 m of drilling at several targets, including Nib, HGM, North Sewell, Boundary and Broadway prospects. At the Sewell North prospect, hole PEN-20-054 returned 4.56 g/t gold over 0.7 m at 15.7 m downhole. The mineralization is hosted in a quartz-pyrite-tourmaline vein system associated with a strongly sheared albite-silica altered diorite (GFG Resources Inc., press releases, November 12, December 17, 2020).

For the HGM prospect, holes PEN-20-052 and PEN-20-053 were designed to test the up-dip western continuity of the system and the system's western plunge. Four distinct zones of mineralization were encountered in PEN-20-052, associated with disseminated pyrite within silica-carbonate altered, quartz-veined mafic volcanic rock between 150 m and 290 m downhole. Hole PEN-20-052 returned assays of 0.55 g/t gold over 5 m, 1.24 g/t gold over 1.5 m and 0.88 g/t gold over 4.5 m. Hole PEN-20-053 intersected 3 mineralized zones with similar characteristics to PEN-20-052, between 375 m and 407 m downhole. Hole PEN-20-053 returned assays of 1.03 g/t gold over 1.3 m, 1.17 g/t gold over 2 m, and 0.98 g/t gold over 1.8 m (GFG Resources Inc., press release, December 17, 2020).

Phase 2 drilling included 4 holes on the top zone at the Nib prospect, where hole PEN-20-047 encountered the intersection mentioned above. Two holes intercepted new zones and extended those discovered in PEN-20-047 at depth with lower grades. Hole PEN-20-59 returned assays of 1.65 g/t gold over 1.7 m and 0.57 g/t gold over 3.6 m from depths 110 and 142 m downhole. Hole PEN-20-60 encountered several mineralized zones from depths of 249 to 495 m downhole. It returned assays of 0.90 g/t gold over 3 m, 0.81 g/t gold over 6 m, and 1.14 g/t gold over 6 m. The mineralization is characterized by disseminated pyrite-arsenopyrite within quartz-veined and variably albite-silica-carbonate altered diorite (GFG Resources Inc., press release, December 17, 2020).

The Boundary prospect had 6 holes planned to test several targets along with the trend. Results from the first 2 holes did not return significant assays, and results from other holes are pending (GFG Resources Inc., press release, December 17, 2020).

HighGold Mining Inc. – Golden Perimeter Property

HighGold Mining Inc. had planned a 5000 m diamond-drilling campaign among its properties of northeastern Ontario: Golden Perimeter, Golden Mile and Munro-Croesus (Kirkland Lake District). The company completed all its planned drill holes, 5 holes totaling 1553 m, on the Golden Perimeter property before halting the program because of the COVID-19 pandemic (HighGold Mining Inc., Management's Discussion and Analysis, September 30, 2020).

The drilling at Golden Perimeter property encountered widespread mineralization over an 850 m long trend in a quartz-veined, variably altered and pyritic monzonite intrusion. Significant intersections include 10.3 g/t gold and 42.8 g/t silver over 0.2 m, 2.3 g/t gold over 0.9 m, 0.5 g/t gold over 4.7 m, 4.04 g/t gold over 0.3 m and 4.82 g/t gold and 57.5 g/t silver over 0.3 m (HighGold Mining Inc., Management's Discussion and Analysis, September 30, 2020).

IAMGOLD Corporation and Sumitomo Corporation Joint Venture – Clam Lake Property

From January to February 2020, IAMGOLD Corporation and Sumitomo Corporation Joint Venture re-logged and sampled historic core collected during a 1987 diamond-drilling campaign along the Hopkins Zone, located south of the Clam Lake area. Three holes from this past drilling campaign were sampled: hole 87-22, hole 87-24 and hole 87-25 (Katz and McKinley 2020).

In hole 87-22, results show punctual anomalous gold from 20.14 to 44.66 m (<0.1 g/t gold to 0.903 g/t gold) and from 51.76 to 62.07 m (0.106 to 0.384 g/t gold), which correspond to diorite breccia and fault breccia. The fault breccia strongly overprints the diorite breccia and is accompanied by quartz flooding. For hole 87-24, a zone of anomalous gold was identified from 12.95 to 26.40 m (0.099 to 3.347 g/t gold) in a diorite breccia and tonalite unit overprinted by later fault breccia with moderate to strong silicification. Few samples from 38.5 to 50.29 m contained anomalous gold (>0.1 g/t gold). A second zone hosted in chlorite-altered quartz diorite and diorite units from 100.13 to 111.03 m was identified as

anomalous gold (<0.1 to 5.74 g/t gold). The anomalous zone is coincident with quartz-carbonate, chlorite, and hematite veining. Finally, in hole 87-25, a discontinuous anomalous gold zone was identified from 10.35 to 32.36 m (<0.1 to 1.042 g/t gold) in a diorite breccia overprinted by fault breccia and quartz flooding (Katz and McKinley 2020).

Kirkland Lake Gold Inc. – Zone 58N Project

Kirkland Lake Gold Ltd. completed a total of 3693 m of diamond drilling in 12 holes targeting Zone 58N, which sits near the Lower Detour Deformation Zone or LDDZ (Kirkland Lake Gold Ltd., Management's Discussion and Analysis, September 30, 2020). The drilling intersected high-grade mineralization 175 m east of the current mineral resource, which totals 2.9 million tonnes grading 5.8 g/t gold in the indicated category and 1 million tonnes grading 4.35 g/t gold in the inferred category. Significant results include 14.6 g/t gold over 5 m (hole DLD-20-504), 11.7 g/t gold over 13 m (hole DLD-20-503), 5.9 g/t gold over 8 m (hole DLD-20-499), and 8.6 g/t gold over 3 m (hole DLD-20-496). Holes DLD-20-496 and DLD-20-499 were planned to test the west portion of the current mineral resource and to confirm previous results. Holes DLD-20-503 and DLD-20-504 tested the main structure at a depth of 150 to 175 m to the west and were among the highest-grade results from Zone 58N to date. The results suggest that the zone lies to the south of the LDDZ at the intersection of a west-trending structural zone within a feldspar porphyry stock. These intersections seemed to lie on the westerly extension of the Zone 58N structure and are defined by a series of narrower units from the same feldspar porphyry (Kirkland Lake Gold Ltd., press release, June 29, 2020).

Melkior Resources Inc. – Carscallen Project

Melkior Resources Inc. possibly discovered a new volcanogenic massive sulphide (VMS) deposit on its Carscallen project during its short three-hole spring drilling program. Hole CAR-20-06 targeted a *mise-à-la-masse* conductor and intersected strong chalcopyrite-sphalerite mineralization, which appeared as clots and dissemination, as well as arsenopyrite, pyrite and pyrrhotite, accompanied with visible gold, within a previously unknown massive rhyolite (Melkior Resources Inc., press releases, May 7 and 21, 2020).

Highlights of the drilling program include: hole CAR-20-04 intersected 4.2 g/t gold over 4 m from 334 to 338 m, including 15.8 g/t gold over 1 m from 337 to 338 m; 0.103% copper over 18.5 m from 472.5 to 491 m; and 8.7% copper and 33.9 g/t silver over 0.5 m from 545 to 545.5 m. Hole CAR-20-05 intersected 25.7 g/t gold over 6 m from 357 to 363 m, including 205 g/t gold, 3.6% copper and 27.8 g/t silver over 0.7 m from 360.5 to 361.2 m. Hole CAR-20-06 intersected 5.6 g/t gold and 6.4 g/t silver over 9.5 m from 486.5 to 496 m, including 67.9 g/t gold, 79.8 g/t silver, 0.62% copper and 0.27% zinc over 0.5 m from 495 to 495.5 m (Melkior Resources Inc., press releases, May 7 and May 21, 2020).

In fall 2020, the company started a 3800 m diamond-drilling program on the Zam Zam-Shenkman trend with a partnership formed with Kirkland Lake Gold Ltd. The trend had already been partially defined by drilling and identified multiple high-grade intercepts of gold. The program will test the gold system for sustained grades at depth and for continuity up-dip and along strike northwest and southeast of previous encouraging drilling results. The company completed 3150 m of drilling before the holiday break in December (Melkior Resources Inc., Management's Discussion and Analysis, August 31, 2020; press release, January 5, 2021).

Rockridge Resources Inc. – Raney Gold Project

Rockridge Resources Inc. completed 9 diamond-drill holes totaling 2070 m from February to March 2020. The diamond-drilling program targeted the main zone over a strike length of 225 m that produced the best historic intercept of 6.5 g/t gold over 8 m. The deepest hole of the program tested the zone down to the 260 m level. All the holes except one intersected mineralization varying from 0.39 to 27.98 g/t gold (weighed). The best hole was hole RN20-06, which returned assays of 27.98 g/t gold over 6 m from 125 to 131 m, including 2.93 g/t Au over 1.0 m from 125.0 m to 126.0 m, 71.28 g/t Au over 2.3 m from 128.7 m to 131.0 m, and 326 g/t Au over 0.5 m from 130.5 m to 131.0 m (Rockridge Resources Inc., Management's Discussion and Analysis, October 31, 2020).

The results prompted the company to pursue prospecting, mapping, geochemical and till sampling, and an airborne drone magnetic survey along the corridor that hosts the mineralization. The corridor potentially extends west, maybe to a nose fold structure. The company started a second phase diamond-drilling program in September 2020, planned to be over 3000 m. Five holes were completed before October 20, 2020, and they encountered alteration similar to the past winter program. The drilling program was planned to test the down-plunge continuity of the known surficial mineralization, evaluate the east-west trend of magnetic features extending and coincident to the Raney Gold Zone, and test an underexplored quartz-feldspar porphyry intrusion proximal to the zone (Rockridge Resources Inc., Management's Discussion and Analysis, October 31, 2020; press release, October 20, 2020).

Sanatana Resources Inc. – Gold Rush Project

Sanatana Resources Inc. acquired the Gold Rush Project in July 2020. The project is located in Carscallen and Turnbull townships. It started exploration in August 2020 when it collected grab samples from the Lalonde East shear zone to ascertain gold reported previously by prospectors. Of the 9 samples of quartz, chlorite and sericite veins with mineralized sulphides, 6 reported over 1 g/t gold and 2 returned assays of 4.01 g/t gold and 5.06 g/t gold, respectively (Sanatana Resources Inc., Management's Discussion and Analysis, September 30, 2020).

In October 2020, the company returned to the property for more grab sampling from different prospects: the North Shaft, North Vein, Staten (also known as Lalonde East), Di Paulo, DeSantis, Martel and DC. Grab samples returned assays of up to 27.3 g/t gold. Samples with assays over 5.0 g/t gold were collected from the Staten, North Vein, North Shaft, DeSantis and DC prospects. The gold mineralization was also accompanied by silver mineralization with an approximate ratio of 5:1. The highest silver assay came from a sample taken at the North Shaft prospect, which returned over 100 g/t silver. Approximately 25% of the 106 samples collected returned assays above 1 g/t silver. The best assay results from the prospects were 59.2 g/t gold from DeSantis, 27.3 g/t gold from North Shaft, 11.2 g/t gold from North Vein, 8.41 g/t gold from DC, 6.45 g/t gold from DeSantis S, 5.06 g/t gold from Staten and 3.54 g/t gold at Leduc (Sanatana Resources Inc., Management's Discussion and Analysis, September 30, 2020; press release, January 13, 2021).

An excavator was mobilized to trench and start channel sampling on the North Shaft area. Trenches were dug at 25 m intervals parallel to the strike of the shear zone, which strikes east-west, characterized by a brittle-ductile quartz vein system hosted in gabbro. The shear zone was traced to over 200 m before it is buried by deeper till cover (Sanatana Resources Inc., Management's Discussion and Analysis, September 30, 2020).

An airborne drone magnetic survey and an electromagnetic and induced polarization/resistivity ground survey program began in late November 2020. They were completed over the North Vein and North Shaft prospects (Sanatana Resources Inc., press releases, November 19, 2020, and January 13, 2021).

DISTRICT STAFF AND ACTIVITIES

Because of the public health restrictions that were implemented in response to the COVID-19 pandemic, all Resident Geologist Program (RGP) staff worked remotely during the time period between March 16 and December 31, 2020. The primary impacts of these restrictions on RGP services included the suspension of public access to our offices and the cancellation of the 2020 field season (i.e., no property visits or other field investigations). However, staff were able to continue delivering most of our client services using electronic communication channels (e.g., telephone, email and video calls). Staff were also able to access the offices on an as-needed basis to obtain paper files and other materials that were required to fulfill these services. Client requests for physical documents, exploration equipment loans (e.g., Beep Mats) and diamond-drill core were accommodated outside the office setting in accordance with public health guidelines.

The Timmins Resident Geologist Office was staffed by E. van Hees (from January to August), and Z. Azadbakht (from August to December), Regional Resident Geologist; P. Bousquet, District Geologist; C. Boucher, District Geological Assistant; S. Hinz, Mineral Deposit Compilation Geoscientist, and Laura Rodriguez Miguel as Geoscience Data Processor.

The Timmins (South Porcupine) office serves as the northeast regional center for the Resident Geologist Program. R. Millar was the Senior Manager between January and October 2020, after which time M. Puumala became the acting Senior Manager for the rest of 2020. T. Gomwe was the Northeast Regional Manager of the Resident Geologist Program until October, after which time D.A. Metsaranta became the acting Regional Manager for the rest of 2020. C. Daniels was the Northeastern Regional Land Use Geologist until August when she became Land Use Planning and Policy Coordinator. C. Patterson is the GIS and Data Specialist for northeastern Ontario. C. Caron is the Administrative Assistant and Coordinator for the Northeast Resident Geologist Program.

The office added 6, updated 92, and deleted 1 Mineral Deposit Inventory (MDI) points in the Timmins Mining District (*see* Table 16). Assessment files received in 2020 are listed in Table 10 and publications received are listed in Table 13.

Table 10. Assessment files received in the Timmins District in 2020.

Abbreviations

AEM ..... Airborne electromagnetic survey
AGRAD ..... Airborne gravimetric survey
AMAG ..... Airborne magnetometer
ARAD ..... Airborne radiometric
ASSAY ..... Assaying and analyses
AVLF ..... Airborne electromagnetic very low frequency
BEEP ..... Beep Mat survey
BULK ..... Bulk sampling
CHNL ..... Channel sampling
DHGEO ..... Downhole geophysics
DHRLG ..... Core re-logging
EM ..... Electromagnetic survey
GCHEM ..... Geochemical
GEOL ..... Geological survey/mapping
GCOMP ..... Compilation and interpretation - geology
PDRILL ..... Diamond drilling
PHOTO ..... Air photo and remote imagery interpretation
PMAN ..... Manual labour
PMECH ..... Mechanical
PROSP ..... Prospecting by license holder
PSTRIP ..... Overburden stripping
PTRNCH ..... Bedrock stripping
RCDH ..... Reverse circulation drilling
ROCK ..... Rock sampling
SEDMT ..... Sediment sampling
TRPT ..... Technical report

File Id	Township/Area	Performed For	Property	Year	Work Type	Work Approved ($)	MLAS Transaction ID
20000018269	Abraham	Harte Gold Corp.	Sugar Zone Property	2018–2019	ASSAY, PDRILL, ROCK	185 588	46820
20000018458	Abraham, Bayfield, Cooper, Gourlay, Hambleton, Johns, Matthews, Mosambik, Nameigos, Odlum, Strickland, Tedder	Harte Gold Corp.	Sugar Zone Property	2019	ASSAY, PROSP, ROCK	373 351	54769
20000018337	Adams, Blackstock, Deloro, Ogden, Price, Thomas	David Meunier	Golden Perimeter Project	2020	AGRAD	88 485	52831, 52865
20000018184	Aubin, Bradburn, Calder, Crawford, Jamieson, MacDiarmid, Mahaffy	Noble Mineral Exploration Inc.	Calder Property, MacDiarmid Property, Mahaffy Block	2018	AEM, AMAG	164 194	50943, 51058, 51067
20000018040	Bartlett	Hermann Daxl	Not specified	2019	GCHEM, GEOL, SOIL	11 600	49892
20000018169	Bartlett, McArthur	DH Exploration Inc.	McArthur Property	2018–2019	PROSP, ROCK	11 316	47527
20000017884	Bayfield	Harte Gold Corp.	Dayohessarah Lake Property	2019	ASSAY, PDRILL, ROCK	79 636	46183
20000017937	Bayfield, Gourlay, Hambleton	Harte Gold Corp.	Dayohessarah Lake Property, Flat Lake Area, Sugar Zone Property	2019	VLF	42 990	2262, 45501
20000018453	Bayfield, Gourlay, Hambleton, Matthews	Harte Gold Corp.	TNT Zone	2019–2020	VLF	72 651	56058
20000018282	Benton, Heenan	Fancamp Exploration Ltd.	Mallard Gold Property	2019	IP, LC, MAG	38 325	52616
20000018025	Blackstock	David Meunier	Golden Perimeter Project	2019	IP	74 266	48535
20000017919	Blamey, Cunningham, Greenlaw, Kaplan	Fancamp Exploration Ltd.	Cunningham Property	2019	AEM, AGRAD	91 466	44537
20000018389	Borden, Cochrane	Newmont GoldCorp Porcupine	Borden Gold Property	2019	ASSAY, PDRILL, ROCK	4 347 549	50942
20000018444	Borden, Cochrane	Newmont Goldcorp Porcupine	Borden Gold Property	2018–2019	ASSAY, PDRILL, RCDH, ROCK	503 145	55114

File Id	Township/Area	Performed For	Property	Year	Work Type	Work Approved ($)	MLAS Transaction ID
20000018390	Borden, Gamey	Newmont Borden Ltd.	Borden Gold Property	2019	ASSAY, PDRILL, ROCK	1 910 779	50992
20000017966	Bristol	Melkior Resources Inc.	Bristol Property	2017	ASSAY, GCHEM, SOIL	4 996	2356, 46205
20000017931	Carnegie, Kidd, Prosser, Wark	Explor Resources Inc.	Prosser Property	2019	VLF	3 920	45326
20000018181	Carscallen	Melkior Resources Inc.	Carscallen Township Property	2019	ASSAY, GEOL, PDRILL, ROCK	187 094	50757
20000018700	Carscallen	Nitinat Minerals Corporation	Carscallen Property	2018	AMAG	6 300	31516
20000017967	Carscallen, Denton	Melkior Resources Inc.	Carscallen Property, Denton Property	2017	ASSAY, PDRILL, ROCK	171 968	46208
20000018661	Chester	Iamgold Corporation	South Swayze Property	2018–2019	ASSAY, GEOL, PDRILL, ROCK	44 359	3676, 3677, 60082, 60083
20000018612	Chester, Yeo	Iamgold Corporation, Sumitomo Corporation	Clam Lake Property	2019–2020	ASSAY, CHNL, DHRLG, GEOL, PROSP, PSTRIP, ROCK	128 936	58721
20000018589	Chester, Yeo	Iamgold Corporation	Chester Property, Watershed West Property	2017–2020	ASSAY, BULK, GEOL, PDRILL, ROCK	297 523	57675
20000017959	Chewett, Collins	2254022 Ontario Ltd, Andrew Lorne Currah	Nemegosenda Alkalic Complex	2019	ASSAY, GEOL, PROSP, ROCK	11 735	2341, 46075
20000018048	Clergue	Dawn Salo-Clark	Salo-Clark Clergue Township Property	2019	ASSAY, GCHEM, PMAN, SOIL	2 569	48533
20000018707	Clergue	International Explorers & Prospectors Inc.	Montclerg Property	2016–2017	ASSAY, PDRILL, ROCK	38 579	32354
20000017938	Cooper, Strickland	Harte Gold Corp.	Dayohessarah Lake Area, K7 South Grid, Sugar Zone Property	2019	VLF	39 490	2263, 45502
20000018401	Coppell, Cunningham, Denyes, Dore, Garnet, Swayze	GFG Resources	Dore Gold Project Property	2019	AMAG	165 413	53847, 53855, 53873, 53886, 53893, 53903, 53906
20000018611	Crawford	Noble Mineral Exploration Inc., Spruce Ridge Resources Ltd.	Crawford Nickel Project	2018	ASSAY, PDRILL, ROCK	261 283	57653
20000018176	Cunningham	1537763 Ontario Inc.	Not specified	2019	PTRNCH	2 467	49799
20000018416	Cunningham, Garnet	1537763 Ontario Inc.	Not specified	2019	PMECH, PTRNCH	11 304	54982
20000017927	Deloro	Central Timmins Exploration Corp.	Pine South Property	2019	IP, VLF	29 083	45241
20000018591	Deloro	Newmont Goldcorp Porcupine	Dome Mine Property	2018	ASSAY, PDRILL, ROCK	59 625	58420
20000018646	Deloro	Goldcorp Canada Ltd, Metals Creek Resources	Ogden Property	2018–2020	AMAG, ASSAY, PROSP, ROCK, SOIL	10 571	59741
20000018590	Deloro, Tisdale	Newmont Goldcorp Porcupine	Dome Mine Property	2018	PDRILL	704 409	58416

File Id	Township/Area	Performed For	Property	Year	Work Type	Work Approved ($)	MLAS Transaction ID
20000017903	Devitt	C Villeneuve Construction Co Ltd.	Devitt Property	2019	AMAG	6 046	43379
20000017889	Dundonald	C Villeneuve Construction Co Ltd.	Dundonald Property	2019	AMAG	8 000	47556
20000018334	English	DH Exploration Inc.	Muskasenda South Project	2017–2019	ASSAY, PROSP	22 490	51050
20000017969	Fawn, Garnet	2294527 Ontario Inc, Charles Mortimer	Mortimer Soapstone Project	2018–2019	GEOL, PMAN, PMECH, PTRNCH	14 305	46255
20000018167	Foleyet, Ivanhoe, Keith, Kenogaming, Muskego, Penhorwood, Reeves, Sewell	GFG Resources Inc.	Pen Gold Project	2018	AMAG	179 742	52505, 52506, 52507, 52509, 52510, 52511, 52512, 52513, 52514, 52515, 52516, 52517, 52518, 52519, 52520, 52521, 52522, 52523, 52524, 52525
20000018643	Foleyet, Lemoine	Enviromine Inc.	Shawmere Anorthosite Project	2019	ASSAY, PTRNCH, PROSP, ROCK	56 339	57453
20000017932	Fripp	Mark Brazeau	Faultline Minerals	2016	ASSAY, PROSP, SOIL	7 757	45335
20000017939	Fripp	Mark Brazeau	Property name not specified	2018	ASSAY, PTRNCH, ROCK	7 233	2265, 45539
20000017924	Godfrey	International Explorers & Prospectors Inc.	Genex Property	2018	ASSAY, PDRILL	26 683	45169
20000018702	Godfrey	International Explorers & Prospectors Inc.	Genex Property	2017	ASSAY, PDRILL, ROCK	104 303	31657, 31672, 31689
20000018047	Godfrey, Loveland	International Explorers & Prospectors	Kankotia Area West Timmins	2018	ROCK, TRPT	28 660	48494, 48585
20000018452	Gourlay, Hambleton	Harte Gold Corp.	TNT Zone	2019–2020	ASSAY, PDRILL, ROCK	264 245	56031
20000018583	Gourlay, Hambleton, Odlum, Strickland	Harte Gold Corp.	Sugar Zone Property	2018–2020	ASSAY, PDRILL, ROCK	723 225	55971
20000018000	Gowan	Gowest Gold Ltd., Transition Metals Corp.	Gowan Property	2019	AMAG	9 800	47351
20000017956	Hambleton	Harte Gold Corp.	Dayohessarah Lake Property	2018–2019	ASSAY, PDRILL, ROCK	693 289	2323, 45998
20000018658	Hambleton, Odlum	Harte Gold Corporation	Sugar Zone Property, Wolf Zone Property	2018–2020	ASSAY, PDRILL, ROCK	3 408 598	3579, 58911
20000018659	Hambleton, Odlum	Harte Gold Corporation	Sugar Zone Property, Wolf Zone Property	2018–2020	ASSAY, PDRILL, ROCK	903 305	3617, 59206
20000017986	Hambleton, Odlum, Strickland	Harte Gold Corp.	Dayohessarah Lake Property	2018–2019	ASSAY, PDRILL, ROCK	312 350	46787
20000017983	Hawkins	Pavey Ark Minerals Inc.	Hawkins Gold Property	2019	ASSAY, CHNL	11 796	46750
20000018051	Hawkins	Pavey Ark Minerals Inc.	Hawkins Gold Property	2019	EM, SOIL	30 516	49033

File Id	Township/Area	Performed For	Property	Year	Work Type	Work Approved ($)	MLAS Transaction ID
20000018183	Hawkins	Pavey Ark Minerals Inc.	Hawkins Gold Property	2020	IP	33 097	50938
20000018648	Hecla, Kilmer	VR Resources Ltd.	Ranoke Property	2020	AEM	83 202	59857
20000017990	Heenan, Marion	Chad Micheal Gloster, Normand Collins	Heenan Property, Marion Property	2019	GCOMP, MAG	12 125	46871
20000017909	Horwood	Paul W Adams	Silica Outcrop	2019	ROCK	4 471	44045
20000018278	Horwood	CJP Exploration Inc.	Silk Road Property	2019	PROSP	3 425	52326
20000018451	Ivanhoe, Keith, Kenogaming, Muskego, Penhorwood, Reeves, Sewell	GFG Resources	Pen Gold Project	2018	ASSAY, SOIL	325 673	55969, 55970
20000018163	Jamieson	International Explorers and Prospectors	Jameland Property	2018	DHGEO	11 350	52251
20000018018	Jamieson, Robb	International Explorers & Prospectors Inc.	Halfmoon Lake Property	2019	PDRILL	164 442	48276, 48332, 48971, 48976, 49090, 49451, 49462, 49469, 49473
20000018027	Keefer	Moon Energy Corp. Foundation Canada	Stargate Project	2018	GEOL	9 307	48677
20000018333	Keefer	John Charles Grant	Star Lake Property	2020	IP	7 650	50437
20000018277	Kenogaming	DSB Capital Corp.	Kenogaming Property	2020	EM	1 546	51519
20000018182	Lackner	2586189 Ontario Ltd.	Not specified	2019	SEDMT	5 011	50812
20000018391	Lackner	2586189 Ontario Ltd.	Portage Complex	2019	ASSAY, GEOL, ROCK	4 924	51277
20000018164	Loveland	Western Kidd Resources Inc.	Loveland Property	2020	PDRILL	40 180	52349
20000018340	Loveland	International Explorers & Prospectors Inc.	Loveland Nickel Property	2020	PDRILL, ROCK	68 360	53247, 53644, 53827
20000018399	Lowther	2004402 Ontario Inc.	Lowther Township Pegmatite	2018	BEEP, PMAN, PROSP, ROCK	4 322	52914
20000018445	Lowther	Gerald Lecours	Not specified	2019	PROSP, PSTRIP, ROCK	9 549	53337
20000018153	Lucas	Noble Mineral Exploration Inc.	Lucas Gold Project	2018	ASSAY, PDRILL, ROCK	689 389	50528
20000018204	Macklem, Thomas	Kraken Gold Corporation	Macklem-Thomas Property	2019–2020	IP, VLF	6 100	49392
20000018213	Mallard	Fancamp Exploration Ltd.	Mallard Gold Property	2019	PDRILL, ROCK	214 977	51183
20000018298	Mallard	Fancamp Exploration Ltd.	Mallard Gold Property	2019	IP, LC, MAG	47 000	53013
20000017918	Marion, Heenan	Chad Gloster, Normand Collins	Heenan and Marion Properties	2019	MAG	12 080	44392, 44398
20000018173	Mountjoy	Hermann Daxl	Not specified	2019	ASSAY, GEOL, SOIL	14 400	49471
20000018568	Mulholland, Pickett	VR Resources Ltd.	Ranoke Property	2019–2020	PDRILL	1 105 250	56523
20000018579	Murphy	Hermann Daxl	Not specified	2019–2020	ASSAY, PROSP, SOIL	9 290	59197

File Id	Township/Area	Performed For	Property	Year	Work Type	Work Approved ($)	MLAS Transaction ID
20000017880	Odlum, Strickland	Harte Gold Corp.	Dayohessarah Lake Property	2017–2019	ASSAY, PDRILL, ROCK	94 765	44949
20000017885	Odlum, Strickland	Harte Gold Corp.	Dayohessarah Lake Property	2018–2019	ASSAY, PDRILL, ROCK	116 121	46235
20000017358	Odlum, Strickland, Tedder	Harte Gold Corp.	Dayohessarah Lake Property	2017–2019	ASSAY, PDRILL, ROCK	187 376	44958
20000017954	Ogden	Goldcorp Canada Inc, Metals Creek Resources Corp.	Ogden Property	2018	PDRILL, ROCK	228 536	2320, 45977
20000018022	Osway	Dan Patrie Exploration Ltd.	Osway Property	2019	IP	17 355	48416
20000018647	Raney	Rockridge Resources Ltd.	Raney Gold Property	2020	ASSAY, PDRILL, ROCK	269 399	59767
20000018154	Robb	Hermann Daxl	Not specified	2018–2019	ROCK, SOIL	23 200	50765
20000018409	Stock	McEwen Mining Inc.	Stock Mill Property	2018–2019	ASSAY, PDRILL, ROCK	2 688 724	51853
20000018454	Strickland	Harte Gold Corp.	Kabi Zone	2020	ASSAY, PDRILL, ROCK	28 892	56065
20000017963	Strickland, Tedder	Harte Gold Corp.	Dayohessarah Lake Property, K7 Zone, Sugar Zone Property	2018–2019	ASSAY, PDRILL, ROCK	380 961	2349, 46103
20000017890	Tisdale	Newmont Goldcorp Porcupine	Dome Mine	2018	ASSAY, PDRILL, ROCK	622 553	47566
20000018156	Wark	Hermann Daxl	Not specified	2019	ASSAY, SOIL	16 400	51289
20000018580	Wark	Hermann Daxl	Not specified	2019–2020	ASSAY, PROSP, SOIL	5 755	59227
20000018569	Whitney	Goldcorp Canada Ltd.	Pamour Mine Property	2018	ASSAY, PDRILL, ROCK	349 480	56643

Remote Drill Core Storage Site

The Remote Drill Core Storage Site (RDCSS) in Timmins was used by one client in 2020. No core was reboxed in 2020.

PROPERTY EXAMINATIONS

Public health restrictions implemented in response to the COVID-19 pandemic resulted in the cancellation of the 2020 RGP field season. As a result, the content of this section is based on a property visit completed in the summer of 2019, during which 9 samples from 8 outcrops were obtained for assay analysis (*see* Table 11).

Kamiskotia Gabbroic Complex, Massey, Enid and Robb Townships

LOCATION AND ACCESS

The rocks of the Kamiskotia Gabbroic Complex, located about 15 km west of Timmins, were accessed through outcrops along Mallette Rd. and through bush roads extending from each side of it. They were also looked at from the far end of a bush road extending south from the dead-end of Leclair Avenue, west of Kamiskotia Lake.

PREVIOUS WORK

Laurion Mineral Exploration Inc. was active in the area in the mid-2000s, when airborne magnetic and electromagnetic surveys were performed over the area. These were followed by mechanical stripping, prospecting, line cutting, induced polarization and magnetic surveys, diamond drilling and sampling in locations where sulphide occurrences were detected (Atkinson et al. 2007; Webster and Johnson 2007; Kleinboeck 2008; Tihor 2007, 2008). The work identified occurrences of nickel-copper-PGE mineralization (Biaz) and VMS mineralization near the complex (Santrap, Talaos) (Tihor 2007, 2008).

In the eastern part of the Kamiskotia Gabbroic Complex, New Walcoro Mines Limited completed geological mapping, a magnetic survey, sampling and assays back in 1949. Kayjon Minerals Limited did electromagnetic and magnetic surveys, geological mapping, geochemistry and assays back in 1965–1966. Vatco Exploration Inc. completed an electromagnetic and magnetic survey, geological mapping, sampling and assays in 1980–1983. Jonpol Explorations completed an electromagnetic survey, geological mapping, sampling, assays, as well as completing 1 diamond-drill hole in 1984. The company aimed at a quartz vein contained in a shear zone. The best intersection encountered was 5 ft (1.52 m) at 0.026 oz/t Au (Bradshaw 1984).

GEOLOGY

Mallette Road, accessed from Highway 101 west of Timmins, is underlain by mafic intrusive rocks in Massey Township and follows the contact between mafic to intermediate and mafic to ultramafic metavolcanics rocks in Enid and Massey townships. The following is a series of descriptions of outcrops encountered along the road (Figure 7).

Stop 1: 440408E 5372141N

Moss-covered ridge consisting of medium- to fine-grained mafic rock intrusive. The rock is greyish on the altered surface with some iron staining and dark grey to black on the fresh surface. The rock shows magnetism (Sample: PB-2019-06).

Stop 2: 438970E 5373659N

The outcrop is characterized by a big mound covered with moss. The mafic rock shows equigranular texture of fine grains. The rock shows faint magnetism and iron staining (Sample: PB-2019-07).

Stop 3: 435972E 5376079N (KM-37)

This outcrop stands next to the kilometer 37 posts on Mallette Rd. The rocks are greyish and covered with moss and lichen. Subvertical bands 1 to 5 cm in width are visible, although they appear to be truncated (Figure 8). The strike of these bands is 135º (Sample: PB-2019-08). Visible amphiboles are aligned, and epidote is present. It is possibly the edge of a mafic intrusive.

Stop 4: 435068E 5375864N

The outcrop consists of a medium-grained, salt-and-pepper–textured diabase. The diabase is crossed by a 20 cm thick, subvertical quartz vein striking at 338º (Sample: PB-2019-09).

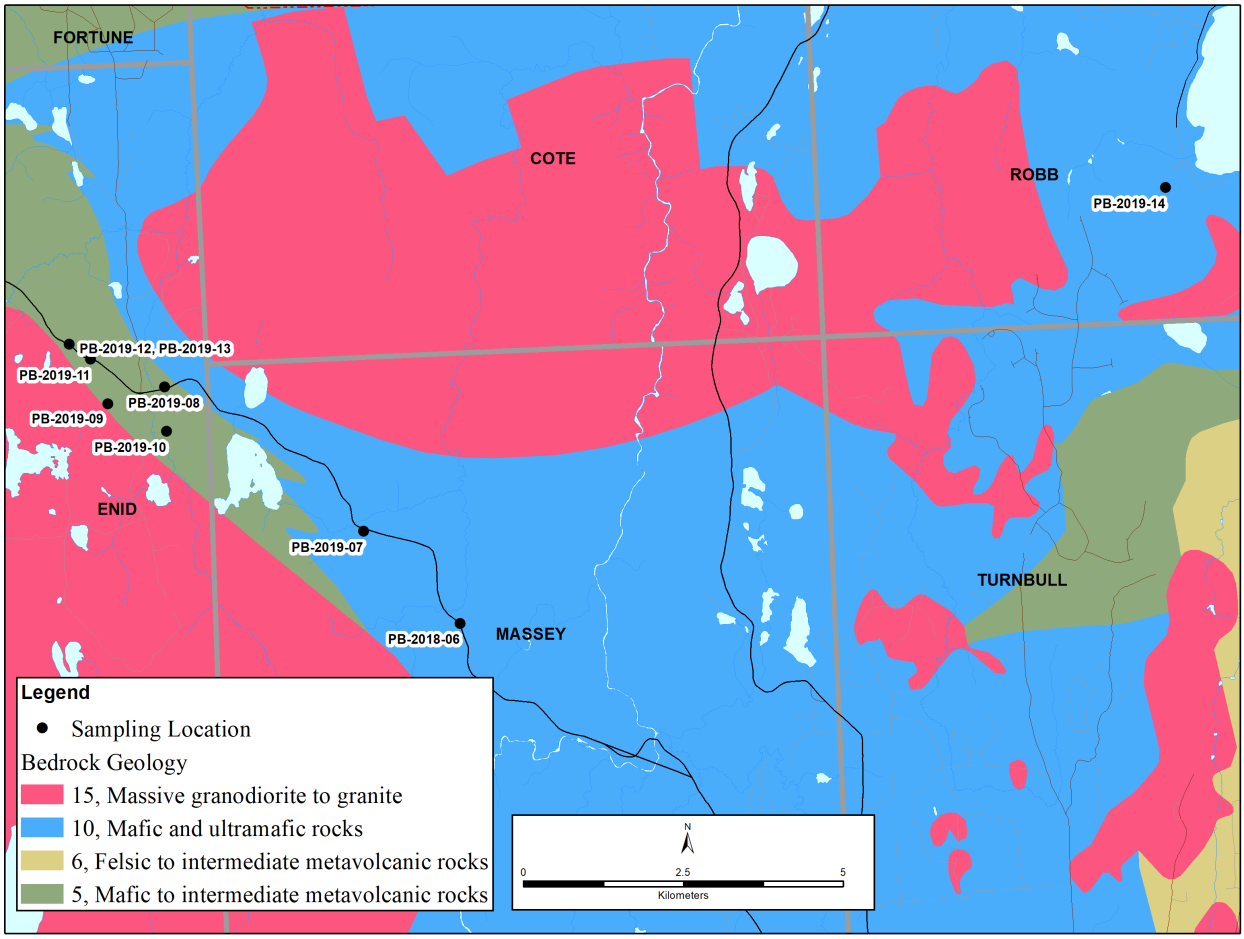


Figure 7. Geological map of the Kamiskotia Gabbroic Complex showing the location of 8 samples taken along Mallette Road and one just southwest of Kamiskotia Lake, in the northeast portion of the figure. Results of the assay analysis of these samples are provided in Table 11. Geology *from* Ontario Geological Survey (2011).

Figure 8. Mafic metavolcanics rocks, showing banding at Stop 3, KM-37 on Mallette Road.

Stop 5: 435967E 5375686N

Big mound covered by moss and lichen. The mafic rocks are fine-grained, brown-grey on weathered surface, dark grey on a fresh surface. The outcrop is crossed by a diabase dike (Sample: PB-2019-10). The quenching zone along the dike is made of pink potassic feldspar, amphibole and quartz. The dike looks deformed.

Stop 6: 434837E 5376574N

The outcrop is on the side of the road. It is brown-grey on a weathered surface. The fresh surface is dark grey. The rock is nonmagnetic with a salt-and-pepper texture. The rock is possibly an extrusive mafic rock (Sample: PB-2019-11).

Stop 7: 434512E 5376825N

This outcrop is a ridge running alongside the road. The rock is pinkish grey on the altered surface and grey on the fresh surface. The andesitic volcanic rock is fine grained, equigranular and shows a salt-and-pepper texture (Sample: PB-2019-12). Few quartz injections are present on the surface. About 20 m west, the rock changes into a basalt with large clasts (Sample: PB-2019-13).

Stop 8: 451817E 5378370N

The outcrop is a hill surrounded by swampy land. The rock is very coarse grained with noticeable magnetite grains of 1 cm in size. The rock looks patchy and iron-stained. The rock is a ferroan gabbro (Sample: PB-2019-14). More information about this area can be found in the "Recommendations for Exploration" section.

Table 11. Assay results from the Mallette Road rocks.

Sample	Rock	Au (ppb)	Co (ppm)	Cu (ppm)	Ni (ppm)	Pd (ppb)	Pt (ppb)	Sc (ppm)	Ti (ppm)	V (ppm)	Zn (ppm)
PB-2019-06	Gabbro	2.4	63.01	148.9	95.3	0.49	1.1	47.6	5649	372	96.1
PB-2019-07	Gabbro	2.2	55.69	121.3	126.2	4.18	7.42	41	5118	278.9	102.3
PB-2019-08	Basalt	1.9	27.29	47.8	100.9	0.23	0.52	21.2	4326	118.6	77.8
PB-2019-09	Quartz vein	-	0.65	2.6	3.1	-	-	<1.1	127	2.6	4.4
PB-2019-10	Gabbro	0.6	45.11	13.7	126.4	0.15	0.39	35.8	3914	202.8	93.8
PB-2019-11	Basalt	<0.6	24.08	8.2	100.9	<0.14	<0.6	18.5	4589	122.2	77.8
PB-2019-12	Dacite	<0.6	7.69	25.9	3.1	<0.14	<0.6	11.9	3347	14.5	84.6
PB-2019-13	Gabbro	2.4	48.26	154.4	126.4	12.78	3.17	40.2	6132	296	100.9
PB-2019-14	Ferroan gabbro	<0.6	51.89	63.2	34.9	<0.14	<0.6	46.5	20020	808	110.2

RECOMMENDATIONS FOR EXPLORATION

Rare Earth Elements—The New Gold?

INTRODUCTION

Rare earth elements (REEs) are a group of elements in the periodic table known as the lanthanides. These elements include cerium (Ce), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), holmium (Ho), lanthanum (La), lutetium (Lu), neodymium (Nd), praseodymium (Pr), promethium (Pm), samarium (Sm),

terbium (Tb), thulium (Tm) and ytterbium (Yb), which are commonly grouped with scandium (Sc) and yttrium (Y) based on their similar chemical characteristics. The REEs are divided into light (LREE), middle (MREE) and heavy (HREE) rare earth elements based on their atomic numbers. Despite their name, REEs are more common within the earth's crust than some major commodities like copper (Cu) and lead (Pb). For example, Ce is more abundant than Cu, while Nd, Pr, and Y are more abundant than Pb.

The 2020 U.S. Geological Survey's annual Mineral Commodity Summary reported the global reserves of REEs to be 140 million tons while the worldwide production was estimated at 210 000 tons (USGS 2020). After growing at a compound annual growth rate (CAGR) of 6.4% from 2015 through 2019, Adamas Intelligence forecasted global consumption of magnet REEs (i.e., Nd, Pr, Dy, and Tb) to reach 9.3% in 2020. It should be noted that the rise of COVID-19 has negatively impacted global demand. Nevertheless, with the ongoing reopening of key demand markets for industries, including EV traction motors to micromotors and sensors, wind power generators, consumer appliances, cordless power tools, Adamas Intelligence expects demand for most end-users and applications to rebound strongly in 2021 and 2022 and then sustain a steady rise through the end of the decade (Adamas Intelligence 2020a).

RARE EARTH ELEMENT USAGE AND PRICE

Rare earth elements commonly occur together and are used in a wide variety of industries as a metal alloy, catalyst, and polishing powder; however, the advancing usage of REEs, especially Nd, Pr, Dy, and Tb, in the production of permanent magnets as magnet feeds, makes them one of the most promising exploration targets in the upcoming years. Furthermore, the price of magnet rare earth oxides determines the economic value of a deposit. The current values are US$58/kg Pr_6O_{11}, US$79/kg Nd_2O_3, US$940/kg Tb_4O_7 and US$290/kg Dy_2O_3 (BAIINFO Rare Earth Price Analysis, November 27, 2020, http://www.baiinfo.com/en/RareEarth). The main function of Dy and Tb in magnets is to increase heat tolerance; however, the high value of these elements has motivated industries to look for elemental substitutions. For example, a permanent magnet industry leader, Neo Performance Materials, has developed a method to replace up to 70% of the Nd contents with Ce. As magnet rare earth element prices rise and supplies become progressively scarce through the second half of the decade, the adoption of Ce- and/or La-bearing magnets will accelerate (Adamas Intelligence 2020b). Furthermore, a Chinese financier is now looking into Ce occurrences within northern Ontario, hoping to develop new exploration targets (*Northern Ontario Business*, September 9, 2020, https://www.northernontariobusiness.com/industry-news/mining/chinese-financier-has-a-keen-eye-for-northern-ontario-cesium-2698524?).

RARE EARTH ELEMENT DEPOSITS

Rare earth element deposits are commonly associated with metavolcanic rocks, carbonatite–alkalic rocks, highly fractionated granitic rocks and pegmatites, clay-laterite, and in some cases tailing dams. However, LREE-enriched carbonatites supply more than 80% of global production and are the dominant source of magnet feeds (i.e., Nd, Pr; Adamas Intelligence 2020a).

Two types of REE-bearing deposits occur in the Timmins and Sault Ste. Marie districts: 1) carbonatite and 2) alkalic intrusive suites. Carbonatites are defined as igneous rocks containing more than 50% modal primary carbonates and less than 20 wt % SiO_2 by the International Union of Geological Sciences (LeMaitre 2002). On the other hand, alkalic complexes are more granitic in composition and are HREE enriched. Carbonatites are the main source of the REEs and Nb, while alkalic complexes are important sources of copper, apatite, fluorite, vermiculite, and other commodities (Simandl and Paradis 2018).

WHAT TO LOOK FOR IN CARBONATITES?

There are more than 150 REE-bearing minerals in nature; however, just 3, including monazite (LREE PO_4), bastnäsite (LREE CO_3F), and xenotime (HREE PO_4), are currently commercialized and used to produce high-grade rare earth element oxides (REEO) by the industry. More importantly, the variety of REE-bearing minerals within a deposit is the major factor controlling the value of the deposit (i.e., less variation, higher value).

RARE EARTH ELEMENT DEPOSITS IN TIMMINS AND SAULT STE. MARIE DISTRICTS

There are 13 carbonatite and alkalic intrusive suites in the Timmins District and 2 carbonatite complexes in the Sault Ste. Marie District (Table 12). Using the unstaked REE occurrences of the mineral occurrences catalogued in the Mineral Deposit Inventory (MDI) database (Ontario Geological Survey 2020), 1337 and 23 unstaked areas were identified in the Timmins and Sault Ste. Marie districts, respectively (Figures 9 and 10; information current to October 16, 2019). There is also a direct relationship between carbonatites and alkalic suites with the observed REE mineralization in both districts. Howells, Mowbray, Hopkins and Shenango townships have the most unstaked REE occurrences, followed by Clay and Cargill townships within the Timmins District. On the other hand, McMurray, Lastheels, and Bouck townships each have up to 15 REE occurrences open for staking within the Sault Ste. Marie District. It is important to add that carbonatites are REE enriched in the centre and Nb enriched in their rims. For example, the latest studies on Seabrook and Firesand carbonatite in Sault Ste. Marie indicated greater than 1 wt % Nb_2O_5 mineralization (Sage 1988h, 1988d; Simandl and Paradis 2018).

Another interesting REE-bearing "deposit" within the Timmins District is a tailings dam. In 2016, Pierre Bousquet (Timmins District Geologist) took a few samples from the Agrium mine tailings dam situated southwest of Cargill Township, southwest of Kapuskasing. All the samples are highly enriched in REEs, with total REE content reaching up to 6700 ppm.

Table 12. Known carbonatite and alkalic rock occurrences of Timmins and Sault Ste. Marie Districts.

Name	Township (Tp)	Patented Land	Leased Land	Reference
Timmins District				
Albany Fork	South of Lone Lake Area	No	No	Sage (1987b)
Argor	West of Marberg Creek Area	No	Partly	Sage (1988a)
Borden	Borden	Yes	No	Sage (1987a)
Cargill	Cargill, Cumming	No	Partly	Sage (1988b)
Clay–Howells	Clay, Hopkins, Howells, Mowbray	Partly	No	Sage (1988c)
Goldray	Yesterday River Area	No	No	Sage (1988e)
Hecla–Kilmer	Hecla-Kilmer	No	No	Sage (1988f)
Lackner Lake	Lackner, McNaught	Yes	No	Sage (1988g)
Martison Lake	South of Ridge Lake Area	No	Partly	Potapoff (1989)
Nagagami River Belt	Nagagami River Area	No	No	Sage (1983)
Nemegosenda Lake	Chewett, Collins, Pattinson, McGee	Partly	No	Sage (1987c)
Shenango	Shenango, Sherlock	No	No	Sage (1987d)
Valentine	Valentine	No	No	Sage (1988i)
Sault Ste. Marie District				
Firesand River	Tp. 28 Range 23, Lastheels	Partly	No	Sage (1988d)
Seabrook Lake	Tp. 5e, Maeck, Rollins, Tp. 4e	No	No	Sage (1988h)

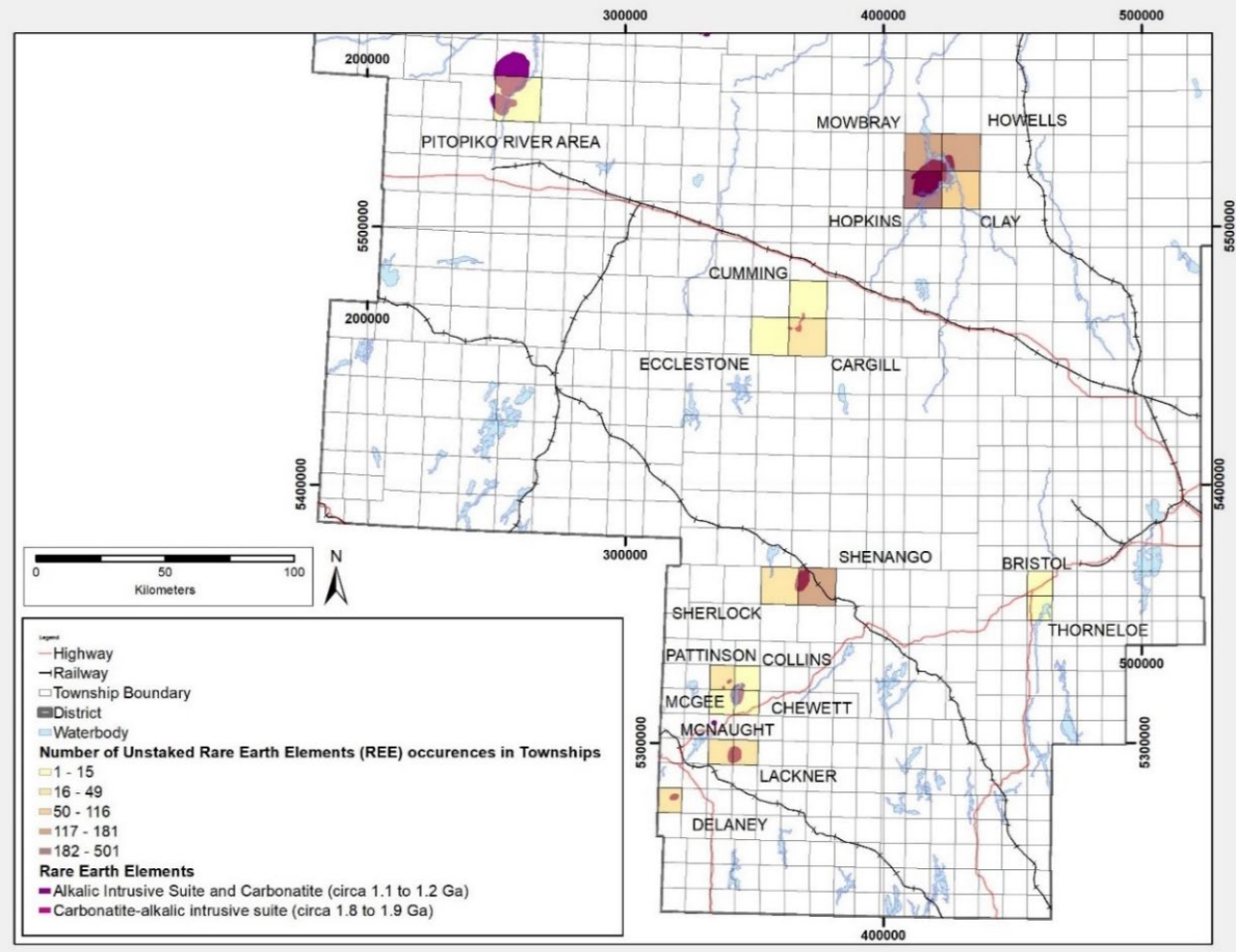


Figure 9. A map of the Timmins District showing the location of unstaked rare earth element occurrences.

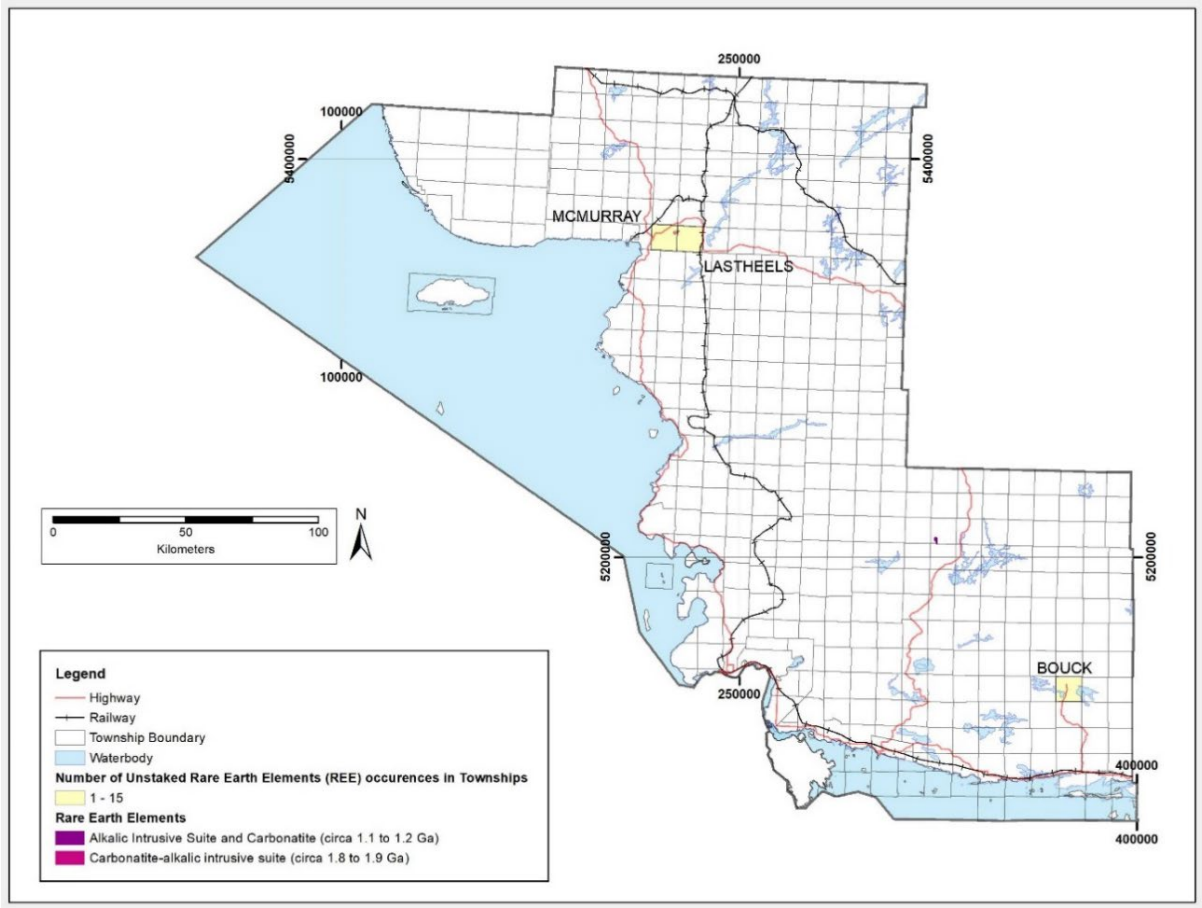


Figure 10. A map of the Sault Ste. Marie District showing the location of unstaked rare earth element occurrences.

Looking Around for Gold

The Timmins District is host to world-class gold deposits. The names of Hollinger Mine, Dome Mine and McIntyre Mine call on dreams of wealth and prosperity. In 2020, gold prices hovered around C$2500.00 per ounce (Kitco website, https://www.kitco.com/). Gold exploration renewed vigor in the District. Where would you go? It is with this perspective that the following gold occurrence maps were created for the southern part of the Timmins District (Figures 11, 12, 13, 14).

The figures display occurrences data from the Mineral Deposit Inventory (MDI) (Ontario Geological Survey 2020) on the bedrock geology of Ontario (*from* Ontario Geological Survey 2011). Each point plotted is a mineral occurrence that is documented in the MDI, with a status ranging from occurrence to past-producing mine. All points have gold as either primary or secondary in the commodity declaration. It is up to the reader to further the research about the point and what triggered its notation (i.e., What is the context of the occurrence? What is the grade returned from the assay? Is the information reliable? Is it a volcanogenic massive sulphide deposit? What other commodities are present?). The use of the OGSEarth MDI layer on Google Earth™ or the Mineral Occurrences layer under Geology on the Mining Lands Administration System (MLAS) is recommended for that purpose.

Each point represented on the main map, Figure 11, has approximately a 1 km radius. The MDI points are created when a commodity reaches a threshold amount in a location. In the case of gold, the threshold is 0.5 g/t. The minimum distance between MDI points is ~200 m. Points that are close together are potential prospects.

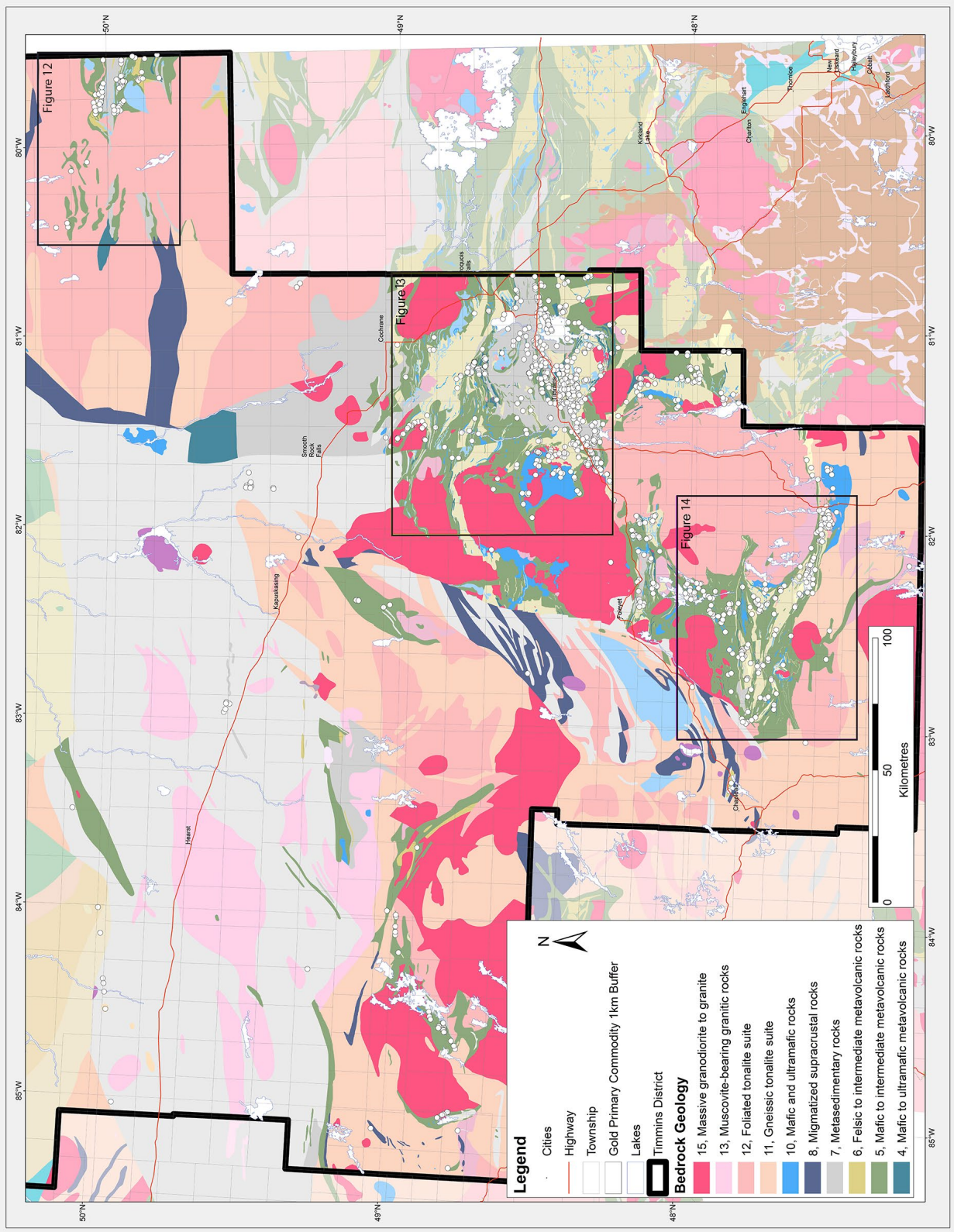


Figure 11. Bedrock geology map of the Timmins area showing gold occurrences (white dots) and location of insets (Figures 12, 13 and 14). Data and bedrock geology *from* Ontario Geological Survey 2020 and 2011, respectively.

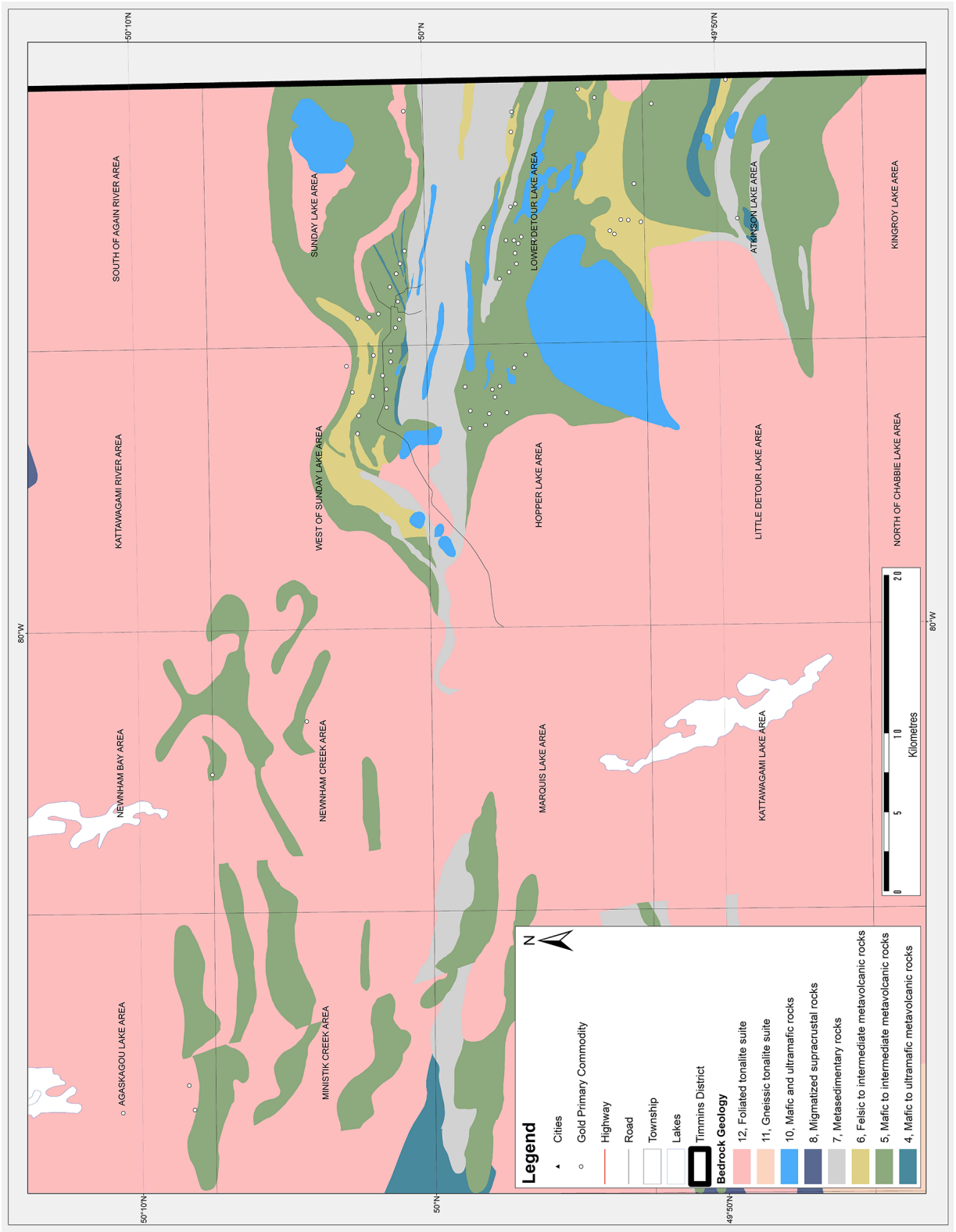


Figure 12. Bedrock geology map of Detour Lake area (*see* location of inset on main map of the Timmins District, Figure 11) with gold occurrences (white dots). Data and bedrock geology *from* Ontario Geological Survey 2020 and 2011, respectively.

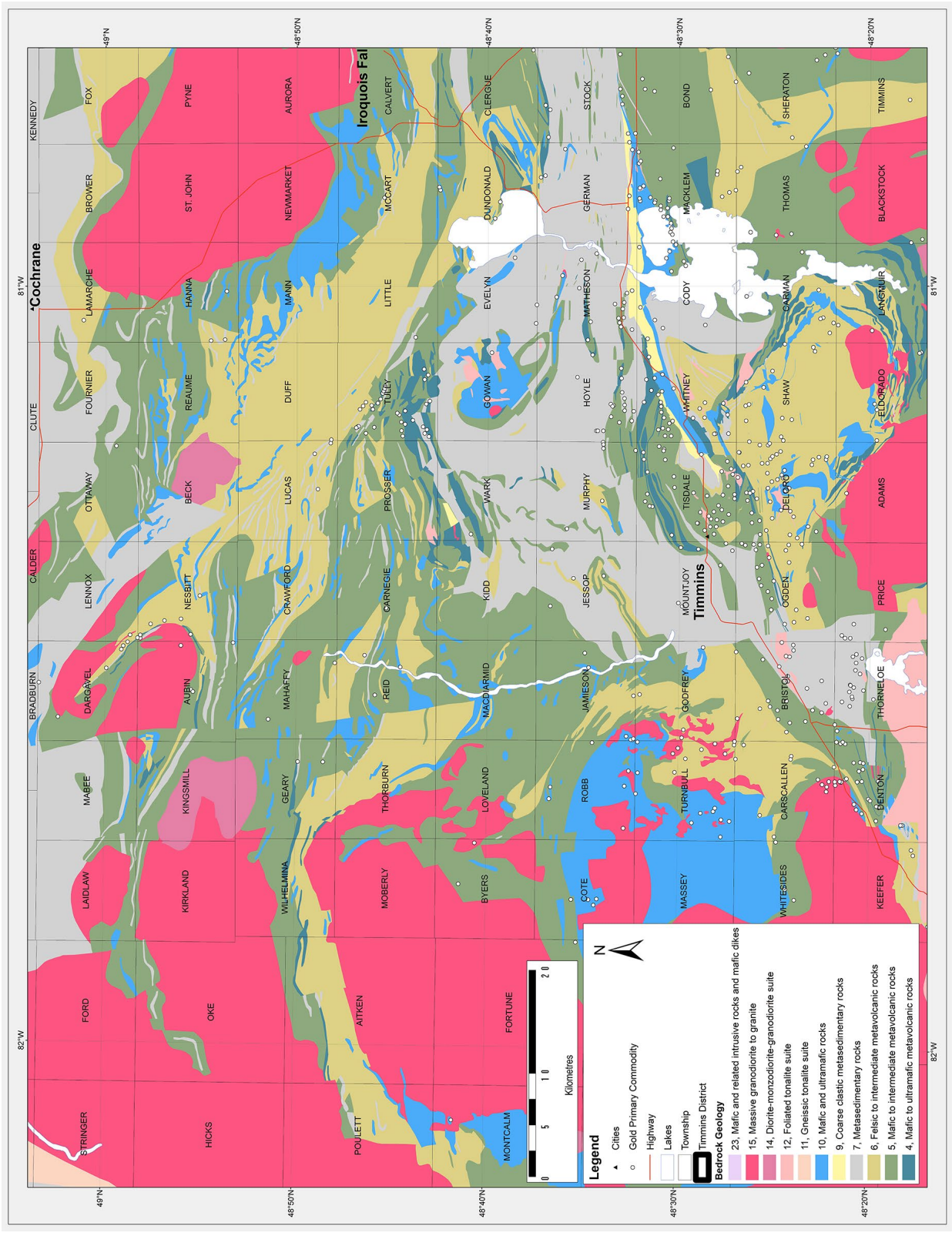


Figure 13. Bedrock geology map of the Timmins area (*see* location of inset on main map of the Timmins District, Figure 11) with gold occurrences (white dots). Data and bedrock geology *from* Ontario Geological Survey 2020 and 2011, respectively.

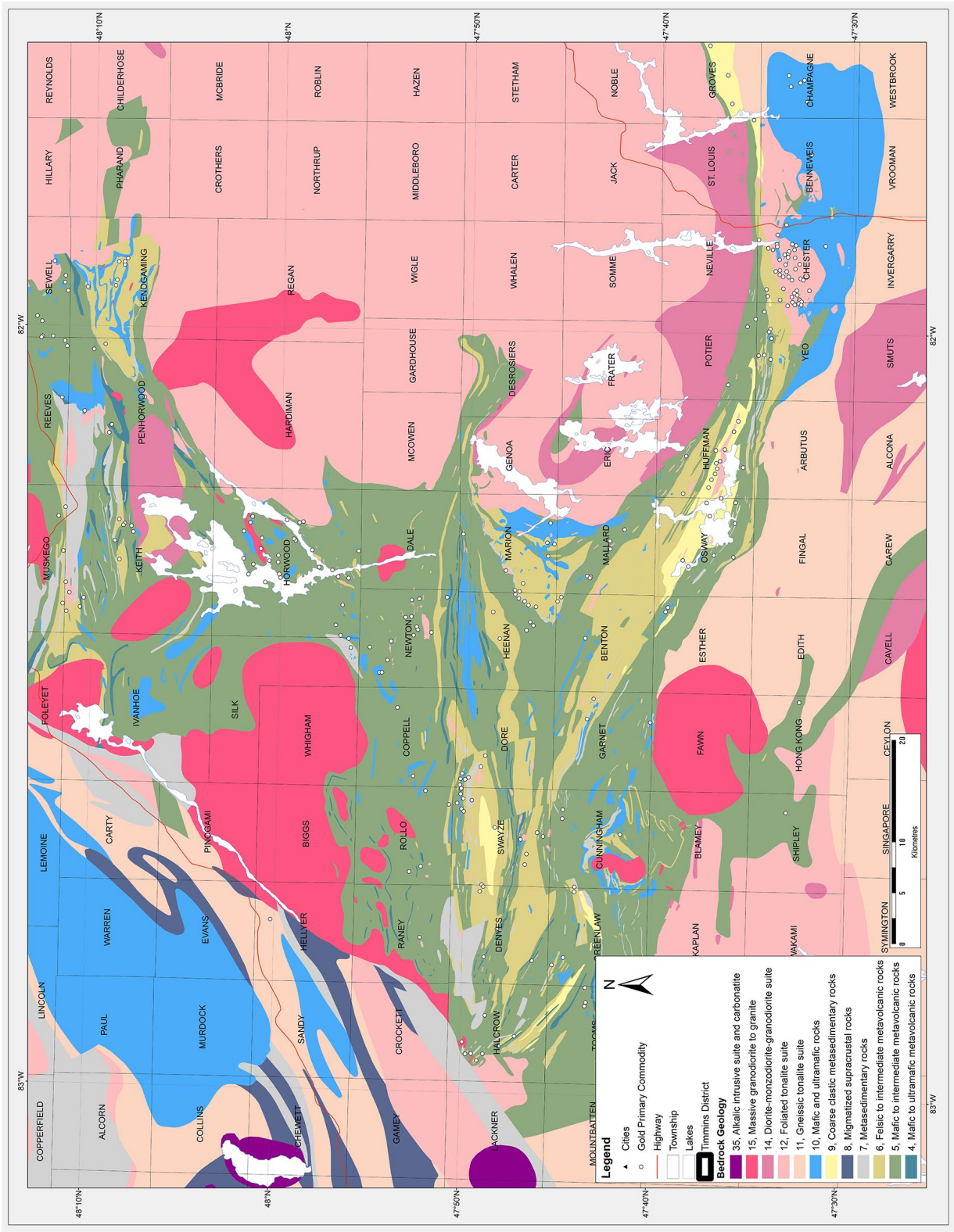


Figure 14. Bedrock geology map of the Swayze area (*see* location of inset on main map of the Timmins District, Figure 11) with gold occurrences (white dots). Data and bedrock geology *from* Ontario Geological Survey 2020 and 2011, respectively.

It is evident that 1 km radius points will overlap in the results. Some trends are apparent in that context; some are in need of further work for confirmation (e.g., Dargavel and Carscallen townships, located to the north and southwest, respectively, in the centre inset of Figure 11 and in Figure 13). In Chester Township (located to the southeast in the southern inset of Figure 11 and in Figure 14), the points are in a cluster; the construction of Côté Lake Mine almost becomes self-evident.

These maps give insight to where to look for gold. Should that mean that all points on the map will lead to a gold deposit? No. However, it will increase your likelihood of finding a gold deposit.

OGS ACTIVITIES AND RESEARCH BY OTHERS

Public health restrictions implemented in response to the COVID-19 pandemic resulted in the cancellation of the 2020 field season for the OGS Earth Resources and Geoscience Mapping Section (ERGMS). Below lists the activities and academic research projects done by others outside of the OGS that were able to continue in 2020.

Metal Earth

1. High-resolution magnetotelluric (MT) and audio-magnetotelluric (AMT) surveys along Highway 655.

Metal Earth, OGS, Royal Ontario Museum

2. Gold fingerprinting.

Academic research activities in the Timmins District in 2020 are listed below. Publications received in the Timmins District Geologist office during 2020 are listed in Table 13.

- Thomas Gemmell, PhD candidate at Laurentian University, is working with Dr. Harold Gibson and Dr. Bruno Lafrance on Stratigraphy and Base Metals in the Southern Swayze Greenstone Belt.
- Evan Hastie, PhD candidate at Laurentian University, is working with Dr. Bruno Lafrance and Dr. Daniel Kontak on Gold Metallogeny of the Southern Swayze Greenstone Belt, Abitibi Subprovince, Ontario.
- Qihang Wu, PhD candidate at the University of Waterloo, is working with Dr. Shoufa Lin on the Structural Geology and Computer Modeling of the Southern Swayze.
- Jillian Kendrick, PhD candidate at the University of Waterloo, is working with Dr. Chris Yakymchuk on Metamorphism of the Wawa Gneiss Terrane.
- Blake Mowbray, MSc candidate at Laurentian University, is working with Dr. Harold Gibson on Supracrustal Stratigraphy, Mineralogy, Mineralization, Metamorphism, Alteration and Structure of the Jefferson Prospect, Swayze Greenstone Belt, Ontario.
- Connor Small, MSc candidate at Laurentian University, is working with Dr. Andrew McDonald, Evan Hastie, Dr. Daniel Kontak, and Dr. Pedro Jugo on The Rundle Intrusive Complex, Abitibi Greenstone Belt: Investigating Oxidation Processes Related to Gold Mineralization in an Archean Alkaline Intrusive Setting.

Table 13. Publications received by the Timmins District Geologist office in 2020.

Title	Author	Type and Year of Publication
Report of Activities 2019, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	W.P.E. Paterson, C. Ravnaas, S.O. Lewis, G.F. Paju, S.P. Fudge, C.M. Daniels and T.K. Pettigrew	Ontario Geological Survey, Open File Report 6363, 2020
Report of Activities 2019, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	R.M. Cundari, G.F. Paju, M. Dorado-Troughton, C.M. Daniels, S.P. Fudge, T.K. Pettigrew and G. Dorland	Ontario Geological Survey, Open File Report 6364, 2020
Report of Activities 2019, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	M.A. Puumala, D.A. Campbell, G.F. Paju, C.M. Daniels, S.P. Fudge, T.K. Pettigrew and M. Dorado-Troughton	Ontario Geological Survey, Open File Report 6365, 2020
Report of Activities 2019, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	E.H. van Hees, P. Bousquet, J. Suma-Momoh, C.M. Daniels, S.L.K. Hinz, C. Boucher, P. Sword, L. Wang, S.P. Fudge, A. Millette and C. Patterson	Ontario Geological Survey, Open File Report 6366, 2020
Report of Activities 2019, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	P.J. Chadwick, A.S. Péloquin, J. Suma-Momoh, C.M. Daniels, S.L.K. Hinz, C.A. Kennedy, L. Streit and R.M. Todd	Ontario Geological Survey, Open File Report 6367, 2020
Report of Activities 2019, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts, and Petroleum Operations Centre	P.S. LeBaron, N. Sabiri, D.A. Laidlaw, S.L.K. Hinz and L. Fortner	Ontario Geological Survey, Open File Report 6368, 2020
Summary of Field Work and Other Activities, 2020	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6370, 2020

MINERAL DEPOSITS NOT BEING MINED

Mineral deposits not being mined in the Timmins District are listed in Table 14.

Table 14. Mineral deposits not being mined in the Timmins District in 2020.

Abbreviations

AF ..... Assessment Files
AR ..... Annual Report
CAMH ..... Canadian and American Mines Handbook [since 2000–2016]
Cg .....Carbon Graphite
CMH ..... Canadian Mines Handbook [up to and including 2003–2004]
GR ..... Geological Report
MD&A ..... Management's 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 @ 3.89% Cg; Total Inferred Resource: 20.1 Mt @ 2.2% Cg	Zenyatta Ventures Ltd.	NI 43-101 Rpt. 9/07/2015	Diamond drilling in 2013
Augdome property Tisdale Tp. MDI42A06NE00086	Au	Historical resource: 140 000 tons @ 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: 136.3 Mt grading 0.6 g/t Au (4 866 000 oz Au); Inferred Resource estimate: 2.5 Mt @ 1.23 g/t Au (99 000 oz. Au)	Detour Gold Corporation	Detour Gold Corporation NI 43-101 Rpt. 4/02/2014	Diamond drilling 2013–2014 Measured and Indicated: 136.3 Mt averaging 1.11 g/t gold, for 4 866 000 oz Inferred Resource: 2.5 Mt averaging 1.23 g/t Au, for 99 000 oz Au

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Paymaster Project, advanced exploration project (producing mine) 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	McEwen Mining Inc.	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 @ 2.37 g/t Au (292 800 oz) underground; 3.27 Mt @ 4.76 g/t Au; Inferred Resource (open pit): 2.74 Mt @ 2.31 g/t (203 400 oz); Inferred Resource (underground) 2.81 Mt @ 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 @ 5.17 g/t Au (proven and probable)	Marshall Minerals Corp.	CMH 2001, p.234	Inactive
Clay–Howells Fe-REE Project Clay and Howells Tp. MDI42G16SE00006	Fe, REE	Inferred Resource: 8 477 000 t @ 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: 99 391 000 t @ 1 g/t Au (3 004 000 contained oz.); Inferred Resource: 66 911 400 t @ 0.9 g/t Au (1 712 000 contained oz.)	IAMGOLD Corporation (64.75%) Sumitomo Metal Mining Co., Ltd (35.25%)	CMH 2016–2017 p.226	Construction of the mine began on September 11, 2020
Clavos gold mine (past producer) Stock and German Tp. MDI42A10SW00046	Au	Indicated Resource: 1 258 400 tonnes @ 4.81 g/t (194 600 oz.) Inferred Resource: 796 000 tonnes @ 4.7 g/t (120 000 oz.)	In Receivership with Deloitte	NI 43-101 Rpt 12/04/2013	
Lexam VG Gold Corp Tisdale Tp. MDI42A11SE00011	Au	Open pit resources Measured: 452 000 t @ 2.44 g/t Au (35 500 oz); Indicated open pit: 0.12 Mt @ 2.43 g/t Au (9300 oz) Underground resources Indicated: 3 356 000 t @ 4.91 g/t Au (4400 oz.) Underground resources Inferred: 0.05 Mt @ 4.0 g/t Au (6600 oz.) OP indicated 0.12 Mt averaging 2.43 g/t Au for 9300 oz. U/G Indicated Resources 30 Kt; averaging 4.91 g/t Au for 9300 oz. U/G 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
Northern Ontario Project Ogden Tp. MDI42A06NW00025	Au	Albitite Zone: 72 212 tons @ 0.229 oz/t Au (probable; non-NI 43-101 compliant); Hydrothermal Zone: 334 308 tons @ 0.19 oz/t Au (estimated non-NI 43-101 compliant)	Osisko Mining Inc.	Lateegra Gold Corp. press release 08/02/2010	Diamond drilling 2012–2013 (DD-18-6686 m)

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Detour Lake West Gold Project west of Sunday Lake area MDI32L04SW00016	Au	Measured Resource: 0.3 Mt @ 0.93 g/t Au (9 000 000 oz.) Indicated Resource: 30 600 000 t @ 0.88 g/t Au (870 000 oz.)	Detour Gold Corporation; Exploration Project along Sunday Lake, 7 km east of Detour Gold	Detour Gold NI 43-101 Rpt. 01/25/2016 (1 732 244 oz)	Active
Dundonald South deposit Dundonald Tp. MDI42A10NW00039	Ni	Inferred Resource: 116 000 t @ 3.16% Ni (3658 t Ni)	Transition Metals Corp.	NI 43-101 Rpt. 30/01/2009	Inactive
Extender Minerals (past producer) Penhorwood Tp. MDI42B01SE00004	Ba	Historical resource: 100 000 t @ 95% barite	Extender Minerals of Canada Ltd.	Assessment file	Inactive
Fuller Project Tisdale Tp. MDI42A06NW00030	Au	Total Indicated (open pit): 6 239 000 t @ 0.056 oz./t Au (351 000 oz.); Total Inferred (open pit): 3 911 000 t @ 0.063 oz/t Au (247 000 oz.); Underground Indicated Resource: 0.33 Mt @ 5.77 g/t Au (61 000 oz. Au); Inferred: 0.82 Mt @ 4.97 g/t Au (135 000 oz.)	McEwen Mining Inc.	NI 43-101 Rpt. 05/06/2014	Diamond drilling Tisdale and Deloro 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 O/P 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. O/P 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 @ 5.41 g/t Au (301 700 oz.) Inferred Resource: 1 914 000 t @ 5.19 g/t Au (1 027 800 oz.)	Tahoe Resources Inc.	CMH 2014–2015 p.407	Diamond drilling 2010–2012 - Indicated
Goose Lake Iron prospect Shaw Tp. MDI42A06NE00038	Fe	100 000 000 t @ 68.8% Fe (historical resource)	Timnor Iron Ore	Assessment file	Diamond drilling 2013
Hart prospect Eldorado Tp. MDI42A06SE00065	Ni, Cu	Total Indicated Resource: 1 546 000 t @ 1.40% Ni, 0.10% Cu (47 779 000 lb. Ni); Total Inferred Resource: 322 000 t @ 1.26% Ni, 0.08% Cu (899 000 lb Ni)	Regal Resources 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 @ 0.53 Nb_2O_5 (305 000 000 lb Nb_2O_5) Total Inferred Resource: 33 800 000 t @ 0.52 Nb_2O_5 (285 000 000 lb Nb_2O_5)	Niobay Metals Inc.	NI 43-101 Rpt. 24/08/2020	Active

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Jerome gold mine (past producer) Osway Tp. MDI41O09SE00005	Au	Inferred Resource: 18 737 000 t @ 1.71 g/t Au (1 030 489 oz)	IAMGOLD Corporation	Augen Gold Corp. NI 43-101 Rpt. 18/07/2011	Diamond drilling 2010
Kabinakagami Lake Occurrence Lizar Tp. MDI42C16NW00004	Fe	10 100 000 t @ 66.5% Fe	Crown Land	MDC011	Staked 2014
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 lbs Ni, 1 million lbs Cu and 0.66 million lbs Co Alexo–Dundonald Inferred Resource 2 010 000 t averaging 1.01 % Ni, 0.03% Cu, 0.02% Co for 44.51 million lbs Ni, 1.29 million lbs Cu and 0.89 million lbs Co	Class1Nickel	NI 43-101 Rpt. 15/12/2020	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 @ 0.23 oz./t Au	Goldcorp Canada Inc. and Metals Creek Resources Corp. JV	Assessment file	Diamond drilling 2009–2014
Kenty Mine Swayze Tp. MDI41O15SE00029	Au	Historical resource: #9 vein has possible resource of 43 300 t @ 4.7 g/t Au	Joshua Gold Resources Inc.	Assessment file	Active
Kidd #3 Zone Chester Tp. MDI41P12SW00122	Au	Historical resource: 408 000 t @ 9.9 g/t Au	IAMGOLD Corporation	OGS OFR5912	Inactive
Kipling Kaolin Kipling Tp. MDI42J01NE00005	kaolin, silica sand, ball clay	Historical resource: 30 000 000 t	James Bay Kaolin Corporation	OGS OFR5918	Inactive
Langmuir deposit Langmuir Tp. MDI42A06SE00099	Ni, Cu, PGE	Indicated Resource (W4 deposit, open pit and underground): 677 000 lbs. averaging @ 1.00% Ni, 0.06% Cu, for 14 813 000 lbs. Ni and 989 000 lbs Cu; Inferred Resource 3 360 000 lbs Ni and 210 000 lbs Cu.	Rogue Resources Inc.	NI 43-101 Rpt. 06/01/2010	Past producer
Langmuir #2 North deposit Langmuir Tp. MDI42A06SE00006	Ni, Cu	Indicated Resource: 8 324 000 t @ 0.40% Ni, Inferred Resource: 1 017 000 t @ 1.38% Ni	Rogue Resources Inc.	NI 43-101 Rpt. 06/01/2010	Past producer
Loveland property Loveland Tp. MDI42A12NE00028	Cu, Ni, PGE	Cominco Zone: 130 000 tons @ 0.68% Ni, 0.73% Cu (historical resource) Hollinger Zone: 422 000 tons @ 0.71% Ni, 0.42% Cu (historical resource)	Moneta Porcupine Mines Inc.	Amador Gold Corp. website 19/01/2011	Diamond drilling 2010
Lucas Gold Project Lucas Tp. MDI42A14SE00005	Au	136 077 t @ 3.4 g/t Au (drill indicated)	Noble Mineral Exploration Inc.	Assessment file	Diamond drilling and assays in 2018

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Martison Lake deposit South of Ridge Lake MDI42J06SW00004	phosphate, REE	Measured and Indicated Resources (Anomaly A): 54 300 000 t @ 23.4% P_2O_5, 0.39% Nb_2O_5 Inferred resource: 83 000 000 t @ 19.1% P_2O_5, 0.41% Nb_2O_5	Fox River Resources Corporation.	NI 43-101 Rpt. 30/11/2014	Reverse circulation drilling 2011–2012
Multi Minerals Zones 3 and 4 McNaught Tp. MDI41O14SE00024	phosphate, niobium	Historical resource: 37 000 000 t @ 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 @ 69.9% magnetite, 21.88% apatite, 0.12% Nb	6378366 Canada Inc., 6070205 Canada Inc.	OGS Study 32	Sampling 2010
Murgold–Chesbar property (Chester 1 property) Chester Tp. MDI41P12SW00073	Au	Historical measured resource: 144 500 t grading 14.7 g/t Au	IAMGOLD Corporation	Northville Gold Corporation Rpt. 08/06/2002	Bulk sampling 2010
Nemegosenda property Chewett Tp. MDI42B03SE00005	Nb_2O_5	Inferred resource: 11 000 000 tons @ 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 @ 6.06 g/t Au	Moneta Porcupine Mines Inc.	OGS OFR6006	Past producer. Inactive
North Rundle property Newton Tp. MDI41O16NW00002	Au	Historical estimated resource: 16 830 t @ 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 @ 5246 BTU	Onakawana Development Ltd.	OGS OFR5111	Inactive
Owl Creek (East) Hoyle Tp. MDI42A11SE00006	Au	Historical assay resource: 3 019 685 t @ 7.17 g/t Au	Goldcorp Canada Ltd.	OGS OFR5985	Inactive
Owl Creek (West) Hoyle Tp. MDI42A11SE00006	Au	Inferred Resource: 327 230 t @ 7.14 g/t Au	Goldcorp Canada Ltd.	OGS OFR5985	Inactive
Paymaster Project Tisdale Tp. MDI42A06NW00002	Au	Total Indicated Resource (open pit) 5 135 000 tons @ 0.047 oz/t Au (242 000 oz.) Total Inferred Resource: 1 781 000 tons averaging @ 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
Porcupine West property Bristol and Ogden Tp. MDI42A06NW00200	Au	Total Indicated Resource: 4 283 000 t @ 1.55g/t Au (213 000 oz.) Total Inferred Resource: 1 140 000 t @ 2.09 g/t Au (77 000 oz.) Underground Indicated Resources: 4 420 000 t averaging 2.79 g/t Au for 396 000 oz.; Inferred Resource: 5 185 000 t @ 2.36 g/t Au for 393 000 oz.	Explor Resources Inc.	NI 43-101 Rpt. 07/01/2013	Diamond drilling 2017

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Radio Hill iron property Penhorwood Tp. MDI42B01NE00026	Fe	Historical Resource: 296 000 t raw magnetite @ 25.58% Fe	Rogue Resources Inc.	NI 43-101 Rpt. 30/04/2010	Diamond drilling and metallurgical testing 2012
Redstone Mine Eldorado Tp. MDI42A06SE00080	Ni	Inferred Resource 737 000 t @ 1.57% Ni (25 519 000 lb Ni)	Regal Investments Inc.	MD&A 31/12/2012	Property under care and maintenance
Rundle Mine Newton Tp. MDI41O16SW00003	Au	Measured and Indicated: 349 000 t @ 7.88 g/t Au; Inferred Resource: 267 000 t @ 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 @ 12.78 g/t Au; 1 616 770 g (51 986 oz.) Au	PGM Ventures Corporation / Kalwea Financial Corp.	CMH 2001	Diamond drilling 2005
Shunsby property Cunningham Tp. MDI41O10NE00056	Cu, Pb, Zn	Total mineral inventory 4 000 000 tons @ 0.59% Cu and 2.56% Zn	BWR Exploration Inc.	Assessment file	Diamond drilling 2014
Sothman Nickel property Sothman Tp. MDI41P14SE00005	Ni	317 515 t @ 0.89% Ni (0.5% cut-off)	Glencore Canada Corporation		Inactive
Texmont deposit Bartlett Tp. MDI42A03NE00002	Ni	Historical Measured and Indicated: 2 893 000 tons @ 0.92% Ni @ 0.70% Ni cut off (26 757 contained tons)	Fletcher Nickel Inc.	Fletcher Nickel Inc. prospectus 14/05/2007	Diamond drilling 2009
TTM-Timmins talc-magnesite deposit Adams Deloro Tp. MDI42A06SW00024	magnesite, talc	A Zone Core, Indicated Resource: 12 728 000 t @ 52.1% magnesite, 35.4% talc; Inferred Resource: 18 778 000 t @ 53.1% magnesite, 31.7% talc; A Zone Fringe, Indicated Resource: 5 003 000 t @ 34.2% magnesite, 33.4% talc	Globex Mining Enterprises Inc.	NI 43-101 Rept. 16/04/2012	Infill and geotechnical drilling (DD-46-7000 m) 2013
Thunderwood JV Hoyle Tp. MDI42A11SE00113	Au	327 230 t @ 7.14 g/t Au (assay)	Goldcorp Canada Ltd.	OGS OFR5985	
Timmins North Tully Tp. MDI42A11NE00034	Au	Indicated Resource to 350 m 362 090 t @ 8.0 g/t Au (93 140 oz) Total Inferred Resource: 592 070 t @ 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 @ 6.85 g/t Au (708 600 oz.); Inferred Resource: 995 000 t @ 5.34 g/t Au (170 700 oz.)	Tahoe Resources Inc. and Goldcorp Canada Inc.	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 @ 1.75 g/t Au (125 000 contained oz.); Inferred resource: 1 459 000 t @ 3.6 g/t Au (168 800 oz.)	Tahoe Resources Inc.	NI 43-101 Rpt. 14/06/2011	Diamond drilling 2010; 2015 – 39 700 oz.; 2014 – 43 400 oz.

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Warren Township Anorthosite Warren Tp. MDI42B02NW00001	anorthosite	858 504 t @ 30.92% Al (drill indicated)	Avalon Advanced Materials Inc.	Assessment file	Permitted 2012
Watershed gold property Chester Tp. MDI000000001866	Au	Inferred Resource: 4 300 00 t @ 1.22 g/t Au (cut-off grade 0.3 g/t)	Trelawney Augen Acquisition Corp.	Press release; March 9, 2016	Diamond drilling 2015
Whitney talc-magnesite deposit Whitney Tp. MDI000000000349 MDI42A06NE00020	magnesite, talc	54 076 357 t Measured and Indicated Resources; 43 000 000 t Inferred Resource; grades from 43.5 to 51% talc; 25 to 38% magnesium minerals	General Magnesium Corp.	OGS Study 28	Surface mining test 2015

Abbreviation: DD-18-6686 m = 18 diamond-drill holes totalling 6686 m.

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHEAST REGION

Land-Use Planning Activities

The northeast Regional Land Use Geologist, 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 2020, the northeast Regional Land Use Geologist position was staffed from January through July by Catherine Daniels, *P.Geo*. For the remainder of the year, the duties were carried out by Catherine Daniels, *P.Geo.*, in her new position as the Land Use Planning and Policy Coordinator, the northwest Regional Land Use Geologist, Sarah Ferguson, *P.Geo.*, and the acting southern Regional Land Use Geologist, Peter LeBaron, *P.Eng.*

The boundaries of the Regional Land Use Geologists' regions are indicated on Figure 15.

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 2020, the northeast 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.

Figure 15. Extent of the Regional Land Use Geologists' ("RLUG") areas of responsibility (red lines indicate the regional boundaries; grey lines indicate the municipal boundaries).

CROWN LANDS

The Ministry of Energy, Northern Development and Mines (ENDM) engages with the Ministry of Natural Resources and Forestry (MNRF) 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

In 2020, the northeast Regional Land Use Geologist provided support to multiple ministries in the evaluation of potential lands for 2 agriculture dispositions in the Hearst District in northeastern Ontario. Geoscience information was prepared and provided 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*. The northeast Regional Land Use Geologist was not called upon to provide input into the development of Forest Management Plans in 2020.

The northeast Regional Land Use Geologist provided information pertaining to road construction plans for the Nagagami Forest Management Unit to the local District Geologist, so they could inform any applicable stakeholders.

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 Web site (https://nrip.mnr.gov.on.ca).

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.

All but a few First Nation communities in the Far North 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, ENDM has provided geoscience information to Constance Lake and Kashechewan First Nations, as they work on gathering information for their planning areas and learning about the land use planning process. Both communities have completed Terms of Reference.

In 2020, the northeast Regional Land Use Geologist provided information and support to the MNRF Far North Branch with regard to the mineral sector and geoscience information to be applied to the Constance Lake First Nation Community-Based Land Use Plan.

In 2020, MNRF undertook a review of the *Far North Act*, during which time the northeast Regional Land Use Geologist provided support and input as needed. The proposed amendments were posted on the Environmental Registry of Ontario on November 30, 2020: a decision is expected for 2021.

Withdrawal Orders

Other work related to Crown land use in the northeast region may include reviews of applications for withdrawal of lands from staking 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 2020, one withdrawal order was received from the Ministry of Energy, Northern Development and Mines (ENDM) for an area in Hearst Township, District of Temiskaming.

Aggregates

The northeast Regional Land Use Geologist ensured that mineral potential, mineral sector activity and mining-related hazards were identified and considered before decisions are made regarding aggregate permit applications. No aggregate applications were received for comments in 2020.

MUNICIPAL AND PRIVATE LANDS

The Ministry of Energy, Northern Development and 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.

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, ENDM 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/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 ENDM.

In 2020, the northeast Regional Land Use Geologist provided maps, comments and other input as required for municipal planning activities that included

- 16 consent (severance) and plan of subdivision/condominium applications in 4 single-tier municipalities and 8 unorganized geographic townships or areas
- 7 Official Plans and related planning initiatives (such as Offical Plan amendments, zoning by-laws, and minor variances) in 5 communities
- 4 new draft Official Plans or Official Plan updates

The municipalities involved in these planning initiatives are listed below in Table 15.

Table 15. Municipal planning initiatives with ENDM input, northeastern Ontario, 2020.

Consent (Severance) and Subdivision/Condominium Applications
Consent, Town of Blind River
Consent, Municipality of French River
Consent (early consultation), City of Greater Sudbury
Consent (early consultation), Township of Sables–Spanish River
Consent, Finan Township, District of Algoma
Consent, Guibord Township, District of Cochrane (3)
Consent, Lebel Township, District of Temiskaming
Consent, Munro Township, District of Cochrane (2)
Consent, Robillard Township, District of Temiskaming
Consent, Riggs Township, District of Algoma (2)
Consent, Cascaden Township, District of Sudbury
Plan of subdivision, Tudhope Township, District of Temiskaming
Official Plans and Related Initiatives
Early consultation, Town of Blind River
Official Plan amendment, City of Greater Sudbury
Early consultation, Township of Sables–Spanish River
Zoning By-law amendment, Municipality of French River
Zoning By-law amendment, City of Timmins
Site plan amendment, City of Timmins
Minor variance, City of Timmins
Draft Official Plans and Official Plan Updates
Bruce Mines, Town of
Temagami, Municipality of
Plummer Additional, Township of
Desbarats–Echo Bay Planning Area

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 2020, 3 such applications covering a total of 6 mining patents were reviewed for the northeast region, in Grenfell, Ben Nevis and Clifford townships. Comments were provided to ENDM's 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 1 Treaty Land Entitlement Claim site in northeastern Ontario and for the Constance Lake First Nation traditional land use area in the District of Cochrane.

Information about the mineral potential evaluation process undertaken by the Regional Land Use Geologists using the Metallic Mineral Potential Estimation Tool (MMPET) was also provided to the Strategic Support Unit (ENDM). This information is being utilized to inform the Aboriginal Participation Fund Values Mapping program.

Other Activities

The northeast Regional Land Use Geologist also undertook a number of additional activities in 2020, as outlined below.

MINISTER'S ORDERS

In 2020, the northeast Regional Land Use Geologist commented on a proposed amendment to a Minister's Zoning Order in the Wawa–Dubreuilville area.

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.

The northeast Regional Land Use Geologist worked with staff from MNRF and other ministries to ensure that relevant geoscience information and provincial mineral interests were identified and accommodated early in the planning process of projects subject to Class EAs. In 2020, feedback was provided for reviews of 2 Class EA projects within northeastern Ontario:

- a Crown Land purchase for agricultural use in the Kapuskasing area, Hearst District
- a minor Crown Land Use Amendment to allow for agriculture to occur as a permitted use on areas designated for aggregate resource extraction in the Kapuskasing area, Hearst District

In 2020, the Ministry of the Environment, Conservation and Parks (MECP) undertook a review of the Class Environmental Assessment process. The proposed amendments to Class EAs and regulatory exemptions were reviewed by the northeast Regional Land Use Geologist. Input was provided to the Environmental Assessment Coordinator (ENDM), who co-ordinated ENDM's response to MECP.

POLICY AND GUIDANCE

The northeast Regional Land Use Geologist assisted staff from the Resident Geologist Program offices in Timmins, Kirkland Lake, Sudbury and Sault Ste Marie with inquiries that included a land-use component. Land use–related inquiries from the general public, such as abandoned mines information, mineral potential and mining land status, were also addressed.

CONFERENCES AND OUTREACH ACTIVITIES

Because of public health restrictions that were implemented in response to the COVID-19 pandemic, all Resident Geologist Program (RGP) staff worked remotely during the time period between March 16 and December 31, 2020. No conferences or outreach events were attended by the northeast Regional Land Use Geologist in 2020.

MINERAL DEPOSIT COMPILATION GEOSCIENTIST ACTIVITIES—NORTHEASTERN ONTARIO

The Mineral Deposit Compilation Geoscientists (MDCG) 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 Mineral Deposit Inventory (MDI) database is regularly updated. Regular updates are required to ensure that the Ministry of Energy, Northern Development and 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). As of November 2020, Sheree Hinz became the permanent northeastern Ontario MDCG.

The MDI database is a dynamic compilation of over 19 200 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, it provides additional tools for making mineral discoveries in Ontario.

As described below, MDI record information was provided during 2020.

- Timmins District:
  - complete updates were compiled and entered for Cunningham, Dore, Swayze, Denton, and Carscallen townships
  - 6 new MDI points were added based on assessment work (4) and RGP field visits (2)
  - MDI records were compiled for land-use planning decisions in the Timmins District
- Sault Ste. Marie District:
  - a systemic issue was fixed in many Sault Ste. Marie MDI points
  - updates were done for some past producing mines and elsewhere in the district
  - MDI records were compiled for land-use planning decisions in the Sault Ste. Marie District
- Kirkland Lake District:
  - updates were completed in the Cobalt area, including Coleman, Bucke and Lorrain townships
  - various updates were completed around the district
  - MDI records were compiled for land-use planning decisions in the Kirkland Lake District
- Sudbury District:
  - complete updates were compiled and entered for Trill and Hyman townships
  - 1 new MDI point was added based on assessment work
  - various updates were completed around the district
  - MDI records were compiled for land-use planning decisions in the Sudbury District

- Southern Ontario Region (Southeastern Ontario and Southwestern Ontario districts):
  - complete updates were compiled and entered for Cavendish, Methuen and Tudor townships
  - 10 new MDI points were added based on assessment work (6), data compilation (3) and field work done prior to summer 2020 (1)
  - MDI records were compiled for land-use planning decisions in the Southern Ontario Region

Total contributions to the MDI database completed by the northeastern Ontario MDCG in 2020 included 321 updated records, 13 deleted records and 17 new records. A breakdown, by district, of the MDI records revised by the northwestern Ontario Mineral Deposit Compilation Geoscientist is provided in Table 16.

Table 16. Mineral Deposit Inventory records revision in northeastern Ontario in 2020.

District	Updates	Deletions	New
Kirkland Lake	33	5	0
Sault Ste. Marie	120	0	0
Southern Ontario	50	5	10
Sudbury	26	2	1
Timmins	92	1	6
Total	321	13	17

The publicly available version of the MDI database is updated monthly and is available from the OGS online data warehouse, GeologyOntario (www.ontario.ca/geology). The Mineral Deposit Inventory can also be viewed geographically using the OGSEarth application (www.ontario.ca/ogsearth), which helps users discover data through the Google Earth™ mapping service. The activity reports on mineral exploration, available using the OGSEarth application, includes monthly and year-to-date listings of the MDI records that have been updated.

GEOGRAPHIC INFORMATION SYSTEM DATA SPECIALISTS ACTIVITIES—NORTHWESTERN AND NORTHEASTERN ONTARIO

The Geographic Information System (GIS) Data Specialists, based out of Thunder Bay and Timmins, design and construct electronically derived maps, graphs, tables and other graphics for land-use planning purposes, geoscience compilations, reports, posters, displays and presentations. The northwestern Ontario GIS Data Specialist position was staffed by Genevieve Dorland and northeastern Ontario position staffed by Curtis Patterson for 2020. They provide ongoing support and maintenance for the Resident Geologist Program by co-ordinating the design and implementation of geoscience data standards for all program offices.

Existing Data Products

ONTARIO ASSESSMENT FILE DATABASE AND ONTARIO DRILL HOLE DATABASE

The Ontario Assessment File Database (OAFD) and Ontario Drill Hole Database (ODHD) are updated on a continual basis by RGP staff using the Ontario Mineral Exploration Information System (OMEIS). An intranet-based application launched in 2018, OMEIS 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 information 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 ENDM 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 for 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 updates for OAFD and ODHD for release each as 1) a graphical interface or data layer (keyhole mark-up language (*.kml*) files) through OGSEarth (www.ontario.ca/ogsearth), which can be viewed using user-friendly geographic information programs, such as Google Earth™ mapping service; and 2) a compressed (*.zip*) downloadable file on GeologyOntario (www.ontario.ca/geology). A summary of new items added and existing items updated in 2020 is provided in Table 17.

Table 17. Ontario Mineral Exploration Information System (OMEIS) statistics for 2020.

File Type	New Files Added	Existing Files Updated	New Drill Holes Added	Existing Drill Holes Updated
Approved Assessment	444	2665	4782	1462
Non-Assessment Exploration Work	512	17	400	0
Total	**956**	**2682**	**5182**	**1462**

New Data Products

OGSFocus

The GIS Data Specialists were involved in the development of OGSFocus: a new series of data sets that quantify data from the Ontario Assessment File Database (OAFD), the Ontario Drill Hole Database (ODHD) and the Mineral Deposit Inventory (MDI). A score based on the quantity of data available is assigned to each cell in the Mining Lands Administration System (MLAS) provincial grid along with a relative data rating. The resulting "Data Rating Grids" provide a visual representation of the quantity of data available. OGSFocus layers can be used to draw attention to areas that are available for claim acquisition, and where considerable historical exploration has occurred. The "Data Hot Spots" layer highlights significant contiguous areas with robust data that are available for acquisition. Each "Data Hot Spot" and "Data Rating Grid" cell is linked to a summary of data available in that area. OGSFocus is available as a data layer (*.kml* file) through OGSEarth (www.ontario.ca/ogsearth), which can be viewed using Google Earth™ mapping service; and in GIS format as a compressed (*.zip*) downloadable file. OGSFocus is updated bi-weekly.

PROPERTY EXAMINATIONS GEODATABASE

Starting in the 1960s, the RGP has included "Property Examinations" as an integral part of its annual *Reports of Activities*. The articles are based on field visits by RGP geologists and capture exploration history, significant assay results and geological summaries for specific properties and/or mineral occurrences. They provide third-party geological interpretations from the field visit and often provide recommendations to guide further exploration work. The GIS Data Specialists assisted in the creation of a geodatabase containing locations and attributes for 872 property examination articles encompassed by the Thunder Bay North, Thunder Bay South, Kenora and Red Lake districts. Work is currently underway to compile and eventually add property examinations from the other RGP districts to the geodatabase. Data include location information, Web links to each property examination article, a listing of associated MDI points, OGS geoscience report and Assessment File references, and information about the availability of assay data. The Property Examination Articles geodatabase is available as a compressed data layer (*.kmz* file) through OGSEarth (www.ontario.ca/ogsearth).

ACKNOWLEDGMENTS

Information on past activities reported in the text was obtained from assessment files and other files in the Timmins Resident Geologist Office, unless noted otherwise. Information on current mining and exploration activities was provided by individual prospectors and exploration and mining company personnel, compiled from assessment files and obtained from public information sources, company websites and SEDAR®.

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Ontario

Ontario Geological Survey
Resident Geologist Program

Timmins Regional Resident Geologist
(Sault Ste. Marie District)—2020

by

K. Zammit, P. Sword, Z. Azadbakht, and C. Patterson

2021

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Timmins Regional Resident Geologist (Sault Ste. Marie District)—2020

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INTRODUCTION

Mineral production in the Sault Ste. Marie District during 2020 consisted of gold production from 3 gold mines and bedrock aggregate from 3 quarries. Orogenic gold, volcanogenic massive sulphides (VMS), nickel-copper-platinum group element (PGE), banded iron formation (BIF)-hosted gold, and vein-hosted silver-lead were the major mineralizing systems targeted by exploration in 2020. As of January 4, 2021, there were a total of 12 750 active claims covering an area of 243 390 ha in the Sault Ste. Marie District, and 3500 new mining claims and 4069 new cells were registered in the District (Table 1). In total, $24 131 571 worth of assessment work was received and processed by the Sault Ste. Marie District office in 2020 (Table 2). This represents a 12.4% increase in total active claims in the District, and a 161% increase in spending on reported work performed compared to 2019. The increase in claim activity is likely due to record-high prices for gold and other metal commodities experienced during 2020.

Table 1. Total land area covered by claims in the Sault Ste. Marie District from January 9, 2019, to January 4, 2021.

Mining Division	Total Area (ha) Covered by Claims| January 4, 2021	Total Area (ha) Covered by Claims January 6, 2020	Total Area (ha) Covered by Claims January 9, 2019
SAULT STE. MARIE	243 390	222 125	249 176

MINING AND QUARRYING ACTIVITY

Mining Activity

Gold production in the Sault Ste. Marie District came from 3 operating mines in 2020: the Eagle River Mine and Mishi Mine, operated by Wesdome Gold Mines Ltd., and the Island Gold Mine, operated by Alamos Gold Inc. Total gold production was 194 351 oz Au at an average head grade of 9.3 g/t Au (Table 3).

Table 2. Status of claims, cells and value of assessment work received in the Sault Ste. Marie Mining District, compared to other divisions for year ending December 31, 2020.

Mining Division	Total Active Claims	Total Active Cells	Total Cancelled Claims	Total Cancelled Cells	New Registered Claims	New Registered Cells	Work Performed Approved ($)
KENORA	14 548	17 154	9 903	10 005	3 190	3 555	2 646 430
RED LAKE	32 699	41 951	6 491	6 894	5 777	7 064	7 370 955
PATRICIA	17 852	23 235	8 574	8 775	8 463	8 825	2 409 140
THUNDER BAY	65 264	77 238	28 033	28 760	15 829	18 300	18 755 638
SAULT STE. MARIE	**12 750**	**18 540**	**11 304**	**11 511**	**3 500**	**4 069**	**24 131 571**
PORCUPINE	56 699	65 703	20 707	21 094	12 810	14 341	43 415 618
SUDBURY	14 983	18 119	10 082	10 318	3 281	3 677	5 423 547
LARDER	43 727	47 014	14 339	14 535	5 731	7 305	17 997 737
SOUTHERN ONTARIO	4 419	4 537	2 343	2 595	253	253	147 891
TOTAL	**262 941**	**313 491**	**111 776**	**114 487**	**58 834**	**67 389**	**122 298 527**

Note: Some claims are situated and reported in more than one division, and claims and assessment work totals are not adjusted to remove double counting.

Table 3. Total gold production in the Sault Ste. Marie District, 2020.

	Ore Milled (tonnes)	Average Head Grade (g/t Au)	Production (oz)
Alamos Gold Inc.			
Island Gold Mine	386 591	11.62	139 000
Wesdome Gold Mines Ltd.			
Eagle River Mine	196 441	14.2	87 560
Mishi Mine	39 856	2.7	2 718
Total	622 888	9.5	229 278

ALAMOS GOLD INC. – ISLAND GOLD MINE

The Island Gold Mine is an underground gold mine located in Finan Township, approximately 83 km northeast of the town of Wawa. Underground operations at the mine are currently accessed by a ramp system, and the primary mining method is longitudinal retreat long-hole stoping. Ore is processed through a conventional gold mill using a carbon-in-pulp process.

In 2020, total reported gold production was 139 000 oz at an average head grade of 11.62 g/t (Alamos Gold Inc., news release, February 24, 2021; Table 4). In Q2 2020, production experienced a 51% decrease compared to the comparative period in 2019. The decrease in production resulted from a period of limited mining activities during the COVID-19 pandemic (Alamos Gold Inc., news release, July 29, 2020).

In July, the company announced its Phase III Expansion plan. This expansion will increase the total ore milled at the mine to 2000 tonnes per day, and will increase the average annual gold production to 236 000 oz/year starting in 2025. The expansion is expected to double the mine's life to 16 years based on mineable mineral resources of 9.6 million tonnes grading 10.45 g/t Au, containing 3.2 million ounces of gold. The expansion will involve the addition of a new shaft down to 1373 m depth and a paste plant. The

expansion of processing operations will include upgrading the crushing circuit, adding a second parallel ball mill, and a new elution and carbon-in-pulp circuit with carbon screens (Alamos Gold Inc., news release, July 14, 2020).

Table 4. Gold production data from the Island Gold Mine for 2019 and 2020 (Alamos Gold Inc., news release, February 24, 2021).

	2020	2019
Ore milled (tonnes)	386 591	401 276
Head grade (g/t)	11.62	11.85
Production (oz)	139 000	150 400

WESDOME GOLD MINES LTD. – EAGLE RIVER MINE

The Eagle River Mine is an underground gold mine located in the Point Isacor area, approximately 50 km west of the town of Wawa. Underground operations at the mine 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.

In 2020, the Eagle River Mine produced 87 560 oz of gold at an average head grade of 14.2 g/t (Table 5), meeting the low end of Wesdome's unadjusted 2020 production guidance. Guidance for 2021 is set at 92 000 to 105 000 ounces at the Eagle River Mine (Wesdome Gold Mines Ltd., news release, January 14, 2021).

WESDOME GOLD MINES LTD. – MISHI MINE

The Mishi Mine is an open pit mine located in the Mishibishu Lake area, approximately 50 km west of the town of Wawa. Mining is conducted using conventional truck and shovel equipment.

In 2020, the Mishi Mine produced 2718 oz of gold at an average head grade of 2.7 g/t (Table 5). Production at the Mishi Mine was completed in Q4 2020, and the Mishi stockpile now contains over 40 000 tonnes of ore that is planned to be milled in 2021 (Wesdome Gold Mines Ltd., news release, January 14, 2021).

Table 5. Gold production data from the Eagle River and Mishi Mines for 2019 and 2020 (Wesdome Gold Mines Ltd., news release, January 14, 2021).

	Eagle River		Mishi	
	2020	2019	2020	2019
Ore milled (tonnes)	196 441	122 405	39 856	46 405
Head grade (g/t)	14.2	23.1	2.7	11.7
Production (oz)	87 560	88 617	2718	3072

Quarrying Activity

Trap rock, stone and aggregate production continued from 3 bedrock quarries in the Sault Ste. Marie District, including Ontario Trap Rock, the Gilbertson Enterprises Quarry and the LaFarge Quarry.

TOMLINSON GROUP – ONTARIO TRAP ROCK

Ontario Trap Rock quarries crushed bedrock aggregate from the Nipissing gabbro at their operation located 3 km east of the town of Bruce Mines in Plummer Additional Township.

GILBERTSON ENTERPRISES QUARRY

Gilbertson Enterprises of St. Joseph Island operates a quarry east of Highway 548 and south of Highway 17 in Tarbutt Additional Township. The quarried rock is a reddish pink to grey granophyre, a late differentiate typical of Nipissing gabbro found in the Bruce Mines area. Several sizes of aggregate and landscaping products are obtained from crushing and screening operations.

LAFARGE MATERIAL AND CONSTRUCTION

LaFarge quarry is located within the city of Sault Ste. Marie. The quarry produces bedrock aggregate derived from granite gneiss that is primarily used for aggregate and landscaping purposes.

Historical Mineral Production in the Sault Ste. Marie District

Historical mineral production of gold, iron, copper, lead, silver and zinc in the Sault Ste. Marie District is included below in Tables 6, 7, 8, and 9.

Table 6. 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	3 000
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 7. Historical gold production in the Wawa area of the Sault Ste Marie District to the end of 2020.

Mine	Township	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	1995–2020	4 431 253	1 384 097	0.38
Edwards	Jacobson	1938	1537	485	0.32
		1997–2002	389 550	139 692	0.327
Holdsworth prospect	Corbiere	1933	60	10	0.17
Island Gold	Finan	2007–2020	3 722 892	965 486	0.24
Kremzar	Finan	1988–1990	392 858	37 678	0.10
Magino/Algoma Summit	Finan	1930–1940, 1988–1992	>768 679	113 228	0.15
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, 2012–2020	875 435	62 718	0.08
Murphy/Algold/Amherst	Abotossaway	1926–1932, 1936–1938, 1940	23 211	2450	0.10
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	**16 976 630**	**3 934 623**	**0.23**

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

Table 8. 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)

Table 9. Historical uranium production in the Elliot Lake area of the Sault Ste. Marie District.

Mine	Years	Tons	U_3O_8 Production (lbs)
Algoma	1959	1 477 160	2 495 709
Can-Met	1958–1959	1 477 160	2 495 709
Denison	1957–1964	69 484 027	146 618 806
Lacnor		0	0
Milliken	1958–1959	1 796 789	3 169 600
Nordic	1957–1959	3 131 826	7 162 303
Panel	1979–1986 + 1988	7 844 980	14 533 440
Pronto	1957–1960	1 633 788	7 007 999
Quirke	1958–1960	1 962 652	4 437 377
New Quirke	1978–1986	23 294 020	45 490 560
Spanish American		0	0
Stanleigh	1958–1959 + 1988–1996	16 763 378	27 746 205
Stanrock	1958–1967	6 897 765	11 798 778
Rio Algom	1959–1996	88 547 989	188 099 114
	Total	**224 311 534**	**461 055 600**

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

EXPLORATION ACTIVITY

Introduction

In 2020, the Sault Ste. Marie District hosted a total of 15 exploration programs, 3 of which are at an advanced stage. Most activity in the District focussed on exploration of orogenic gold and VMS systems in the Michipicoten, Mishibishu, and Batchawana greenstone belts. Other exploration projects targeted nickel-copper-PGE systems or lead-silver mineralization related to intrusive bodies.

A summary of exploration activity in the District is reported in Table 10. Locations for the activities are shown on Figure 1. Descriptions of exploration activities are presented in the following text.

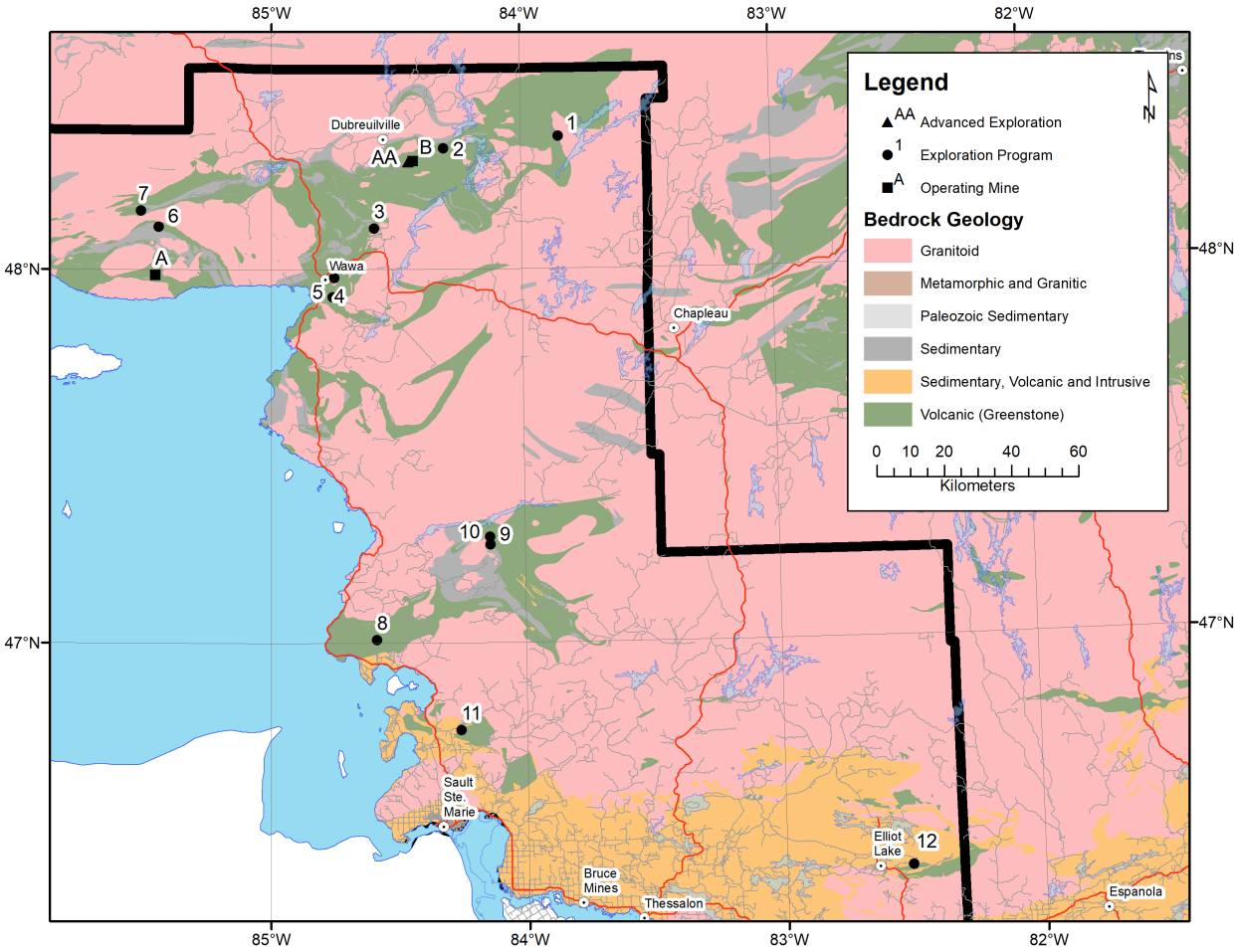

Figure 1. Mining and exploration activity in the Sault Ste. Marie District for the year 2020 (geology *from* Ontario Geological Survey 2011).

Table 10. Exploration activity in the Sault Ste. Marie District in 2020, keyed to Figure 1.

Abbreviations

AEM	Airborne electromagnetic survey
AM	Airborne magnetic survey
ASD	Assay data
CC	Channel cutting
DD	Diamond drilling
DDE	Extension of historical diamond-drill hole(s)
DGP	Down-hole geophysics
GEM	Ground electromagnetic survey
GL	Geological survey
GM	Ground magnetic survey
LiDAR	Airborne light detection and ranging survey
MDA	Mine development activities
MET	Metallurgical testing
MMI	Mobile Metal Ion™ soil sampling survey
MRE	Mineral Resource Estimate (NI 43-101)
NR	News release
Other	Other study
Pr	Prospecting
REP	Technical report (NI 43-101)
Soil	Soil sampling
Str	Stripping
Tr	Trenching
UG	Underground exploration/development
VLF-EM	Very low frequency electromagnetic survey

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity
A	Wesdome Gold Mines Ltd. (WDO) *Eagle River Complex*	Mishibishu Lake, Point Isacor (Au)	ASD, DD, DDE, UG
B	Alamos Gold Inc. (AGI) *Island Gold Property*	Finan, Jacobson (Au)	ASD, DD, MRE, REP, Other, UG
AA	Argonaut Gold Inc. (AR) *Magino Project*	Finan (Au)	ASD, DD, MDA

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity
1	Jubilee Gold Exploration Ltd. (JUB) *Leeson-Brackin Property*	Leeson, Brackin, Stover (Au)	Soil, MMI
2	Manitou Gold Inc. (MTU) *Goudreau Project*	Bruyere, Jacobson, Rennie, Riggs, West (Au)	AEM, AM, ASD, CC, DD, GEM, Pr, Str, VLF-EM
3	Noble Mineral Exploration Inc. *Holdsworth Gold Property*	Corbiere, Esquega (Au, Ag)	MET
4	Red Pine Exploration Inc. (RPX) *Wawa Project*	McMurray (Au)	ASD, DD
5	RT Minerals Corp. (RTM) *Norwalk Property*	McMurray, Naveau, Rabazo (Au)	ASD, DD
6	Angus Gold Inc. (GUS) *Golden Sky Project*	Mishibishu Lake, Point Isacor, Groseilliers, St. Germain (Au)	AEM, LiDAR, REP, Samp
7	Bold Ventures Inc. (BOL) *Farwell Gold and Base Metals Project*	Pukaskwa River, Abbie Lake (Au, Ag, Cu, Zn)	ASD, GL, Pr
8	Stone Gold Inc. (STG) *Glenrock Gold Property*	Kincaid, Nicolet, Ryan, Palmer (Au)	ASD, DGP, GEM, Soil, Tr
9	First Minerals Exploration Ltd. *Jackson Lake Project*	Abottosaway, Aguonie (Au)	GM, VLF-EM
10	Talisker Gold Corp. *Doyle Property*	Runnells (Au)	AEM, GM, VLF-EM
11	Tartisan Nickel Corp. *Sill Lake Project*	Vankoughnet (Ag, Pb)	Other
12	Marvel Discovery Corp. (MARV) *Serpent River Property*	Gaiashk, Joubin (Ni, Cu, PGE, U, REE)	NR

Advanced Projects

ALAMOS GOLD INC. – ISLAND GOLD PROPERTY

The Island Gold property consists of 831 mining tenures that cover an area of approximately 14 930 ha. The property is located in Finan and Jacobson townships, approximately 43 km northeast of the town of Wawa. It is accessible via the all-weather Goudreau Road, which connects to Highway 519 and the Trans-Canada Highway 17 (Bourgeault, Vincent and Webster 2020).

The property geology consists of predominantly greenschist to amphibolite facies volcanic and related metasedimentary rocks that form a homoclinal volcano-stratigraphic sequence, facing and younging to the north. Regionally, the lithologies are tightly to isoclinally folded with fold axes subparallel to a foliation trending 070-095º. The Island Gold Mine is situated within felsic volcanic rocks including tuffs and lavas, and is positioned on the northern limb of the Goudreau Anticline (Bourgeault, Vincent and Webster 2020; Sage 1994).

In August, Alamos Gold Inc. filed an NI 43-101-compliant technical report for the Island Gold Mine that included updated mineral reserves and resources, which are summarized in Table 11. In December, Alamos Gold Inc. acquired Trillium Mining Corp. for C$25 million, which expanded the company's land package by 57% to 14 929 ha. The Trillium land package added 10 km of strike extent within the Goudreau Lake deformation zone, a primary control on gold mineralization within the region (Alamos Gold Inc., news release, December 17, 2020).

Exploration at the Island Gold property focussed on defining near-mine mineral resources. A total of 21 415 m of surface directional drilling, 8352 m of underground directional drilling, and 15 170 m of standard underground exploration drilling was completed in 2020. Drilling focused on 3 areas: the Main Zone, the East Zone and the West Zone (Figure 2). Highlights from the 2020 drilling program are included in Table 12 (Alamos Gold Inc., news release, January 27, 2021). Overall, the company was able to further extend high-grade gold mineralization in all 3 areas of focus, and results will be used to update the mine's total mineral reserves and resources in 2021.

Table 11. Total mineral reserves and resources at the Island Gold Mine as of December 31, 2019 (Alamos Gold Inc., news release, February 18, 2020; Bourgeault, Vincent and Webster 2020).

Proven and Probable Gold Mineral Reserves									
	2019			2018			% Change		
Island Gold	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
	3643	10.37	1215	3047	10.28	1007	20%	1%	21%

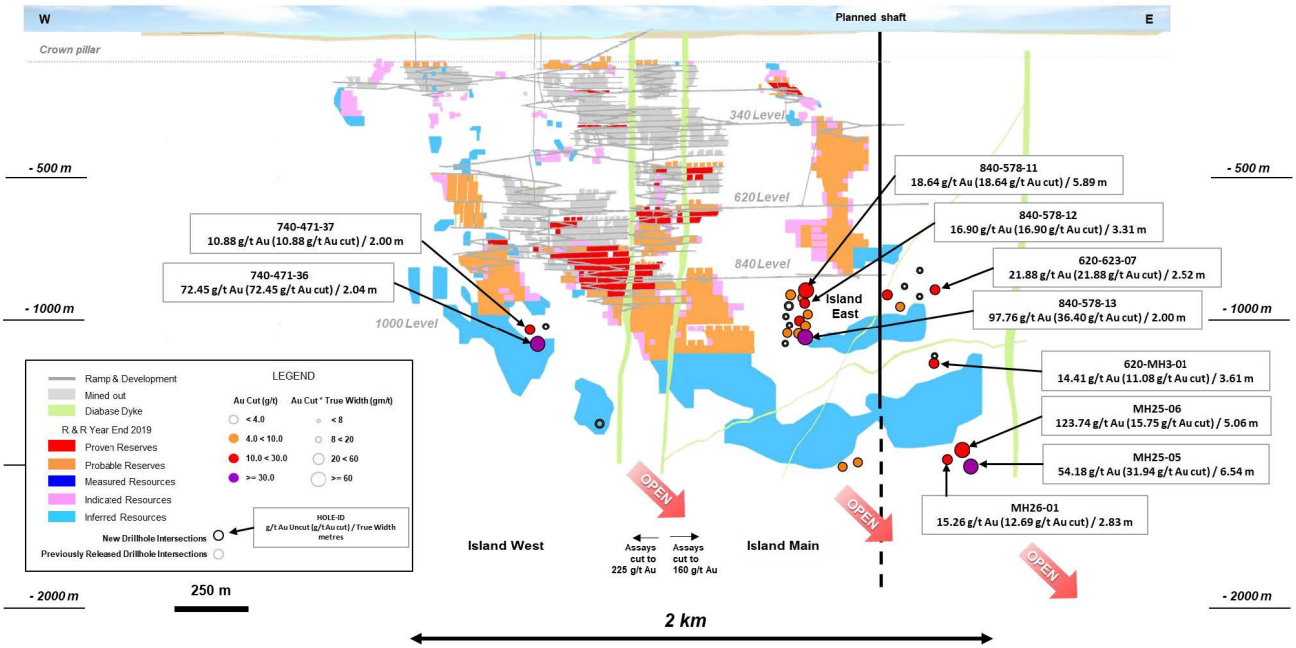

Figure 2. Longitudinal section of the Island Gold Mine, showing the Island West, Main and East zones, select drilling results, and the location of the new planned shaft (*from* Alamos Gold Inc., news release, January 27, 2021).

Table 12. Select highlights from 2020 surface, underground and underground directional exploration drilling at the Island Gold Mine. Drill hole composite intervals may include higher grade samples which have been cut to 160 g/t Au for Island East and 225 g/t Au for Island Main and West (Alamos Gold Inc., news release, January 27, 2021).

Hole ID	Zone	Target Area	From (m)	To (m)	Core Length (m)	True Width (m)	Au Uncut (g/t)	Au Cut (g/t)	Vertical Depth (m)
740-471-36	C	Island West	458.60	461.40	2.80	2.04	72.45	72.45	1067
740-471-37	C	Island West	387.30	390.60	3.30	2.00	10.88	10.88	1018
620-623-04	E1E	Island East	429.10	434.00	4.90	3.67	10.92	10.92	897
620-623-07	E1E	Island East	410.60	414.20	3.60	2.52	21.88	21.88	880
620-MH3-01	E1E	Island East	668.90	678.50	9.60	3.61	14.41	11.08	1135
MH25-05	E1E	Island Main	1626.00	1634.50	8.50	6.54	54.18	31.94	1488
MH25-06	E1E	Island Main	1592.50	1598.30	5.80	5.06	123.74	15.75	1431
MH26-01	E1E	Island Main	1542.30	1547.00	4.70	2.83	15.26	12.69	1465
740-471-36	G	Island West	470.15	475.00	4.85	3.31	5.76	5.76	1074
620-623-01	Unknown	Island East	678.80	683.90	5.10	--	16.92	16.92	1123
620-MH3-01	Unknown	Island East	712.05	721.95	9.90	--	4.62	4.62	1160
MH22-05	Unknown	Island Main	1283.56	1293.75	10.19	--	41.23	41.23	1161
840-572-09	E1E	Island East	225.30	231.50	6.20	4.90	3.73	3.73	936
840-572-10	E1E	Island East	201.50	209.30	7.80	5.46	8.78	8.78	898
840-578-04	E1E	Island East	192.70	202.50	9.80	7.01	5.33	5.33	908
840-578-10	E1E	Island East	266.80	272.40	5.60	2.40	9.35	9.35	1005
840-578-11	E1E	Island East	181.30	188.05	6.75	5.89	18.64	18.64	881
840-578-12	E1E	Island East	212.00	217.00	5.00	3.31	16.90	16.90	926
840-578-13	E1E	Island East	303.75	309.00	5.25	2.00	97.76	36.40	1044
840-572-07	Unknown	Island East	257.90	262.35	4.45	--	5.83	5.83	994

ARGONAUT GOLD INC. – MAGINO PROJECT

The Magino Project consists of 18 patented mining claims, 61 leased mining claims, and 14 unpatented mining claims covering an area of 2213 ha. The property is located in Finan Township, approximately 40 km northeast of the town of Wawa. It is accessible via Chemin Goudreau, an all-weather gravel road that connects to Highway 519 and Trans-Canada Highway 17 (Makarenko et al. 2017).

The property is adjacent to Alamos Gold Inc.'s Island Gold Project, and is underlain by intermediate to felsic pyroclastic metavolcanics capped by pyrite-bearing ironstone, and pillowed, massive and schistose, mafic to intermediate metavolcanic rocks with minor intercalations of mafic pyroclastic rocks. Several medium- to coarse-grained quartz diorite sills and dikes intrude the metavolcanic rocks. Gold 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 (Makarenko et al. 2017; Figure 3).

Exploration in 2020 aimed to expand mineralization beyond the current planned open pit mine. The company completed 56 holes and approximately 48 000 m of diamond drilling (Argonaut Gold Inc., news release, November 23, 2020). Drilling focussed on the Central and Elbow zones, and scout drilling focussed on the newly discovered Scotland, #42, Sandy, and South zones (Argonaut Gold Inc., news release, September 16, 2020; Figure 3). Select drilling results from this year's exploration program are highlighted in Table 13. Future exploration programs will focus on testing the continuity of the Elbow and Central zones as well as testing new targets below and to the west of the planned open pit.

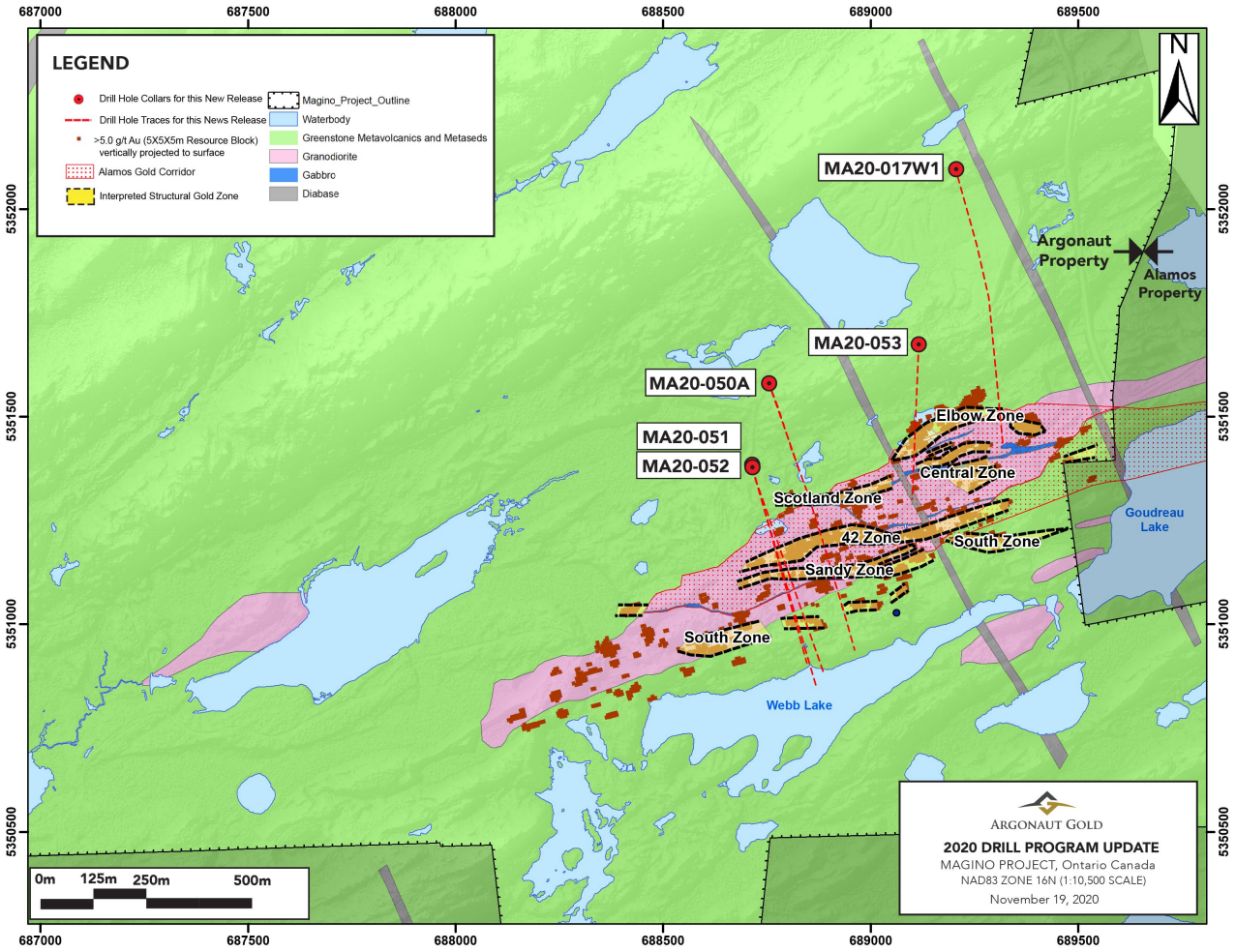

Figure 3. Plan map of the Magino Project showing locations of drill holes in Table 13 (*from* Argonaut Gold Inc., news release, November 23, 2020).

Table 13. Selected highlights from the 2020 drilling program at the planned Magino Mine (Argonaut Gold Inc., news release, November 23, 2020).

Hole	Zone	From (m)	To (m)	Length (m)	Grade (g/t Au)
MA20-017W1	Elbow	767.0	769.0	2.0	6.4
MA20-050A	Scotland	431.0	434.0	3.0	31.9
	#42	365.0	373.0	8.0	9.3
MA20-051	Sandy	605.0	607.0	2.0	18.3
	South	884.0	891.0	7.0	4.2
MA20-052	Sandy	945.0	948.0	3.0	8.9
MA20-053	Elbow	419.6	424.0	4.4	14.1

WESDOME GOLD MINES LTD. – EAGLE RIVER COMPLEX

The Eagle River Complex consists of 2 claim groups covering an area of 11 013 ha. The property is located in the Mishibishu Lake area and Point Isacor area, approximately 50 km west of the town of Wawa. It is accessible via Paint Lake Road, a gravel road that connects to the Trans-Canada Highway 17 (Mannard and Ng 2016).

The southern extent of the Eagle River Complex hosts the Eagle River Mine, which is associated with steeply dipping, north-facing tholeiitic basalts and calc-alkalic andesites that are associated with minor interflow clastic sedimentary rocks, including chert-magnetite iron formation (Mannard and Ng 2016). The lithologies are also affected by minor, moderately to steeply east-plunging fold axes and associated mineral lineations (Mannard and Ng 2016).

Exploration at the Eagle River complex in 2020 focussed on drilling the newly discovered Falcon Zones, the 300 East Zone, and the 311 West Zone (Figure 4). At the Falcon Zones, surface drilling expanded the zone of mineralization to a depth of 4400 m elevation, over a strike of 200 m (Wesdome Gold Mines Ltd., news release, February 12, 2020). The new zone has been interpreted to join the Falcon 7 Zone within the mine diorite 1000 m down-plunge from the initial near-surface discovery (Wesdome Gold Mines Ltd., news release, January 14, 2021). At the 300 East Zone, extension and definition drilling extended the zone to the 1400 m level, and the down-plunge extension measures in excess of 100 m along strike. At the 311 West Zone, continued exploration along the western margin of the mine diorite at the 750 level defined high-grade mineralization over 100 m in strike length, and the zone remains open up-plunge and along strike to the west. This zone will be a focus of 2021 drilling (Wesdome Gold Mines Ltd., news release, December 8, 2020). Highlights of drilling results from the Falcon Zones, 300 East and 311 West Zones are provided in Table 14. Results will be used to update year-end resource and reserve statements, which were not available at the time of this report's writing (Wesdome Gold Mines Ltd., news release, September 30, 2020).

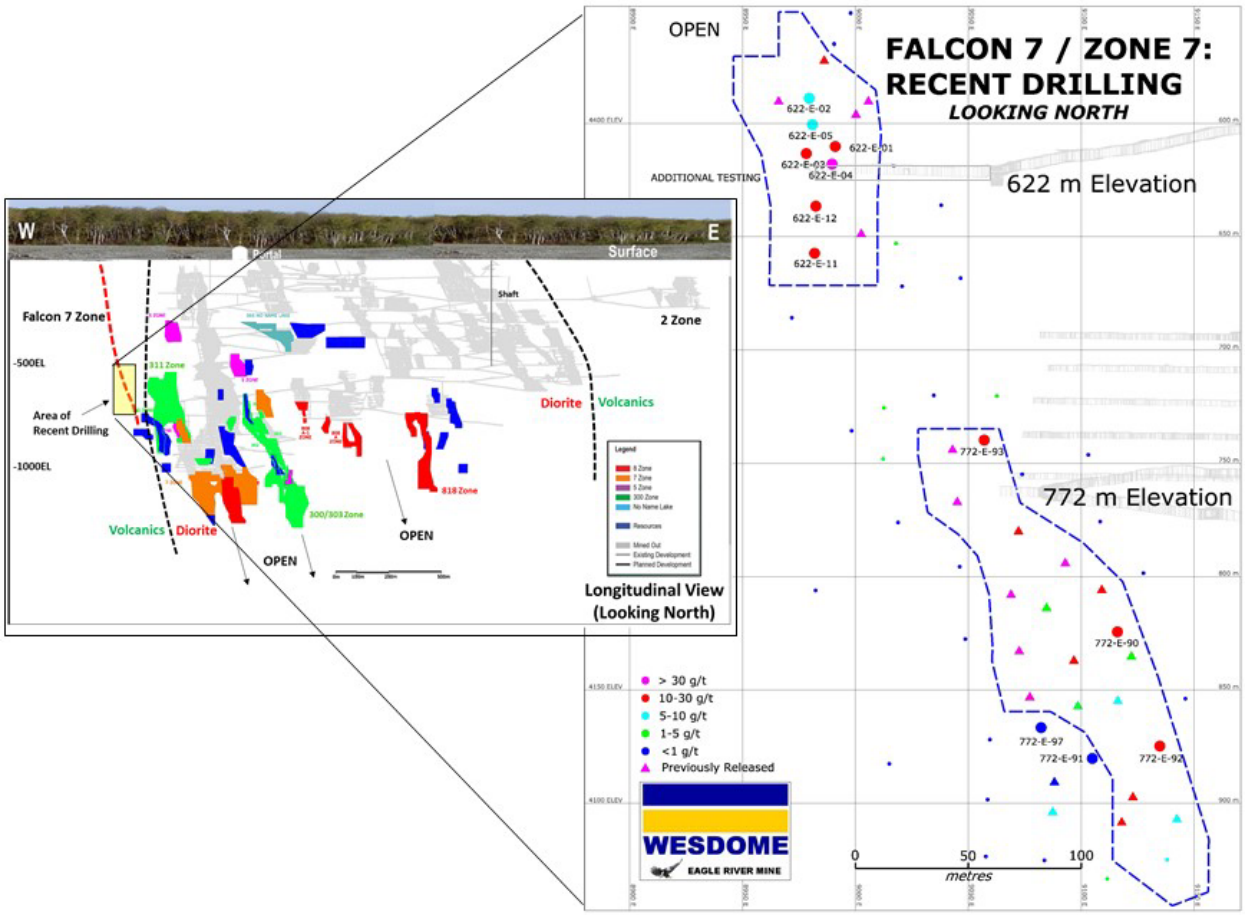

Figure 4. Longitudinal section of the Eagle River Complex, showing the locations of the Falcon Zones, 300 Zones, 311 Zone, approximate lithological contacts, and results of recent drilling from the Falcon 7 Zone (*from* Wesdome Gold Mines Ltd., news release, September 30, 2020).

Table 14. Selected highlights from the 2020 drilling program of the Falcon 7, 300 East and 311 West zones (Wesdome Gold Mines Ltd., news releases, July 8 and December 8, 2020).

Zone	Hole	From (m)	To (m)	Width (m)	True Width (m)	Au g/t (Uncapped)	Au g/t (Capped at 125 g/t)
Falcon 7	772-E-18	75.2	80.4	5.25	4.93	16.06	14.80
	772-E-39	93.4	94.9	1.55	1.50	55.35	53.29
	772-E-81	219.9	224.8	4.90	2.07	49.87	44.74
	772-E-86	99.2	105.2	5.95	5.15	314.42	76.20
							Au g/t (Capped at 140 g/t)
300 East	925-E-135	462.8	472.8	10.0	4.23	40.96	34.79
	925-E-153	374.6	377.2	2.6	1.67	11.21	11.21
	925-E-168	293.3	295.3	1.9	1.49	85.13	40.06
	925-E-169	503.4	506.1	2.7	1.52	5.79	5.79
							Au g/t (Capped at 60 g/t)
311 West	Sill 750-311 Sub #1				2.1	42.9	26.8
	Sill 750-311 Sub #2				2.9	44.8	27.1
	Sill 750-311 Sub #3				2.0	56.7	34.3

Exploration Projects

MICHIPICOTEN GREENSTONE BELT

First Minerals Exploration Ltd. – Jackson Lake Project

The Jackson Lake Project consists of 31 mining claims in Abotossaway and Aguonie townships, approximately 11 km south of the town of Dubreuilville and 34 km northwest of the town of Wawa. The property is accessible via gravel road that connects to Alamos Gold Inc.'s Island Gold Mine (Edgar and Grant 2020).

The property is underlain by Archean mafic metavolcanic rocks mostly composed of massive flows and chlorite schists, as well as minor pillowed flows, amygdaloidal units and massive medium-grained flows. Local sulphide-carbonate facies iron formation occurs on the property, as well as metamorphosed and/or carbonatized quartz gabbro. Numerous instances of quartz porphyries are also found across the property (Edgar and Grant 2020).

In April 2020, Exsics Exploration Ltd. conducted a ground geophysical program across the northern portion of the Jackson Lake property, consisting of very-low frequency (VLF) electromagnetic and magnetic surveys. The purpose of the survey was to generate geophysical exploration targets to guide exploration at the property. The initial surveys outlined several areas of interest, which are interpreted to represent northwest-trending dike-like features that are locally crosscut by northeast-trending faults and/or shear zones. Several other magnetic highs were interpreted from the survey and further follow-up using an induced polarization survey is recommended (Edgar and Grant 2020).

Jubilee Gold Exploration Ltd. – Leeson–Brackin Property

The Leeson–Brackin property consists of 24 patented mining claims in Leeson, Brackin and Stover townships, approximately 120 km northeast of the town of Wawa. The property is accessible via Highway 651, which extends northward from Highway 101. Secondary logging roads provide access to the eastern and westernmost portions of the claims (Troup 2020).

The property is underlain by mafic metavolcanic rocks that are intruded by granodiorite. The main intrusive contact strikes southeasterly across the western portion of the property. The known auriferous vein systems in the area occur within the granodiorite, and typically consist of fine-grained, white sugary quartz with disseminated pyrite and minor galena. The veins vary in thickness from a few inches to over 30 ft (9 m) (Troup 2020).

The 2020 exploration program consisted of soil sampling in the southwestern sector of the property, and was intended to provide geochemical coverage across the main intrusive contact. Sixty soil samples were collected along 4 lines and were analyzed using the Mobile Metal Ion (MMI) method. Up to 9.8 ppb Au was detected in samples (Troup 2020).

Manitou Gold Inc. – Goudreau Project

The Goudreau Project consists of numerous consolidated properties (Figure 5) covering an area of 34 000 ha. The project is located in Bruyere, Jacobson, Rennie, Riggs and West townships, approximately 50 km northeast of the town of Wawa. The property can be accessed via Renabie Road, which connects to Highway 651 and Highway 101. Highway 101 connects to the Trans-Canada Highway 17.

The Goudreau Project is situated adjacent to Alamos Gold Inc.'s Island Gold Project, and is underlain by intermediate to felsic pyroclastic metavolcanic rocks that are capped by pyrite-bearing iron formation. The volcanic lithologies are intruded by gabbro and quartz diorite dikes and sills, as well as felsic intrusions ranging in composition from nepheline syenite to tonalite/trondjhemite. All lithologies are crosscut by multiple north and northeast-trending diabase dikes (Manitou Gold Inc., corporate website, 2020).

The 2020 exploration program consisted of a 1300 m diamond-drilling program that covered 5 previously delineated drilling targets (Patents property, Rockstar vein, Tracanelli occurrence, Stream showing, Reed vein; *see* Figure 5). In addition to drilling, the company completed an airborne magnetic and electromagnetic survey covering the entire project area, and completed magnetometer, induced polarization (IP), and VLF-EM surveys over a portion of the Baltimore deformation zone (*see* Figure 5; Manitou Gold Inc., news releases, January 23 and April 7, 2020). In June, the company purchased the Shihan property located in Rennie Township, and consolidated the Goudreau Project's land package to approximately 34 000 ha (Manitou Gold Inc., news release, June 9, 2020).

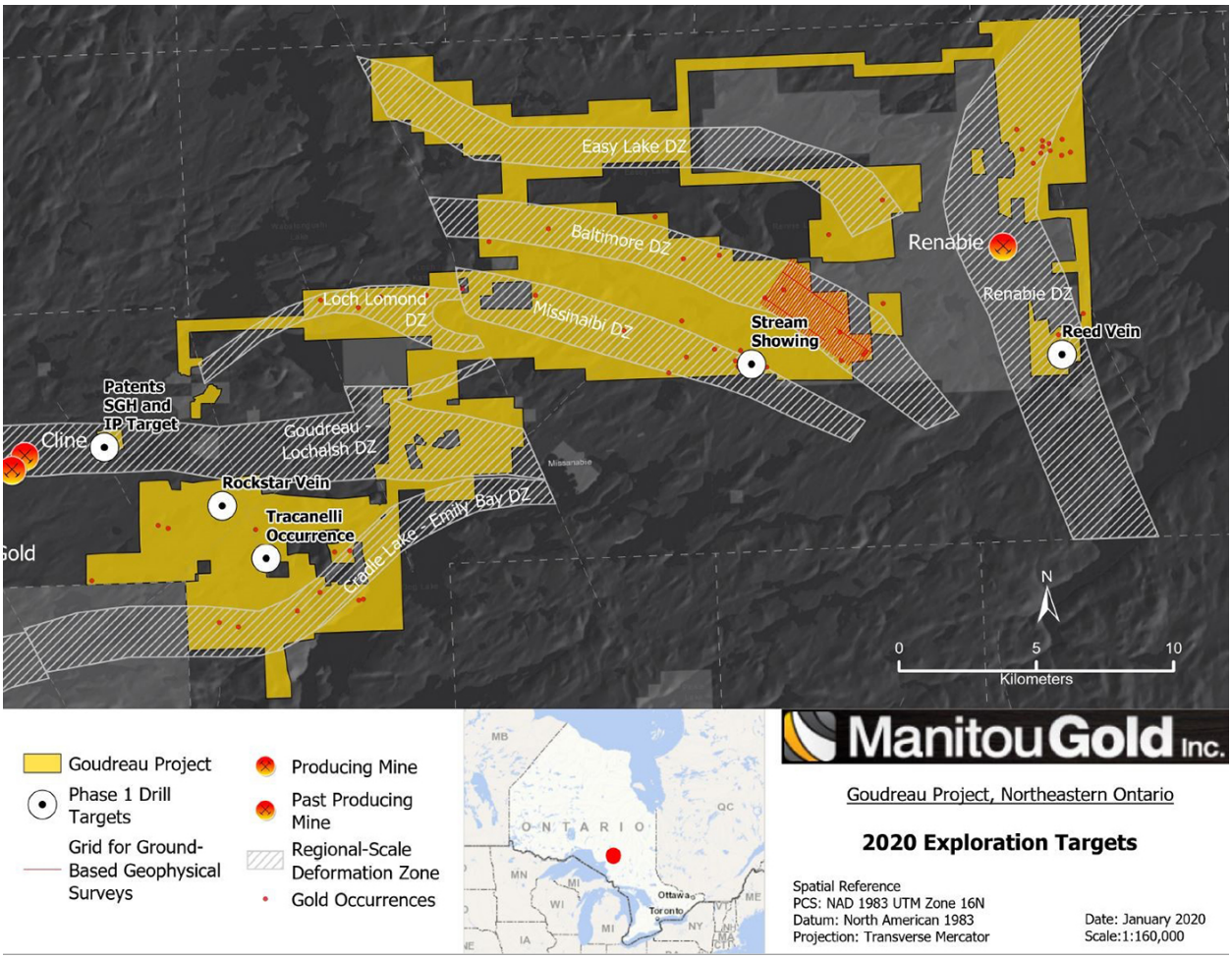

Figure 5. Map showing the locations of Manitou Gold's 2020 exploration program targets. The orange hatched area delineates the region of the ground-based induced polarization and magnetic surveys conducted at the Stover occurrence and along-strike of the Baltimore deformation zone (*from* Manitou Gold Inc., news release, January 23, 2020).

STOVER PROPERTY AND STREAM SHOWING

The Stover property covers approximately 14 km of the Baltimore deformation zone, which is believed to be the fault-offset continuation of the Goudreau–Lochalsh deformation zone, which hosts the operating Island Gold Mine and the developing Magino Mine. The Stream showing is located in the south-central portion of the Stover property. In 2020, geological and geochemical surveys were completed to guide a drilling program at the property (Manitou Gold Inc., news release, September 2, 2020).

A minimum of 5000 m of shallow drilling was devoted to test targets along the Baltimore deformation zone (Manitou Gold Inc., news release, November 5, 2020). Five drill holes were completed by the end of 2020 and intersected 3 broad zones of gold mineralization that returned up to 1.0 g/t gold over 7.6 m, including 2.2 g/t gold over 2.9 m. Drilling of the Baltimore deformation zone and Stream showing continued into 2021 (Manitou Gold Inc., news release, December 16, 2020).

ROCKSTAR VEIN

Exploration of the Rockstar vein and surrounding area included a diamond-drilling program and mechanized stripping. The company completed 6 drill holes to test the down-plunge continuity of the vein between a vertical depth of 150 to 200 m. Notable assay results include Hole MTU-20-16, which returned 5.0 g/t gold over 4.6 m, including 1.2 m at 11.1 g/t gold (Manitou Gold Inc., news release, May 25, 2020). Mechanized stripping 200 m south of the Rockstar vein returned grab sample assay results up to 8.68 g/t gold (Manitou Gold Inc., news release, June 22, 2020)

TRACANELLI OCCURRENCE

The 2020 property-wide airborne electromagnetic survey outlined 2 significant untested anomalies at the Tracanelli occurrence (Manitou Gold Inc., news release, June 22, 2020). The 2020 exploration program included mechanized stripping, channel sampling and mapping. Channel sampling highlights from the Tracanelli occurrence include 4.9 g/t over 2.3 m, 2.2 g/t gold over 6.2 m, and 8.9 g/t gold over 1.2 m (Manitou Gold Inc., news release, July 28, 2020).

PATENTS PROPERTY

Drilling at the Patents property focussed on testing a coincident Soil Gas Hydrocarbon (SGH) and IP resistivity and chargeability anomaly (Manitou Gold Inc., news release, January 23, 2020). The company intersected multiple mineralized quartz veins in a shear zone, which the company termed the Porphyry Zone, that returned assay values including 12.8 g/t gold over 0.5 m, 11.9 g/t gold over 0.7 m, and 2.2 g/t gold over 4.8 m (Manitou Gold Inc., news releases, April 30 and October 27, 2020).

REED VEIN

Three to four holes were allocated to testing the Reed vein, where previous surface sampling returned up to 79.9 g/t gold in a north-northeast–striking shear zone in tonalitic rocks of the Missinaibi Lake batholith (Manitou Gold Inc., news release, January 23, 2020). Results of this drilling program were not published in 2020.

Noble Mineral Exploration Inc. – Holdsworth Gold Property

The Holdsworth gold property consists of 19 contiguous patented mining claims and covers an area of 304 ha. It is located 25 km northeast of the town of Wawa, Ontario, in Corbiere and Esquega townships. It has been historically referred to as the Holdsworth prospect, Soocana–Holdsworth prospect, and Holdsworth Iron Range (MDI42C02SE00011 (OGS 2020b), MDI42C02SE00106 (OGS 2020c)).

The property can be accessed using a 3.2 km gravelled bush road leading north from Hawk Junction (Yarie 2016).

The property is located in the Michipicoten greenstone belt proximal to the Wawa–Hawk Lake–Manitowik Lake fault system. The property comprises mafic to felsic volcanic and volcaniclastic rocks, porphyritic intrusions and Algoma-type banded iron formation. Gold targets on the property are associated with the Soocana Vein System, a quartz vein complex developed within mafic to intermediate metavolcanic rocks, "Pyrite Zones", and a black, granular oxidized cap zone referred to as the "Oxide Sands" (Figure 6; Yarie 2016).

Noble Mineral Exploration Inc. acquired the Holdsworth gold property from MacDonald Mines Exploration Ltd. in August, 2020 (MacDonald Mines Ltd., news release, August 25 2020; Noble Mineral Exploration Inc., news release, August 25, 2020).

In 2020 Noble Mineral Exploration Inc. submitted a 20 kg oxide sand sample for metallurgical testing and metals concentration to Dundee Sustainable Technologies Inc. (Noble Mineral Exploration Inc., news release, September 3, 2020). The sample was ground, mixed, homogenized and split prior to being concentrated by flotation. Two flotation tests were conducted and generated concentrate products containing 35.84 g/t Au and 33.19 g/t Au. The company's next step would be to optimize the flotation process in order to further increase metal recoveries, with the goal of generating a marketable gold-silver-rich concentrate (Noble Mineral Exploration Inc, news release, November 2, 2020).

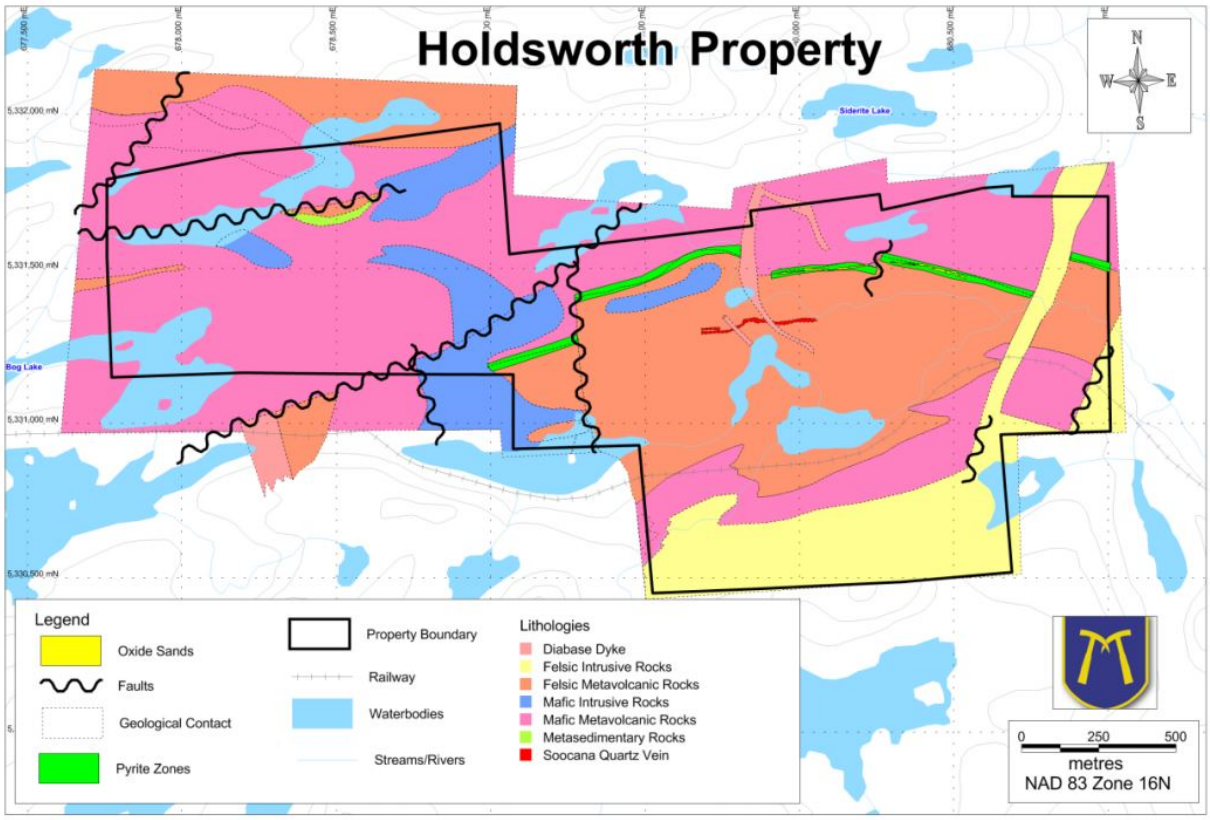

Figure 6. Geological map of the Holdsworth property (*from* Yarie 2016).

Red Pine Exploration Inc. – Wawa Project

The Wawa project consists of 164 patented mining claims and 371 unpatented mining claims that cover an area of 6519 ha. The property is located in McMurray Township, approximately 2 km southeast of the town of Wawa. It is accessible via a gravel road that connects to Highway 101 (Thomas 2019).

The overall geology of the property predominantly consists of greenschist facies and felsic to intermediate metavolcanic rocks that are intruded by the Jubilee stock, a calc-alkalic intrusive complex formed of porphyritic and/or phaneritic mafic to felsic rock types. Almost all historic gold mines on the property, such as the Surluga deposit, are located within or at the margins of the Jubilee stock (Thomas 2019).

Exploration at the Wawa Project in 2020 focussed on expanding gold mineralization in the down-dip and down-plunge extensions of the Surluga deposit. A total of 5300 m of drilling was completed which intersected several zones of high-grade gold mineralization and indicated that gold mineralization remains open at depth (Figure 7; Red Pine Exploration Inc., news release, October 15, 2020). In August, an MSc thesis was completed at the University of Windsor providing insight into gold mineralization and hydrothermal activity on the property (Wehrle 2020).

Currently, project ownership is divided between Red Pine Exploration Inc. (64.5%) and Citabar LP (35.5%). Work is currently ongoing to consolidate the ownership of the property (J-F. Montreuil, Red Pine Exploration Inc., written communication).

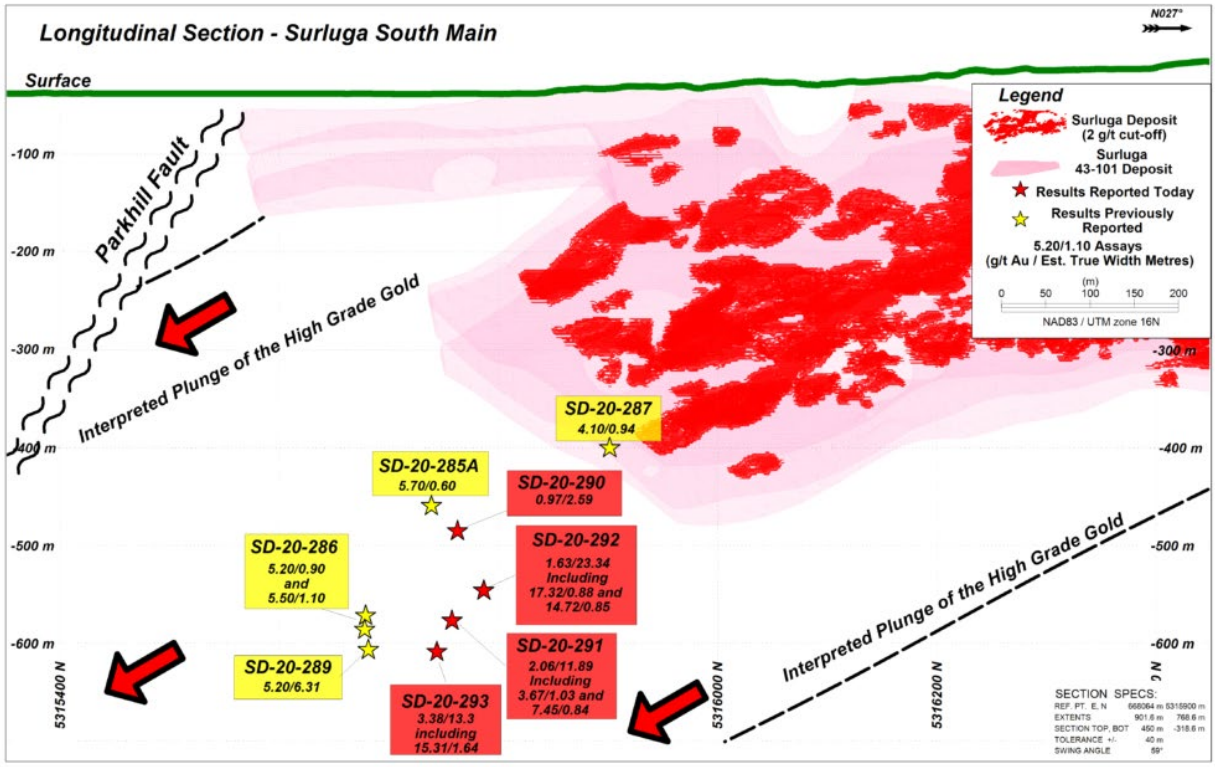

Figure 7. Longitudinal section showing drill intercepts from the 2020 exploration program at the Surluga deposit (*from* Red Pine Exploration Inc., news release, October 15, 2020).

RT Minerals Corp. – Norwalk Property

The Norwalk property consists of 33 mining claims that cover an area of 460 ha. It is located in Rabazo, Naveau and McMurray townships, approximately 6 km south of the town of Wawa. The property is accessible via the all-weather High Falls Road that runs eastward from the Trans-Canada Highway 17 (Clark 2020).

The property is underlain by metavolcanic units, including basaltic flows overlain by felsic dacites and related pyroclastic rocks. Locally, bodies of quartz porphyry are also present. The volcanic units are intruded by foliated to gneissic granodiorites and trondhjemites (Clark 2020).

In 2020, exploration at the property consisted of 1404 m of diamond drilling to test a large geophysical anomaly, as well as testing previously discovered gold occurrences at the Red Carbonate Zone (RT Minerals Corp., news release, November 16, 2020). No significant gold mineralization was intersected by 4 holes drilled during the program (RT Minerals Corp., news release, December 22, 2020).

MISHIBISHU GREENSTONE BELT

Angus Gold Inc. – Golden Sky Project

The Golden Sky project consists of over 900 mining claims and covers an area of approximately 234 km^2 between Wesdome's Mishi and Eagle River mines. It is located 50 km west of the town of Wawa within the Mishibishu Lake and Point Isacor areas, and Groseilliers and St. Germain townships. 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 (Kilbourne 2020).

The property comprises metavolcanic and metasedimentary rocks intruded by 3 granitoid bodies and diabase dikes (Figure 8; Kilbourne 2020). The metavolcanic rocks mostly consist of mafic massive to pillowed flows and associated pyroclastic units (Bowen 1986; Kilbourne 2020). The property hosts multiple deformation zones, but the main structure of interest, as of 2020, is the Dorset deformation zone, which hosts the Dorset Gold Zone (DGZ; Kilbourne 2020).

In early 2020, the property was acquired by Angus Gold Inc. (formerly Angus Ventures Inc.) from Talisker Gold Corp. in option agreements with IAMGOLD Corp. and Exiro Minerals Corp. (Angus Ventures Inc., news releases, February 5 and March 4, 2020). At the time of acquisition, the property consisted of 531 unpatented mining claims. An NI 43-101 technical report was filed shortly after the acquisition and included the historic NI 43-101–compliant resource estimate for the DGZ (Table 15; Angus Ventures Inc., news release, March 10, 2020; Kilbourne 2020).

Beginning in March, Angus Gold Inc. expanded its land package through staking an additional 347 mining claims contiguous and adjacent to the existing property (Angus Ventures Inc., news release, March 23, 2020). The company also purchased the Ellen Creek Gold and River Gold properties from Metalcorp Ltd. (Angus Ventures Inc., news release, May 22, 2020), and later 17 more claims through a private vendor in the Mishibishu greenstone belt (Angus Ventures Inc., news release, July 20, 2020). In November, the company acquired the Macassa Creek, Mishi Lake and Abbie Lake properties from Argo Gold Inc. (Argo Gold Inc., news releases, November 16 and 27, 2020).

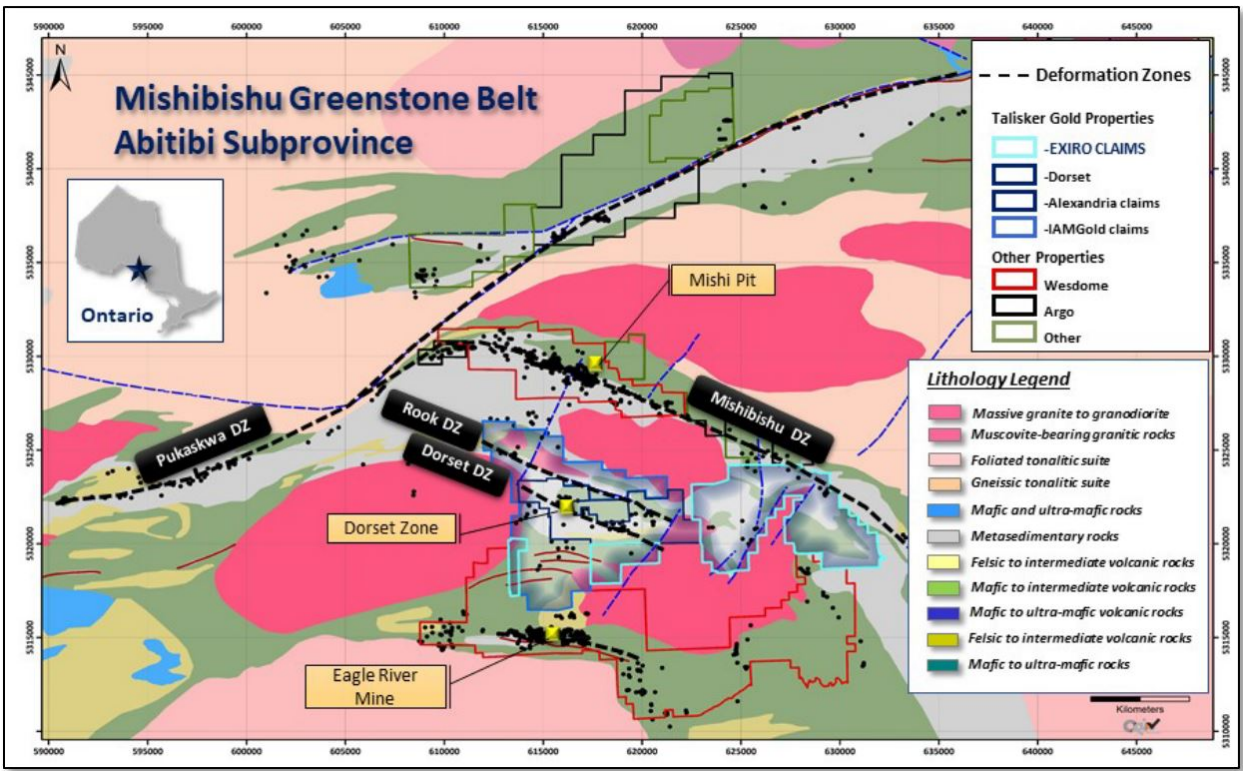

Figure 8. Geological map of the Golden Sky Project and surrounding properties, showing locations of Talisker claims and deformation zones on the property (*from* Kilbourne 2020).

The company's summer exploration program focussed on the DGZ and Banded Iron Formation Zone (BIF). At the DGZ, field programs were successful in identifying high-grade gold mineralization in outcrop west and along strike of the DGZ over a strike length of approximately 2 km. At the BIF, high-grade gold mineralization was also confirmed. In November, Angus Gold Inc. announced it completed regional airborne geophysical and LIDAR surveys covering the entire Golden Sky Project that identified new target areas outside the DGZ and BIF (Angus Gold Inc., news release, November 2, 2020).

Table 15. NI 43-101–compliant resource estimate for the Dorset Gold Zone (DGZ; Kilbourne 2020).

Dorset – Indicated Resource				Dorset – Inferred Resource		
Tonnes	Grade Au (g/t)	Contained Gold (oz)	Cut-off Au (g/t)	Tonnes	Grade Au (g/t)	Contained Gold (oz)
780 000	1.42	40 000	0.50	4 760 000	1.19	180 000
540 000	1.71	30 000	1.00	2 580 000	1.58	130 000
290 000	2.12	20 000	1.50	1 180 000	2.00	80 000

Bold Ventures Inc. – Farwell Gold and Base Metals Project

The Farwell Project consists of 143 mining claims and covers an area of approximately 7770 ha. It is located 55 km northwest of the town of Wawa within the Pukaskwa River and Abbie Lake areas. 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 (White and Thomson 2020; Figure 9).

The property is located within the southwest extension of the Michipicoten greenstone belt and comprises mafic to intermediate metavolcanic rocks and related clastic metasedimentary rocks that are intruded by ultramafic to mafic rocks (White and Thomson 2020). The property is interpreted to include the southwest extension of the Iron Lake deformation zone, which occurs along the contact between metavolcanic and metasedimentary rocks (*see* Figure 9).

Bold Ventures Inc. optioned the Farwell Project in January 2020 (Bold Ventures Inc., news release, January 6, 2020), and later received an interpretive report of an airborne electromagnetic survey conducted by the Ontario Geological Survey in 1987 (OGS 1987; Bold Ventures Inc., news release, August 12, 2020). The interpretive report was used to plan the field season's prospecting, sampling and mapping program, which focussed on 3 areas within the claim group: the Tundra Gold Horizon (TGH), Farwell Sulphide Zone (FSZ), and Koala Gold Area (KGA; White and Thomson 2020; *see* Figure 9).

A total of 102 samples were collected during the field season and submitted to AGAT Laboratories in Thunder Bay for gold and trace-element analysis. At the TGH, a total of 33 samples returned assay values ranging from less than 2 ppb to 253 ppb Au, with associated silver ranging from 0.1 to 9.28 g/t Ag. Copper values up to 0.58% Cu and zinc values up to 0.23% Zn were also recorded. At the FSZ, a total of 39 samples were collected, and returned assay values ranging from less than 2 ppb to 53 ppb Au. A direct association with silver content was also noted, with values ranging from 4.41 to 25.2 g/t Ag. Three samples returned copper assay values of 1.7% , 3.99% and 6.62% Cu. At the KGA, a total of 30 samples returned assay values ranging from less than 2 ppb to 284 ppb Au, and copper values ranging from 1.7 ppm to 666 ppm Cu (Bold Ventures Inc, news release, November 12, 2020).

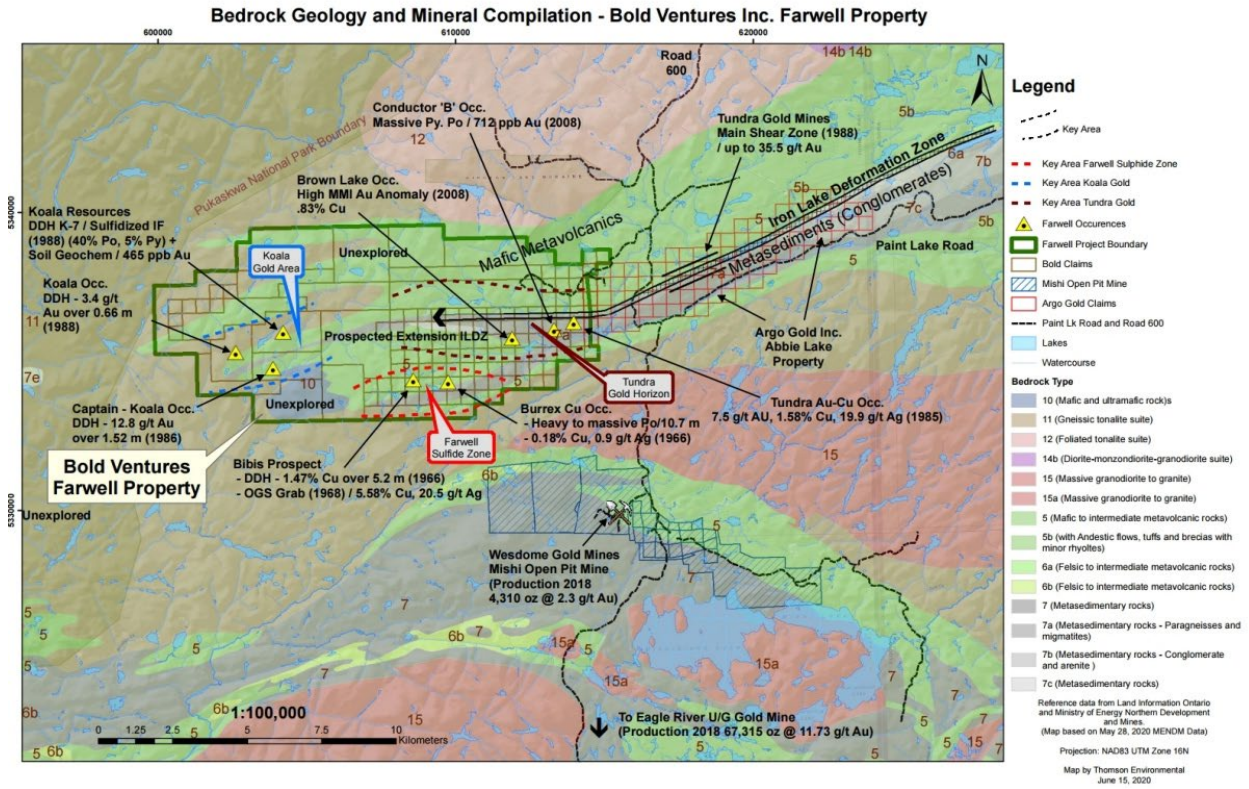

Figure 9. Geological map of the Farwell Gold and Base Metals Project and surrounding properties (*from* White and Thomson 2020).

BATCHAWANA GREENSTONE BELT

Stone Gold Inc. – Glenrock Gold Property

The Glenrock gold property is part of a larger land package, referred to as the Coppercorp property, consisting of 132 unpatented mining claims that cover an area of approximately 17 856 ha (Boyd 2017). The Glenrock Gold Property is located 85 km north of the City of Sault Ste. Marie in the Palmer Township, however, the entire Coppercorp land package extends into the Ryan, Kincaid and Nicolet Townships. The property can be accessed via a network of logging and/or bush roads that connect to the Trans-Canada Highway 17 (Boyd 2017).

The property is underlain by greenschist to amphibolite facies, mafic to intermediate metavolcanic rocks that contain minor felsic metavolcanic units. To the northeast of the claim group, local Algoma-type banded iron formation is present. Gold showings and occurrences on the Glenrock gold property are hosted by sheared, east-west striking, mafic metavolcanic carbonatized rocks with cherty seams, thin quartz veins, and patchy pyritization (Boyd 2017).

Exploration at the Glenrock gold property in 2020 consisted of a surface exploration program, including trenching, surface rock sampling, soil sampling, and ground and borehole geophysical surveys (CR Capital Corp., news release, January 13, 2020). Results of the surface rock and soil geochemical sampling program were available in late 2020. There were 28 samples obtained from outcrop and 30 soil geochemical samples collected. Analytical results range from less than 0.01 to 11.8 g/t Au, averaging 1.74 g/t Au (Table 16), and up to 43 ppb Au in soil (Stone Gold Inc., news release, November 9, 2020).

Table 16. Analytical highlights from the 2020 Glenrock gold property sampling program (Stone Gold Inc., news release, November 9, 2020).

Glenrock Gold Property Location	Sample No.	Sample Size and Type	2020 Assays (g/t Au)
Glenrock between West and Main occurrence	1058206	1.0 m chip sample	3.51
Glenrock between West and Main occurrence	1058207	1.0 m chip sample	0.72
Glenrock between West and Main occurrence	1058208	1.0 m chip sample	0.51
Glenrock between West and Main occurrence	1058209	1.0 m chip sample	0.53
Glenrock between West and Main occurrence	1058210	1.0 m chip sample	1.35
Glenrock between West and Main occurrence	1058211	grab	2.12
Glenrock between West and Main occurrence	1058214	grab	4.59
Glenrock Northwest occurrence	1058215	0.5 sq. m composite grab	0.63
Glenrock Northwest occurrence	1058216	0.5 sq. m composite grab	11.80
Glenrock Northwest occurrence	1058217	0.5 sq. m composite grab	3.34
Glenrock Northwest occurrence	1058218	0.5 sq. m composite grab	5.51
Glenrock Northwest occurrence	1058219	0.5 sq. m composite grab	7.86
Glenrock Northwest occurrence	1058223	grab	1.99
Glenrock Northwest occurrence	1058225	grab	2.46

Talisker Gold Corp. – Doyle Property

The Doyle property consists of 109 mining claim cells and covers an area of approximately 2365 ha. The Doyle property is located 92 km southeast of the town of Wawa, and approximately 86 km north of the city of Sault Ste. Marie. The property is accessible via a series of all-weather roads, logging roads and all-terrain vehicle (ATV) trails.

The Doyle property is situated within the Batchawana greenstone belt and is underlain by felsic volcanic and clastic sedimentary rocks that trend 300° to 340° and dip 70° to vertical. The property is bounded on the west by the Grey Owl Lake stock. At least 7 stratabound chert-sulphide-bearing stratigraphic units have been located within the felsic volcanic rocks. The sulphide horizons, formally referred to as sulphide iron formations, were found to be continuous to up to 500 m in length, 200 m in depth and are 0.5 to 10 m wide. Accessory minerals can include visible sphalerite. These units are also anomalous in copper, lead and silver and can carry significant multi-gram gold values up to 17.49 g/t Au over 1.0 m. Visible gold is also seen in quartz veins that cut the volcanic rocks (J. Atkinson, Talisker Gold Corp., written communication, 2020).
In 2020 Talisker completed ground very low frequency (VLF) and airborne electromagnetic (EM) and magnetic surveys and identified anomalous values across the property (Atkinson and Parent 2020). Several of the EM anomalies appear to be underlain by sulphide-rich exhalative horizons. It appears that not all the anomalies have been previously drilled. The aeromagnetic data has shown some important regional and local structures that cross the property (J. Atkinson, Talisker Gold Corp., written communication, 2020).

The data is being interpreted and will be used to assist in developing the exploration program for 2021, which is anticipated to include structural mapping, prospecting, trenching and possibly drilling (J. Atkinson, Talisker Gold Corp., written communication, 2020).

HURONIAN SUPERGROUP

Marvel Discovery Corp. – Serpent River Property

The Serpent River property consists of 10 mining claims with 115 unpatented mining claims and covers an area of approximately 1840 ha. It is located approximately 13 km east of the city of Elliot Lake within Gaiashk and Joubin townships. The property is accessible via gravel road from Highway 108 during the summer months (*see* Figure 10).

The property is underlain by Archean metavolcanic rocks and Paleoproterozoic sedimentary rocks of the Huronian Supergroup. The sedimentary rocks are crosscut by Nipissing diabase, as well as by narrow aplite and lamprophyre dikes. Exploration at the property is currently focussed on nickel-copper-PGE mineralization, but the property also hosts uranium and rare earth element mineralization (Cochrane and Roscoe 2007).

In 2015, new exploration and geophysical interpretation of the property outlined a significant 5.7 km long and 4.2 km wide magnetic anomaly derived from gabbroic lithologies, called the Pecors anomaly. The Pecors anomaly has the potential to host nickel-copper-PGE mineralization, and the company plans to delineate the extent of any nickel, copper and PGE mineralization through exploratory drilling. In 2020, Marvel Discovery Corp. received an extension to its drilling permit from the Ontario Ministry of Energy, Northern Development and Mines (Marvel Discovery Corp., news release, December 17, 2020). At the time of this report's writing, drilling had yet to commence on the property.

Tartisan Nickel Corp. – Sill Lake Project

The Sill Lake lead-silver project consists of 13 single cell mining claims that cover an area of 372.8 ha. The property is located in Vankoughnet Township, approximately 40 km north of the city of Sault Ste. Marie. The property can be accessed via Robertson Lake Road, a gravel road that connects to Old Highway 17 Road and the Trans-Canada Highway 17.

The geology of the area comprises sedimentary rocks of the Paleoproterozoic Gowganda Formation that unconformably overlie Archean metavolcanic and metasedimentary rocks. These lithologies are intruded by Nipissing diabase, which dominates the area. Mineralization is associated with multiple northwest-trending, coarse-grained, galena-bearing quartz-carbonate veins within tension fractures in fault zones that crosscut all lithologies (Atkinson et al. 2009).

Tartisan Nickel Corp. completed a Spectral Analysis survey and a Synthetic Aperture Radar survey on the property that identified several alteration minerals on the property, including saponite, orthoclase feldspar, and kaolinite. Results of the survey suggest that galena and goethite are the principal characteristic minerals associated with the lead-silver occurrences on the property (Tartisan Nickel Corp., news release, March 10, 2020).

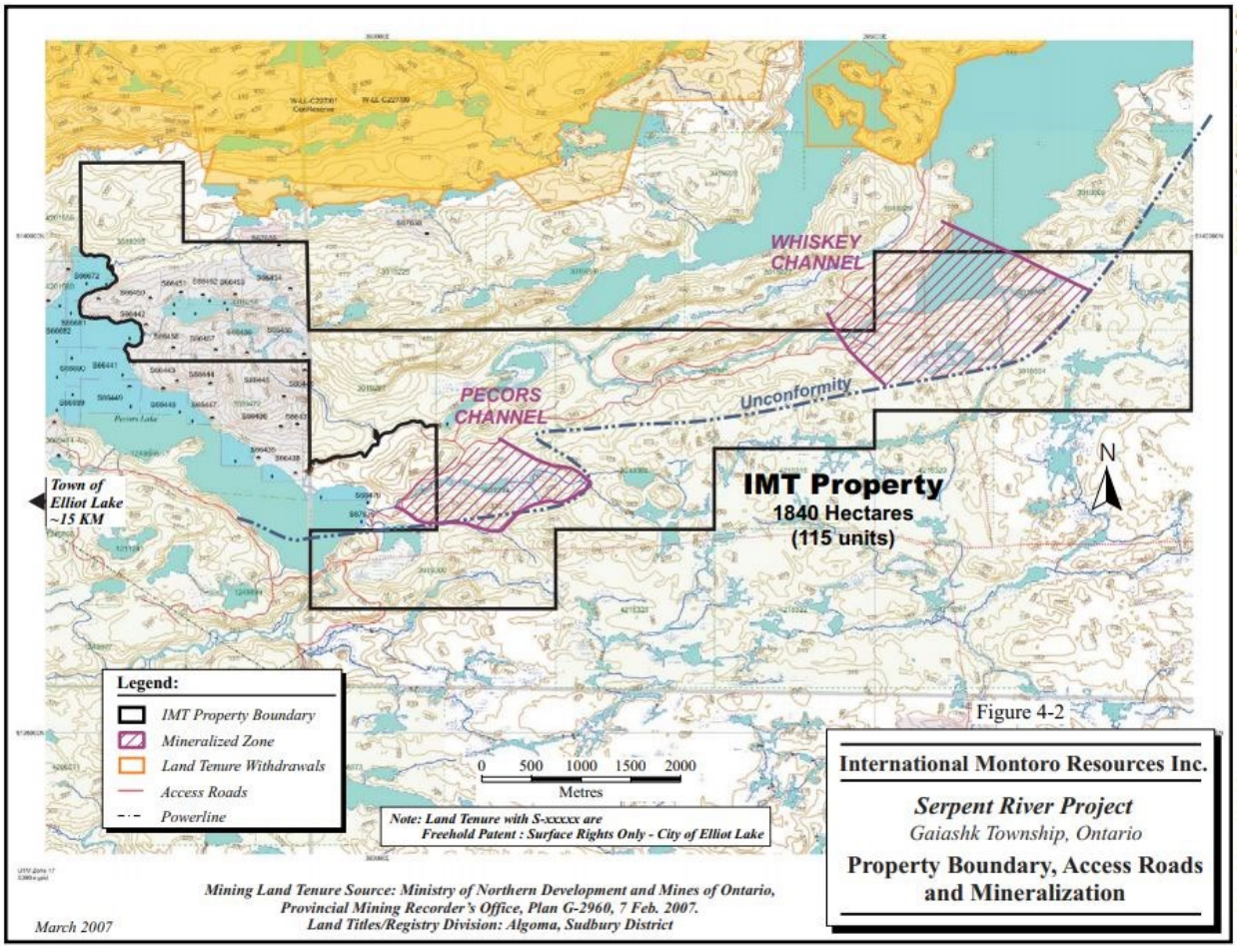

Figure 10. Topographic map showing the extent of the Serpent River Project (*from* Cochrane and Roscoe 2007).

Active Exploration Plans, Exploration Permits and Assessment Files Received in 2020

There were 61 active Exploration Plans and Exploration Permits for projects in the Sault Ste. Marie District in 2020, an increase of 48% compared to 2019. Active Exploration Plans are listed in Table 17 and Active Exploration Permits are listed in Table 18.

Assessment files received by the Sault Ste. Marie District Geologist's Office in 2020 are summarized in Table 19. All reports in 2020 were for work conducted during 2020 or earlier.

Table 17. Exploration plans in the Sault Ste. Marie District in 2020.

Abbreviations

GEOPH ..... Geophysical
LC ..... Line cutting
PDRILL ..... Mechanized drilling
PSTRIP ..... Mechanized stripping
PTRNCH..... Pitting and trenching

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PL-20-000050	Philip Escher	Goudreau Project	Bird, Bruyere, Jacobson, Riggs	LC, GEOPH	07/04/2020
PL-19-000101	Conquest Resources Limited	Campbell Vein Gold (Au) Project	Brackin, Leeson, Rennie, Stover	PSTRIP, PTRNCH, GEOPH	08/16/2019
PL-18-010987	2254022 Ontario Ltd	Otter Project - Helfrick	Casson, Otter	LC, GEOPH	02/03/2019
PL-18-010989	Battery Mineral Resources Limited	Otter Project - Helfrick	Casson, Otter	LC, GEOPH	01/03/2019
PL-19-000012	Gabriel Roy	DPE Chesley Grid Project	Chesley	LC	04/28/2019
PL-20-000004	Michael Tremblay, Philip Escher	Goudreau Project	Glasgow, Meath, Rennie, Stover, Riggs, West	LC, GEOPH	03/11/2020
PL-17-10795	Comstock Metals Ltd.	Old Cabin	Jacobson	LC, PSTRIP, GEOPH	10/05/2017
PL-20-000003	Bruce Mackie	Goudreau Project	Meath, Rennie, Stover	LC, GEOPH	03/11/2020
PL-20-000110	IAMGOLD Corporation	Golden Sky Project	Mishibishu Lake area	LC, GEOPH	10/17/2020
PL-20-000111	Angus Ventures Inc.	Golden Sky Project	Mishibishu Lake area	LC, GEOPH	10/17/2020
PL-19-000088	Michael Tremblay, Philip Escher	Wish Ore Project	Palmer, Wishart	LC, PSTRIP, GEOPH, PTRNCH	07/14/2019
PL-20-000002	Bruce Mackie	Goudreau Project	Stover	LC, GEOPH	03/11/2020

Table 18. Exploration permits in the Sault Ste. Marie District in 2020.

Abbreviations

GEOPH ..... Geophysical
LC ..... Line cutting
PDRILL ..... Mechanized drilling
PSTRIP ..... Mechanized stripping
PTRNCH..... Pitting and trenching

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-17-11237	Judy Baker	Abbie Lake	Abbie Lake Area, Keating, Keating Additional	PDRILL, PSTRIP, PTRNCH, LC	02/15/2020
PR-19-000228	Jean Gaudreau	Abigo Property Project	Abigo	PDRILL, PSTRIP, LC	10/08/2020
PR-17-11223	First Minerals Exploration Limited	Goudreau Project	Abotossaway, Aguonie	PDRILL	02/20/2020
PR-20-000200	Philip Escher	Goudreau Project	Bird, Bruyere, Jacobson, Riggs	PDRILL, PSTRIP, PTRNCH, LC	07/30/2020
PR-19-000111	Manitou Gold Inc.	Goudreau Project	Bird, Bruyere, Jacobson, Riggs, West	PDRILL, PSTRIP, PTRNCH, LC	08/15/2020
PR-18-000019	Manitou Gold Inc.	Rockstar 3	Bird, Jacobson	PDRILL, PSTRIP, PTRNCH, LC	07/13/2020
PR-19-000165	Michael Tremblay, Philip Escher	Goudreau Project	Brackin, Leeson	PDRILL, PSTRIP, PTRNCH, LC	08/15/2020
PR-20-000203	Philip Escher	Goudreau Project	Brackin, Leeson, Meath, Rennie	PDRILL, PSTRIP, PTRNCH, LC	07/29/2020
PR-20-000201	Philip Escher	Goudreau Project	Bruyere, Copenace, Glasgow, Riggs, West	PDRILL, PSTRIP, PTRNCH, LC	07/30/2020
PR-18-000018	Manitou Gold Inc.	Rockstar 2	Bruyere, Riggs	PDRILL, PSTRIP, PTRNCH, LC	07/13/2020
PR-17-11238	Judy Baker	Macassa Creek	David Lakes Area	PDRILL, PSTRIP, PTRNCH, LC	02/16/2020
PR-20-000237	Steven Anderson	Echum Project	Dolson, Echum	PDRILL, PSTRIP, LC	11/10/2020
PR-17-11149		Ballard Lake	Dolson, Lang, Marsh	PDRILL, PSTRIP, LC	07/20/2020
PR-20-000093	Kyle Stanfiled	Magino Gold Project	Finan	PDRILL, LC	09/16/2020
PR-20-000302	Randy Sedore	Magino	Finan	PSTRIP, PTRNCH	10/26/2020
PR-20-000338E	International Montoro Resources Inc.	Serpent River – Pecors Anomaly	Gaiashk	PDRILL	12/16/2020
PR-14-10588R	International Montoro Resources Inc.	Serpent River – Pecors Anomaly	Gaiashk, Joubin	PDRILL	10/24/2020
PR-20-000210	Philip Escher	Goudreau Project	Glasgow, Meath	PDRILL, PSTRIP, PTRNCH, LC	07/30/2020
PR-19-000110	Michael Tremblay, Philip Escher	Goudreau Project	Glasgow, Meath, Rennie	PDRILL, PSTRIP, PTRNCH, LC	08/15/2020
PR-18-11310	Bruce Mackie, Michael Tremblay, Philip Escher	Stover	Glasgow, Meath, Rennie, Stover, Riggs, West	PDRILL, PSTRIP, PTRNCH, LC	05/24/2020

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-20-000202	Philip Escher	Goudreau Project	Glasgow, Meath, Riggs, West	PDRILL, PSTRIP, PTRNCH, LC	07/29/2020
PR-19-000143	Prodigy Gold Inc.	Trillium Gold Project	Jacobson, Riggs	PDRILL	08/06/2020
PR-17-11127	Michael Tremblay, Marc Tremblay	Dill River	Lastheels, McMurray	PDRILL, LC	08/03/2020
PR-18-000231	Stornoway Diamond	RIL Project	Laughren, Meen	PDRILL	10/18/2020
PR-18-000229	Stornoway Diamond	RIL Project	Leluk	PDRILL	10/18/2020
PR-19-000238	Red Pine Exploration Inc., Wawa GP Inc.	Wawa Gold East	McMurray	PDRILL, PSTRIP, PTRNCH, LC	10/24/2020
PR-20-000280	Fred Kiernicki	Norwalk	McMurray, Naveau, Rabazo		11/02/2020
PR-17-11224	First Minerals Exploration Limited	Missinabie	Meath, West	PDRILL, PSTRIP	02/05/2020
PR-20-000337E	First Minerals Exploration Limited	Missinabie Project	Meath, West	PDRILL	12/23/2020
PR-17-11234	Robert Peever	Meen	Meen	PDRILL	01/22/2020
PR-18-000230	Stornoway Diamond	RIL Project	Meen	PDRILL	10/18/2020
PR-18-000232	Stornoway Diamond	RIL Project	Meen	PDRILL	10/18/2020
PR-19-000188	Wesdome Gold Mines Ltd.	East Eagle River Project	Mishibishu Lake Area, Point Isacor Area	PDRILL, PSTRIP, PTRNCH, LC	09/17/2020
PR-17-11239	Judy Baker	Mishi Lake	Mishibishu Lake Area, St. Germain	PDRILL, PSTRIP, PTRNCH, LC	02/16/2020
PR-18-000233	Stornoway Diamond Corporation	RIL Project	Morningstar	PDRILL	10/18/2020
PR-17-11240	Judy Baker	South Wawa	Naveau	PDRILL, PSTRIP, PTRNCH, LC	02/16/2020
PR-20-000303	Steven Anderson	Naveau Project	Naveau	PDRILL, PSTRIP, LC	11/12/2020
PR-20-000274	Trevor Boyd	Glenrock	Palmer		11/02/2020
PR-19-000320	Nathan Forslund	Peek-a-Boo Area	Pilot Harbour Area	PDRILL, PSTRIP, LC	01/29/2020
PR-19-000187	Wesdome Gold Mines Ltd.	West Eagle River Project	Pilot Harbour Area, Point Isacor Area	PDRILL, PSTRIP, PTRNCH, LC	09/16/2020
PR-19-000176	Conquest Resources Limited	Z-22 Vein Project (Smith Lake Property)	Rennie	PSTRIP	09/03/2020
PR-20-000204	Philip Escher	Goudreau Project	Rennie	PDRILL, PSTRIP, PTRNCH, LC	07/30/2020
PR-18-000017	Manitou Gold Inc.	Rockstar	Riggs	PDRILL, PSTRIP, PTRNCH, LC	07/13/2020
PR-18-000103	CR Capital Corp.	Coppercorp 1	Ryan	PDRILL, PSTRIP, PTRNCH, LC	10/22/2020

Plan #	Claim Holder/Proponent	Project Name	Township/Area	Activities	Effective Date
PR-18-000104	CR Capital Corp.	Coppercorp 2	Ryan	PDRILL, PSTRIP, PTRNCH, LC	10/22/2020
PR-18-000105	CR Capital Corp.	Coppercorp 3	Ryan	PDRILL, PSTRIP, PTRNCH, LC	10/22/2020
PR-18-000106	CR Capital Corp.	Coppercorp 4	Ryan	PDRILL, PSTRIP, PTRNCH, LC	10/22/2020
PR-18-000234	Stornoway Diamond	RIL Project	Shulman	PDRILL	10/18/2020
PR-20-000108	Michael Tremblay	Wish Ore	Wishart	PDRILL, PTRNCH	09/16/2020

Table 19. Assessment files received in the Sault Ste. Marie District in 2020.

Abbreviations

AEM.....Airborne electromagnetic survey
AMAG.....Airborne magnetometer
ARAD ..... Airborne radiometric
ASSAY .....Assaying and analyses
CHNL .....Channel sampling
EM……..Electromagnetic survey
GCHEM ..... Geochemical
GEOL .....Geological survey/mapping
GLCOMP ..... Compilation and interpretation - geology
IP ..... Induced polarization
LC .....Line cutting
MAG ..... Magnetic/magnetometer survey
PDRILL .....Diamond drilling
PROSP ..... Prospecting by license holder
PSTRIP ..... Overburden stripping
PTRNCH ..... Bedrock stripping
ROCK ..... Rock sampling
SOIL ..... Soil sampling
VLF ..... Electromagnetic very low frequency

Township/Area	Company Filing Report	Year	Work Performed	File ID	Credits Applied	Resident Geologist Office File Designation
Abbie Lake Area	Argo Gold Inc.	2017–2019	CHNL, GCHEM, ROCK, SOIL	20000017946	$18 663	WP_Abbie Lake-50
Abotossaway, Aguonie	First Minerals Exploration Ltd.	2020	EM, VLF	20000018576	$21 175	WP_Abotossaway-57
Bird, Brackin, Bruyere, Jacobson, Leeson, Meath, Rennie, Riggs, Stover, West	Manitou Gold Inc.	2018–2019	ASSAY, CHNL, GLCOMP, PROSP, ROCK	20000018143	$429 098	WP_Riggs-86
Brackin	Jubilee Gold Exploration Ltd.	2019	ASSAY, IP, LC, MAG, SOIL	20000018004	$25 235	WP_Brackin-65
Casson, Otter	Battery Mineral Resources Ltd.	2019	ASSAY, PROSP, ROCK	20000018292	$11 034	SSMP_Casson-27
Chabanel	Bruce Clarida	2018	ASSAY, PROSP, ROCK	20000017989	$5 577	WP_Chabanel-99
Finan, Jacobson	Alamos Gold Inc.	2015–2017	ASSAY, PDRILL	20000018624	$10 183 619	WP_Finan-101
Jackson	Battery Mineral Resources Ltd.	2019	ASSAY, PROSP, ROCK	20000017988	$10 506	Jackson-11
Jacobson, Riggs	Timothy Lavoie	2019	AEM, ARAD	20000018155	$1 200	WP_Riggs-87

Township/Area	Company Filing Report	Year	Work Performed	File ID	Credits Applied	Resident Geologist Office File Designation
McNie	James Ralph	2018	ASSAY, CHNL, PROSP, ROCK	20000018291	$6 936	McNie-01
Meen	Stornoway Diamond Corp.	2018	ASSAY, PDRILL	20000018616	$56 677	Meen-001
Naveau	Steven Anderson	2019	ASSAY, PROSP, ROCK	20000018178	$2 895	Naveau-0027
Parkinson, Wells	Battery Mineral Resources Ltd.	2019	GCHEM, PROSP	20000017896	$8 086	SSMP_Wells-12
Parkinson, Wells	Battery Mineral Resources Ltd.	2019	ASSAY, PROSP, ROCK	20000018142	$8 086	SSMP_Wells-12
Point Isacor Area	Wesdome Gold Mines Ltd.	2017	PDRILL	20000018581	$173 885	WP_Point Isacor-34
Point Isacor Area	Wesdome Gold Mines Ltd.	2016	ASSAY, PDRILL	20000018415	$699 150	WP_Point Isacor-33
Point Isacor Area	Wesdome Gold Mines Ltd.	2017	GEOL, ROCK	20000017997	$20 448	N/A
Rabazo	RT Minerals Corp.	2017–2018	ASSAY, PDRILL, PSTRIP	20000018533	$247 817	WP_Rabazo-60
Riggs	Alamos Gold Inc.	2020	AMAG	20000018197	$4 088	WP_Riggs-88
Runnalls	Talisker Gold Corp.	2019	ASSAY, GEOL, ROCK, VLF	20000018418	$19 562	Runnalls-21
Vankoughnet	Canadian Arrow Mines Ltd.	2019	OTHER	20000018191	$13 598	SSMP_Vankoughnet-21
Wishart	Michael Tremblay	2018	ASSAY, PROSP, ROCK	20000018704	$22 275	SSMP_Wishart-14
Wishart	Michael Tremblay	2019	IP, PROSP, PTRNCH, VLF	20000018174	$173 648	SSMP_Wishart-13

DISTRICT STAFF AND ACTIVITIES

Because of public health restrictions implemented in response to the COVID-19 pandemic, all Resident Geologist Program (RGP) staff worked remotely during the time period between March 16 and December 31, 2020. The primary impacts of these restrictions on RGP services included the suspension of public access to our offices and the cancellation of the 2020 field season (i.e., no property visits or other field investigations). However, staff were able to continue delivering most of our client services using electronic communication channels (e.g., telephone, email and video calls). Staff were also able to access the offices on an as-needed basis to obtain paper files and other materials that were required to fulfil these services. Client requests for physical documents, exploration equipment loans (e.g., Beep Mats) and diamond-drill core were accommodated outside the office setting in accordance with public health guidelines.

The Sault Ste. Marie District Geologist office was staffed by K. Zammit, District Geologist, and P. Sword, District Geological Assistant. A total of 23 assessment files were catalogued by the District Geologist's office in 2020 (Table 17), and 464 donated files were indexed and scanned to the GeologyOntario and OGSEarth database (Table 20).

In March, K. Zammit attended the Prospectors and Developers Association of Canada (PDAC) conference in Toronto, Ontario. While at the conference, K. Zammit networked with various prospectors and junior exploration companies active in the Sault Ste. Marie District.

In May, the Sault District Geologist's office provided the Algoma District School Board with geological education activities that students, parents and teachers could access from home. The activities focussed on using the OGSEarth application and the GeologyOntario database from home, as well as basic rock identification.

In October, K. Zammit, P. Sword and E. Hastie (Earth Resources and Geoscience Mapping Section, OGS) met with the Lands and Resources Manager of the Mississaugi First Nation to plan future field trips and presentations related to ongoing mapping efforts in the Huronian Supergroup by the Ontario Geological Survey.

Throughout the year, K. Zammit and P. Sword attended remote monthly meetings held by the Sault and District Prospectors Association (S&DPA), where they provided updates on Ministry activities and procured presenters for a geological presentation series, including S. Magnus of the Earth Resources and Geoscience Mapping Section, Ontario Geological Survey, who presented *Geology and Mineralization of the Western Schreiber–Hemlo Greenstone Belt*, and L. Rush, an MSc candidate with Laurentian University's Metal Earth program, who presented *Constraining Metal Zonation for Effective Exploration Targeting of the Five-Element (Ag-Co-Ni-As-Bi) Vein Deposits of the Cobalt Mining District, Ontario*.

The Sault Ste. Marie District Geologist's office continued to produce monthly updates on mining and exploration activity for use in the OGSEarth application, as well as providing advice to government and prospectors on geological exploration activity in the District. The office also continued to provide a rock identification service for the public through email.

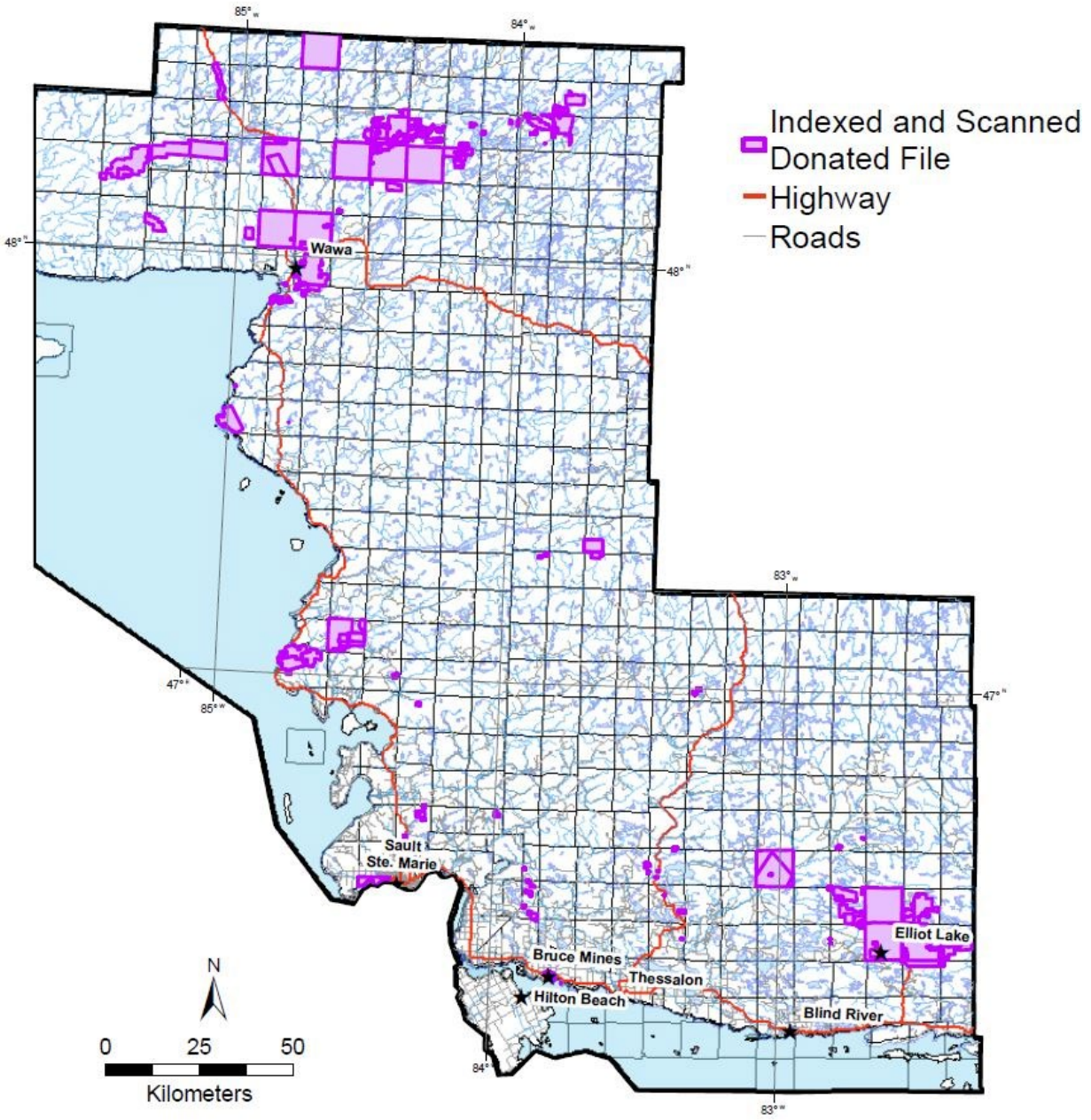

Figure 11. Map showing geographic locations of donated assessment files scanned in the Sault Ste. Marie District in 2020.

Table 20. List of scanned and indexed donated files in the Sault Ste. Marie District. Files that occur in multiple townships have been included in the total for each township.

Township	Number of Files	Township	Number of Files
Abbie Lake	7	Esten	1
Aberdeen Additional	10	Finan	26
Abotossaway	34	Gaiashk	2
Aguonie	10	Gould	3
Alanen	1	Gunterman	20
Alarie	1	Jacobson	30
Albanel	3	Joubin	9
Allouez	1	Keating	1
Anderson	1	Keating Additional	1
Andre	1	Killins	1
Archibald	1	Lalibert	6
Asselin	1	Leeson	37
Atkinson	1	McMurray	2
Awenge	2	Naveau	1
Aweres	7	Neill	3
Bailloquet	5	Nicolet	44
Beange	12	Otter	2
Bird	3	Plummer Additional	23
Bolger	3	Proctor	2
Bouck	11	Rabazo	17
Brackin	15	Riggs	6
Bruyere	4	Ryan	4
Buckles	3	Sagard	3
Casson	5	Schembri	3
Chabanel	47	Scriven	2
Chesley Additional	1	Sherratt	3
Corbiere	1	St. Germain	1
Cowie	2	Stover	9
Degle	1	Wells	3
Dumphy	1	Wishart	4
		Total	**464**

Drill Core Storage Site

Despite working remotely, the Sault Ste. Marie District Geologist's office continued to maintain and provide access to the Drill Core Storage Site during the summer of 2020. Client inquiries for the District's drill core ranged from industry sampling programs to global academic research projects. A list of drill core that was accessed by clients is included in Table 21.

Table 21. Drill core accessed at the Sault Ste. Marie District Geologist's office drill core compound in 2020.

Core Donor	Year	Township	File ID	Resident Geologist Office File Designation
Locator Exploration Services Ltd.	1988	Palmer	41N02SE0055	SSMP_Palmer-0013
Falconbridge Nickel Mines Ltd.	1985	Hawkins	N/A	Hawkins-0026-0031
Tri Origin Exploration Ltd.	1990	Runnells	41N08SE0020	SSMP_Runnells-04
Granges Exploration Ltd.	1990	Runnells	41N08SE0024	Runnells-0021

PROPERTY EXAMINATIONS

Public health restrictions implemented in response to the COVID-19 pandemic resulted in the cancellation of the 2020 RGP field season. As a result, no property examinations were conducted by the Sault Ste. Marie District Geologist's office.

RECOMMENDATIONS FOR EXPLORATION

Gold Potential in the Southwestern Batchawana Greenstone Belt

Highlights

- Southwestern Batchawana greenstone belt represents a relatively underexplored Archean terrane that hosts multiple gold occurrences
- Positive results from recent exploration warrant further investigation of the region's gold potential

Various gold occurrences are documented in the southwestern Batchawana greenstone belt (Table 22). The belt is located approximately 100 km south of the Michipicoten greenstone belt, which hosts multiple operating orogenic gold mines.

The southwestern Batchawana greenstone belt hosts multiple historic copper ± gold mines (i.e., Coppercorp Mine, Tribag Mine–Breton Breccia, and Mamainse Mine; Figure 12). It comprises Archean mafic to intermediate metavolcanic rocks and metasedimentary rocks that are intruded by felsic metavolcanic rocks. The westernmost portion of the map area is overlain by basalts and intrusive rocks of the Proterozoic Keweenawan Supergroup (Giblin and Armhurst 1973). The various rock types of the area are crosscut by multiple east-northeast- and north-northwest-trending faults and shear zones. Although multiple gold occurrences have been documented within the southwestern Batchawana greenstone belt (*see* Figure 12), and it comprises rock types and structures that are conducive to hosting various types of gold mineralization, it remains relatively underexplored for gold.

RECENT GOLD EXPLORATION

Recent exploration conducted at the Wish Ore, Glenrock and Doyle properties provides evidence for gold mineralizing systems within the greenstone belt.

The Wish Ore property (*see* Figure 12) is underlain by sequences of tholeiitic metavolcanic flows, which are increasingly intercalated with metasedimentary rocks, including iron formations, and felsic tuffs towards the east (Tremblay 2015). Gold mineralization is associated with volcanic rocks with quartz veining and carbonate alteration, low concentrations of sulphides and chalcopyrite mineralization, and northwest-trending shear zones that intersect the east-northeast-trending Carp River Fault (Golden Goliath Resources 2019a). Gold values of up to 4.28 g/t gold over 3 m, including 9.05 g/t gold over 1.0 m, were identified based on channel sampling on the property (Golden Goliath Resources 2019b).

The Glenrock property (*see* Figure 12) is associated with sheared mafic metavolcanic rocks, as well as significant patches of sulphide mineralization and carbonate alteration (MDI41N02SE00004; Ontario Geological Survey 2020d). Recent surface rock sampling at the property reported values up to 3.29 g/t Au, and results of 15 soil samples delineated an approximately northwest-trending zone of elevated values up to 1.72 g/t Au, averaging 0.18 g/t Au. Analysis of the property's historical drill core

from the Sault Ste. Marie District drill core library (*see* Figure 12) revealed up to 0.99 g/t Au over 0.8 m (Stone Gold Inc. 2020).

The Doyle property is located in the northeastern Batchawana greenstone belt, which was previously recommended for gold exploration by the Ontario Geological Survey (Pace 2016). The property is underlain by felsic volcanic and volcaniclastic sedimentary rocks that have shown widespread zinc and gold mineralization through previous drilling and trenching (Talisker Gold Corp. 2018). Though it is not in the immediate vicinity of the area considered for this recommendation, the Doyle property comprises rock types and structures that are conducive to hosting gold mineralization, and provides further evidence to support the presence of gold mineralizing systems in the Batchawana greenstone belt.

RECOMMENDATION

Based on multiple recorded historic gold occurrences, and positive results from recent exploration work conducted in the Batchawana greenstone belt, it is recommended that further investigation into the belt's gold potential be considered.

Table 22. Summary of recorded gold occurrences in the southwestern Batchawana greenstone belt (Ontario Geological Survey 2020d). Assessment files can be searched for and retrieved using the Ontario Geological Survey online data warehouse, GeologyOntario (www.ontario.ca/geology), or by contacting the Sault Ste. Marie District Geologist's office.

Township	Easting	Northing	Name	Primary (P) or Secondary (S) Occurrence	Mineralization Classification	Number of Assessment Reports on File
Davieux (A.C.R)	713863	5222155	Mine Pond, Hammar Bridge	P	Hydrothermal	4
Olsen	704229	5220648	McCollough Lake	P	Hydrothermal	1
Olsen	709179	5220944	South Paquette	P	Hydrothermal	3
Olsen	701819	5218246	McGovern Lake	P	Hydrothermal	2
Olsen	703770	5218768	McGovern Lake East	S	Hydrothermal	1
Olsen	703297	5217722	Minnex 52-53	P	Lode	4
Palmer	683886	5209329	Glenrock	P	Lode/Hydrothermal	15
Palmer	684680	5206503	Palmer Gold	P	Lode/ Hydrothermal	7
Palmer	686478	5210035	STP-10	P	Lode/Vein (Polymetallic)	3
lmer	686062	5211804	Palmer Breccia Zone	S	Hydrothermal	8
Wishart	693878	5209818	Wish Ore	P	Lode	1

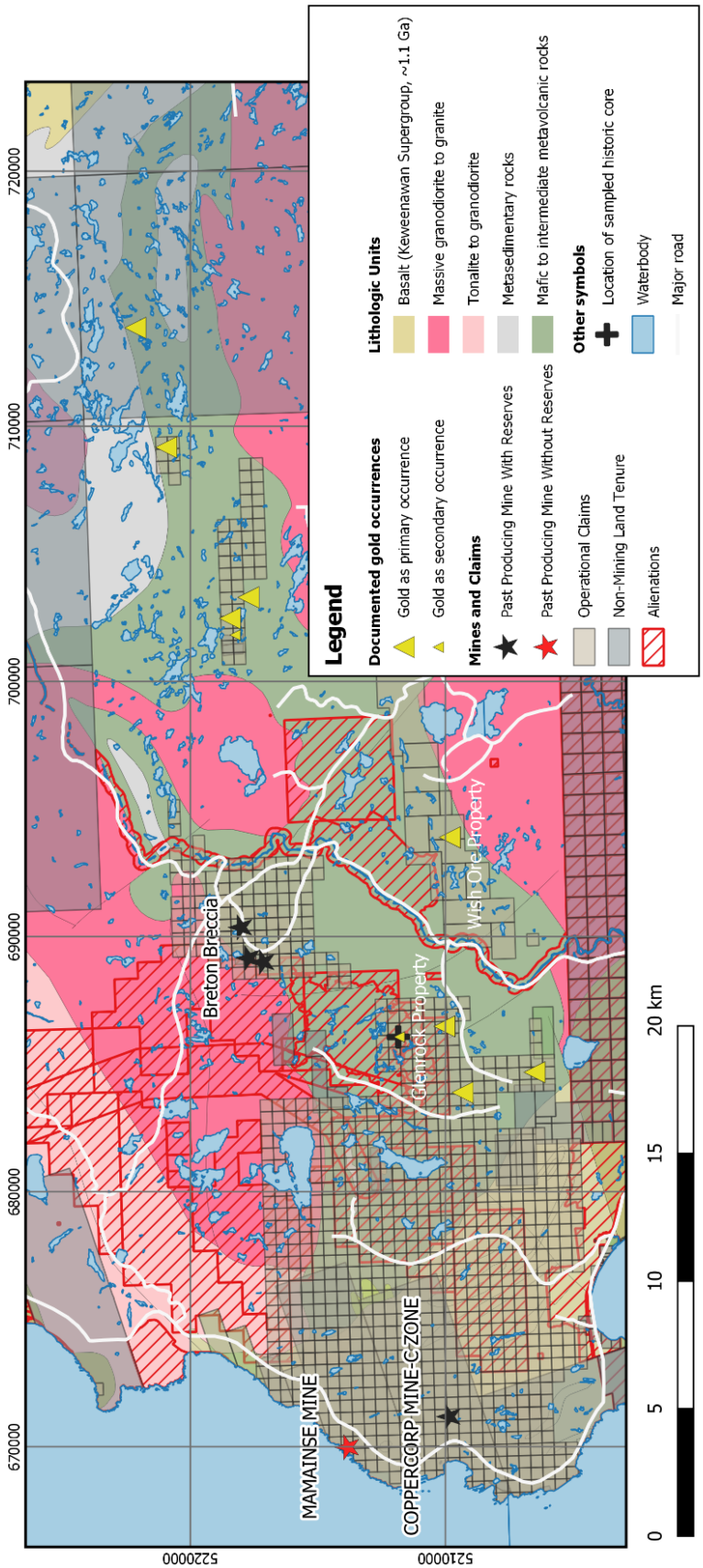

Figure 12. Simplified geological map showing the locations of documented gold occurrences in the southwestern Batchawana greenstone belt, as well as operational claims, mining alienations and historic mines. Co-ordinates are provided in UTM Zone 16N, NAD83. Data compiled from the Mineral Deposit Inventory database (Ontario Geological Survey 2020d). Geology *from* Ontario Geological Survey (2011).

OGS ACTIVITIES AND RESEARCH BY OTHERS

Public health restrictions implemented in response to the COVID-19 pandemic resulted in the cancellation of the 2020 field season for the OGS Earth Resources and Geoscience Mapping Section (ERGMS). However, activities that did not require field work continued for the projects listed below (Table 23).

Details of activities reported during the year by staff of the Earth Resources and Geoscience Mapping Section, Ontario Geological Survey, are provided in *Summary of Field Work and Other Activities 2020* (OGS 2020a). Field activity within the Sault Ste. Marie District is summarized in the following article:

- Project NE-19-004. Summary of 2019 Field Activity, Ramsey-Algoma Area Compilation Project, Superior and Southern Provinces (Préfontaine 2020).

Several academic endeavours in the Sault Ste. Marie District were published in 2020, including

- Mesoproterozoic porphyry copper mineralization at Mamainse Point, Ontario, Canada, in the context of the Midcontinent rift metallogeny (Perelló, Sillitoe and Creaser 2020).
- Gold mineralization in the Archean Wawa Gold Corridor, Wawa, Ontario (Wehrle 2020).

Other academic research activities were

- C. O'Neil, Applied MSc candidate at Laurentian University, is working with Dr. Daniel Kontak on the structural assessment of gold-bearing quartz veins in the Wesdome Eagle River gold deposit at Wawa, Ontario.

Table 23. Publications received by the Sault Ste. Marie District Geologist office in 2020.

Title	Author	Type and Year of Publication
Report of Activities 2020, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	W.P.E. Paterson, C. Ravnaas, S.O. Lewis, G.F. Paju, S.P. Fudge, C.M. Daniels and T.K. Pettigrew	Ontario Geological Survey, Open File Report 6363, 2020
Report of Activities 2020, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	R.M. Cundari, G.F. Paju, M. Dorado-Troughton, C.M. Daniels, S.P. Fudge, T.K. Pettigrew and G. Dorland	Ontario Geological Survey, Open File Report 6364, 2020
Report of Activities 2020, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	M.A. Puumala, D.A. Campbell, G.F. Paju, C.M. Daniels, S.P. Fudge, T.K. Pettigrew and M. Dorado-Troughton	Ontario Geological Survey, Open File Report 6365, 2020
Report of Activities 2020, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	E.H. van Hees, P. Bousquet, J. Suma-Momoh, C.M. Daniels, S.L.K. Hinz, C. Boucher, P. Sword, L. Wang, S.P. Fudge, A. Millette and C. Patterson	Ontario Geological Survey, Open File Report 6366, 2020
Report of Activities 2020, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	P.J. Chadwick, A.S. Péloquin, J. Suma-Momoh, C.M. Daniels, S.L.K. Hinz, C.A. Kennedy, L. Streit and R.M. Todd	Ontario Geological Survey, Open File Report 6367, 2020
Report of Activities 2020, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts, and Petroleum Operations Centre	P.S. LeBaron, N. Sabiri, D.A. Laidlaw, S.L.K. Hinz and L. Fortner	Ontario Geological Survey, Open File Report 6368, 2020
Summary of Field Work and Other Activities, 2019	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6360, 2019
Summary of Field Work and Other Activities, 2020	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6370, 2020

MINERAL DEPOSITS NOT BEING MINED

Table 24. Mineral deposits not being mined in the Sault Ste. Marie District in 2020.

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 Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS Site #
Pater Mine Spragge Tp. 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 Tp. 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. Tp. 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. Tp. 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. Tp. 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 Tp. 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 Tp. 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. Tp. 41J/05SW	Cu	124 000 T @ 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 Tp. 41J/05SW	Cu, Ni, Au	9 tons of ore shipped from 100-foot level, 280 feet of lateral work. Shaft is 160 feet depth.	MRC 12, p.34-35. MRC 2, p.74. AF Index plan	Past Producer 1899–1901	08013
Bilton option Patton Tp. 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 Tp. 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 Tp. 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 Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS Site #
Glagoma Mine Gladstone Tp. 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 Tp. 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 Tp. 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 Tp. 41J/06NE	Cu	105 750 tons @ 1.08% Cu (drill indicated) A Zone: L-600 by W-10 by D-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 Tp. 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 Tp. 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 Tp. 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 Tp. 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 Tp. 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 Tp. 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 Tp. 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 Tp. 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 v.37, pt.3, p.72-73	Past Producer 1939	07833
Goulais River, Doughty, Eagle Mine, Tribag, Edwards. Vankoughnet Tp. 41K/16SW	Cu, Ag	250 000 tons @ 2.35% Cu, 0.26 oz/ton Ag in 3 zones (drill-indicated).	GDIF #75, OBM 1905, v.14, pt.1 AR 1970, MP 46, p.92-93 AR 1973, MP 57, p.86.	Past Producer 1900	07974
Kristina Mine (Supercrest) (Superior) LaVerendrye Tp. 41K/16NE	Cu	369 350 tons @ 1.95% Cu in No.4 and No.6 shaft zones. 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, v.11, p.274 OBM, v.17, 1908, p.79	Past Producer 1903–1907 1952–1957: 22 000 ft of diamond drilling.	08040
Prace–Sill Lake Mine Vankoughnet Tp. 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 ft width.	AF SSMP Vankoughnet 16, 17.	Past Producer 1975, 1979, 1981, 1983–1984 and 1985–1987	07976

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status	AMIS Site #
Caputo–Just (Caputo-Thompson, Ontex) Wishart Tp. 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 Tp. 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 Tp. 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 Tp. 41N/02SE	Cu, Mo	Reserve est. 18 M tons @ 0.19% Cu and 0.05% MoS2	MRC 12, p.60-61 MRC 7, p.11 AF RYAN SSMP -15, p.30	1965/66: diamond drilling	07924
Mamainse Mine Ryan Tp. (A.McDonell Location -west of Ryan Tp.) 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 Tp. 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 1865/66 and 1949, 1955/56	07902 Same as 07899
Pancake Lake (Richards) Kincaid Tp. 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 Tp. 41N/02SE	Cu, W, Ag, Au	4 zones (Breton, West, East and South) Reserve est. 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 Tp. 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. AMIS = Abandoned Mine Information System.*

Unit abbreviations used*: lbs = pounds; M = million; oz = ounce(s).*

Table 25. Mineral deposits not being mined in the Wawa area in 2020.

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	Ownership References	Reserve References	Status
Alden–Goudreau (past producer) Cowie Township	Au	170 000 tons @ 0.50 oz Au per ton	Michipicoten Forest Resources and Cedar Falls Forest Resources	CMH 1937–1943	Diamond drilling 2011
Betty Lake Iron Range Knicely Township	Fe	1 570 140 t @ 39.5% Fe	Essar Steel Algoma Inc.	RGF	Inactive. Bulk sampled 1999
Big Lake Iron Range Corbiere Township	Fe	302 150 tons per 100 feet @ 36.6% Fe	Michipicoten Forest Resources and Cedar Falls Forest Resources	GR 153	Last active exploration 1955
Braminco prospect Brackin Township	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)	Conquest Resources Limited	RGF	Last explored 2004
Cline gold mine (past producer) Jacobson Township	Au	204 000 tons @ 0.221 oz Au per ton (88-60 Zone)	Cline Mining Corporation	NI 43-101 Rpt. 30/11/2009	Diamond drilling 2008
Edwards Mine (past producer) Jacobson Township	Au	96 000 t @ 11.3 g/t Au (at the end of 2000)	Strike Minerals Ltd.	RGF	Dewatering and diamond drilling 2011
Ego Mines Claims Abotossaway Township	Au, Cu	7 mineralized zones; W-8 Zone hosts 442 080 t @ 2.6 g/t Au, 1.91% Cu	Richmont Mines Inc.	OFR 5587	Inactive
Goudreau Zone Finan Township	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)	Richmont Mines Inc.	RGF	Diamond drilling 2010
G.W. Macleod Mine (past producer) McMurray Township	Fe	18 700 000 t (blocked out) @ 31% Fe	Essar Steel Algoma Inc.	OFR 5990	Mine closed in 1998.
Josephine–Bartlett Iron Range Corbiere Township	Fe	7 555 788 t @ 58.36% Fe	Essar Steel Algoma Inc.	OFR 5578	Diamond drilled 1946.
Josephine Mine (past producer) Corbiere Township	Fe	3 965 00 tons @ 51.65% Fe, 14.92% Si, 1.88% S	Canada Iron Inc.	RGF	Mine cave-in in 1946. Inactive.
Jubilee–Surluga property (past producer) McMurray Township	Au	Inferred resource: 32 200 000 t @1.14 g/t Au	Augustine Ventures Inc.	NI 43-101 Rpt 21/11/2011	Past producers (8) 1902–1991. Diamond drilling 2011.
Kremzar Mine (past producer) Finan Township	Au	229 777 t @ 7.65 g/t Au	Richmont Mines Inc.	RGF	Active exploration 2000

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Lakemount property Esquega Township	Ni, Cu	Inferred resource: 3 048 000 t @ 0.35% Ni, 0.20% Cu, 0.13 g/t Pt, 0.09 g/t Pd	First Development Holdings Corporation	NI 43-101 Rpt. Platinum Group Metals 21/01/2005	Diamond drilling 2003–2004
Lochalsh Zone (past producer) Finan Township	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)	Richmont Mines Inc.	RGF	Diamond drilling 2010
Lucy Iron Range (past-producer) Chabanel Township	Fe	13 780 000 t @ 33.2% Fe	Essar Steel Algoma Inc.	RGF	Mine closed 1970.
Magino Mine (past producer) Finan Township	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)	Prodigy Gold Incorporated	NI 43-101 Rpt. 2/11/2011	Diamond drilling 2011
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	Wesdome Gold Mines Ltd.	CMH 1997–1998, p.204	Underground exploration 2004. Drifting westward toward Mishi Mine.
Magpie Iron Range (past producer) Leclaire Township	Fe	332 400 t @ 36% Fe	Essar Steel Algoma Inc.	RGF	Mine closed 1921. Underground mine.
Markes occurrence Jacobson Township	Au	65 000 t @ 5.75 g/t Au	Pele Mountain Resources Inc.	RGF	Diamond drilling 2010
Minto Mine South property McMurray Township	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)	Augustine Ventures Inc. / Red Pine Exploration Ltd.	NI 43-101 Rpt 31/12/2018	Diamond drilling 2018
Murphy–Algold–Amherst gold mine (past-producer) Abotossaway Township	Au	248 800 tons @ 0.305 oz Au per ton	Lake Shore Gold Corp.	RGF	Diamond drilling 2003.
Nudulama prospect Leeson Township	Au	579 325 t @ 0.194 oz Au per ton	Gold Train Resources Inc.	RGF	Inactive
No.8 Zone Finan Township	Au	90 700 t @ 6.9 g/t Au	Richmont Mines Inc.	RGF	Exploration 1997
Pine Zone Finan Township	Au	70 000 t @ 6.4 g/t Au	Richmont Mines Inc.	RGF	Inactive

Deposit Name/ Township	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Ranson Mine Rabazo Township	Au	30 300 t @ 12.4 g/t Au	N/A	RGF	Diamond drilling 2001
Renabie Mine (past producer) Leeson Township	Au	1 million t @ 0.2 g/t Au. Past producer 1 100 000 oz Au	N/A	RGF	Rehabilitated
Ruth Iron Range (past-producer) Chabanel Township	Fe	34 608 000 t @ 30.9% Fe	Essar Steel Algoma Inc.	RGF	Diamond drilling 1967 by Algoma Ore Company Ltd.
Shenango Mine Hawkins Township	Au	37 440 t @ 4.3 g/t Au	Canadian Orebodies Inc.	RGF	Inactive
Shihan VMS property Meath and Rennie townships	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	Goldpath Resources Corp.	NI 43-101 Rpt 14/11/2011	Inactive
Sir James Dunn Mine (past producer) Chabanel Township	Fe	65 454 545 t @ 34% Fe, 7% SiO_2	Essar Steel Algoma Inc.	RGF	Inactive
Surluga Mine (past producer) McMurray Township	Au	Inferred resource: 19 824 000 t @ 1.71 g/t Au (1 088 000 ounces @ 0.5 g/t cut-off)	Augustine Ventures Inc. / Red Pine Exploration Ltd.	NI 43-101 Rpt 06/05/2015	Diamond drilling 2018

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

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

MINERAL DEPOSIT COMPILATION GEOSCIENTIST ACTIVITIES—NORTHEASTERN ONTARIO

The activities of the Mineral Deposit Compilation Geoscientist are described *in* "Mineral Deposit Compilation Geoscientist—Northeastern 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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