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**Ontario Geological Survey
Open File Report 6314**

**Report of Activities, 2015
Resident Geologist Program**

**Red Lake Regional Resident
Geologist Report:
Red Lake and Kenora District**

2016





ONTARIO GEOLOGICAL SURVEY

Open File Report 6314

Report of Activities, 2015
Resident Geologist Program

Red Lake Regional Resident Geologist Report:
Red Lake and Kenora Districts

by

A.F. Lichtblau, C. Ravnaas, C.C. Storey, R.D. Tuomi, A. Tims, R.L. Debicki,
T.K. Pettigrew, G.F. Paju and J. Wetendorf

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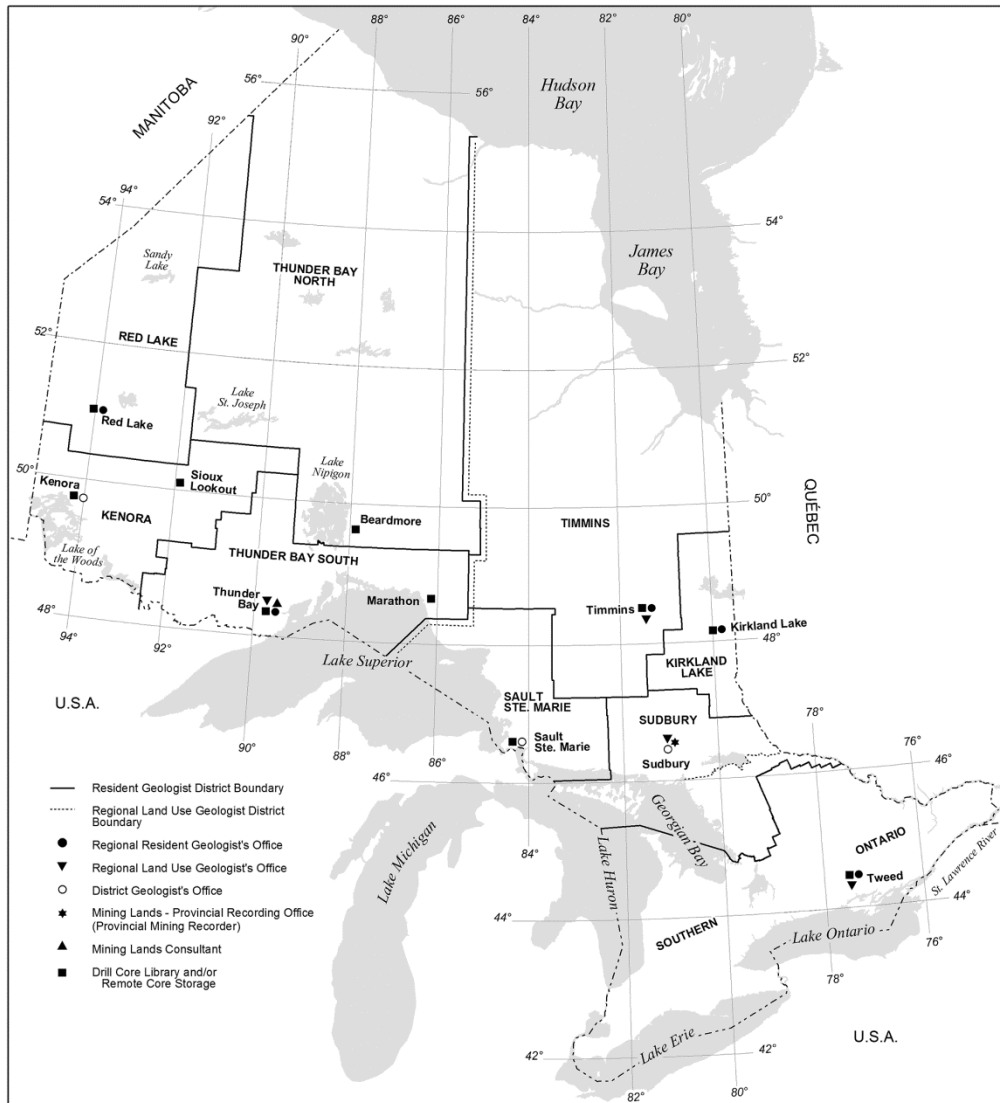
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**ONTARIO GEOLOGICAL SURVEY
RESIDENT GEOLOGIST PROGRAM
REPORT OF ACTIVITIES—2015**

**RED LAKE
REGIONAL RESIDENT GEOLOGIST REPORT**

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1. Red Lake District
2. Kenora District



**Ontario Geological Survey
Regional Resident Geologist Program**

Red Lake Regional Resident Geologist (Red Lake District)—2015

by

**A.F. Lichtblau, C.C. Storey, G.F. Paju, R.D. Tuomi, A. Tims, R.L. Debicki
and T.K. Pettigrew**

2016

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Red Lake Regional Resident Geologist (Red Lake District)—2015

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INTRODUCTION

Gold was the only commodity mined in the Red Lake District in 2015. In 2015, annual production at the Red Lake Gold Mines of 375 700 ounces gold was down by approximately 9% compared to the prior year's production (Figure 1; Table 1) (Goldcorp Inc., news release, February 25, 2016). Rubicon Minerals Corporation's Phoenix gold project poured its first gold on June 24, 2015 (Rubicon Minerals Corporation, news release, June 24, 2015) and, to date, has poured 4412 ounces of gold since May 2015 (Rubicon Minerals Corporation, news release, November 3, 2015).

Exploration and development work on 2 major Advanced Exploration projects in the Red Lake greenstone belt continued throughout 2015: 1) Rubicon Minerals Corporation's Phoenix gold project, which halted all underground work and exploration on November 3, 2015 (Rubicon Minerals Corporation, news release, November 3, 2015); and 2) Goldcorp Inc.'s Bruce Channel discovery (Cochénour Project). Although almost all exploration expenditures were directed toward gold, Houston Lake Mining Ltd. continued work on its Pakeagama Lake rare metals project, and has commenced updating its previous National Instrument (NI) 43-101-compliant Mineral Resource Estimate (Houston Lake Mining Inc., news release, December 12, 2015).

Other significant exploration activity in the Red Lake District includes Pure Gold Mining Inc. (formerly Laurentian Goldfields Ltd.), which continued work on its Madsen Mine project and announced an agreement to sell off its non-core claims ("Buffalo claims") to Premier Gold Mines Limited (Pure Gold Inc., news release, December 2, 2015). Premier Gold Mines Limited secured a 100% interest in the historic Hasaga property from Goldcorp Inc. (Premier Gold Mines Limited, news release, February 11, 2015) and completed 60 310 m of diamond drilling in 2015 (Premier Gold Mines Limited, news release, December 7, 2015).

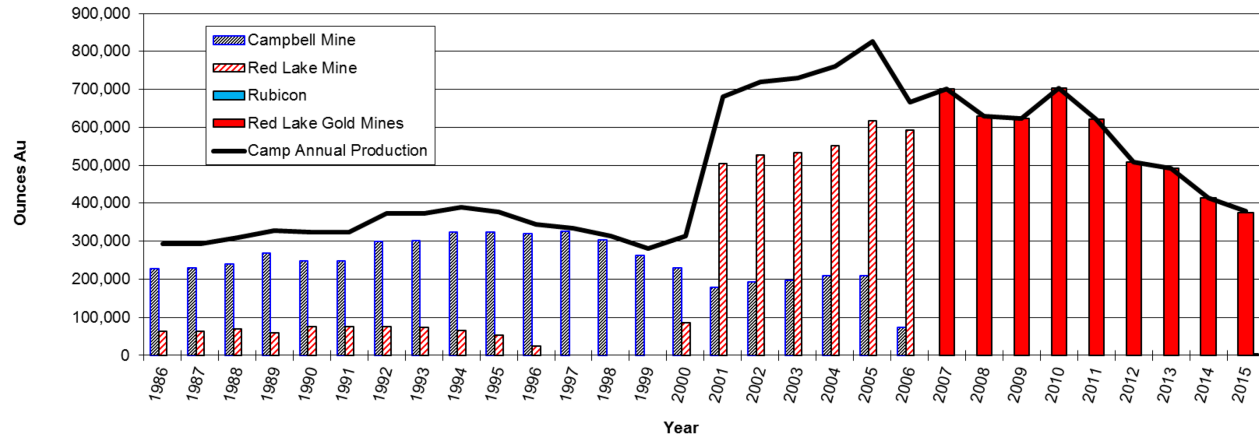


Figure 1. Annual gold production in the Red Lake greenstone belt, 1986–2015. (Note: No production at the Red Lake Mine between 1997 and 1999 due to strike by unionized employees.)

Table 1. Mine production and reserves in the Red Lake District in 2015.

Mine	Production in 2014		Production in 2015		Reserves (Proven + Probable) at End of 2015
	Tonnage @ Grade	Total Commodity	Tonnage @ Grade	Total Commodity	
Goldcorp Inc.– Red Lake Gold Mines ⁽¹⁾	684 100 t @ 19.47 g/t	414 400 ounces Au	645 800 t @ 18.44 g/t	375 700 ounces Au	7 100 000 t @ 9.10 g/t Au = 2.08 million ounces Au

⁽¹⁾Goldcorp Inc., news release, February 25, 2016.

The average price of gold decreased approximately 8% over the previous year, to US\$1160 (Figure 2).

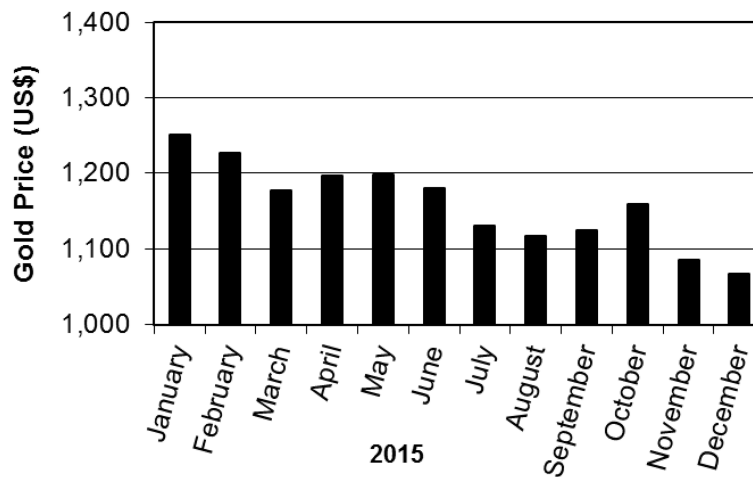


Figure 2. Average monthly price of gold in 2015 (price information from www.kitco.com under Charts & Data | Historical Charts & Data | Gold | select “Yearly Gold Charts–2015” [accessed January 26, 2016]).

Claim staking activity in the Red Lake Mining Division increased by 32% in 2015 (Table 2) and the number of cancellations decreased by approximately 40%. These factors did not, however, decrease the total number of claim units in good standing at the end of the year (20 237 units).

Table 2. Summary of claim status in the Red Lake Mining Division, 2015.

Year	Cancelled (Claim Units)	Recorded (Claim Units)	Active (Claim Units)
2015	2237	1879	20 237
2014	3690	1423	20 523
2013	3637	657	22 791
2012	3244	2740	22 803
2011	2314	6474	26 378
2010	3569	6271	22 514
2009	4737	2917	19 816
2008	1921	5008	21 326
2007	1878	4716	18 334
2006	4759	3358	15 436
2005	5165	3117	16 911
2004	3690	2099	18 647
2003	1842	6781	21 127
2002	1795	7689	15 732

MINING ACTIVITY

Gold production in Red Lake continued at the integrated operations of Goldcorp Inc.'s Red Lake Gold Mines, comprising the Campbell, Red Lake and Balmer complexes. Goldcorp Inc.'s current production and reserves are provided below and historical statistics for all gold producers in the district are provided in Table 3. The workforce comprises 1051 employees and 309 contractors. The mine manager is Dan Gignac.

Goldcorp Inc.–Red Lake Gold Mines

Gold production in 2015 was 375 700 ounces at an all-in sustaining cost of US\$906 per ounce and an average realized gold price of US\$1163 per ounce (Goldcorp Inc., February 25, 2016, Management's Discussion and Analysis for the Year Ended December 31, 2015). Underground drilling focussed on resource expansion at depth and, in particular, on the adjacent **H.G. Young property**, which is a former producer (*see* Table 3) situated 1 km northwest of the Campbell Complex. The H.G. Young Mine produced 55 244 ounces gold from 1960 to 1963. Surface diamond drilling (319 holes totalling 145 212 m) and work on rehabilitating the underground access to the H.G. Young on Level 14 of the Campbell Complex continued during the year. The Level 14 exploration drift will provide a new platform for follow-up drilling down-plunge of positive diamond-drill intercepts from the surface program.

Reserve and Resource estimates for the Red Lake Gold Mines, as of December, 31, 2015, are provided:

Category	Contained Ounces Gold
Proven and Probable Reserves	7 100 000 t @ 9.10 g/t Au = 2 080 000 ounces Au
Measured and Indicated Resources	3 710 000 t @ 19.02 g/t Au = 2 270 000 ounces Au
Inferred Resources	3 450 000 t @ 19.86 g/t Au = 2 200 000 ounces Au

(Goldcorp Inc., February 25, 2016, Management's Discussion and Analysis for the Year Ended December 31, 2015)

The **Cochenour Project** comprises the historic Cochenour–Willans Mine workings with the addition of the **Bruce Channel deposit**, which is the down-plunge extension of the Cochenour–Willans orebodies. The majority of surface facilities have been completed; underground development continued throughout the year. The construction of the 5 km long, high-speed haulage drift to connect Cochenour–Willans infrastructure with the Red Lake Mine on the 5400-foot level was completed. Underground diamond drilling of the Bruce Channel deposit continued to assess the core area where there were changes in orientation of the mineralized veins from previous interpretations. Inferred Resources had been estimated at 9.05 Mt at 11.18 g/t Au, totalling 3.25 million ounces gold (Goldcorp Inc., February 14, 2014, Management’s Discussion and Analysis for the Year Ended December 31, 2013). Results from exploration drilling and development during 2015 were used to update the deposit model, which resulted in a 37% decrease in Inferred Resources to 2.19 million ounces gold (Goldcorp Inc., February 25, 2016, Management’s Discussion and Analysis for the Year Ended December 31, 2015).

Production from the Bruce Channel is now expected in the fourth quarter of 2016 (Goldcorp Inc., news release, October 29, 2015). At full production, forecast life-of-mine gold production from Cochenour is expected to be between 225 000 and 250 000 ounces gold per year (Goldcorp Inc., news release, January 7, 2013), which will, in part, offset declining production from the Campbell Complex where only remnant pillar mining took place during the year.

EXPLORATION ACTIVITY

Gold and rare metal pegmatites were the focus of exploration in the Red Lake District in 2015. Assessment work received (totalling \$5 200 698) by the Red Lake Resident Geologist’s office is listed in Table 4, and a summary of exploration activity is provided in Table 5. Continuing interest in the Red Lake District focussed on surface and underground development work:

- Rubicon Minerals Corporation on its Phoenix gold project;
- Goldcorp Inc. on its Cochenour (Bruce Channel deposit) and H.G. Young projects;
- Pure Gold Mining Inc. recommenced exploration work, including diamond drilling, at the past-producing Madsen gold mine;
- Premier Gold Mines Limited completed an extensive surface diamond-drilling program on its newly acquired Hasaga property;
- Gold Canyon Resources Inc. completed an environmental assessment on a proposed access corridor and finished 3 years of baseline aquatic studies on its Springpole Lake gold property;
- Houston Lake Mining Inc. recovered a bulk sample from its PAK rare metals property; and
- Goldeye Explorations Limited increased its property position substantially on the Weebigee project at Sandy Lake.

Table 5 lists the companies and individuals who reported some activity on their property during 2015; several are described in more detail in the following pages. Programs with significant exploration expenditures and/or significant known results, and properties for which the location is of particular strategic or geologic interest are described. Information included in this section is taken from assessment files in the Red Lake Resident Geologist’s office, unless otherwise indicated. Programs listed in Table 5 are keyed to Figures 4, 5, 6 and 7.

Table 3. Gold production in the Red Lake District to December 31, 2015.

Mine	Years of Production	Ore Milled (Tonnes)	Gold Produced		
			Troy Ounces	Ounces per Short Ton	Grams per Metric Tonne
Red Lake Gold Mines	2006–present ⁽¹⁾	7 552 122	5 661 290	0.680	23.32
Campbell Mine	1949–2006 ⁽²⁾	19 944 241	11 216 443	0.510	17.49
Goldcorp (Dickenson)	1948–2006 ⁽³⁾	8 715 228	5 962 948	0.621 ⁽⁴⁾	21.28
Madsen	1938–1976, 1997 ⁽⁵⁾ –1999	7 872 679	2 452 388	0.283 ⁽⁶⁾	9.69
Cochenour–Willans	1939–1971	2 096 654	1 244 279	0.538 ⁽⁷⁾	18.46
McKenzie Red Lake	1935–1966	2 135 361	651 156	0.277	9.48
Howey	1930–1941, 1957 ⁽⁸⁾	4 200 972	421 592	0.091 ⁽⁹⁾	3.12
Hasaga	1938–1952	1 374 641	218 213	0.144	4.94
Starratt Olsen	1948–1956	823 554	163 990	0.181	6.19
Berens River	1939–1948	508 574	157 341	0.281	9.62
Uchi	1939–1943	686 806	114 467	0.151	5.18
Jason (Argosy)	1934–1952	250 903	101 875	0.368	12.63
H.G. Young	1960–1963	261 432	55 244	0.192	6.57
Sachigo River	1938–1941	42 145	52 560	1.131	38.79
McMarmac	1940–1948	138 779	45 246	0.296	10.14
Gold Eagle	1937–1941	163 379	40 204	0.223	7.65
Jackson Manion	1934–1940	95 578	27 142	0.258	8.83
Red Lake Gold Shore	1936–1938	78 320	21 100	0.244	8.38
Phoenix	2015	57 793	4906	0.077	2.64
Hudson Patricia	1936–1937	10 186	1857	0.165	5.67
Buffalo	1981–1982	29 017	1656	0.052	1.78
Abino	1985–1986	2479	1397	0.511	17.53
Lake Rowan	1986–1988	11 814	1298	0.100	3.42
Kostynuk Brothers	1963–1966	577	1126	1.770	60.70
Mount Jamie	1976	882	377	0.388	13.30
Bobjo	1929	N/A	362 ⁽¹⁰⁾	N/A	N/A
Bathurst	1927–1937	510	307	0.546	18.73
Red Summit	1935–1936	536	277	0.469	16.07
Sol d'Or	1933–1936	415	258	0.563	19.31
TOTAL		57 055 578	28 621 299	0.455	15.60

Notes:

(1) Includes total production from the Red Lake complex from January 1, 2006, and production from the Campbell complex subsequent to May 12, 2006, the date of acquisition.

(2) Includes production figures under Placer Dome (CLA) Ltd., to May 12, 2006.

(3) For 1997, 1998 and 1999, no production due to strike by unionized employees.

(4) From 1970, includes production from Robin Red Lake.

(5) Includes clean-up of ore and materials from the mine site.

(6) Historic grade, actual grade for 1999 was 0.14 ounce per ton gold.

(7) Includes production from Ancco and Wilmar properties.

(8) Continuous production 1930 to 1941; includes 268 ounces recovered from clean up in 1957.

(9) The ore mined at Howey, before sorting, totalled 5 158 376 tons.

The average production from run-of-mine ore was therefore 0.0817 ounce per ton gold.

(10) Not included in total production figure.

N/A Data not available.

Historical production in short tons has been converted to metric tonnes.

Table 4. Assessment files received in the Red Lake District in 2015.

Abbreviations						
AEM	Airborne electromagnetic survey	IP	Induced polarization survey			
AM	Airborne magnetic survey	Lc	Line cutting			
ARA	Airborne radiometric survey	MMI	Mobile Metal Ion (MMI™) soil sampling survey			
Beep	Beep Mat survey	MRE	Mineral resource estimate (NI 43-101)			
Bulk	Bulk sampling	ODH	Overburden drill hole(s)			
Comp	Compilation	PEA	Preliminary economic assessment			
Consult	First Nations Consultation	PEM	Pulse electromagnetic survey			
DD	Diamond drilling	PGM	Platinum group metals			
DDH	Diamond drill hole(s)	Pr	Prospecting			
DGP	Down-hole geophysics	Rep	Technical report (NI 43-101)			
GC	Geochemical survey	RES	Resistivity survey			
GEM	Ground electromagnetic survey	Samp	Sampling (other than bulk)			
GL	Geological survey	Seismic	Seismic survey			
GM	Ground magnetic survey	Soil	Soil sampling			
GPSG	Georeferencing	SP	Self-potential survey			
GRA	Ground radiometric survey	Str	Stripping			
Grav	Gravity survey	Tr	Trenching			
HLEM	Horizontal loop electromagnetic survey	UG	Underground exploration/development			
HM	Heavy mineral sampling	VLEM	Vertical loop electromagnetic survey			
IM	Industrial mineral testing and marketing	VLFEM	Very low frequency electromagnetic survey			

Township/Area	Company Filing Report	Year	Work Performed	AFRO Number	Credits Applied	Resident Geologist Office File Designation
Bateman Township	Goldcorp Inc.	2013	Samp, DDH	2.55559	\$805 911	RL3574
Killala Township	Bounty Gold Corp.	2013–2015	Samp, Pr	2.55914	\$23 491	RL3575
Pakeagama Lake Area	Houston Lake Mining Inc.	2013–2014	Samp, DDH, Str	2.55487	\$1 033 952	RL3576
Dome Township	J.S. Franko	2014–2015	Samp, GC	2.55659	\$10 749	RL3577
Killala Township	Bounty Gold Corp.	2013–2015	Samp, Pr	2.55876	\$23 168	RL3578
Granite Bay Area (Sandy Lake)	Goldeye Explorations Ltd.	2013–2015	Samp, GL	2.56039	\$70 752	RL3579
Casummit Lake Area	Gold Canyon Resources Inc.	2012–2014	Samp, DDH, Other	2.55676	\$3 219 122	RL3580
South of Otter Lake Area	T.J. Twomey	1999	Samp, GC, GL, GEM	Non-Assessment	\$0	RL3581
Slate Lake Area, Karas Lake Area, Ear Falls Area	877578 Ontario Ltd.	2015	Pr	2.56001	\$2880	RL3582
Bruce Lake Area	Northern Iron Corp.	2015	GEM	2.56111	\$10 673	RL3583
Pakeagama Lake Area	Houston Lake Mining Inc.	2015	Comp	Non-Assessment	\$0	RL3584
Earngey Township	Tashota Nipigon Mines Ltd.	1972	Comp	Non-Assessment	\$0	RL3585
Baird Township	Redaurum Red Lake Mines Ltd.	1989	Comp	Non-Assessment	\$0	RL3586
Dome Township	Crown Gold Corp.	2010–2012	Rep	Non-Assessment	\$0	RL3587

Table 5. Exploration activity in the Red Lake District in 2015, keyed to Figures 4, 5 and 6.

Abbreviations			
AEM	Airborne electromagnetic survey	MMI	Mobile Metal Ion™ soil sampling survey
AM	Airborne magnetic survey	MRE	Mineral resource estimate (NI 43-101)
ARA	Airborne radiometric survey	NR	News release
Bulk	Bulk sampling	OD	Overburden drilling
Comp	Compilation	ODH	Overburden drill hole(s)
DD	Diamond drilling	PEA	Preliminary economic assessment
DDH	Diamond-drill hole(s)	Pr	Prospecting
DGP	Down-hole geophysics	REP	Technical report (NI 43-101)
GC	Geochemical survey	RES	Resistivity survey
GEM	Ground electromagnetic survey	Samp	Sampling (other than bulk)
GL	Geological survey	Seismic	Seismic survey
GM	Ground magnetic survey	Soil	Soil sampling
GRA	Ground radiometric survey	Str	Stripping
Grav	Gravity survey	Tr	Trenching
IP	Induced polarization survey	UG	Underground exploration/development
Lc	Line cutting	VLEM	Vertical loop electromagnetic survey
MD&A	Management Discussion and Analysis	VLF-EM	Very low frequency electromagnetic survey

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity (Reference)
1	AurCrest Gold Inc. (AGO) <i>(formerly Tribute Minerals Inc.)</i> (Richardson Lake property)	Casummit Lake Area (Au)	Announced the formation of Wiigwaasaatig Energy Inc., a wholly owned subsidiary of AurCrest Gold Inc. (AurCrest Gold Inc., NR, Oct. 14, 2015)
2	Bayfield Ventures Corp. (Baird property)	Baird Township (Au/Ag)	New Gold Inc., completed the acquisition of Bayfield Ventures Corp. (Bayfield Ventures Corp., NR, Jan. 1, 2015)
3	Bounty Gold Corp. (Laird Lake property)	Killala Township (Au)	Samp, Pr, GL Bounty Gold Corp. partnered with the Ontario Geological Survey and Lakehead University in sponsoring a MSc thesis on its Laird Lake gold property (Gélinas and Hollings 2015)
4	Cangold Limited. <i>now Great Panther Silver Ltd.</i> (Argosy project)	Casummit Lake Area (Au)	Great Panther Silver Limited completed the acquisition of Cangold Limited (Cangold Limited, NR, May 27, 2015)
5	Confederation Minerals Ltd. (CFM) (Newman–Todd property)	Todd Township (Au)	Company prepared a revised REP and PEA (Confederation Minerals Ltd., NR, Jan. 13, 2015) Increased ownership of the Newman–Todd property to 70% (Confederation Minerals Ltd., NR, Mar. 24, 2015)
6	Cypress Development Corp. (CYP) (McKenzie Island property)	Dome, Fairlie townships (Au)	Comp (Cypress Development Corp., NR, Feb. 3, 2015)
7	Duncan Park Holdings Corp. (DPH) / Sphere Resources Inc. (SPH) (Dome and McManus properties)	Heyson, Dome townships (Au)	IP; 14-lines on the lake-based Dome claims (Duncan Park Holdings Corp., MD&A, Feb. 11, 2015) Sphere Resources Inc.'s 25% interest in the joint-ventured Dome property with Duncan Park Holdings Corp. has been converted to a 10-year, 5% Net Profits Interest (Duncan Park Holdings Corp., NR, Mar. 4, 2015)
8	First Mining Finance Corp. (FF) <i>(formerly Gold Canyon Resources Inc.)</i> (Springpole Lake property)	Casummit Lake Area (Au)	First Mining Finance Corp. completed the acquisition of Gold Canyon Resources Inc., and PC Gold Inc. (First Mining Finance Corp., NR, Nov. 17, 2015) Irving Resources Inc. created to hold Gold Canyon's non-gold properties (Irving Resources Inc., NR, Dec. 23, 2015)
9	Franko, J.S. (Dome Claim)	Dome Township (Au)	Samp, GC (assessment file AFRO# 2.55659)
10	Frontline Gold Corporation (FGC) (Chukuni property)	Byshe Township (Au)	Acquired 100% interest in the property from Rubicon Minerals Corp. (Frontline Gold Corporation, NR, June 24, 2015)
11	Frontline Gold Corporation (FGC) (Whitehorse Island property)	Dome Township (Au)	Acquired 100% interest in the Whitehorse Island property (Frontline Gold Corporation, NR, Aug. 6, 2015) Abitibi Royalties Inc. acquired a 2% net smelter royalty (NSR) in the property for \$10 000 (Frontline Gold Corporation, NR, Aug. 31, 2015)

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity (Reference)
12	Gold Canyon Resources Inc. (GCU) <i>now First Mining Finance Corp.</i> (Springpole Lake property)	Casummit Lake Area (Au)	Mine Environmental Assessment commenced; \$1.3 million financing completed (Gold Canyon Resources Inc., NR, March 11, 2015) Gold Canyon Resources Inc. was acquired by First Mining Finance Corp. (see this Table: "First Mining Finance Corp.")
13	Goldcorp Inc. (G) (Red Lake Gold Mines)	Balmer Township (Au)	UG Goldcorp continued regular gold production (see text "Mining Activity", "Goldcorp Inc.—Red Lake Gold Mines") Goldcorp Red Lake Gold Mines signed a collaboration agreement with Wabauskang First Nation (Goldcorp Inc., NR., Jan. 30, 2015)
14	Goldcorp Inc. (G) (H.G. Young Mine)	Balmer Township (Au)	DDH (319)=145 212 m with 5 surface drills (as well as underground drilling from the 14 Level at the Campbell Complex) (see text "Mining Activity", "Goldcorp Inc.—Red Lake Gold Mines")
15	Goldcorp Inc. (G) (Cochenour project)	Dome Township (Au)	UG The tram connecting the Cochenour project with the Red Lake Gold Mines Complex was completed, though production ramp-up is delayed until late 2016 and into 2017 (see text "Mining Activity", "Goldcorp Inc.—Red Lake Gold Mines") (Goldcorp Inc., Q3 2015 Goldcorp Inc., Earnings Call—edited transcript, Oct. 29, 2015)
16	Goldcorp Inc. (G) / Premier Gold Mines Limited (PG) (Rahill–Bonanza property)	Dome Township (Au)	DDH (4)=5240 m Premier transferred 35% of its interest in the Rahill–Bonanza property and \$20 million US to Goldcorp, for 40% interest in Goldcorp's South Arturo Mine project in Nevada (Premier Gold Mines Limited, NR, June 2, 2015)
17	Goldcorp Inc. (G) / Premier Gold Mines Limited (PG) (East Bay project)	Bateman Township (Au)	Goldcorp Inc. will acquire Premier's interest in the East Bay property and a property north of the Musselwhite Mine. In exchange, Premier will acquire 100% interest in Goldcorp's Hasaga property (see text "Exploration Activity", "Red Lake Greenstone Belt", "Premier Gold Mines Limited") (Premier Gold Mines Limited, NR, Feb. 11, 2015)
18	Goldeye Explorations Limited (GGY) (Weebigee project)	Granite Bay, Kakapitum Lake, Rathouse Bay areas (Au)	AEM (1264 line-km); 1400 claims staked adjacent to main property (Goldeye Explorations Limited, NR, June 1, 2015) GPM Metals Inc. can earn up to a 70% interest in the property (see text "Exploration Activity", "Northern Greenstone Belts", "Goldeye Explorations Limited") (Goldeye Explorations Limited, NR, April 15, 2015)
19	Grandview Gold Inc. (GVX) (Sanshaw–Bonanza property)	Dome Township (Au)	The company acquired all issued and outstanding shares of My Courier Depot Inc. (MCD), and will carry out MCD business under the new name PUDO Inc. (Grandview Gold Inc., NR, Mar. 19, 2015) Grandview Gold Inc., announced its delisting from the NEX exchange of the TSX Venture Exchange, effective July 2, 2015, with the sale of assets on or around July 7, 2015 (Grandview Gold Inc., NR, July 3, 2015)
20	Great Panther Silver Ltd. (GPR) <i>(formerly Cangold Limited)</i> (Argosy project)	Casummit Lake Area (Au)	Great Panther Silver Ltd. completed the acquisition of Cangold Limited (Great Panther Silver Ltd. NR, May 27, 2015)
21	Houston Lake Mining Inc. (HLM) (PAK Lithium project)	Pakeagama, Margot and Mechita Lake areas (Rare Metals)	DDH (10)= 2249 m Bulk sample (approximately 300 t) MRE Samp (see text "Exploration Activity", "Northern Greenstone Belts", "Houston Lake Mining Inc.")
22	Mega Precious Metals Inc. (MGP) <i>now Yamana Gold Inc.</i> (North Madsen project)	Heyson Township (Au)	Mega Precious Metals Inc. was acquired by Yamana Gold Inc. (Mega Precious Metals Inc., NR, June 22, 2015)

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity (Reference)
23	Northern Iron Corp. (NFE) (Griffith iron mine)	Bruce Lake Area (Fe)	Comp, GM Completed 11 line-km of ground magnetic survey on the Griffith property to outline the broad trend of the iron formation, to help guide the next phase of drilling (Northern Iron Corp., NR, July 27, 2015)
24	Orefinders Resources Inc. (ORX) (Derlak Gold property)	Heyson Township (Au)	Company acquired 100% ownership of the Derlak Project in Red Lake, after signing an agreement with Jubilee Gold Exploration Ltd. (Orefinders Resources Inc., NR, Sept. 9, 2015)
25	Premier Gold Mines Limited (PG) / Goldcorp Inc. (G) (Rahill–Bonanza property)	Dome Township (Au)	<i>(see this Table: “Goldcorp: Rahill–Bonanza property”)</i>
26	Premier Gold Mines Limited (PG) / Goldcorp Inc. (G) (East Bay property)	Bateman Township (Au)	<i>(see this Table: “Goldcorp: East Bay Project”)</i>
27	Premier Gold Mines (PG) (Hasaga property)	Heyson Township (Au)	DDH (130)=60 310 m, Samp <i>(see text “Exploration Activity”, “Red Lake Greenstone Belt”, “Premier Gold Mines Ltd.”)</i>
28	Pure Gold Mining Inc. (PGM) <i>(formerly Laurentian Goldfields Inc.)</i> (Madsen project)	Baird, Heyson, Dome townships (Au)	DDH (27)=6000 m, Tr, Str, GL, Samp, Soil, GC
29	Redstar Gold Corp. (RGC) / Confederation Minerals Ltd. (CFM) (Newman–Todd property)	Todd Township (Au)	Company retained 30% interest in the Newman–Todd property, with Confederation Minerals Ltd. (holding 70%) as operator (Redstar Gold Corp., NR, Sept. 8, 2015)
30	Rubicon Minerals Corporation (RMX) (Phoenix project)	Bateman Township (Au)	UG DDH surface (21)=9553 m DDH underground (274)=45 252 m <i>(see text “Exploration Activity”, “Red Lake Greenstone Belt”, “Rubicon Minerals Corporation”)</i>
31	Signature Resources Ltd. (SGU) (Lingman Lake property)	Lingman Lake Area (Au)	Comp The company established an advisory board of Dr. Scott Jobin-Bevans and Andrew Cook to assist exploration at Lingman Lake (Signature Resources Ltd., NR, Dec. 7, 2015) The company continued data analysis of the Lingman Lake property and has had a 3-D mineralized shell model for the deposit made by Caracle Creek International Inc. (Signature Resources Ltd., NR, Dec. 16, 2015)
32	Sphere Resources Inc. (SPH) / Duncan Park Holdings Corp. (DPH) (Dome property)	Dome Township (Au)	Sphere Resources Inc.’s 25% interest in the joint-ventured Dome property with Duncan Park Holdings Corp has been converted to a 10 year, 5% net Profits Interest (Duncan Park Holdings Corp., NR, Mar. 4, 2015)
33	West Red Lake Gold Mines Inc. (RLG) <i>(formerly Hy Lake Gold Inc.)</i> (Rowan Lake Mine property)	Todd, Ball townships (Au)	DDH (6)=1657 m, MRE The company plans further diamond drilling on the Rowan Lake Mine property (West Red Lake Gold Mines Inc., NR, Oct. 30, 2015). The company is preparing an NI 43-101–compliant technical report on the Rowan Mine property, which is anticipated to be released mid-January 2016 (West Red Lake Gold Mines Inc., NR, Dec. 24, 2015).
34	Yamana Gold Inc. (YRI) <i>(formerly Mega Precious Metals Inc.)</i> (North Madsen project)	Heyson Township (Au)	Mega Precious Metals Inc. was acquired by Yamana Gold Inc. (Yamana Gold Inc., NR, June 22, 2015)

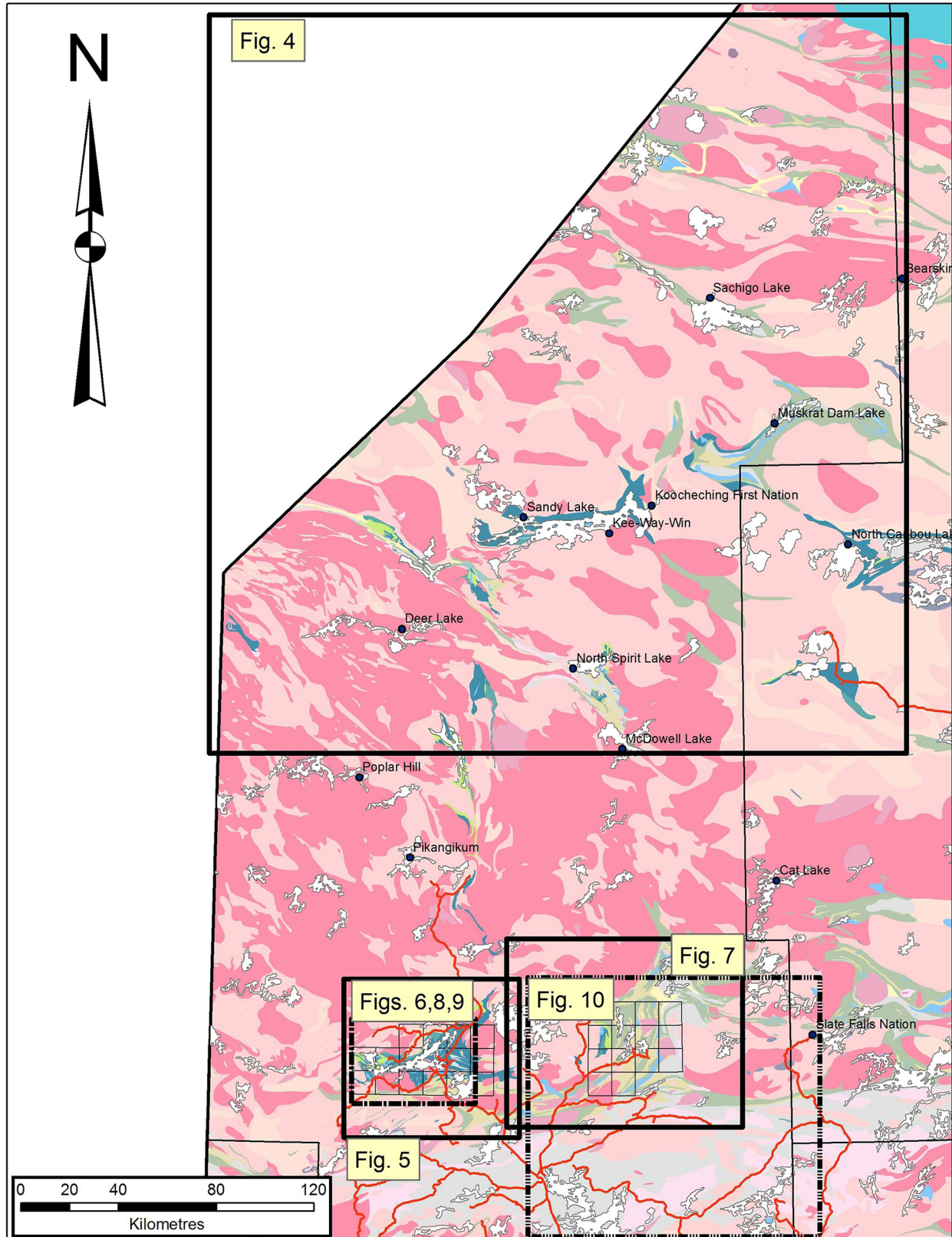


Figure 3. The Red Lake District and index map for Figures 4 to 10.

Red Lake Greenstone Belt

As was seen throughout the Red Lake District, exploration in the Red Lake greenstone belt decreased over previous years. Table 5 lists the projects active during 2015. Several major projects, based on significant discoveries in previous years, continued at the Advanced Exploration stage, including Rubicon Minerals Corporation's Phoenix Project and Goldcorp Inc.'s work at Cochenour and H.G. Young. Projects with NI 43-101-compliant Mineral Resource Estimates are listed in Table 23. Late in 2015, Rubicon Minerals Corporation shut down all surface and underground activities at their Phoenix Project due to low gold grades and production from preliminary mining. At year-end, the company was re-evaluating the project to determine how to proceed during the early part of 2016.

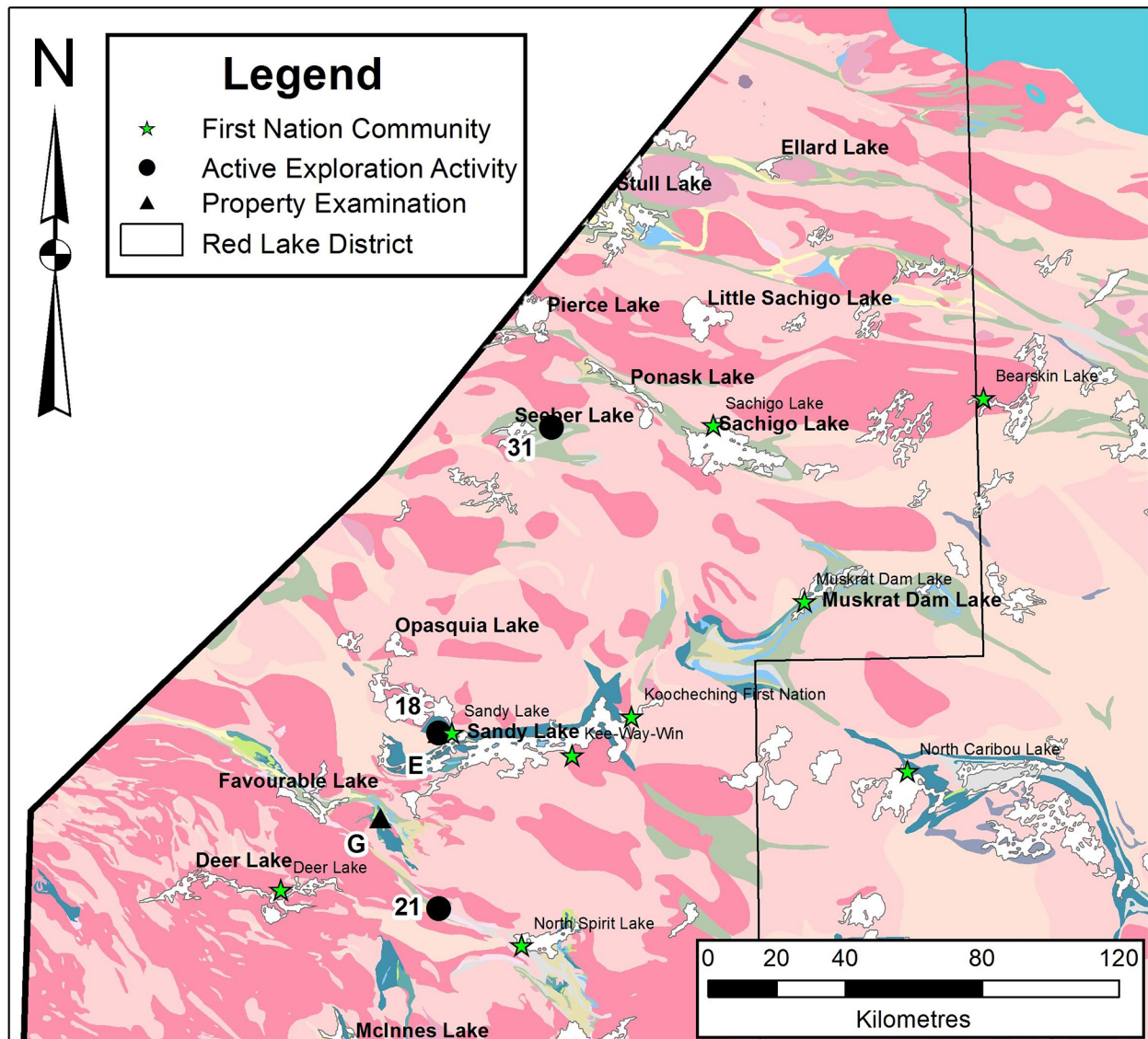


Figure 4. Red Lake District (north part): exploration activity (see Table 5) and property examinations (see Table 9) (bedrock geology from Ontario Geological Survey (OGS) 2011).

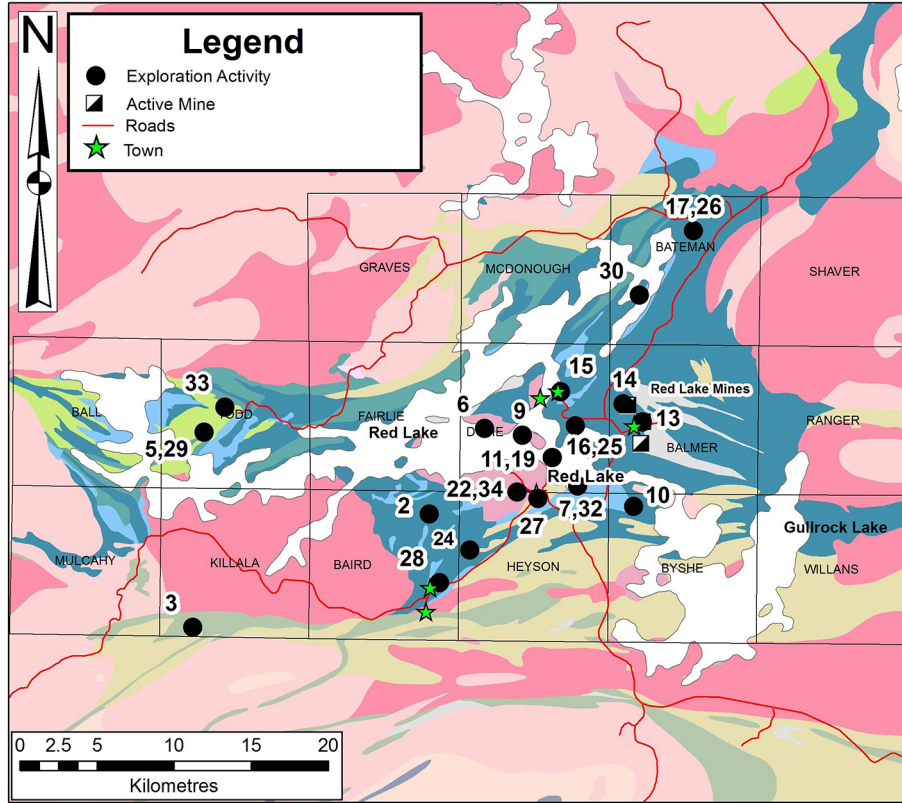


Figure 5. Red Lake greenstone belt: exploration activity (see Table 5) and active mines (bedrock geology from OGS 2011).

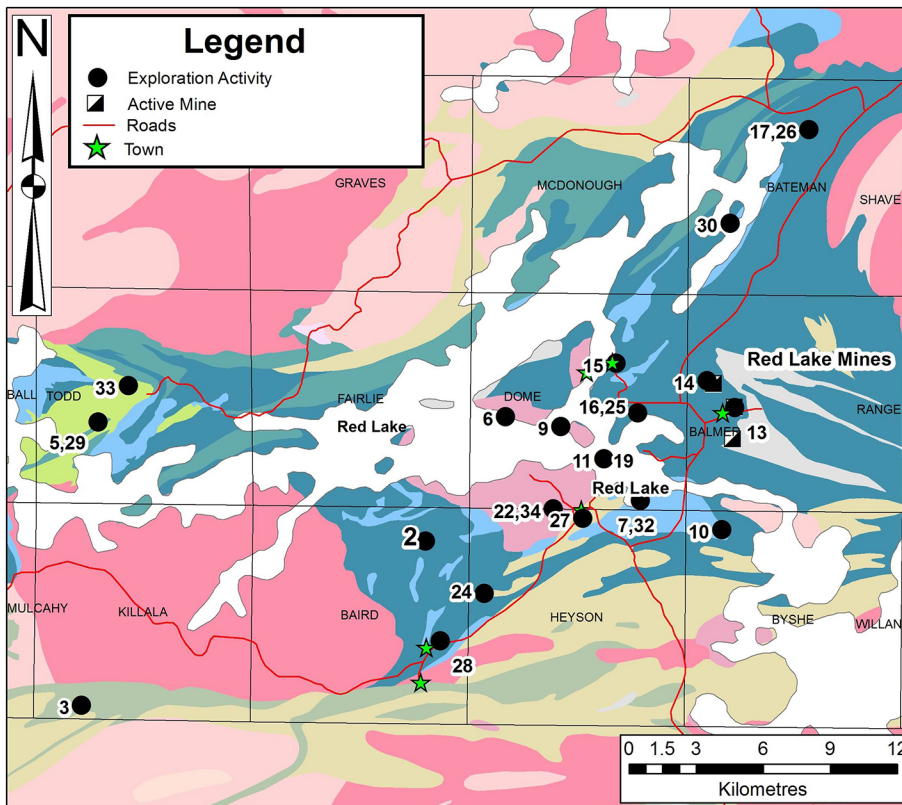


Figure 6. Red Lake greenstone belt: exploration activity (see Table 5) and active mines (bedrock geology from OGS 2011).

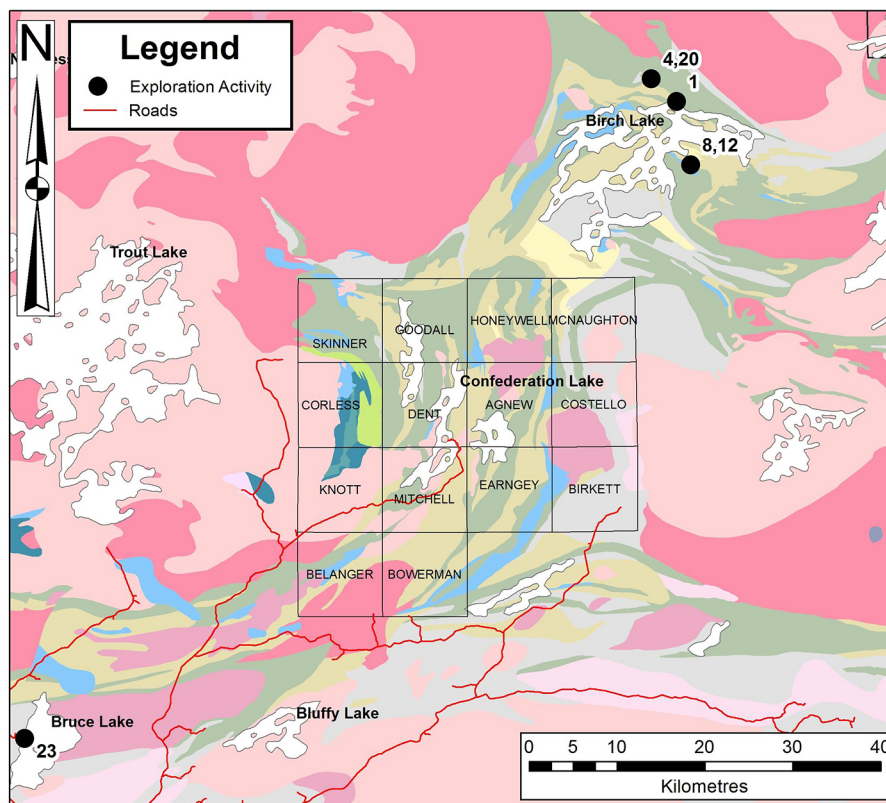


Figure 7. Birch–Uchi greenstone belt: exploration activity (see Table 5) (bedrock geology from OGS 2011).

GOLDCORP INC.

Goldcorp Inc. carried out surface exploration on several projects, either by itself or in joint venture. Table 5 lists the exploration projects and the amount of diamond drilling carried out in 2015. The **Cochenour project** combines the existing workings of the historic Cochenour–Willans Mine with the Bruce Channel gold discovery (Figure 8). Work on the surface facilities and underground definition drilling continued through the year (see “Mining Activity”, “Goldcorp Inc.”).

Surface exploration activity on the mine site focussed on diamond drilling of the H.G. Young project. A total of 319 drill holes (totalling 145 212 m) were completed in 2015. Rehabilitation of the 14 Level of the Campbell Complex will provide access for exploration diamond drilling from underground. At year-end, for the H.G. Young deposit, the Indicated Mineral Resource was 205 000 t grading 19.08 g/t Au and the Inferred Mineral Resource was 787 000 t grading 20.44 g/t Au (Goldcorp Inc., www.goldcorp.com, under Investor Resources | Presentations | February 29, 2016 “BMO - 2016 Global Metals & Mining Conference” [accessed March 16, 2016]).

The **Rahill–Bonanza project** is situated between the Red Lake Mine complexes and the past-producing Cochenour–Willans Mine in Dome Township. Goldcorp Inc. is the project operator with a 51% interest; Premier Gold Mines Limited. holds the remaining 49%. Underground diamond drilling from the 5400 Level tram linking the Campbell and Cochenour complexes began in March 2015, with a budget of approximately \$2 million (Premier Gold Mines Limited, Management’s Discussion and Analysis for the 3 months Ending September 30, 2015). Strong veining, alteration and mineralized zones within the laterally extensive Fold Target, located approximately 200 m south of the tram, were intersected, with multiple high-grade intercepts of up to 46.00 g/t Au across 11.0 m, including 121.20 g/t Au across 3.8 m. Exploration work in 2016 will continue to define the Fold Target and other zones with a planned budget of 10 000 m of underground diamond drilling.

Surface diamond drilling (4 holes, totalling 5240 m) on the **Rahill–Bonanza project** by operator Goldcorp Inc., tested the potential down-dip extension of the near-surface Bonanza deposit, which has a NI 43-101-compliant Inferred Resource of 1.59 Mt @ 7.6 g/t Au (Harron 2009).

Goldcorp Inc. entered into a property swap (non-cash) agreement with Premier Gold Mines Limited (Premier Gold Mines Limited, news release, February 11, 2015) whereby Premier transferred to Goldcorp its 35% interest in the **East Bay property**, as well as its 100% interest in the PQ North property (north of Goldcorp’s Musselwhite gold mine). In return, Premier received from Goldcorp, a 100% interest in the Hasaga property in Red Lake (see “Exploration Activity”, “Red Lake Greenstone Belt”, “Premier Gold Mines Limited”).

Goldcorp Inc. has other properties in the Red Lake and Birch–Uchi greenstone belts that were not active in 2015.

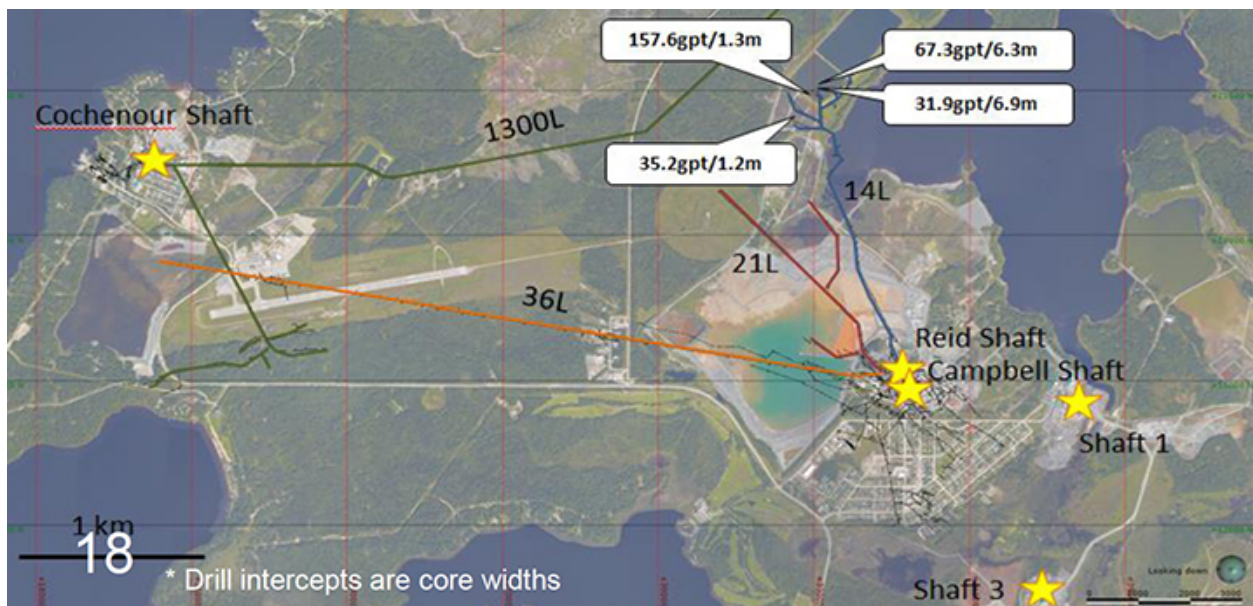


Figure 8. Aerial view of Goldcorp Inc.’s Red Lake Gold Mines. Location of H.G. Young target is below area of surface intercepts (shown in caption boxes). Green, blue, red and yellow lines are underground drifts at various depths: 36L represents the haulage drift connecting Cochenour–Bruce Channel development to the Campbell Complex (from Goldcorp Inc., Corporate Update July 2015, p.18; www.goldcorp.com, under Investor Resources | Presentations | 2015 | July 14, 2015 “Corporate Update - July 2015” [accessed February 3, 2016]).

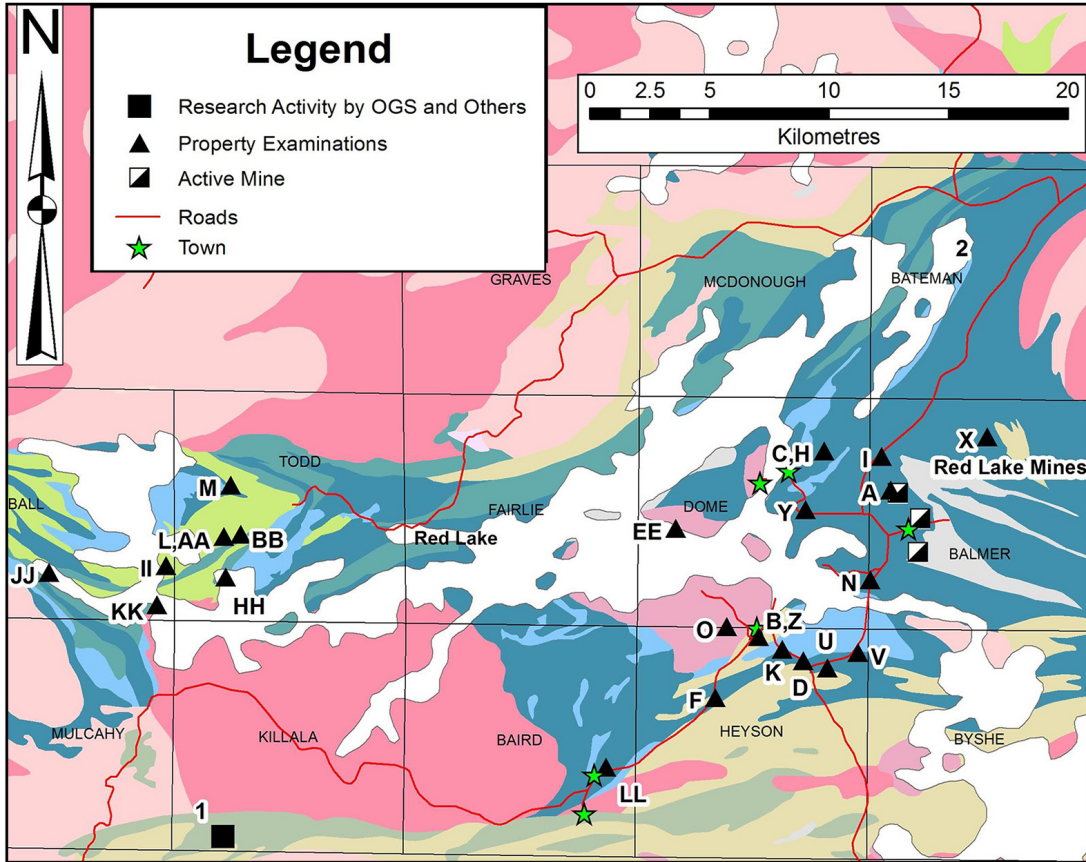


Figure 9. Red Lake greenstone belt: property examinations (*see* Table 9) and research activity by OGS and others (*see* text) (bedrock geology *from* OGS 2011).

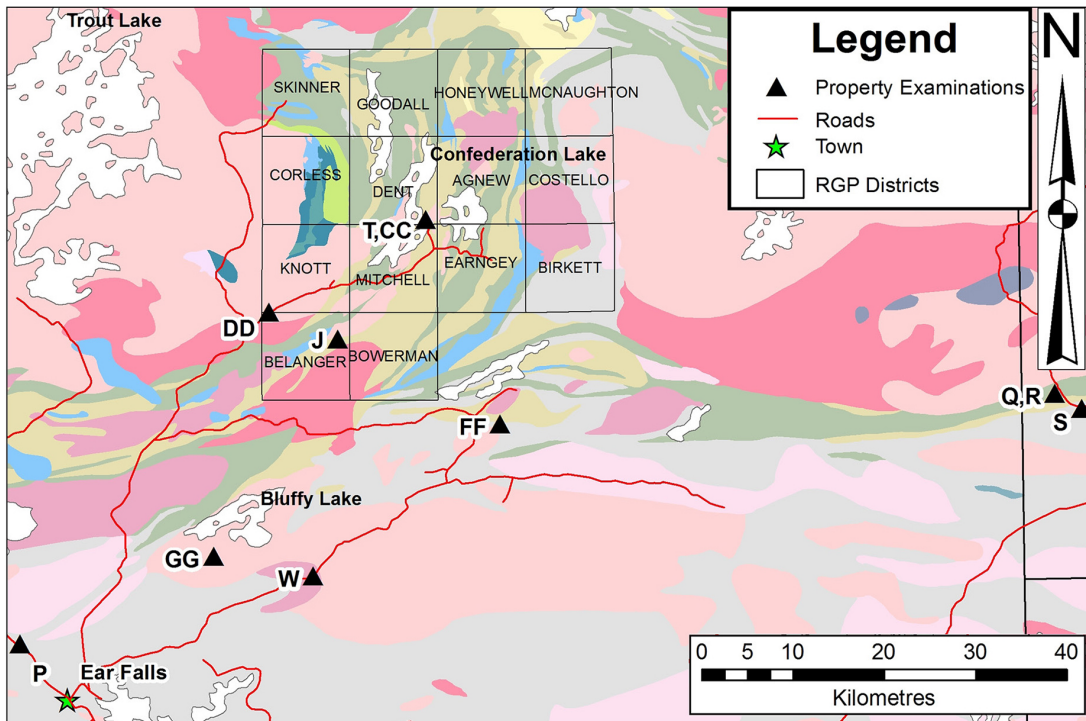


Figure 10. Birch-Uchi greenstone belt: property examinations (*see* Table 9) (bedrock geology *from* OGS 2011).

PREMIER GOLD MINES LIMITED

Premier Gold Mines Limited acquired 100% of the Hasaga property from Goldcorp Inc. by assigning 35% of its interest in the East Bay property and 100% of its PQ North property (near Goldcorp’s Musselwhite Mine) to Goldcorp in exchange for the Hasaga property (Premier Gold Mines Limited, news release, February 11, 2015). The 677 ha Hasaga property hosts the past-producing Hasaga (218 213 ounces gold) and Red Lake Gold Shore (21 100 ounces gold) mines. The property was approximately doubled in size by the subsequent purchase of an adjoining 513 ha claim block from Pure Gold Mining Inc., which hosts the Buffalo Mine (produced 1656 ounces of gold in 1981 and 1982; Premier Gold Mines Limited, news release, December 2, 2015). Figure 11 shows the property location and size (1190 ha) and the locations of the 3 mine sites within it.

Exploration during 2015 consisted of diamond drilling 130 holes, totalling 60 310 m. Exploration started on the Hasaga target and was expanded to include the Central and North Gate targets. The original Hasaga Mine was developed in a mineralized felsic porphyry body that is the western extension of the Howey Mine orebody. Widespread mineralized zones were intersected, with assays up to 1.19 g/t Au over 107 m in the porphyry and localized higher grade intercepts (Premier Gold Mines Limited, news release, September 15, 2015). Visible gold-bearing quartz veins returned assays of up to 16.44 g/t Au over 2.0 m and 17.37 g/t Au over 1.1 m (Premier Gold Mines Limited, news release, July 14, 2015). This is now referred to as the “Hasaga porphyry zone”. The Central zone target consists of a series of conjugate structures within the Dome granodiorite stock.

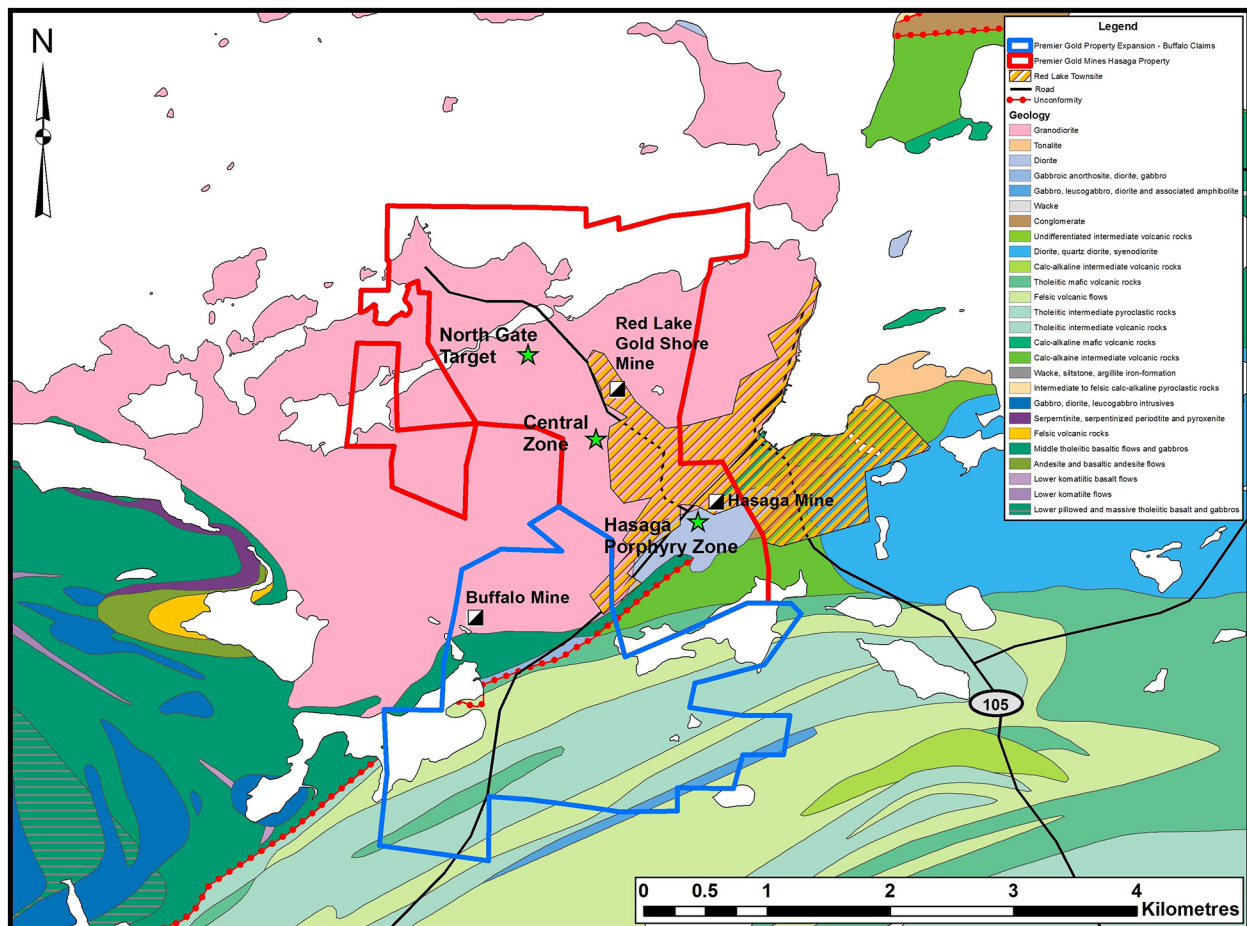


Figure 11. Outline of Premier Gold Mines Limited properties superimposed on the bedrock geology of the area (bedrock geology from Ontario Geological Survey 2011).

Gold mineralization had been reported from this area in the past and Premier's initial diamond drilling returned assays of up to 1.06 g/t Au over 93 m (Premier Gold Mines Limited, news release, September 15, 2015). An additional target, the North Gate, features a gold intersection of 57.65 g/t Au over 2.0 m (Premier Gold Mines Limited, news release, January 26, 2016).

RUBICON MINERALS CORPORATION

The Phoenix project is Rubicon Minerals Corporation's main exploration and development project in the Red Lake camp. Rubicon began 2015 with continued in-fill diamond drilling on the F2 deposit on the 244 m and 610 m underground levels. Definition diamond drilling at 12.5 m or less spacing was started for stopes between the 122 and 305 m levels. During 2015, the company drilled 274 holes underground, for a total of 45 252 m (M. Ross, Rubicon Minerals Corporation, personal communication, 2015). Underground development in this area had 8 stopes underway by April 2015, with 11 600 tons of mineralized material stockpiled on surface. Long-hole mining is planned. (Rubicon Minerals Corporation, news releases, January 7 and April 14, 2015).

Surface exploration continued with diamond-drilling programs to test the northern extension of the F2 deposit and several high-grade intercepts previously found on the Carbonate zone (CARZ) (Rubicon Minerals Corporation, news release, June 17, 2015). During 2015, Rubicon drilled 21 holes, totalling 9553 m, on the CARZ and the northern extension of the F2. The CARZ target area is centred on McFinley Island, approximately 1 km northeast of mine surface infrastructure. It comprises a 25 m wide colliform iron-carbonate zone where gold is associated with brecciation, sulphidization and silicification of host iron-carbonate. The CARZ hanging wall is a parallel zone, also 25 m wide structurally immediately above the CARZ. Gold is associated with arsenopyrite in shear bands, and silicified and actinolite-altered quartz-carbonate veins. Assays of up to 10.77 g/t Au over 2.65 m were reported from the CARZ and assays of up to 24.17 g/t Au over 2 m were reported from the CARZ hanging wall; generally, most assays were under 10 g/t Au. The zones remain open at depth. Diamond drilling north of the F2 deposit between the mine and McFinley Island intersected intense alteration zones and anomalous gold values, indicating further potential in the F2 trend. Assays of 10.26 g/t Au over 1.18 m were reported (from Rubicon Minerals Corporation, www.rubiconminerals.com, under Projects | Red Lake Exploration [accessed January 19, 2016]).

The mill was completed by June 2015 and commissioned in August 2015 (Rubicon Minerals Corporation, news release, August 20, 2015). The first gold bar (741 ounces) was poured on June 24, 2015 (Rubicon Minerals Corporation, news release, June 24, 2015). Trial mining continued in the 305-030 stope (between the 244 and 305 m levels) through August and September, with an anticipated production of 20 000 t by the end of September (Rubicon Minerals Corporation, news release, August 20, 2015). On September 30, Rubicon was ordered by the Ontario Ministry of Environment and Climate Change (MOECC) to suspend mill operations in order to treat elevated ammonia levels, discharge sufficient water from the tailings management facility and to upgrade the tailings management facility; underground operations were not affected. On October 30, the MOECC gave Rubicon permission to re-start milling operations (Rubicon Minerals Corporation, Management Discussion and Analysis for Third Quarter Ending September 30, 2015, released November 12, 2015).

The results of its trial mining indicated that the geology of the deposit was more complex and challenging than was anticipated and, on November 3, the company suspended all underground operations. Most staff and contractors (approximately 300 workers) were laid off. On October 31, a stockpile of 11 000 t at an estimated grade of 4.0 g/t Au, was expected to be processed in November. At year-end, the project was being re-evaluated by company staff and consultants with the goal of developing a better geological model and improving mining methods. During the trial stopping period from July to September, the

following results were recorded (Rubicon Minerals Corporation, Management Discussion and Analysis for Third Quarter Ending September 30, 2015, released November 12, 2015).

Trial Stopping Period (July to September 2015)				
Operating Metrics	July	Aug	Sept	Total
Waste mined (tonnes)	13 326	9339	16 475	39 140
Mineralized material milled (tonnes)	5940	8460	6318	20 718
Average milling rate (tonnes per day)	192	273	211	225
Grade to the mill (g/t Au)	3.34	5.26	3.89	4.29
Average mill recovery (%)	94.4	92.9	90.6	92.6
Produced gold (ounces)	602	1329	716	2647

By the end of 2015, Rubicon produced 4906 ounces of gold from 57 793 tonnes of mineralized material for an overall grade of 2.64 g/t Au. Of this, 4412 ounces was actually poured (Rubicon Minerals Corporation, news release, January 11, 2016); the difference represents gold tied-up in the mill machinery. The project is currently being re-evaluated, following revised resource estimates by SRK Consulting (Canada) Inc. A more conservative resource estimate, based on a revised geological model, reduced the deposit size and contained ounces, as shown below (Rubicon Minerals Corporation, news release, January 11, 2016). Cut-off grade is 4.0 g/t Au.

Classification	Quantity (t)		Grade (g/t Au)		Contained Gold (ounces)	
	2013	2016	2013	2016	2013	2016
Indicated	4 120 000	492 000	8.52	6.73	1 129 000	106 000
Indicated	7 452 000	1 519 000	9.26	6.28	2 219 000	307 000

The gold distribution is less continuous than previously thought and the geology more complex. Underground diamond drilling and trial stopping provided new information on the nature of the deposit. High-grade gold mineralization is less continuous and is controlled by the intersection of east-trending crosscutting structures (D₂) and the north-trending, high-titanium basalt unit (Rubicon Minerals Corporation, news release, January 11, 2016). An NI 43-101-compliant technical report is being prepared for release later in 2016.

PURE GOLD MINING INC.

Pure Gold Mining Inc. continued exploration on its Madsen property (Figure 12). The approximately 4000 ha land package includes the past-producing Madsen, Starratt-Olsen and Faulkenham mines (*see* Table 3) and numerous additional exploration targets. Late in 2015, the company sold a 513 ha, 28-claim block, which includes the Buffalo Mine, to Premier Gold Mines Limited for \$5 000 000 plus a 1% Net Smelter Royalty (Pure Gold Mining Inc., news release, December 2, 2015).

Exploration work on the Russet South target focussed on trenching, stripping, channel sampling and geological mapping in structural corridors. An expansion of the geochemical sampling program was initiated, which entailed an additional 3400 soil samples for Mobile Metal Ion (MMI™) analysis across the property. A 27-hole, 6000 m, diamond-drilling program was carried out on the Russet South and Fork Zone target areas. Results included 35.2 g/t Au over 0.6 m and 5.4 g/t Au over 8.0 m (including 12.3 g/t Au over 2.9 m) from hole PG15-045 on the Russet South target and 3.9 g/t Au over 12.1 m (including 8.4 g/t Au over 1.6 m and 7.3 g/t Au over 2.5 m) from hole PG15-037 on the Fork Zone target (Pure Gold Mining Inc., news release, August 12, 2015).

The exploration work in the Russet South area identified 3 target zones, designated Alpha, Beta and Kappa. Chip sampling at the Beta zone returned 53.0 g/t Au over 1.1 m; channel sampling returned 31.8 g/t Au over 1.0 m from a northwest-trending (D₂) structure uncovered during stripping. At the Kappa target, stripping

and trenching exposed a 160 m long, silicified structure, from 1 to 5 m in width. Channel sampling returned 4.8 g/t Au over 2.3 m, including 9.9 g/t Au over 0.8 m. These exploration targets are outside the Madsen Mine NI 43-101-compliant resource area (Pure Gold Mining Inc., news release, September 15, 2015).

A winter diamond-drilling program is planned for early 2016 (Pure Gold Mining Inc., news release, September 14, 2015) and is designed to test and advance new interpretations of near-surface, high-grade targets, in close proximity to the Madsen Mine.

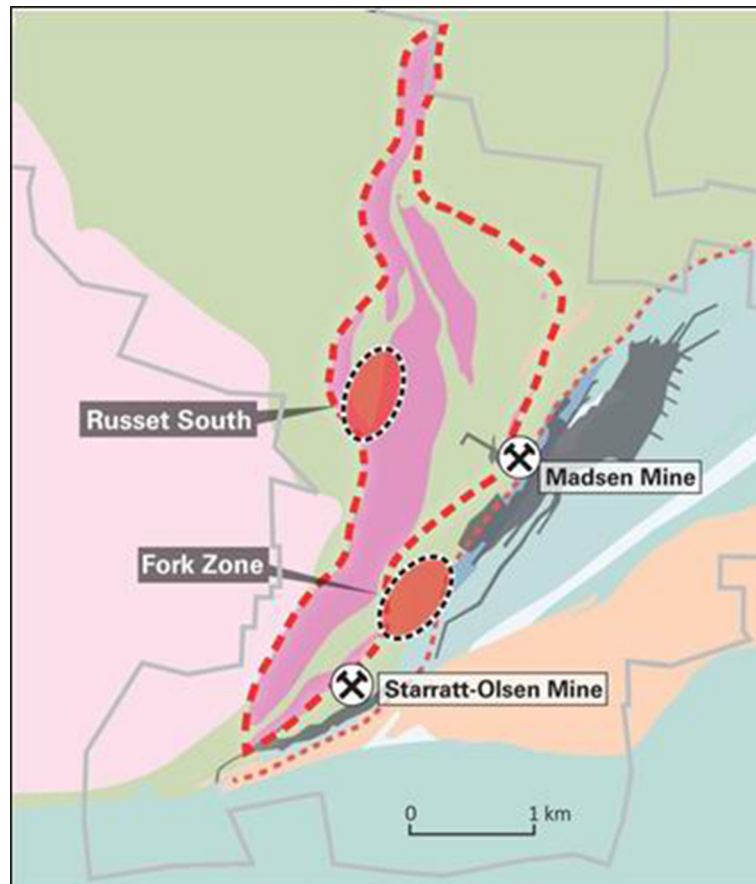


Figure 12. General geology and target areas, Madsen Mine area (from Pure Gold Mining Inc., Corporate Presentation, December 2015). Legend: grey = areas previously mined; blue = Confederation assemblage rocks; pink and orange = felsic intrusive rocks; green = Balmer assemblage basaltic rocks; purple = Balmer assemblage ultramafic rocks.

BOUNTY GOLD CORP.–LAIRD LAKE PROPERTY

Bounty Gold Corp. holds a 100% interest in 10 claims (totaling approximately 1832 ha) in Mulcahy and Killala townships and Medicine Stone Lake Area (see Figure 6: location 3). The property is located in the southwestern portion of the Red Lake greenstone belt, approximately 15 km and 13 km west-southwest of, respectively, the past-producing Madsen (produced 2.45 million ounces of gold from 1938 to 1999) and Starratt Olsen (produced 0.16 million ounces of gold from 1948 to 1956) mines. Both mines are proximal to an angular unconformity separating the Mesoarchean Balmer assemblage and the Neoproterozoic Confederation assemblage. The world-class Red Lake deposit, currently being mined by Goldcorp Inc., has produced approximately 22 million ounces of gold from structures proximal to the unconformity in the eastern portion of the greenstone belt. Results of mapping completed in 2000 as part of the Western Superior NATMAP program led to the interpretation that the Laird Lake area was underlain by a dextrally

faulted offset of the main Red Lake greenstone belt, including both Neoproterozoic and Mesoproterozoic volcanic rocks and the unconformity separating them (Sanborn-Barrie, Skulski and Parker 2004). This idea had previously been put forward by Atkinson and Storey (1997).

A mapping program over the central portion of Bounty Gold Corp.’s Laird Lake property was started in the summer of 2015 by B.R. Gélinas, Lakehead University, as part of a MSc thesis project. Preliminary results indicated that the property is underlain by felsic to intermediate, mafic and ultramafic extrusive metavolcanic rocks, an intrusive metapyroxenite, and tonalite and granitic intrusions (Figure 13; Photo 1; Gélinas and Hollings 2015). Detailed mapping in 2016 will focus on the “Gold-Bearing zone”, which has been explored since approximately 1938 (Horwood 1945). Two Mineral Deposit Inventory (MDI) entries correspond with areas of current work by Bounty Gold Corp.

1. **Pit zone** (MDI52L16NE00034, No.1 showing; Ontario Geological Survey 2016): strongly sheared mafic metavolcanic rocks and magnetite iron formation; quartz-pyrite-chalcopyrite veins in strongly pyrite-chalcopyrite-altered host rock; grab samples by Bounty Gold Corp. returned up to 140 g/t Au.
2. **GBZ and EBGZ zones** (MDI52L16NE00009, No. 2 showing; Ontario Geological Survey 2016): the gold-bearing zone is hosted in highly sheared, silicified and carbonatized mafic metavolcanic rocks and cherty iron formation at the contact with a carbonatized ultramafic rock unit. The silicified zone attains a width of up to 2.1 m at the GBZ occurrence; a channel sample by Bounty Gold Corp. across this width returned 35 g/t Au.

The **RSPZ** zone is a gold occurrence newly discovered by Bounty Gold Corp. approximately 200 m east of the EBGZ zone. Gold mineralization occurs in a quartz vein and within highly altered and arsenopyrite-bearing mafic wall rock. Grab samples, returning up to 8.2 g/t Au and 2.07% As, were reported (*from* Bounty Gold Corp., www.bountygoldcorp.com, *under* Projects | Laird Lake Claim Group | section “Highlights of 2013–14” – “RSPZ (Roadside Pit Zone)” [accessed January 16, 2016]).



Photo 1. Spinifex-textured ultramafic flow (UTM 419957E 5643995N, NAD83, Zone 15; photo *courtesy of* B.R. Gélinas).

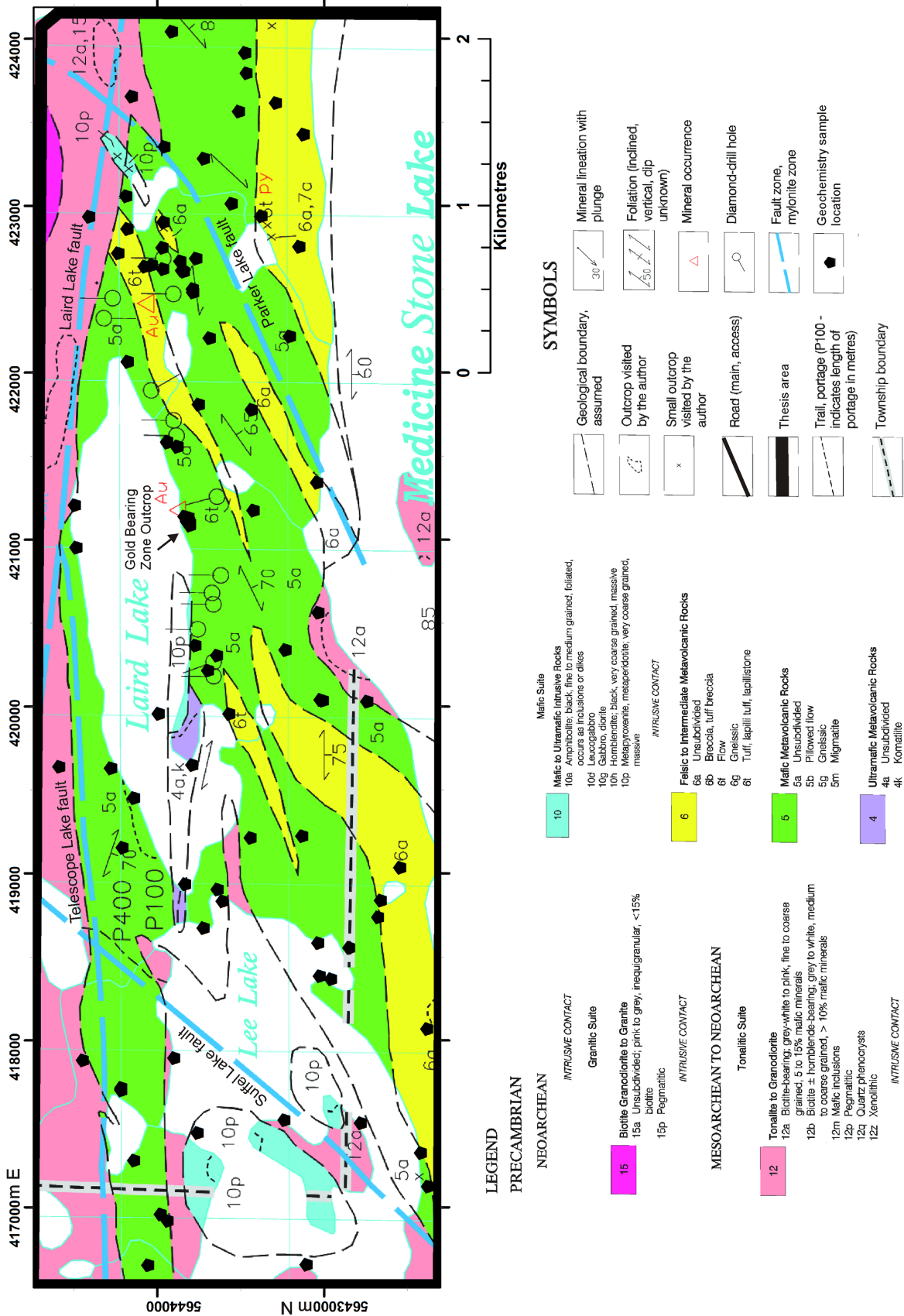


Figure 13. Geological map of part of the Laird Lake property (figure courtesy of B.R. Gélinas) (UTM co-ordinates in NAD83, Zone 15).

Birch–Uchi and Confederation Greenstone Belts

The Birch–Uchi and Confederation greenstone belts are geologically similar to the Red Lake greenstone belt, except that they have a much larger proportion of Neoproterozoic Confederation assemblage supracrustal rocks; only a small proportion of Mesoproterozoic rocks (the Woman and Narrow Lake assemblages) have been identified in these 2 belts (Sanborn-Barrie, Skulski and Parker 2004). A large amount of mafic metavolcanic rock is exposed in the Birch Lake area and in the eastern extension of the belt toward the district boundary west of Root Lake. Rare element-enriched, S-type granite and associated rare-element pegmatites have been reported by Breaks, Selway and Tindle (2003); the pegmatites along the eastward extension of the Confederation greenstone belt have been the focus of some exploration work. Both gold and base metals have been historically produced (*see* Tables 3 and 6), but there are no currently producing mines. While large areas of ground are held, exploration activity here is not as intense as that in the Red Lake greenstone belt. During the year, only 1 company carried out a field program in the Birch–Uchi greenstone belt. Gold Canyon Resources Inc. has the most advanced project, the Springpole Lake gold property in the Casummit Lake Area, where aquatic habitat surveys were completed and environmental assessment for its access corridor was also successfully terminated (*see* Table 5, “Gold Canyon Resources Inc.”).

Table 6. Metal production other than gold in the Red Lake District to December 31, 2015.

Mine	Years of Production	Ore Milled (Short Tons)	Production ⁽¹⁾		
			Metal	Quantity	Grade
Berens River	1939–1948	560 607	Silver	5 796 177 oz	10.34 opt
			Lead	6 105 872 lbs ⁽²⁾	
			Zinc	1 797 091 lbs ^(2, 3)	
South Bay	1971–1980	1 637 948	Silver	2 876 878 oz	1.76 opt ⁽⁴⁾
			Zinc	158 079 tons ⁽⁵⁾	
			Copper	22 604 tons ⁽⁵⁾	
Griffith	1968–1986		Iron	22 850 000 tons pellets 82 031 500 tons ore ⁽⁶⁾	66.7% (pellets) 30% (ore) ⁽⁶⁾

Notes:

- 1) Production figures from Mineral Deposit Inventory (MDI; OGS 2014). Abbreviations: lbs = pounds; opt = ounces per ton; oz = ounce(s).
- 2) Several different total production figures are found in different sources due to information restrictions during World War II; these figures are from Shklanka (1969).
- 3) Zinc was only produced in 1942–1945.
- 4) Average grade over mine life.
- 5) Zinc and copper concentrate.
- 6) Estimated from pellet production.

Northern Greenstone Belts

In the Red Lake District, the northern greenstone belts include those metavolcanic belts formed on rifted continental crust of the North Caribou terrane (i.e., McInnes Lake, North Spirit Lake, Setting Net Lake, Favourable Lake, Sandy Lake, Muskrat Dam Lake, Sachigo Lake and Lingman Lake greenstone belts), and greenstone belts within the Stull–Oxford terrane that formed as products of juvenile ocean floor–arc volcanism (i.e., Stull Lake, Ellard Lake greenstone belts; Sanborn-Barrie et al. 2005). Several companies hold claims in the northern terranes, either individually or in joint-venture agreements; information on current activity is summarized in Table 5.

The lack of all-weather roads, infrastructure and logistical difficulties have always made the northern greenstone belts less attractive than the generally road-accessible Red Lake and Birch–Uchi greenstone belts. In spite of this, some companies have ongoing exploration programs in this area. While precious metals are the primary target in the northern greenstone belts, rare element-bearing pegmatites, base metals, molybdenum, uranium and iron have all been identified here.

- Goldeye Explorations Ltd. and partner GPM Metals Ltd. completed a major staking program in the Sandy Lake greenstone belt, followed by an airborne electromagnetic (AEM) survey, prospecting and geological mapping.
- Houston Lake Mining Inc. continued work on its Pakeagama Lake pegmatite, carrying out a channel sampling, diamond drilling and bulk sampling program.

Even though some areas of the northern greenstone belts are under exploration and/or mining moratoria from one or more First Nation communities, work continues on several projects under agreements with individual communities.

HOUSTON LAKE MINING INC. – PAK RARE METALS PROJECT

Houston Lake Mining Inc.'s PAK rare metals project is approximately 160 km north of Red Lake and is accessible by air and winter road. The company has held the claims and has been actively exploring the property since 1999. The property consists of 6672 ha in the Margot Lake, Mechita Lake and Pakeagama Lake areas. The original pegmatite discovery was made by the Ontario Geological Survey in the 1990s (Breaks, Selway and Tindle 2003). Previous geological mapping identified mineralogically distinct zones. Property-scale mapping by Houston Lake has refined the geological interpretation of zonation within the pegmatite (Figure 14). The 3 main pegmatite zones explored by Houston Lake (from northwest to southwest and perpendicular to the strike of the pegmatite) comprise the following: a) a central, tantalum-, rubidium- and cesium-enriched, intermediate zone (CIZ)); b) an upper, lithium- and rubidium-enriched, intermediate zone (UIZ)); and c) a lower, lithium- and rubidium-enriched, intermediate zone (LIZ). There is also a Wall zone and a Border zone, but their extents are limited. The property deposit model is a highly evolved, granitic, rare element-lithium-cesium-tantalum-bearing (LCT), complex type–spodumene or petalite subtype pegmatite, similar to the Tanco pegmatite in the Bird River greenstone belt in southeastern Manitoba (McCracken 2014).

The Pakeagama Lake pegmatite is subvertical and has a known strike length of 500 m with an estimated true width varying from 10 to 125 m. In March 2016, Houston Lake released an NI 43-10–compliant resource estimate for the PAK rare metals project. There is a Measured and Indicated Mineral Resource of 7.89 million tonnes (Mt) of 1.73% Li₂O equivalent (Eq) at a cut-off grade of 0.4% Li₂O, including 6.87 Mt at 1.96% Li₂O Eq in technical-grade lithium zones with low-iron spodumene, and an Inferred Mineral Resource of 295 000 t at 1.35% Li₂O Eq, including 228 700 tonnes at 1.69% Li₂O Eq in technical-grade lithium zones with low-iron spodumene (Houston Lake Mining Inc., news release, March 4, 2016).

Resource Category	Commodity	Zone	Tonnes (× 1000)	Li ₂ O (%)	Ta ₂ O ₅ (ppm)	Cs ₂ O (%)	Rb ₂ O (%)	Contained Li ₂ O (t)	Contained Ta ₂ O ₅ (t)	Li ₂ O Eq (%)
Measured and Indicated	Li	Upper intermediate (UIZ)	638.1	3.58	63	0.04	0.17	22 856	40	3.67
	Li	Lower intermediate (LIZ)	6209.3	1.63	107	0.04	0.29	101 496	662	1.79
	<i>Total lithium zones</i>		<i>6847.4</i>	<i>1.82</i>	<i>103</i>	<i>0.04</i>	<i>0.28</i>	<i>124 352</i>	<i>821</i>	<i>1.96</i>
(cut-off 0.4% Li ₂ O)	Ta, Rb	Central intermediate (CIZ)	1039.7	N/A	114	0.07	0.57	N/A	119	N/A
	Li, Ta, Rb	<i>Bulk pegmatite</i>	<i>7887.1</i>	<i>1.58</i>	<i>104</i>	<i>0.04</i>	<i>0.31</i>	<i>124 352</i>	<i>821</i>	<i>1.73</i>
Inferred	Li	Upper intermediate (UIZ)	1.8	2.61	67	0.06	0.18	47	0	2.70
	Li	Lower intermediate (LIZ)	226.9	1.54	98	0.05	0.30	3505	22	1.69
	<i>Total lithium zones</i>		<i>228.7</i>	<i>1.55</i>	<i>98</i>	<i>0.05</i>	<i>0.30</i>	<i>3552</i>	<i>22</i>	<i>1.69</i>
	Ta, Rb	Central intermediate (CIZ)	66.9	N/A	119	0.07	0.54	N/A	8	N/A
(cut-off 0.4% Li ₂ O)	Li, Ta, Rb	<i>Bulk pegmatite</i>	<i>295.6</i>	<i>1.20</i>	<i>103</i>	<i>0.06</i>	<i>0.36</i>	<i>3552</i>	<i>30</i>	<i>1.35</i>

Chemical element symbols: Cs, cesium; Li, lithium; O, oxygen; Rb, rubidium; Ta, tantalum.

Source: from Houston Lake Mining Inc., news release, March 4, 2016.

Li₂O Eq is calculated based on price and recovery assumptions for a combined Li₂O and Ta₂O concentrate, no credit was included for rubidium, cesium or any other element.

The resource remains open to depth and along strike to the northwest and southeast. Work in 2015 included Phase III and IV diamond-drilling programs (10 holes totalling 2249 m) that were designed to extend the known strike length and upgrade the lithium Indicated Mineral Resource to the Measured category. In addition, a ~300 t bulk sample was taken to help determine the ability of the deposit to produce a technical-grade quality spodumene product for use in the production of speciality glass and ceramics (Houston Lake Mining Inc., news release, March 23, 2015).

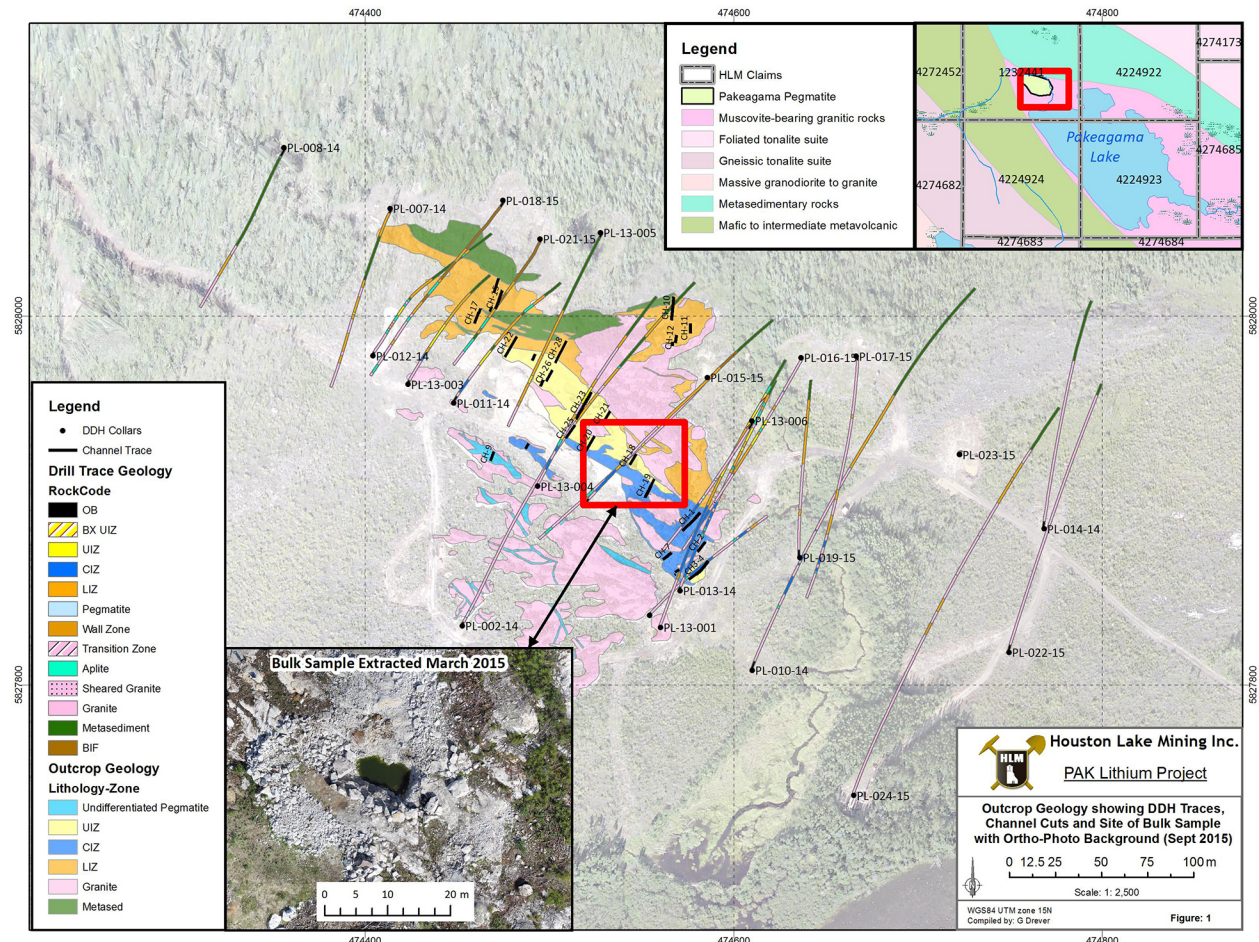


Figure 14. Aerial photo and bedrock geology of the PAK pegmatite showing traces of diamond-drill holes and the location of bulk sample (courtesy of Houston Lake Mining Inc.).

GOLDEYE EXPLORATIONS LIMITED—WEEBIGEE PROJECT

Goldeye Explorations Limited’s **Weebigee project** is located in the Sandy Lake greenstone belt, 227 km north of Red Lake, adjacent to Sandy Lake First Nation. After a long period of negotiations, Goldeye and Sandy Lake First Nation entered into a 5-year Exploration Agreement on November 12, 2013. In addition, Goldeye appointed Russell Kakepetum to the Board of Directors of the Company. Russell Kakepetum is a Band Councillor and a member of the Sandy Lake First Nation (Goldeye Explorations Ltd., news release, December 16, 2014).

In 2015, Goldeye Explorations entered into an option–joint-venture agreement with GPM Metals Inc., whereby GPM Metals can earn up to a 70% interest in the property (Goldeye Explorations Limited, news release, April 15, 2015). GPM Metals also becomes operator of future exploration programs. A major

staking program was undertaken following the signing of the agreement (Goldeye Explorations Limited, news release, June 1, 2015), whereby the original property, comprising 363 claims (totalling approximately 6000 ha) was increased by an additional 1412 claims; the Weebigee property now comprises approximately 28 000 ha (Figure 15) covering nearly 55 km of strike length of the Sandy Lake greenstone belt.

The greenstone belt was divided into several distinct assemblages by Thurston, Cortis and Chivers (1987). The area of Goldeye's original claim block was centred on historic gold showings in the Northwest Arm of Sandy Lake adjacent to the Reserve lands, underlain by the North Sandy assemblage (2945 Ma) (Thurston, Osmani and Stone 1991). The staking completed in 2015 covers the on-strike extension of this assemblage, and associated historic gold occurrences, 35 km to the east. Base metal occurrences are known from the Sanborn Bay area (Photo 2), approximately 10 km south of the community of Sandy Lake, where the additional staking has expanded the property to cover extensions of prospective horizons. This area is underlain by the Sanborn Bay assemblage, a possible quartzite-carbonate-komatiite platform to rift sequence separated by the regionally important Sandy Lake shear zone (Thurston, Cortis and Chivers 1987).

An area of approximately 6500 ha in the Northwest Arm and Sanborn Bay areas was covered by a 1264 line-kilometres helicopter airborne electromagnetic and horizontal magnetic gradiometer survey (Goldeye Explorations Limited, news release, August 27, 2015).

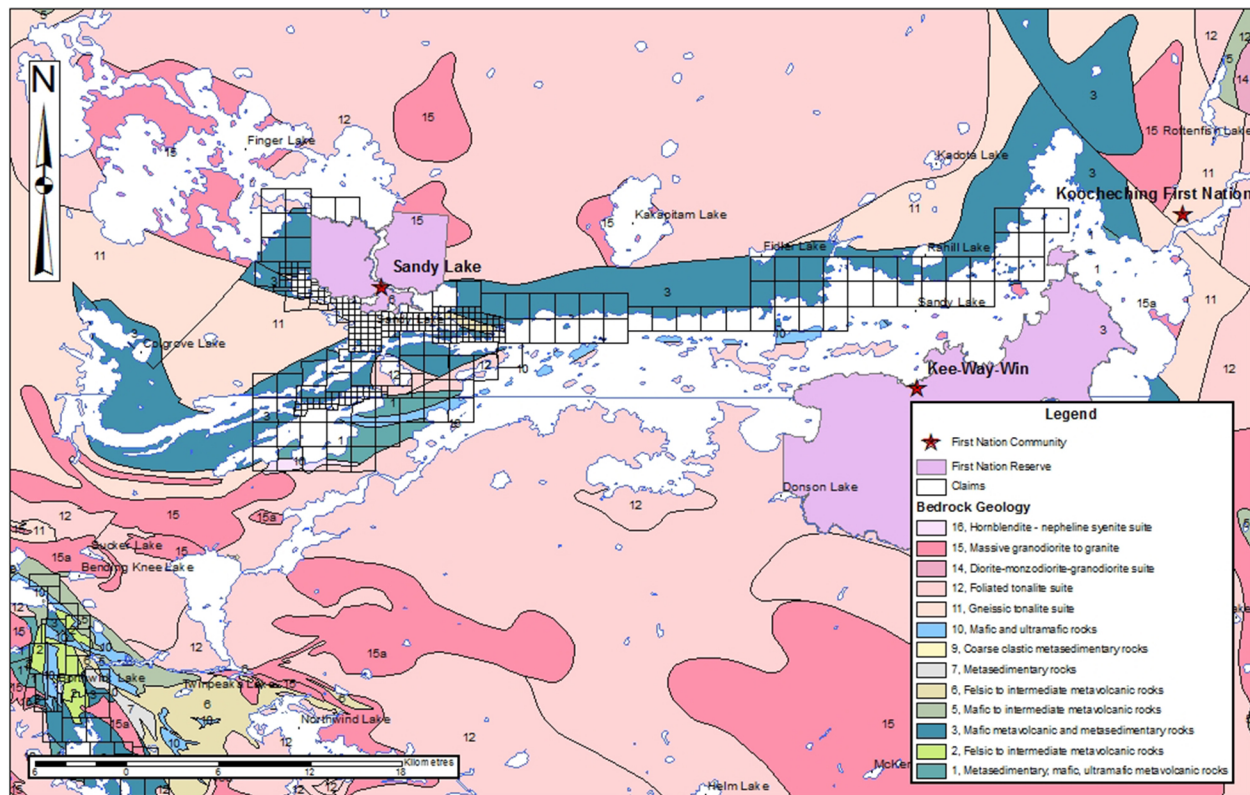


Figure 15. Bedrock geology of the Sandy Lake greenstone belt and claims in the area (bedrock geology from Ontario Geological Survey 2011; claim fabric current to January 16, 2016).



Photo 2. Trenching on a volcanogenic massive sulphide (VMS) target in the Sanborn Bay area, Weebigee property, Sandy Lake (photo courtesy of GPM Metals Inc.).

RESIDENT GEOLOGIST STAFF AND ACTIVITIES

In 2015, staff of the Red Lake Resident Geologist's office comprised Andreas Lichtblau, *P.Geo.*, Regional Resident Geologist; Carmen Storey, *P.Geo.*, District Geologist; and Greg Paju, District Geological Assistant (May to year-end).

During the year, staff of the Resident Geologist's office made 38 visits to active and inactive mineral properties, core shacks and research sites in the Red Lake and Kenora districts and gave 3 field trips to exploration industry personnel in the Red Lake and Kenora districts. Field and office activities focussed on delivering high-quality services, data and expertise to the exploration and mining sector, First Nations, municipalities, and provincial and federal agencies. Field trips, in which staff of the Red Lake Resident Geologist's office participated, are listed in Table 7. A.F. Lichtblau, C.C. Storey and G.F. Paju organized the Red Lake field trip for the Institute on Lake Superior Geology, May 19 and 20, for 16 participants. They also organized the well-attended annual Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Red Lake Branch Exploration Roundup and Field Trip in June in Red Lake, which included an overview of exploration activity in the Red Lake District, an overview of Pure Gold Mining Limited's exploration work at Madsen by Jeanette Marcotte and a presentation on Ontario's Mineral Policy by Rob Merwin (MNDM). A field trip to see outcrops around the old Consolidated Marcus property near the Red Lake airport, led by Mark Epp of Goldcorp Red Lake Gold Mines, was held in the afternoon. There were 40 people in attendance at the morning session and 12 people participated in the field trip.

A.F. Lichtblau attended the Northwestern Ontario Mines and Minerals Symposium in Thunder Bay, the Institute on Lake Superior Geology in Dryden in May, the Resident Geologist Program Northwest Regional Meeting and field trip in Thunder Bay in September, and the Mines and Minerals Division Branch Meeting in Sudbury in November. He continued to be actively involved in the Red Lake Branch of CIM as membership chair. C.C. Storey attended the Prospectors and Developers Association of Canada (PDAC) Convention in March, the Northwestern Ontario Mines and Minerals Symposium in Thunder Bay in April, the Institute on Lake Superior Geology (ILSG) in Dryden in May, the Resident Geologist Program Northwest Regional Meeting and field trip in Thunder Bay in September, the Manitoba Mines and Minerals Symposium in Winnipeg in November, and the Mines and Minerals Division Branch Meeting in Sudbury also in November. He continued to be actively involved in Red Lake Branch of CIM and was re-elected as Technical Program Chair for the current year. G.F. Paju attended the ILSG meeting in Dryden, the Resident Geologist Program Northwest Regional Meeting and field trip in Thunder Bay in September, and the Mines and Minerals Division Branch Meeting in Sudbury in November.

Table 7. Field trips in 2015 in which staff of the Red Lake Resident Geologist’s office participated.

Area	Date	Leader	Party
Consolidated Marcus	June 11	M. Epp	CIM Exploration Roundup
Experimental Lakes area	Sept 10	M. Lung, M. McCandless, S. Higgins	A.F. Lichtblau, G.F. Paju, C.C. Storey, K. Austen, plus Kenora Northern Development Office staff
Dryden Pegmatites	May 23	S.E. Zurevinski	A.F. Lichtblau, G.F. Paju, ILSG group
Mattabi Mine	May 23, 24	G. Hudak	C.C. Storey, ILSG group
Red Lake	June 17	M. Epp	G.F. Paju

Drill Core Storage Site

The remote diamond-drill core storage compound is located 6 km south of Red Lake on Highway 105. The compound is operated as a self-serve facility by the Red Lake Resident Geologist’s office. The Kenora Drill Core Library houses an additional 14 529.9 m of diamond-drill core from the Red Lake District. Work in the fall of 2015 consisted of cleaning up the site and disposing of scrap lumber and rotted broken core boxes in preparation for obtaining a large number of dismantled surplus core racks from Rubicon Minerals Corporation. Delivery of the racks is anticipated in January 2016.

In 2015, the site had 1 user for the core and 4 contractors doing physical work. The Mineral Development and Rehabilitation section of MNDM carried out diamond drilling at the past-producing South Bay Mine site in Dent Township. All the core from this drilling (totalling 319.6 m) was added to the collection (Table 8). C.C. Storey logged and sampled the core (*see* “Property Examinations”, “South Bay Mine”).

Table 8. Drill core stored at the Red Lake Resident Geologist's office remote drill-core compound.

Company	Property	Township/Area	Length (m)
Ansil Resources Ltd.	Baird Township	Baird Township	177.9
Ansil Resources Ltd.	Willans Township	Willans Township	351
Ansil Resources Ltd.	Ranger Lake	Ranger Township	245
Asarco Exploration Co. of Canada Ltd.	Skinner, Goodall	Skinner and Goodall townships	444.0
Barrick Gold Corp.	Hasaga Mine	Heyson Township	2889.8
Barrick Gold Corp.	Red Lake Gold Shore Mine	Dome Township	106.7
Barrick Gold Corp.	Red Lake Gold Shore Mine	Dome Township	257.6
Belmont Resources Inc. / International Montoro Resources Inc.	Walsh Lake	Bateman Township	474.0
Belmont Resources Inc. / International Montoro Resources Inc.	Shaver Lake	Bateman and Shaver townships	882.2
Canadian Industrial Minerals Corp.	Bouzan Lake	Heyson Township	2029.2
CANMET Howey and Hasaga Mine Hazards Drilling	Howey-Hasaga	Heyson Township	1027.2
Central Geophysics Ltd.	Conifer Lake Complex	Sumach Lake Area	170.8
Cross Lake Minerals Ltd.	Gerry Lake	Gerry Lake Area	981.0
Cypress Development Corp. / Skyharbour Resources Ltd.	McKenzie Island	Dome Township	3059.9
Cypress Development Corp. / Skyharbour Resources Ltd.	McKenzie Island	Dome Township	2081.8
East West Resource Corp.	Bouzan Lake	Heyson Township	1489.5
Freewest Resources Ltd.	McQuaig property	Dome Township	993.1
Hemlo Gold Mines Ltd.	Miles Red Lake	Todd Township	369.3
ITL Capital Corp. / Rupert Resources Ltd.	Durham-McEwen	Balmer Township	1682.5
Lac Properties Ltd.	Hasaga Mine: time-domain reflectometry (TDR) cables installed in the Crown Pillar	Heyson Township	33.7
*Laurentian Goldfields Ltd.	Goldpines South project	Cabin Bay Area	882
*Laurentian Goldfields Ltd.	Goldpines North project	Bruce Lake Area	1391.5
Loydex Resources Inc.	Bug River	Heyson Township	190
Mutual Resources Ltd.	Dixie Lake	Dixie Lake Area	499.3
Noramco Explorations Inc.	Various	Ball, Balmer, Byshe, Dome, Fairlie, Goodall, Honeywell, McDonough, Ranger, Skinner, Todd townships; Shabumeni Lake Area	31 268.6
Noranda Exploration Company Ltd.	Selco Dixie Joint Venture	South of Otter Lake and Karas Lake areas	1638.2
Pure Gold Resources Inc.	McKenzie Island	Dome Township	1762.4
Rio Algom Exploration Co. Ltd.	Fly Lake	Mitchell Township	731.0
**Skyharbour Resources Ltd.	Heyson	Heyson and Byshe townships	2018.2
**Skyharbour Resources Ltd.	Heyson	Heyson and Byshe townships	731.0
**Skyharbour Resources Ltd. / Consolidated Abaddon Resources Inc.	Sidace Lake property	Sobeski Lake Area	2215.7
**Skyharbour Resources Ltd. / Consolidated Abaddon Resources Inc.	Black Bear property	Black Bear Lake Area	694.9
Solitaire Minerals Corp. / Ashburton Ventures Inc.	Chukuni property	Byshe Township	391.3
Teck Exploration Ltd.	Howey Mine	Heyson Township	7255.5
Tri Origin Exploration Ltd.	RLX property	Willans Township	686.5
Tri Origin Exploration Ltd.	RLX property	Willans Township	120.0
Tri Origin Exploration Ltd.	RLX property	South of Otter Lake Area	32.3
Tri Origin Exploration Ltd.	RLX property	Willans Township	837.0
Tri Origin Exploration Ltd.	RLX property	Willans Township	828.5
Tri Origin Exploration Ltd.	Sky Lake property	Matapesatakun Bay Area	1180.0
United Reef Petroleum Limited	Aiken-Russett	Baird Township	8154.0
Western Pacific Energy Corp.	Swain Lake	Goodall Township	1936.2
MNDM Mineral Development and Rehabilitation Branch	South Bay Mine	Dent Township	319.6
TOTAL			87 434.9

*2013 submission.

**length is total length of hole including overburden.

PROPERTY EXAMINATIONS

Table 9 lists the property visits conducted by staff in 2015 in the Red Lake District. Locations, keyed to the property letters, are shown in Figures 4, 9 and 10.

Table 9. Property visits conducted by the Red Lake Regional Resident Geologist and staff in 2015 (keyed to Figures 4, 9 and 10).

Letter	Property	Location	See Figure
A	H.G. Young	Dome Township	9
B	Hasaga	Heyson Township	9
C	McMarmac	Dome Township	9
D	Harry's Corner	Heyson Township	9
E	Sandy Lake Airport Quarry	Sandy Lake	4
F	Coin Creek	Heyson Township	9
G	Berens River Mine	Setting Net Lake	4
H	McMarmac	Dome Township	9
I	Cons Marcus	Dome Township	9
J	Garnet Lake Arrow zone	Belanger Township	10
K	Tims pit	Heyson Township	9
L	Rivard	Todd Township	9
M	Mt. Jamie Mine	Todd Township	9
N	Headway	Balmer Township	9
O	Laverty	Heyson Township	9
P	Sandy Creek beryl	Camping Lake	10
Q	McCombe Pegmatite	Root Lake	10
R	Consolidated Morrison pegmatite	Root Lake	10
S	Slate Road recon	Root Lake	10
T	South Bay Mine lake sediment	Dent Township	10
U	Herbo sulphide	Heyson Township	9
V	Spinelli pit	Heyson Township	9
W	Wenasaga Rd pegmatite	Whitemud Lake area, also Bluffy Lake and Slate Lake	10
X	Balmer Forest Road	Balmer Township	9
Y	Rahill Shaft	Dome Township	9
Z	Hasaga	Heyson Township	9
AA	Rivard	Todd Township	9
BB	Newman-Todd	Todd Township	9
CC	South Bay Mine	Dent Township	10
DD	South Bay concentrate spill	Knott Township	10
EE	McKenzie Island property	Dome Township	9
FF	877578 Ontario Inc. Bondy Road	Slate Lake Area	10
GG	877578 Ontario Inc. Chilcott Road	Karas Lake Area	10
HH	Lime kiln	Todd Township	9
II	West Red Lake Mine	Ball Township	9
JJ	Trout Bay stromatolites	Ball Township	9
KK	Trout Bay Mining Museum	Ball Township	9
LL	Madsen Mine core shack	Heyson Township	9

Base Metal Sulphide Deposits in the Confederation Assemblage

Confederation assemblage metavolcanic rocks have been explored for volcanogenic massive sulphide (VMS) base metal deposits since the early 1960s. The South Bay VMS discovery in 1968 initiated a wave of base metal exploration, particularly in the area south and west of the South Bay Mine. Although several sub-economic deposits and numerous occurrences have been found, only 1 deposit (South Bay Mine) was brought into production. The deposits listed in Table 10 were compiled from several sources and the available resource estimates for a deposit vary from source to source, depending on when the estimate was made and what cut-off grade was used. Only one of the published resource estimates meets NI 43-101 requirements. The deposit classifications are the same as used in MNDM's Mineral Deposit Inventory (MDI) (*see also* Wilson et al. 2008).

Table 10. Base metal sulphide deposits in Confederation assemblage rocks (*compiled from* Ontario Geological Survey (2014), unless another source is indicated).

Name	Location (NTS Map)	Reported Commodity	Status*	Mineral Deposit Inventory Number	Additional Reference
Borgford Lake	Dent Township 52N02NE	Zn, Cu, Pb, Ag, Au	Occurrence 12.9% Zn, 1.8% Cu, 0.51% Pb, 2.79 opT Ag, 0.01 opT Au	MDI52N02NE00061	
Caravelle	Gerry Lake Area 52K14NE	Zn, Cu	Occurrence 4.44% Zn, 0.22% Cu over 1.1 m	MDI42C13SW00027	Assessment files 2.2698, 2.8604, 63.2739
Copper Lode Hornet zone	Belanger Township 52K15NW	Zn, Cu	Developed Prospect with Reserves 4.07% Zn, 2.3% Cu over 5.03 m 145 000 tonnes (Smith 2008)	N/A	Harper (1996)
Copper Lode massive sulphides	Belanger Township 52K15NW	Zn, Cu	Prospect 0.88% Zn, 0.13% Cu over 3.7 m	MDI52K15NW00019	Harper (1996)
Copper Lode Stringer zone	Belanger Township 52K15NW	Zn, Cu	Occurrence 2.33% Zn, 0.34% Cu	MDI52K15NW00019	MacDougall (1993)
Copper Lode A Main zone	Fredart Lake Area 52K15NW	Cu, Ag	Developed Prospect with Reserves 425 612 tons of 1.56% Cu, 0.98 opT Ag	MDI52K15NW00016	
Copper Lode B	Belanger Township 52K15NW	Zn, Cu	Prospect 1.68% Cu, 2.5% Zn over 6.25 m	MDI52K15NW00019	MacDougall (1993)
Copper Lode C	Belanger Township 52K15NW	Cu, Zn	Prospect 6.02% Cu, 0.21% Zn over 1.5 m	MDI52K15NW00019	MacDougall (1993)
Copper Lode D	Belanger Township 52K15NW	Zn, Cu	Prospect 36 000 tons of 0.26% Cu, 7.58% Zn	MDI52K15NW00019	Assessment file 2.17097
Copper Lode E	Belanger Township 52K15NW	Zn, Cu	Prospect with Reserves 160 000 tons of 8.28% Zn, 1.02% Cu, 0.39 opT Ag	MDI52K15NW00019	Archibald (1970)
DDH 3200-2-80	Agnew Township 52N02SE	Zn, Cu	Occurrence 1.18% Zn, 0.11% Cu over 0.82 m	MDI52N02SE00072	
Diamond Willow	Gerry Lake Area 52K14NE	Cu, Zn	Occurrence 2.3% Cu, 1.8% Zn over 4.2 m	N/A	Harper (1996)
Dixie 17B	South of Otter Lake 52K14NW	Zn, Cu	Occurrence 7.34% Zn, 1.44% Cu over 31 feet	MDI52K14NW00011	
Dixie 18	South of Otter Lake 52K14NW	Zn	Developed Prospect with Reserves 150 000 tons of 14% Zn	MDI52K14NW00010	Atkinson et al. (1993)
Dixie 19	South of Otter Lake 52K14NW	Zn, Cu, Ag	Prospect 1.18% Zn, 0.81% Cu, 24 g/t Ag over 1.3 m	MDI52KNW00012	
Dixie 3	Karas Lake Area 52K14SE	Zn, Cu	Developed Prospect with Reserves 91 000 tons of 1% Cu, 10% Zn	MDI00000000290	Assessment file 2.15981
Fly Lake 3197-7-80	Mitchell Township 52N02SE	Zn, Pb, Cu, Ag	Occurrence 1.33% Pb, 1.56 opT Ag over 0.15 m 3.63% Zn over 1.24 m 0.49% Cu over 0.49 m	MDI52N07SE00078	

Name	Location (NTS Map)	Reported Commodity	Status*	Mineral Deposit Inventory Number	Additional Reference
Fly Lake	Mitchell Township 52N02SE	Zn	Occurrence 2.64% Zn over 5.4 feet	MDI52N02SE00062	
Fly Lake UW-36, 37	Mitchell Township 52N02SE	Zn, Cu, Ag	Occurrence 1.26% Zn, 0.07% Cu, 0.56 opT Ag over 2.3 feet	MDI52N02SE00073	
Fly Lake UW-40, 41	Mitchell Township 52N02SE	Cu, Zn, Ag	Occurrence 1.27% Cu, 2.86 g/t Ag over 0.57 m 1.63% Cu, 0.23% Zn, 4.63 g/t Ag over 0.64 m	MDI52N02SE00074	
Fly Lake FL-90-3	Mitchell Township 52N02SE	Zn, Cu	Occurrence 6.48% Zn over 0.5 m 2.77% Cu over 0.9 m	MDI52N02SE00076	
Fly Lake 3197-6-80	Mitchell Township 52N02SE	Zn, Pb, Cu	Occurrence 7.44% Zn over 0.64 m 1.17% Pb over 0.5 m 0.23% Cu over 0.31 m	MDI52N02SE00077	
Fly Lake 3197-7-80	Mitchell Township 52N02SE	Zn, Pb, Cu, Ag	Occurrence 3.63% Zn over 1.24 m 1.33% Pb, 1.56 opT Ag over 0.15 m 0.15% Cu over 0.49 m	MDI52N02SE00078	
Garnet Lake Arrow zone	Belanger Township 52K15NW	Zn, Cu, Ag, Au	Developed Prospect with Reserves: <u>Indicated Resource</u> (NI 43-101-compliant) 3% Zn equivalent cut-off: 2 071 000 t of 5.92% Zn, 0.75% Cu, 0.58 g/t Au, 21.1 g/t Ag, Indium average value 34.6 g/t <u>Inferred Resource</u> (NI 43-101-compliant) 3% Zn equivalent cut-off: 120 552 t of 2.60% Zn, 0.56% Cu, 0.40 g/t Au and 18.6 g/t Ag	MDI52K15NW00017	Carter (2007)
George property	Knott Township 52N02SE	Cu	Occurrence 3240 ppm Cu	MDI000000001354	
Half Lake	Shabumeni Lake Area 52N07SE	Cu	Occurrence 0.1% Cu over 5 feet	MDI52N07SE00066	
Horseshoe	Mitchel Township 52N02SE	Zn	Prospect 5.5% Zn over 11 m	MDI52N02SW00016	Harper (1996)
Hudson Bay zone	Karas Lake Area 52K14SE	Zn	Occurrence 2.28% Zn over 7 m	N/A	Harper (1996)
Joneston Lake North	Casummit Lake Area 52N08NW	Cu	Discretionary Occurrence 0.11% Cu	MDI52N08NW00005	
Joy New zone	Gerry Lake Area 52K14NE	Cu, Zn	Developed Prospect with Reserves 300 000 tons of 4% combined Cu+Zn	MDI52K14NE00006	
Moose Creek West	South of Otter Lake 52K14NW	Zn, Cu	Occurrence 3.22% Zn, 0.96% Cu over 1.2 feet	MDI52K14NW00013	
Newmont	Dixie Lake Area 52K13SE	Cu, Zn	Discretionary Occurrence 0.1% Cu, 0.02% Zn	MDI52K13SE00002	
Northern drill target	Mitchell Township 52N02SE	Zn	Occurrence 13100 ppm Zn over 1 m	MDI000000001355	
Northwest Explorers	Shabumeni Lake Area 52N07SE	Zn, Cu	Discretionary Occurrence 0.4% Zn, 0.05% Cu, 0.1 opT Ag, 0.005 opT Au	MDI52N07SE00005	
Seagrave Lake	Seagrave Lake Area 52N08SE	Zn, Cu	Occurrence 8.38% Zn, 0.25% Cu	MDI52N08SE000007	
Shabu Lake North Island	Shabu Lake Area 52N07SW	Cu, Ag	Occurrence 0.23% Cu, 0.24 opT Ag over 1 foot	MDI52N07SE00023	
Shabu Lake Northwest	Shabu Lake Area 52N07SW	Cu, Ag	Occurrence 0.24% Cu over 4 feet Grab sample 0.95% Cu, 1.32 opT Ag	MDI52N07SW00024	
Shabumeni Lake	Shabumeni Lake Area 52N07SE	Zn	Occurrence 0.83% Zn over 27.9 feet	MDI52N07SE00053	

Name	Location (NTS Map)	Reported Commodity	Status*	Mineral Deposit Inventory Number	Additional Reference
Slate Lake 3191-2-80	Slate Lake Area 52K15NE	Zn, Cu, Ag	Occurrence 9.06% Zn, 0.51% Cu, 1.16 opT Ag over 0.05 m	MDI52K15NE00013	
South Bay Crab grid	Agnew Township 52N02NE	Zn	Discretionary Occurrence 0.16% Zn over 0.9 feet	MDI52N02NE00002	
South Bay Mine	Dent Township	Zn, Cu, Ag	Past-Producer without Reserves Produced 1 637 948 tons 11.06% Zn, 1.8% Cu and 2.12 opT Ag	MDI52N02SE00012	
Swain Lake	Shabumeni Lake Area 52N07SE	Cu	Occurrence 4.04% Cu over 1.4 feet 2.15% Cu over 6.3 feet	MDI52N07SE00056	
Trippier	Mitchel Township 52N02SE	Zn	Prospect 5.9% Zn over 12 m	N/A	Harper (1996)
VANCO 1979	Honeywell Township 52N07SE	Zn, Cu, Ag	Discretionary Occurrence 0.2% Cu, 0.09% Cu, 0.22 opT Ag	MDI52N07SE00002	
Vent Zone	Karas Lake Area 52K14SE	Zn, Cu	Occurrence 2.74% Zn, 0.11% Cu over 7 m	N/A	Harper (1996)
Wasp Lake	Agnew Township 52N02SE	Zn	Prospect 2.0% Zn over 20 m	N/A	Harper (1996)
Whitefish Falls East	Gerry Lake Area 52K14NE	Cu, Zn	Occurrence 0.24% Cu over 15.9 feet, 9579 ppm Zn over 4.4 feet	MDI52K14NE00007	
Zip Lake	Shabumeni Lake Area 52N07SE	Zn	Occurrence DDH 6300 ppm Zn	MDI52N07SE00073	

*Abbreviations: DDH, diamond-drill hole; g/t, grams per tonne; opT, ounce per ton. Status terminology as outlined by Wilson et al. (2008).

South Bay Mine (C.C. Storey, G.F. Paju)

The past-producing South Bay Mine is located in the southeastern corner of Dent Township, approximately 80 km east-northeast of Red Lake. The mine produced 1 637 948 tons of zinc-copper-silver ore from 1971 to 1981. Two concentrates were produced: a copper-silver concentrate shipped to Noranda, Quebec, and a zinc concentrate shipped to western Europe (Thurston et al. 1978). Over the life of the mine, average grades were 1.8% Cu, 11.06% Zn and 2.12 ounces silver per ton (Atkinson, Parker and Storey 1991). The history of the mine and geology of this volcanogenic massive sulphide (VMS) deposit were described by Lichtblau et al. (2015).

As part of a long-term remediation and hazard mitigation effort, the Rehabilitation and Compliance Section of the Ontario Ministry of Northern Development and Mines carried out a 13-hole diamond-drilling program during March and April of 2015. The intent of the drilling was to investigate the thickness and condition of the crown pillars prior to any remediation work on the site. All the holes terminated when they broke into the open mine workings. A total of 319.6 m of NQ-sized core was recovered and stored at the Red Lake Remote Drill Core Storage Site. Geotechnical logs were prepared by AMEC Foster Wheeler Environment and Infrastructure, under contract to MNDM. The logs illustrate core recovery, rock strength and fracture data using visual descriptive methods. Laboratory tests for splitting tensile strength and unconfined compressive strength were carried out on samples of core from each hole by AMEC. C.C. Storey of the Resident Geologist Program provided a lithological log of the holes and selected samples for major and trace element analyses. This diamond-drilling program provided an opportunity to get unweathered sample material from known locations near the ore zones. To facilitate lithological logging, the rock types are described as follows:

Rock Type	Description
Overburden	Sandy soil and waste rock mix
Rhyolitic Tuff	Felsic fragmental rock, often with lapilli or larger fragments; some intersections may be a breccia rather than tuff; green to greenish-grey in colour with lighter coloured fragments. The fragments are elongated parallel to the foliation. Most are clearly lapilli-size fragments, except DDH 012, which is predominantly ash tuff and highly altered (sample 2015CS025). Some fragments contain disseminated fine-grained pyrite.
Quartz-Feldspar Porphyry (QFP)	Extensive unit of quartz-feldspar porphyry, described in mine nomenclature as QFP2. The rock is foliated with deformed feldspar phenocrysts; predominantly dark grey and variably chlorite-altered. The size and content of phenocrysts is variable, with some examples containing up to 80% phenocrysts in a fine-grained matrix. Feldspar phenocrysts are light coloured; quartz phenocrysts are clear to bluish and resisted deformation. Sulphide content is low and comprises disseminated, fine-grained, euhedral pyrite.
Felsic Dike	Light-coloured, fine-grained quartz and quartz-feldspar porphyry with fine-grained to nearly aphanitic matrix and small phenocrysts. Phenocryst content is low (15% or less). Narrow dike-like units in DDH 001, 004, 005, 006A and 006C, and samples 2015CS029, 030 and 036. These are called dikes, but their true nature is not known.
Sulphide-Bearing Rhyolitic Tuff	Rhyolitic tuff with up to several percent disseminated sulphides
Sulphide-Bearing Quartz-Feldspar Porphyry (QFP)	QFP with disseminated sulphide or layers of sulphide
Massive Sulphide	Samples comprise primarily sulphide minerals; can range from only pyrite, to pyrite with minor brown sphalerite layers, to nearly all sphalerite with minor pyrite layers (Photos 3 and 4)

The overburden at the mine site has been reworked during mine construction and subsequent activities at the site. Current overburden thickness where the drilling took place ranges from 3 to 6 m, but is not indicative of pre-mining overburden thickness. The drill holes covered a small area near the surface projection of the ore zones and the known mine workings (Figures 16 and 17). Several holes ended in massive sulphide and one, DDH 007, was collared in massive sulphide. The individual drill holes are grouped into 3 cross sections. They were not projected onto an arbitrary section plane and the horizontal distance is not to scale. In spite of the small area, there is considerable variation in the rocks intersected and in the details of these rocks. Sections showing the rock types and sample locations are shown in Figures 18 to 20. Sample descriptions and analytical results are found in Tables 11 to 15.

The quartz-feldspar porphyry (QFP) constitutes the largest proportion of drilled bedrock. The original mine terminology subdivided the porphyry into less-altered QFP1 and QFP2, which is a more highly altered version found in close association with the ore zones. The QFP in the drill holes is probably all QFP2. The rhyolitic tuff comprises a group of units that show features of both a tuff-breccia and a lapilli tuff. The body represented by sample 2015CS025 from DDH 012 is distinctly different from the other fragmental units in that it is primarily composed of ash-sized fragments and is more highly altered. Because of its proximity to the sulphide mineralization, it is interpreted to represent what, in mine terminology, would be dacitic breccia. Fine-grained intrusive rocks, intersected in several cores, are interpreted to be the felsic dike units. They are porphyritic, but the sparse phenocrysts are very small (<1 mm), and foliation is much less evident than in other rock types. There are distinct differences between these intersections and it is unlikely that the “dikes” are all from the same source intrusion. Contacts between the rock units are sharp, as is the contact with massive sulphide. Several thin units of massive sulphide are found within both the QFP and the rhyolitic tuff (DDH 011). Both the rhyolitic tuff and the QFP show a moderate to strong foliation between 20° and 60° to core axis, averaging 45° to core axis.

Fine-grained quartz and carbonate veinlets, often following foliation, and usually accompanied by pyrite, are common in both the QFP and the rhyolitic tuff. Chlorite forms distinct thin layers following the foliation. This is particularly evident in fine-grained fragmental units, as shown in sample 2015CS025. Larger quartz and quartz-carbonate veins are present in several cores, often accompanied by sulphides. These veins are several centimetres in width and cut the host rock at different angles. One sample of a quartz-carbonate vein was assayed (2013CS014), but did not contain precious metals above the analytical detection limit.

Sampling other surficial material at the mine site was restricted to the tailings (2013CS009 to 2013CS012) and loose material near the site of the old concentrator building. At some time, a large number of plastic pails were filled with loose surface material consisting of mostly gravel and left on the concrete slab floor of the old concentrator building. One of these pails was sampled (2015CS070). Waste material along the road at the south side of the concentrator with blue-green secondary copper minerals related to weathering was also sampled (2015CS071).



Photo 3. South Bay Mine massive sulphide core from DDH 007. Brown mineral is sphalerite; brass-coloured minerals are predominantly pyrite.

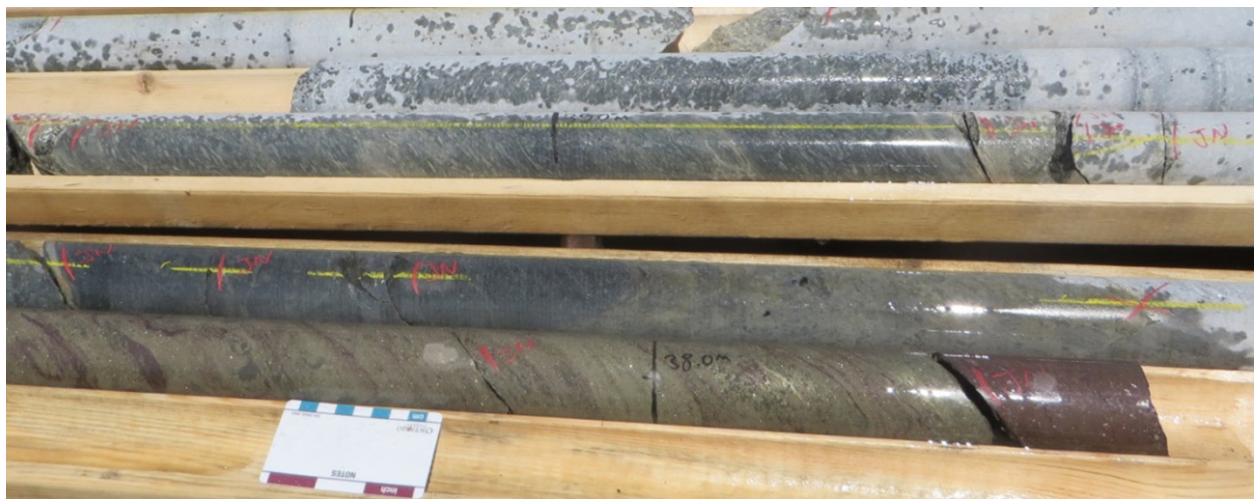


Photo 4. South Bay Mine massive sulphide core from DDH 008; note the sharp contact at bottom right between edge of a brown sphalerite ore zone (core broke along contact) with pyrite-rich sulphide layer. The drill hole ended in an open stope.

Table 11. Descriptions and locations of samples collected from the South Bay Mine.

Sample No.	Location	Description
2013CS009A	Tailings pond 522230E 5662623N	Tailings, 20 cm light grey, fine sand-sized material at top of tailings just below 3 to 8 cm rusty oxidized layer
2013CS009	Tailings pond 522230E 5662623N	Tailings, dark grey, fine sand-sized material; continues to depth
2013CS010	Tailings pond 522235E 5662692N	Tailings, wet tailings; dark grey; no light grey at this site
2013CS011	Tailings pond 522166E 5662710N	Tailings, wet tailings; light and dark material are mixed in sample
2013CS012	Sample from large poly bag of tailings-like material on road beside tailings pond	Tailings-like material, brown, sand size; source of this material is not known
2015CS014	DDH 013 15 to 15.3 m	4 cm thick quartz-carbonate vein, approximately parallel to core axis
2015CS025	DDH 012 17.5 to 18 m	Fine-grained, well-foliated felsic fragmental rock logged as rhyolitic tuff (Photo 5)
2015CS026	DDH 012 13.4 to 14 m	Dark grey fragmental rock with minor pyrite and quartz veinlets
2015CS027	DDH 002 16.5 to 17 m	Felsic lapilli tuff; medium grey with light grey, lapilli-sized fragments comprising 80% of the rock fragments; look to be stretched slightly (<i>see</i> Photo 5)
2015CS028	DDH 005 5.5 to 6 m	Foliated QFP
2015CS029	DDH 005 7.0 to 7.5 m	Massive fine-grained felsic intrusive rock with minor fine euhedral pyrite
2015CS030	DDH 004 8.7 to 9.0 m	Fine-grained light beige dike with trace amounts of disseminated pyrite
2015CS031	DDH 004 11.0 to 11.5 m	Light grey chloritic QFP with minor quartz veinlets and disseminated pyrite
2015CS032	DDH 010 8.0 to 8.5 m	Dark grey chloritic QFP with traces of disseminated pyrite
2015CS033	DDH 002 10.0 to 10.5 m	QFP; approximately 75% phenocrysts; weak foliation (<i>see</i> Photo 5)
2015CS034	DDH 002 21.5 to 22.0 m	Lapilli tuff similar to 2015CS027
2015CS035	DDH 007 10.8 to 11.05 m	Light grey, fine-grained chlorite-altered felsic; minor disseminated euhedral pyrite
2015CS036	DDH 006A 11.0 to 11.5 m	Fine-grained, grey massive QFP
2015CS037	DDH 006A 13.0 to 13.5 m	Felsic fragmental; medium to dark grey chloritic lapilli and larger fragments; minor discontinuous pyrite layers
2015CS038	DDH 008 36.0 to 36.5 m	Grey chloritic QFP foliated 45° to core axis; minor pyrite
2015CS039	DDH 009 14.0 to 14.51 m	Altered QFP in contact with massive sulphide
2015CS040	DDH 013 10.0 to 10.5 m	Deformed felsic lapilli tuff; fragments are stretched parallel to foliation; rock is approximately 80% lapilli and larger fragments; some larger fragments are quartz-phyric and contain minor pyrite
2015CS070	South Bay Mine	Rusty gravel from pails of material at concentrator site
2015CS071	South Bay Mine	Rusty weathered gravel and possible mill concentrate, from road at south side of concentrator site

Abbreviations: DDH = diamond-drill hole; QFP = quartz-feldspar porphyry; UTM = Universal Transverse Mercator co-ordinates provided using North American Datum 1983 (NAD83) in Zone 15.

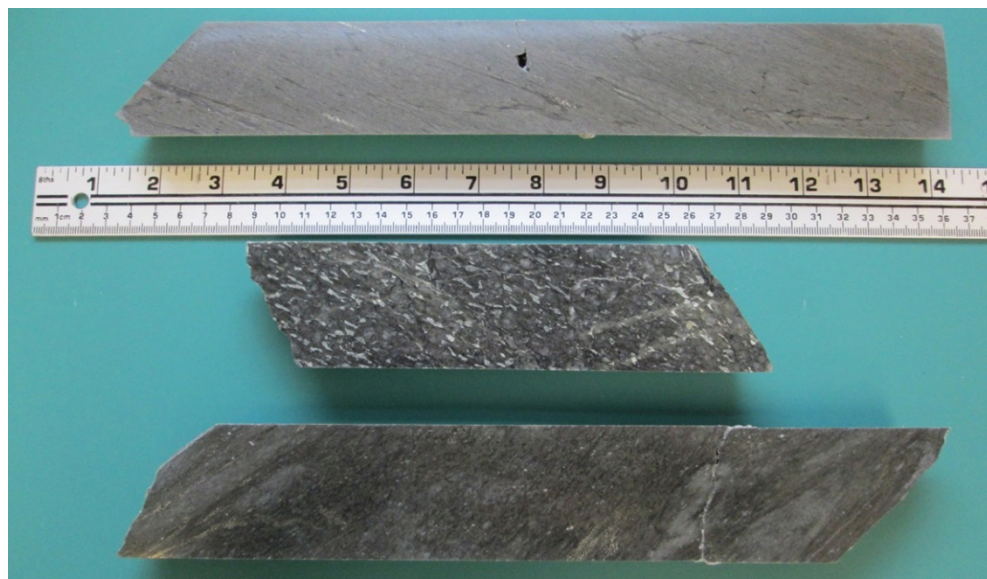


Photo 5. South Bay Mine polished diamond-drill core: sample 2015CS025 (top) is fine ash tuff from DDH 012; sample 2015CS033 (centre) is quartz feldspar porphyry from DDH 002; sample 2015CS027 (bottom) is felsic lapilli tuff from DDH 002; all core is NQ size.

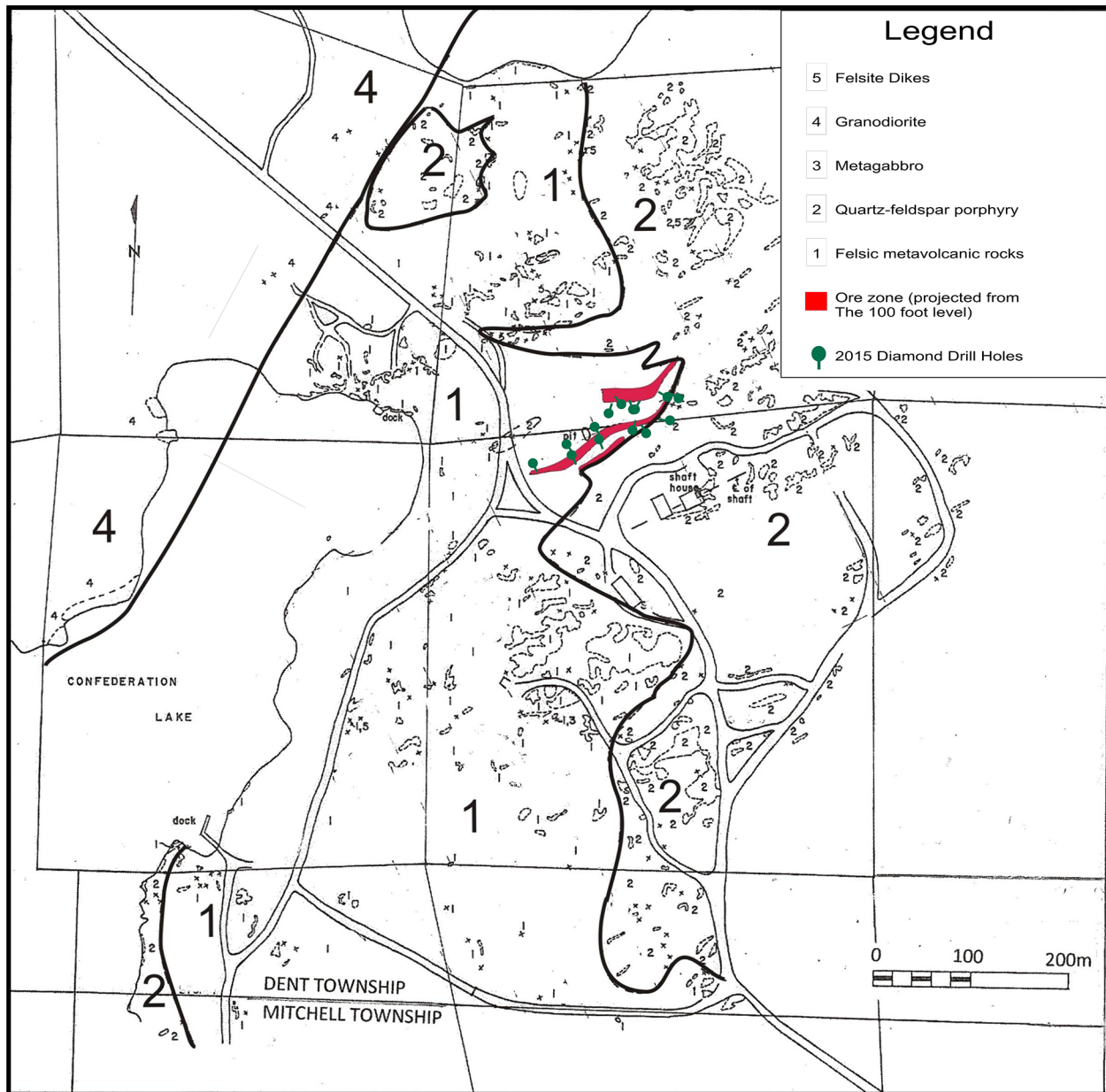


Figure 16. Surface geology of the South Bay Mine showing ore zones projected to surface and locations of 2015 diamond-drill holes. The drill-hole locations are shown in more detail in Figure 17. Geology *after* a compilation by A.P. Pryslak, based on 1971 to 1978 published and unpublished field trip guides to the South Bay Mine. Drill-hole locations from site map provided by AMEC Foster–Wheeler Environment and Infrastructure.

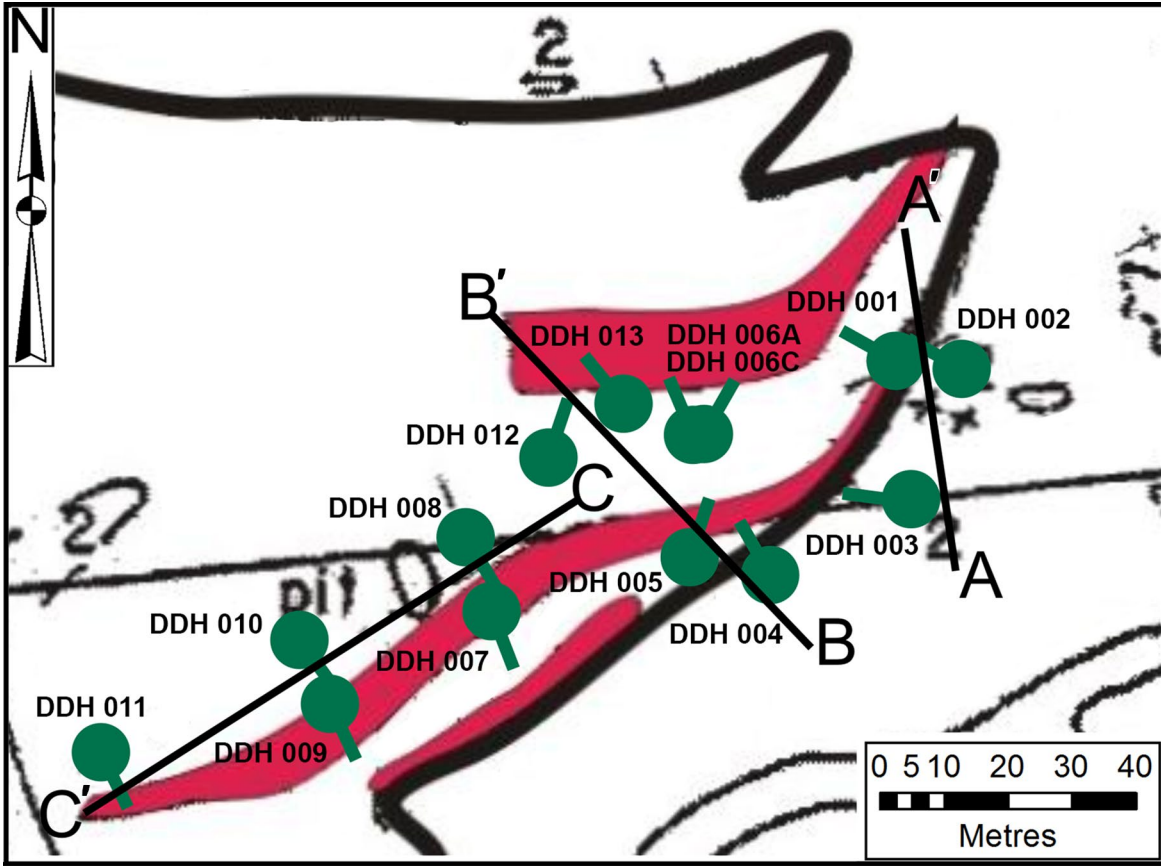


Figure 17. Detailed map of South Bay Mine showing diamond-drill hole (DDH) locations (green dots) and the surface projection of ore zones (in red). Details of diamond-drill cores along transects A–A’, B–B’ and C–C’ are shown in Figures 18, 19 and 20, respectively.

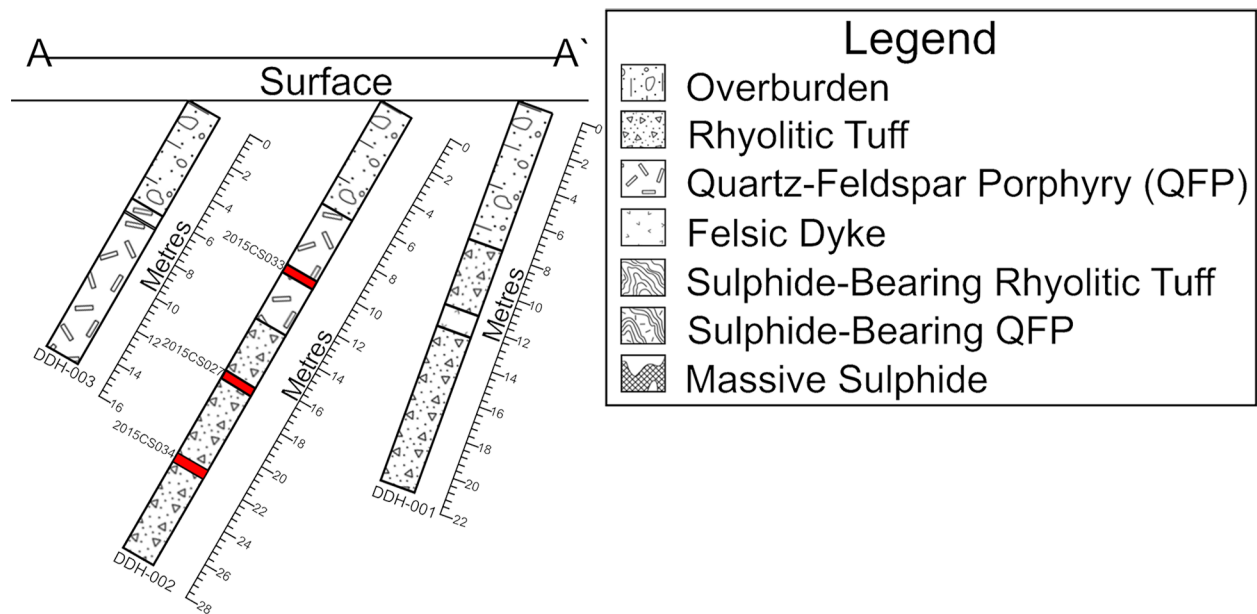


Figure 18. Geology of diamond-drill cores along transect A–A’, as indicated in Figure 17. Sections of drill core sampled for geochemical analyses are labelled (“2015CS”) and are indicated in red (see Table 11 for drill-core sample descriptions).

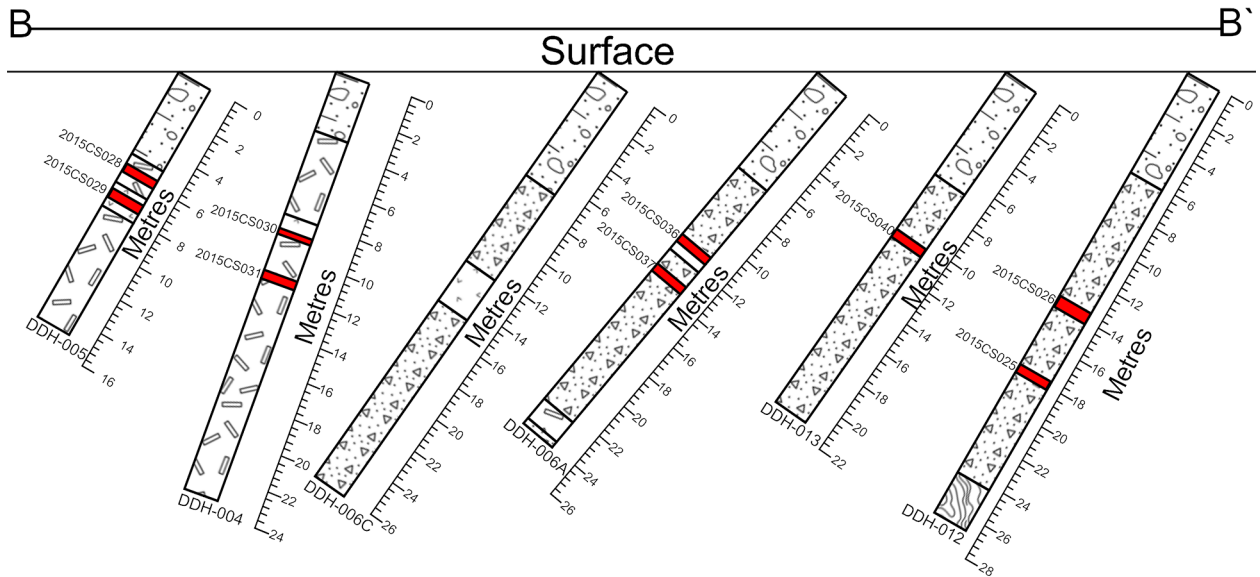


Figure 19. Geology of diamond-drill cores along transect B–B', as indicated in Figure 17. Sections of drill core sampled for geochemical analyses are labelled (“2015CS”) and are indicated in red (*see* Table 11 for drill-core sample descriptions). Legend for geology (patterns) shown in Figure 18.

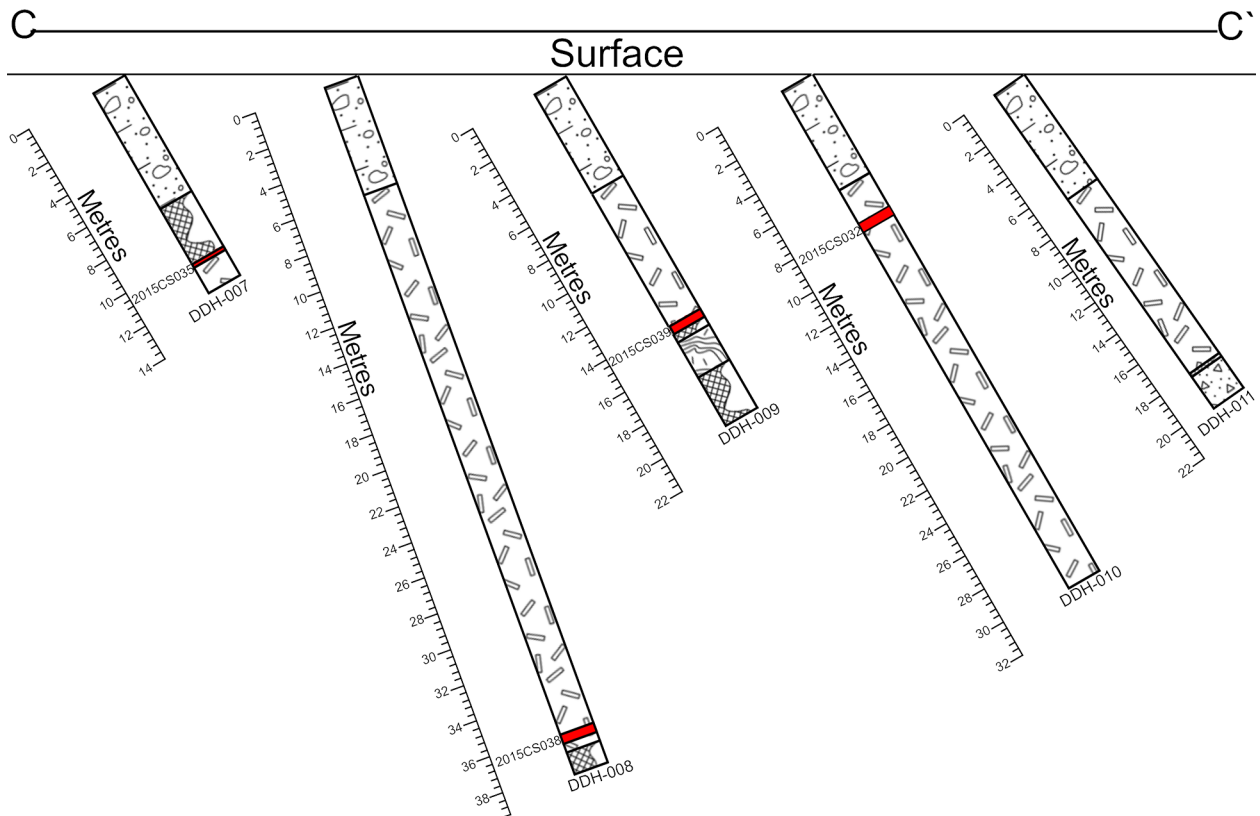


Figure 20. Geology of diamond-drill cores along transect C–C', as indicated in Figure 17. Sections of drill core sampled for geochemical analyses are labelled (“2015CS”) and are indicated in red (*see* Table 11 for drill-core sample descriptions). Legend for geology (patterns) shown in Figure 18.

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Table 12 contains the major element analyses as reported by the OGS Geoscience Laboratories, and also includes a calculated LOI factor used to recalculate the analyses to a volatile-free version for use in the discrimination diagrams (Figures 21 to 25). This was determined by subtracting the LOI value from the analysis total, then divide 100 by this number to give the LOI factor. The other oxide values are multiplied by the LOI factor to give a volatile free number (Hollings 2016). An immobile trace element discrimination diagram (Zr/TiO_2 versus SiO_2), of 16 samples taken from the current diamond-drilling program, indicates that the majority of rocks are of rhyolitic composition (Figure 21). The samples fall into 3 distinct groups (Figure 22). These groups carry through the rest of the discrimination diagrams. The variable, and in some cases quite large, loss-on-ignition (LOI) and CO_2 values indicate a significant level of carbonatization in all but a few of the samples. The rocks sampled are described as rhyolite and all but 2015CS025 look like rhyolite. Five samples in particular (2015CS025, 029, 030, 035 and 036) have depressed SiO_2 content (*see* Table 12). This resulted in these 5 samples plotting in the andesite and basalt fields (*see* Figure 22). This was attributed to alteration and in particular carbonatization, but it could be a reflection of primary andesitic material deposited as the volcanic edifice was created. The sulphide content of the samples is reflected in elevated sulphur and iron content.

A felsic rock classification scheme using yttrium versus Zr/Y was used by Leshner et al. (1986) to discriminate between potentially productive and barren volcanic cycles within selected examples from the western Superior Province. When applied to the current South Bay samples (Figure 23), Group 1 rocks are all FIII rhyolites, Group 2 are FII and Group 1 are FI. These results are consistent with those from South Bay in Leshner et al. (1986: Figure 7b).

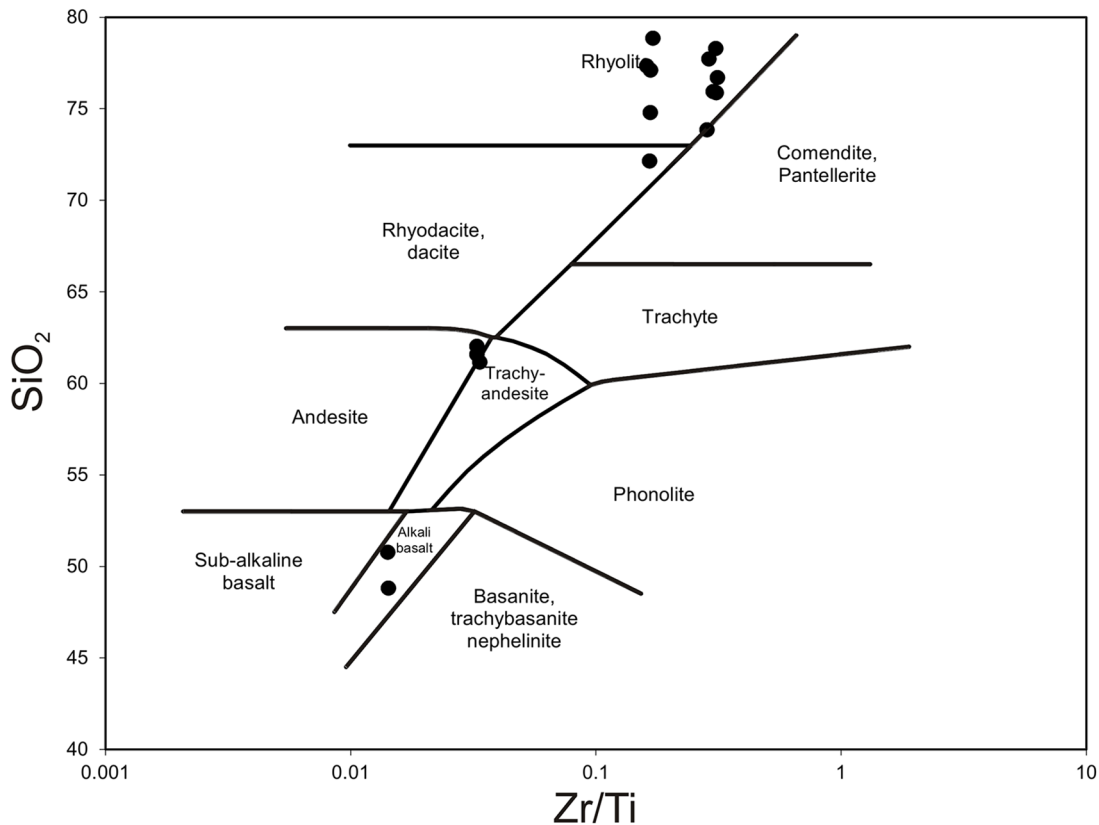


Figure 21. Zirconium–titanium ratio versus SiO_2 diagram for samples collected at the South Bay Mine (*after* Winchester and Floyd 1977).

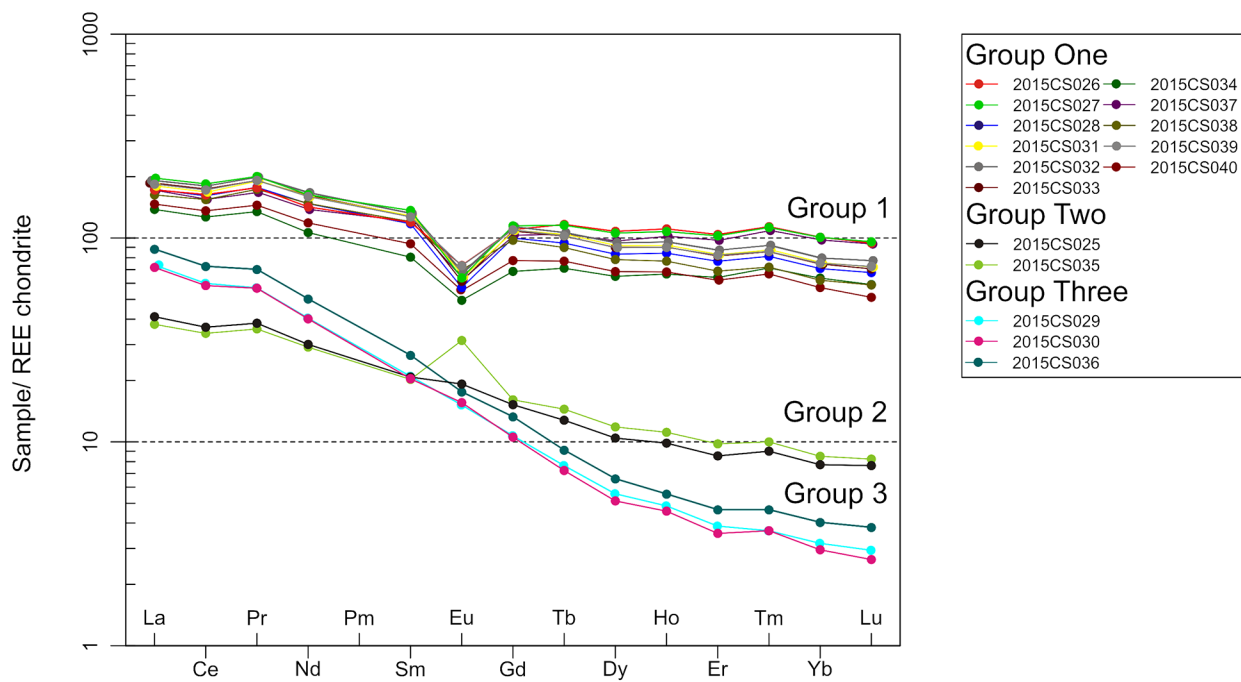


Figure 22. Chondrite-normalized REE patterns for samples collected at the South Bay Mine (normalizing values from Nakamura 1974); see Table 14 for analyses.

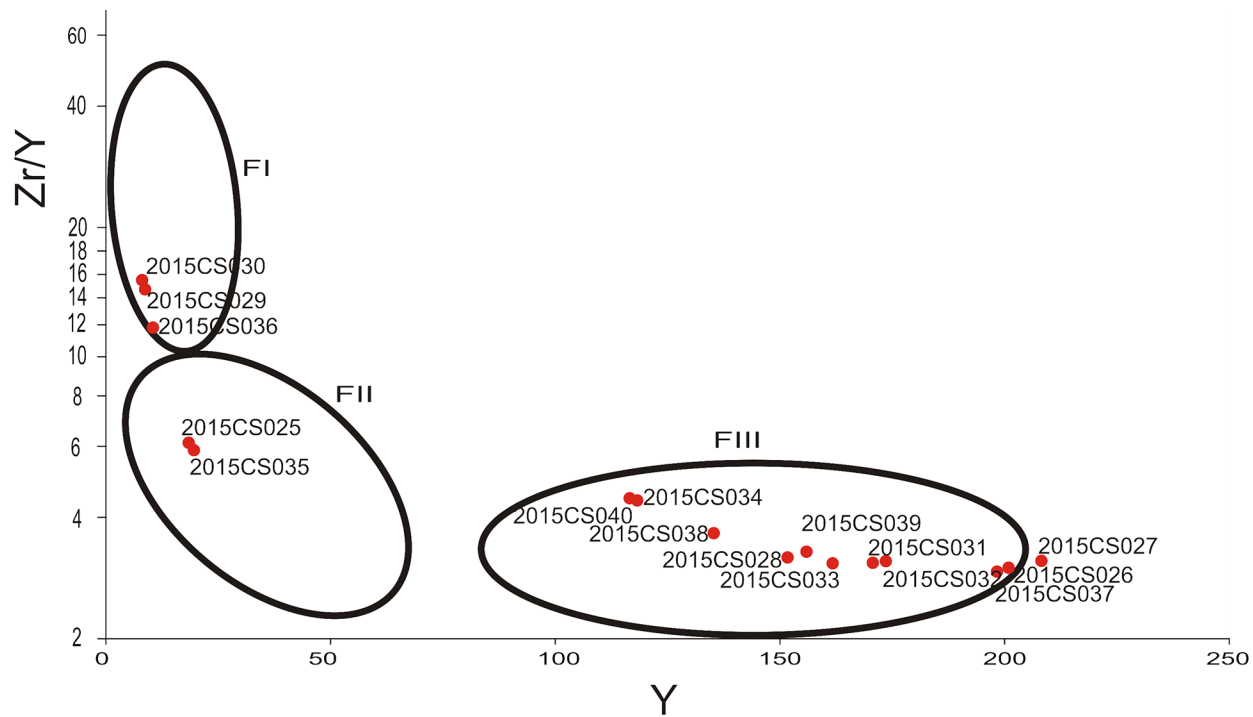


Figure 23. Felsic geochemistry plot using FI-type versus FII- and FIII-type classification (yttrium versus Zr-Y ratio plot) for samples collected at the South Bay Mine (after Leshner et al. 1986).

A magmatic affinities plot (Figure 24: zirconium versus yttrium) indicates the samples are calc-alkaline to transitional, except samples 2015CS025 and 035, which plot as tholeiitic (possibly due to strong carbonate alteration).

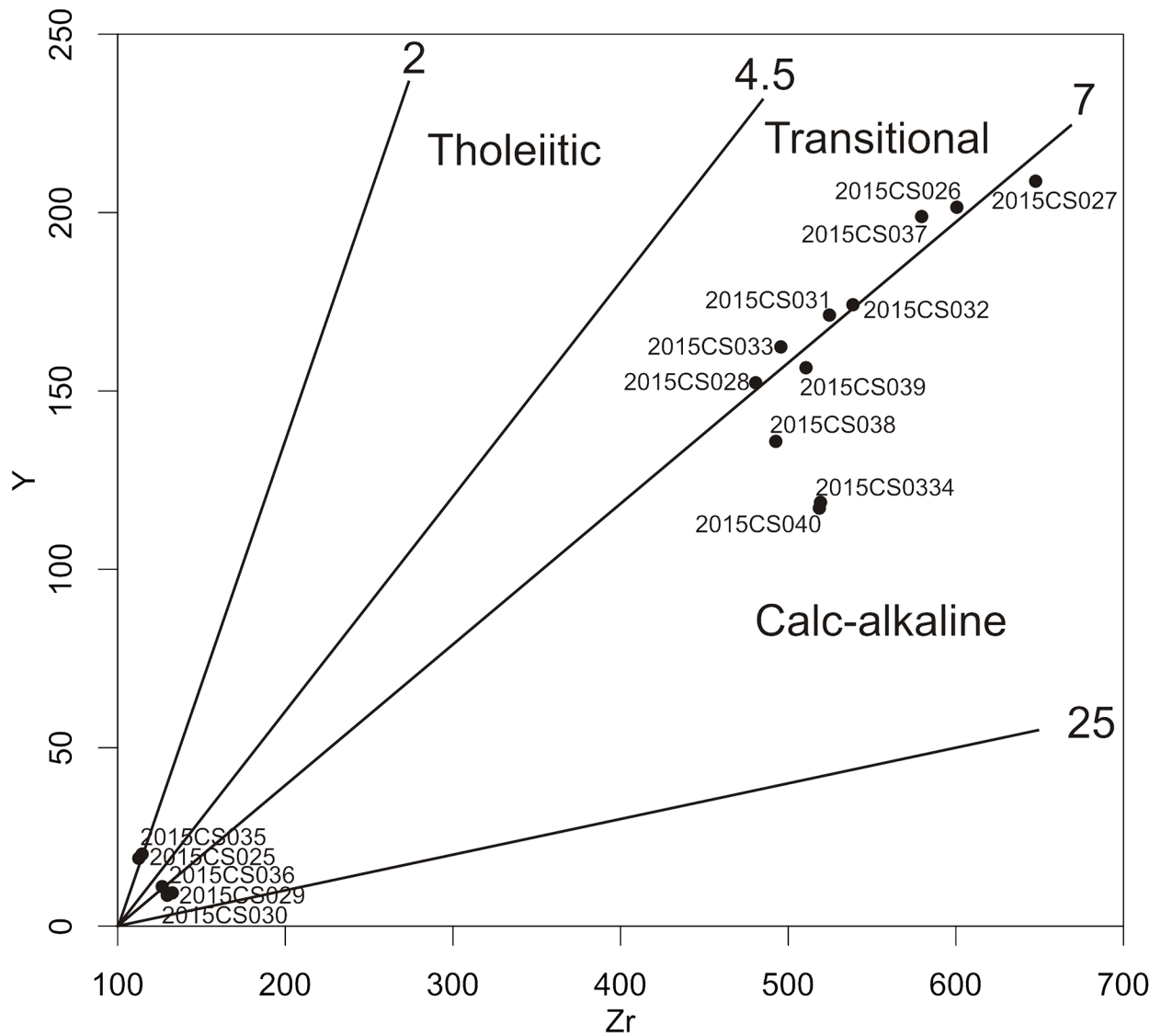


Figure 24. Magmatic affinities (Zr versus Y) plot for samples collected at the South Bay Mine (after MacLean and Barrett 1993).

ALTERATION

The average Na₂O content is 2.19%, with several below 1% (*see* Table 12). This is significantly lower than the 2.9% found by McConnell (1976) for what he termed “background rocks” in the mine area.

An alteration index versus chlorite-carbonate-pyrite index (CCPI) (referred to as an “alteration box plot”) (Figure 25) was constructed following the method of Large et al. (2001). This plot shows the alteration trends of the samples and shows that the same grouping that appeared in Figures 21 to 25 are present, namely

- Group 1, FIII rocks are the most altered and have an affinity for the chlorite-pyrite-(sericite) alteration axis
- Group 2, FII rocks are dominantly carbonate-altered
- Group 3, FI rocks appear as the least-altered suite

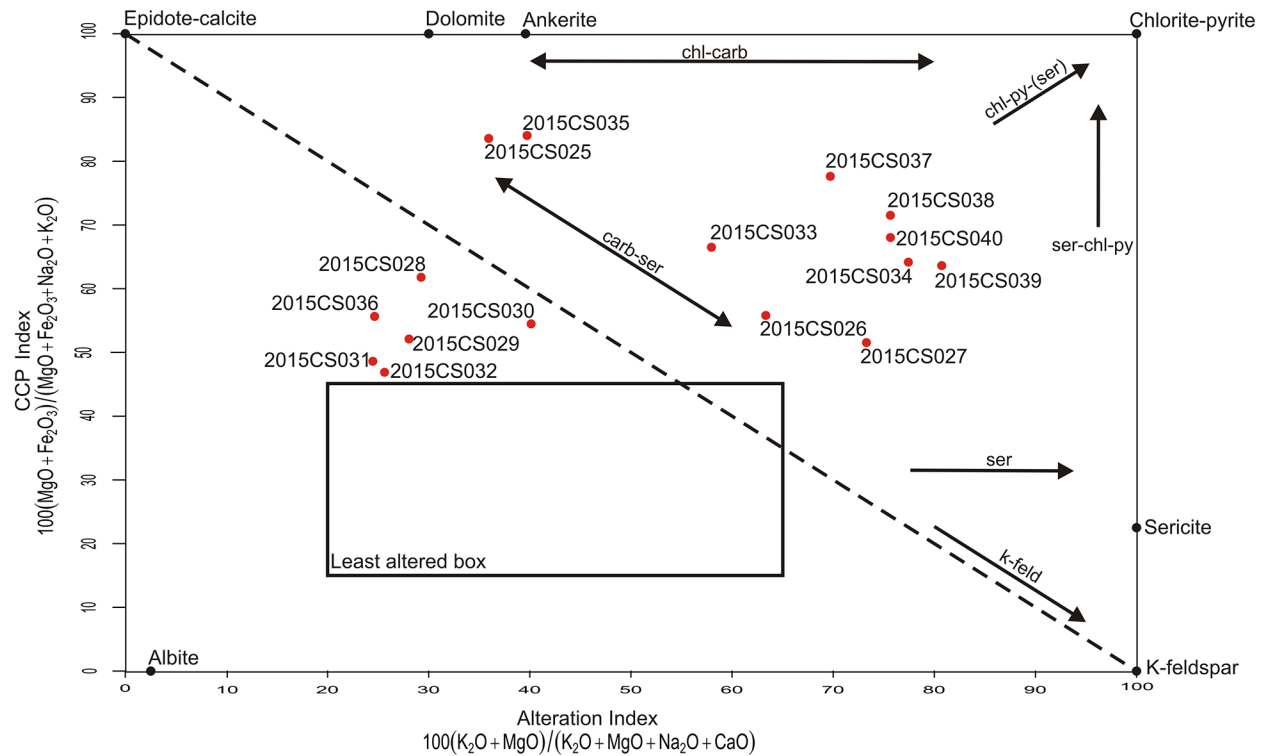


Figure 25. Alteration index versus chlorite-carbonate-pyrite index (CCPI) (“alteration box plot”) for samples collected at the South Bay Mine (*after* Large et al. 2001).

Table 12. Major element analyses for samples collected at the South Bay Mine (for sample descriptions, see Table 11).

	Al ₂ O ₃ (wt %)	BaO (wt %)	CaO (wt %)	Cr ₂ O ₃ (wt %)	Fe ₂ O ₃ (wt %)	K ₂ O (wt %)	LOI (wt %)	MgO (wt %)	MnO (wt %)	Na ₂ O (wt %)	P ₂ O ₅ (wt %)	SiO ₂ (wt %)	TiO ₂ (wt %)	Total (wt %)	CO ₂ (wt %)	S (wt %)	LOI Factor
Detection Limit:	0.02	0.004	0.006	0.002	0.01	0.01	0.05	0.01	0.002	0.02	0.002	0.04	0.01		0.023	0.003	
2015CS025	13.67	<0.004	7.111	0.02	11.72	0.31	12.23	5.49	0.192	3.07	0.346	44.62	1.37	100.17	10.034	0.144	1.14
2015CS026	12.97	0.04	0.409	<0.002	2.77	1.77	2.7	0.79	0.031	1.05	0.087	76.19	0.57	99.37	0.375	0.841	1.03
2015CS027	14.7	0.06	0.967	<0.002	2.99	3.22	3.51	1.02	0.11	0.55	0.087	72.07	0.66	99.93	1.411	0.965	1.04
2015CS028	11.82	0.04	1.637	<0.002	6.1	1.19	3.13	0.79	0.17	3.07	0.048	70.94	0.3	99.23	2.529	0.765	1.03
2015CS029	15.56	0.04	5.015	<0.002	4.91	1.68	7.85	2.26	0.106	4.91	0.198	56.58	0.68	99.79	6.713	0.645	1.09
2015CS030	15.57	0.07	4.978	<0.002	4.95	3.12	8.27	2.22	0.074	2.87	0.197	56.56	0.67	99.55	7.412	0.162	1.09
2015CS031	12.15	0.04	1.435	<0.002	3.99	1.13	2.96	0.56	0.092	3.68	0.046	73.52	0.31	99.89	2.045	0.012	1.03
2015CS032	11.79	0.05	1.231	<0.002	3.92	1.14	2.34	0.75	0.041	4.15	0.044	73.84	0.34	99.63	1.355	0.007	1.02
2015CS033	11.8	0.06	1.727	<0.002	4.57	2.22	3.72	1.05	0.063	0.61	0.041	73.59	0.29	99.75	1.998	0.079	1.04
2015CS034	12.3	0.05	0.436	<0.002	4.49	2.5	3.11	0.99	0.064	0.56	0.067	73.98	0.57	99.1	0.373	1.785	1.03
2015CS035	13.98	0.02	6.589	0.03	13.7	0.96	11.59	5.21	0.373	2.63	0.353	43.09	1.41	99.93	9.286	0.058	1.13
2015CS036	15.42	0.05	4.914	<0.002	5.32	0.61	6.7	3.05	0.097	6.06	0.217	57.22	0.67	100.33	6.127	0.267	1.07
2015CS037	12.69	0.04	1.027	<0.002	7.64	2.11	4.31	1.56	0.324	0.54	0.077	68.66	0.56	99.54	1.665	1.792	1.05
2015CS038	11.19	0.05	0.502	<0.002	5.65	2.16	2.55	1.08	0.063	0.52	0.046	75.11	0.33	99.26	0.626	0.136	1.03
2015CS039	11.55	0.07	0.611	<0.002	4.44	2.79	2.7	0.86	0.108	0.24	0.045	75.55	0.32	99.28	0.86	0.081	1.03
2015CS040	12.12	0.04	0.531	<0.002	4.52	2.17	2.96	1.29	0.073	0.56	0.071	74.68	0.56	99.57	0.635	0.699	1.03

*Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario.
Loss-on ignition (LOI) Factor is a calculated variable used to produce volatile-free whole-rock recalculation.*

Table 13. Trace element analyses for samples collected at the South Bay Mine (for sample descriptions, see Table 11).

	Ba (ppm)	Be (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Ga (ppm)	Hf (ppm)	In (ppm)	Li (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)
Detection Limit:	0.8	0.04	0.47	0.013	0.13	3	0.013	1.4	0.04	0.14	0.0018	0.4	0.08	0.028	0.7	0.18
2013CS009	112.6	0.5	>47	>4	>187	5	0.53	1253.4	26.77	5.39	>1.9	4.4	1.11	12.427	5.2	>700
2013CS009A	213.9	1.32	>47	>4	39.37	12	0.941	580.4	36.69	10.55	1.7156	7.8	1.43	25.855	3.1	>700
2013CS010	126.3	0.84	>47	>4	149.81	14	0.912	569.4	38.91	6.56	1.1819	5.7	1.11	14.271	8.2	>700
2013CS011	216.5	1.38	>47	0.153	129.24	14	1.74	51.1	53.48	8.67	0.2404	8.8	1.36	18.239	5.2	>700
2013CS012	43.3	2.41	0.25	>4	0.59	123	0.308	10.4	2.18	0.14	0.0172	3.7	10.17	1.096	22.1	3.9
2015CS014	65.2	0.4	<0.47	0.777	9.04	192	0.575	9.6	3.58	0.61	0.0633	6	1.46	1.157	28	22.7
2015CS025	50.3	0.8	<0.47	1.456	39.08	181	0.312	361	16.99	2.53	0.1342	74	0.8	5.87	98.8	17.7
2015CS026	285.5	3.2	<0.47	>4	4.61	18	1.71	45.5	31.65	18.21	0.2948	41.4	2.32	38.614	0.9	24
2015CS027	563.9	2.6	<0.47	0.239	6.16	12	2.611	7.7	34.46	19.52	0.1524	26.8	2.35	44.198	0.7	19.4
2015CS028	283	1.38	0.67	3.521	7.49	26	0.681	139.4	27.46	13.44	0.6662	14.2	3.01	22.777	6.2	20.7
2015CS029	373.5	1.43	<0.47	0.157	16.32	33	1.312	20.9	19.79	3.27	0.0737	15.8	0.38	4.356	20.7	12.7
2015CS030	585.9	1.77	<0.47	0.095	14.21	29	2.495	20.3	19.99	3.31	0.0341	7.6	0.21	3.833	21.3	6.4
2015CS031	367.3	2.17	<0.47	0.076	2.24	27	0.703	3.1	27.38	14.33	0.2474	10.8	2.25	24.619	1.1	3.6
2015CS032	467.1	2.66	<0.47	0.382	2.17	22	0.948	7.7	29.25	14.66	0.2429	18.3	2.24	25.375	1.2	5.1
2015CS033	489.7	2.16	<0.47	0.143	1.77	21	1.525	5.4	27.35	13.7	0.2359	24.5	2.03	24.806	1.1	9.2
2015CS034	328.9	1.8	<0.47	0.948	4.59	11	2.001	17.2	27.45	16.56	0.2728	30.8	1.91	35.1	0.7	108.8
2015CS035	177.4	1.17	<0.47	0.695	40.72	188	0.548	67.1	24.29	2.77	0.2017	53.1	0.73	6.038	103.9	5.7
2015CS036	375	1.28	<0.47	0.093	15.88	77	0.618	26.1	19.19	3.33	0.0353	31.8	0.29	4.457	44.2	29.6
2015CS037	352.2	2.16	<0.47	>4	7	7	1.909	104.4	30.36	17.48	0.2295	48.8	1.97	38.568	0.8	42.1
2015CS038	434.2	2.29	<0.47	0.755	1.72	13	1.291	21.6	28.6	13.59	0.2986	23.3	2.91	23.748	0.9	4.8
2015CS039	572.8	2.57	<0.47	0.558	1.69	22	1.517	23.7	40.99	14.36	0.296	17.5	2.91	23.176	0.9	7.3
2015CS040	285.4	2.34	<0.47	0.284	3.21	11	1.809	7	26.61	16.09	0.106	41.3	1.64	35.429	2.1	16
	Ba (ppm)	Be (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Ga (ppm)	Hf (ppm)	In (ppm)	Li (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)
Detection Limit:	0.1	0.04	0.01	0.02	0.03	1	0.023	0.07	0.004	0.05	0.002	0.03	0.03	0.02	0.2	0.2
2015CS070	61.7	0.32	>47	>40	23.52	49	0.650	>500	35.21	0.55	>35	6.16	2.36	1.22	11.9	>150
2015CS071	26.8	0.26	>47	>40	18.2	24	0.530	>500	28.38	0.2	>35	4.88	1.07	1.06	11.6	>150

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples except 2015CS070 and 071 were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) after a four-acid digestion in a closed beaker. Samples 2015CS070 and 071 were analyzed by ICP-MS after a modified aqua regia extraction designed for soils and unconsolidated materials. The analyses after the aqua regia extraction have a different working range and range of analytes from those used for the other samples.

Table 13, continued.

	Rb (ppm)	Sb (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	Ti (ppm)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Zn (ppm)	Zr (ppm)
Detection Limit:	0.11	0.04	0.16	0.6	0.007	0.018	7	0.002	0.011	0.8	0.05	1.8	6
2013CS009	12.35	>28	>14	35.5	0.806	1.795	1315	2.577	0.576	5.7	41.18	6402	184
2013CS009A	22.91	>28	>14	61.4	1.671	3.443	3040	2.206	1.113	12.4	30.25	1012	357
2013CS010	17.9	24.78	>14	46	0.926	2.962	1516	4.621	0.942	11.1	13.59	1040	228
2013CS011	28.13	>28	>14	71.8	1.243	2.964	2235	5.551	0.883	20.3	23.18	48	274
2013CS012	4.44	1.01	0.32	>1560	0.069	0.884	500	2.009	64.599	23	0.15	389	7
2015CS014	11.44	2.83	0.9	100.4	0.061	0.253	1467	0.795	0.067	37.1	4.56	100	27
2015CS025	5.47	5.31	1.17	94.5	0.324	1.067	8171	0.34	0.284	175.7	1.15	295	116
2015CS026	35.35	3.56	9.1	117.8	2.519	8.827	3531	2.39	2.338	7.9	20.47	1578	604
2015CS027	64.86	7.07	8.93	65.8	2.832	9.633	3899	3.477	2.57	8.4	34.87	127	651
2015CS028	19.76	2.55	13.17	67.7	1.426	7.124	1701	1.246	1.814	9	4.76	1214	484
2015CS029	32.32	6.67	8.74	489.2	0.243	3.351	4154	1.984	0.857	76.2	5.47	99	136
2015CS030	61.11	5.3	0.91	373.1	0.247	3.332	4056	1.843	0.822	77.5	1.19	65	133
2015CS031	21.1	1.67	4.3	74.9	1.562	6.834	1703	0.794	1.958	4.1	4.94	84	528
2015CS032	21.41	1.37	4.19	71.8	1.532	7.37	1800	0.359	1.857	4.4	0.97	196	542
2015CS033	41.11	1.48	3.76	48.5	1.492	7.102	1592	1.784	1.701	3.7	1.46	130	499
2015CS034	45.8	9.99	8.81	50.3	2.359	7.983	3126	3.375	2.108	6.2	28.58	387	523
2015CS035	14.89	20.84	>14	88.4	0.347	1.148	8263	2.769	0.287	180.9	40.88	459	118
2015CS036	13.62	7.65	0.93	443.6	0.289	4.61	3863	0.736	1.26	89.5	0.86	111	130
2015CS037	44.56	13.31	7.79	65.3	2.516	8.661	3513	2.985	2.277	7.7	8.58	1187	583
2015CS038	34.87	3.88	8.39	26.2	1.426	6.708	1715	3.252	1.45	4.1	6.24	341	496
2015CS039	42.71	6.2	>14	22.7	1.462	7.081	1665	4.822	1.663	4.1	21.6	222	514
2015CS040	40.25	2.65	6.38	73.9	2.311	7.924	3233	2.671	2.107	7.5	14.02	151	522
	Rb (ppm)	Sb (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	Ti (ppm)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Zn (ppm)	Zr (ppm)
Detection Limit:	0.15	0.06	0.04	1.6	0.004	0.07	7.4	0.003	0.01	4	0.02	3	0.2
2015CS070	8.8	>50	10.83	26.69	<0.004	1.73	878.2	0.41	0.32	25	5.7	>600	19.35
2015CS071	6.52	35.31	19.89	19.16	0.01	1.81	565.9	0.628	0.63	21	2.3	>600	9.94

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples except 2015CS070 and 071 were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) after a four-acid digestion in a closed beaker. Samples 2015CS070 and 071 were analyzed by ICP-MS after a modified aqua regia extraction designed for soils and unconsolidated materials. The analyses after the aqua regia extraction have a different working range and range of analytes from those used for the other samples.

Table 14. Rare earth element and scandium analyses for samples collected at the South Bay Mine (for sample descriptions, see Table 11).

	Ce (ppm)	Dy (ppm)	Er (ppm)	Eu (ppm)	Gd (ppm)	Ho (ppm)	La (ppm)	Lu (ppm)	Nd (ppm)	Pr (ppm)	Sm (ppm)	Tb (ppm)	Tm (ppm)	Y (ppm)	Yb (ppm)	Total	Sc (ppm)
Detection Limit:	0.12	0.009	0.007	0.0031	0.009	0.0025	0.1	0.002	0.06	0.014	0.026	0.0023	0.0019	0.05	0.009		1.1
2013CS009	46.61	11.57	6.86	3.70	10.40	2.35	19.77	0.87	28.86	6.60	8.27	1.78	0.96	63.18	6.02	217.80	3
2013CS009A	53.34	20.32	12.66	3.77	15.85	4.30	22.37	1.68	34.30	7.61	9.96	2.96	1.81	118.62	11.48	321.03	5.4
2013CS010	60.69	13.60	8.04	3.74	12.71	2.75	24.51	1.09	39.22	8.79	10.83	2.12	1.18	74.16	7.43	270.86	4.6
2013CS011	178.31	22.76	10.88	8.43	29.65	4.04	67.82	1.28	118.85	26.53	31.49	4.16	1.50	103.76	9.10	618.56	6.8
2013CS012	43.45	5.83	3.84	1.41	6.94	1.31	33.96	0.48	31.77	7.33	6.31	0.94	0.52	50.92	3.09	198.10	2.8
2015CS014	11.27	3.36	1.68	1.74	3.18	0.63	4.71	0.18	7.81	1.66	2.39	0.53	0.23	17.98	1.34	58.67	11
2015CS025	31.59	3.58	1.92	1.48	4.20	0.69	13.57	0.26	18.95	4.28	4.22	0.60	0.27	18.96	1.70	106.27	23.9
2015CS026	141.40	36.98	23.42	5.65	30.33	7.76	56.76	3.21	89.49	19.74	24.26	5.48	3.41	201.43	22.21	671.53	9
2015CS027	159.42	36.26	23.07	4.91	31.67	7.53	64.94	3.26	102.71	22.45	27.73	5.43	3.38	208.74	22.17	723.67	11.8
2015CS028	139.28	28.58	17.30	4.40	27.58	5.90	57.12	2.30	92.91	19.86	23.84	4.44	2.44	152.24	15.58	593.77	5
2015CS029	51.87	1.91	0.87	1.17	2.96	0.34	24.36	0.10	25.50	6.38	4.26	0.36	0.11	9.26	0.70	130.15	7.9
2015CS030	50.53	1.76	0.80	1.20	2.91	0.32	23.66	0.09	25.27	6.35	4.14	0.34	0.11	8.59	0.65	126.72	7.8
2015CS031	145.58	31.50	18.69	4.99	30.15	6.45	59.45	2.45	100.61	21.43	26.03	4.90	2.63	171.21	16.67	642.74	4.5
2015CS032	155.50	32.48	19.60	5.19	31.32	6.69	63.02	2.63	105.02	22.26	26.78	4.99	2.76	174.11	17.54	669.89	4.6
2015CS033	150.46	30.85	18.37	4.72	29.86	6.32	61.40	2.40	101.99	21.46	26.00	4.80	2.57	162.28	16.41	639.89	4.1
2015CS034	109.66	22.24	14.41	3.81	18.93	4.66	45.58	2.01	67.01	15.09	16.35	3.34	2.14	118.78	13.99	458.00	6.3
2015CS035	29.46	4.06	2.20	2.42	4.44	0.78	12.45	0.28	18.36	4.01	4.11	0.68	0.30	20.12	1.87	105.54	24.9
2015CS036	63.07	2.27	1.05	1.36	3.68	0.39	29.21	0.13	31.80	7.89	5.42	0.43	0.14	11.01	0.89	158.74	10.1
2015CS037	134.09	33.22	21.95	4.85	28.52	7.15	56.59	3.18	87.05	18.77	24.47	4.91	3.27	198.84	21.54	648.40	10.8
2015CS038	133.47	26.89	15.48	5.38	26.90	5.39	53.71	2.00	93.12	19.42	24.42	4.22	2.16	135.81	13.66	562.03	3.3
2015CS039	148.36	30.67	18.47	5.61	30.15	6.28	60.43	2.46	100.29	21.4	25.68	4.80	2.57	156.45	16.48	630.10	4.2
2015CS040	117.6	23.48	13.97	4.25	21.39	4.77	48.41	1.74	74.75	16.23	19.02	3.62	2.00	117.10	12.57	480.90	6.5
	Ce (ppm)	Dy (ppm)	Er (ppm)	Eu (ppm)	Gd (ppm)	Ho (ppm)	La (ppm)	Lu (ppm)	Nd (ppm)	Pr (ppm)	Sm (ppm)	Tb (ppm)	Tm (ppm)	Y (ppm)	Yb (ppm)	Total	Sc (ppm)
Detection Limit:	1.9	0.06	0.011	0.03	0.15	0.013	0.8	0.003	0.6	0.2	0.06	0.02	0.004	0.3	0.02		0.5
2015CS070	19	1.92	1.31	0.5	2.06	0.404	9.3	0.17	9.8	2.4	2.27	0.353	0.185	10.56	1.14	61.37	2.9
2015CS071	16	1.06	0.52	0.43	1.57	0.18	6.68	0.081	8.99	2.04	2.07	0.22	0.08	3.93	0.52	44.37	1.67

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples except 2015CS070 and 071 were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) after a four-acid digestion in a closed beaker. Samples 2015CS070 and 071 were analyzed by ICP-MS after a modified aqua regia extraction designed for soils and unconsolidated materials. The analyses after the aqua regia extraction have a different working range and range of analytes from those used for the other samples.

TRACE AND RARE EARTH ELEMENTS

Trace element values of core samples from this study are given in Table 13. Discussion is limited to the rare earth elements (Table 14).

Three distinct rare-earth element groups are recognized on a chondrite-normalized REE plot (*see* Figure 22):

- Group 1 includes most of the samples and displays a relatively flat slope and negative europium anomalies;
- Group 2 comprises carbonatized samples 025 and 035 displays a steeper slope than Group 1 and positive europium anomalies;
- Group 3 comprises samples 029, 030 and 034, displays the steepest slope and no europium anomalies.

Comparing this diagram to a diagram by Franklin (2014, p.114) indicates that the temperature of formation of Group 1 rhyolites fall in the intermediate-temperature range, whereas groups 2 and 3 fall in the low-temperature range. Group 2 rocks (most of the South Bay samples) have the potential to host VMS deposits that are Zn-Cu-(Pb) rich, whereas lower-temperature Group 3 rocks would have VMS-mineralization that is Zn-Pb-Ag-Au dominant.

Trace elements (not REE) in the rock samples are low with most values less than 100 ppm. These were not treated statistically to determine anomaly levels. Zinc is high in several samples, but 2 other common base metals—copper and lead—are not high (highest values are 139.4 ppm Cu in sample 028 and 108.8 ppm Pb in sample 034). The tailings samples are higher in trace elements as would be expected. In spite of being highly altered and closely associated with the South Bay orebodies, the host rocks do not contain large amounts of metals.

The results of this core logging and geochemical study confirm that the rocks in the immediate vicinity of the South Bay orebodies are highly altered and have many of the characteristics (FIII rhyolite affinity, chlorite-pyrite alteration, Na₂O depletion) associated with many VMS deposits. The availability of new, well-documented diamond-drill core provided an opportunity to document features of the South Bay deposit that have not been accessible since the mine closed. The site still has base metal exploration potential and there are several base metal occurrences nearby (*see* Table 10). Geophysical surveys and follow-up diamond drilling could give additional insights to the base metal potential of the South Bay property.

Table 15. Assay analyses for precious metals for samples collected at the South Bay Mine (for sample descriptions, *see* Table 11). Note, samples with all assay values equal to or below the detection limit are not included in the table.

	Au (ppb)	Au (fire assay) (opt)	Ag (ppm)	Ag (fire assay) (opt)	Pt (ppb)	Pd (ppb)
Detection Limit:	8	0.016	0.01	0.1	0.4	1.3
2013CS009A	NA	<0.01	NA	0.7	<0.4	NA
2013CS009	624	0.01	NA	1.6	<0.4	<1.3
2013CS010	194	<0.01	NA	<0.1	<0.4	<1.3
2013CS011	366	<0.01	NA	0.4	<0.4	<1.3
2013CS012	<8	<0.01	NA	<0.1	0.5	<1.3
2015CS026	ND	<0.016	NA	0.4	ND	ND
2015CS027	8	<0.016	NA	<0.1	ND	ND
2015CS037	13	<0.016	NA	<0.1	ND	ND
2015CS040	11	<0.016	NA	<0.1	ND	ND
2015CS070	256	<0.016	61.7	1.5	ND	ND
2015CS071	657	<0.016	73.7	2.1	ND	ND

*Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario.
Abbreviations: NA indicates not analyzed; ND indicates not detected.*

Granitoid Rock Reconnaissance Sampling (C.C. Storey)

This multi-year sampling project was initiated in 2010 (Lichtblau et al. 2011, 2013). The rationale for the project and descriptions of the type deposits in question are found in Lichtblau et al. (2011, 2013). During the 2013, 2014 and 2015 field seasons, several rare metal-bearing pegmatite occurrences were examined and granitoid rocks sampled in a continuing effort to investigate the potential for rare earth element (REE) and rare element mineralization, in addition to furthering our understanding of known rare metal-bearing pegmatite occurrences. As a result of past exploration activity and research by OGS (Breaks, Selway and Tindle 2003), much more is known about the rare metal occurrences and rare metal mineral potential of the Red Lake District than the REE occurrences and REE mineral potential. Other than the known carbonatite occurrences (Sage 1987), there has been little exploration and research directed at other types of REE mineralization.

Table 16 contains locations and descriptions of all samples taken in 2013, 2014 and 2015 (all locations are NAD83 Zone 15). The first 4 digits of the sample number indicate the year the sample was taken; not all the samples listed were analyzed. A number of samples were taken from diamond-drill core and the bedrock intersections of a rotasonic drilling program carried out by Tri Origin Exploration Ltd. on their Red Lake Extension (RLX) property in Willans Township and South of Otter Lake claim map area in 2007, 2008 and 2009. A full description of this work and complete drill logs are found in assessment files AFRO# 2.37063, 2.43704 and 2.46460. The core is stored at the Red Lake Remote Drill Core Storage Site (*see* Table 8). This core provided information on bedrock in an area largely covered by overburden.

Average crustal REE abundances are provided in Table 17 and major element oxide analyses are provided in Table 18. The trace element results have been subdivided into 2 tables: Table 19 provides REE plus scandium, with an indication of which values exceed crustal abundances, and Table 20 provides the remaining trace elements, including the rare metals and related elements. Scandium has been grouped with the REE, but was not included in the total REE for the sample. Breaks, Selway and Tindle (2003) listed the following elements as “rare elements” (or “rare metals”): Li, Rb, Cs, Nb, Ta, Sn, F, B, Be, Tl and Ge.

Table 16. Sample locations and descriptions of samples collected during the granitoid rock reconnaissance study.

Sample	Property or Area	Location*	Description
2013CS030	Northern Iron Corp. Karas Lake property (sedimentary portion)	489483E 5676055N	Metasedimentary (biotite-quartz-feldspar) host to sample 031, in part lean iron formation
2013CS031	Northern Iron Corp. Karas Lake property	489483E 5676055N	White fine-grained granitic dike material folded with metasedimentary rock
2013CS032	Northern Iron Corp. Karas Lake property	489875E 5627101N	Sample of granitic to pegmatitic white mobilizate from migmatitic metasedimentary rock
2013CS033	Northern Iron Corp. Karas Lake property	460061E 5627101N	White granitic mobilizate from migmatized iron formation-bearing metasedimentary rock
2013CS035	Joyce Road South reconnaissance	500585E 5654227N	Massive light-grey granite with a few mafic xenoliths
2013CS036A	Joyce Road South reconnaissance	499486E 5656127N	Dark-grey massive granite with darker grey xenoliths; outcrop is cut by narrow 5 to 10 cm pink pegmatitic dikes; sample has both host rock and pegmatite and is subdivided into 036A mostly dark-grey host rock and 036B mostly pink pegmatitic material
2013CS036B	Joyce Road South reconnaissance	499486E 5656127N	Sample of pink pegmatitic material with some attached host rock
2013CS037	Joyce Road South reconnaissance	499486E 5656127N	Same as 036A, dark-grey granite, but cut by white muscovite-bearing pegmatite dike; sample from the pegmatite portion
2013CS039	Joyce Road South reconnaissance	501135E 5658706N	Light grey granite with white granitic pegmatite patches and veins; sample from pegmatite portion

Sample	Property or Area	Location*	Description
2013CS040	Joyce Road South reconnaissance	501429E 5658914N	Light pink pegmatite with minor quartz segregations; little obvious mica
2013CS041	Joyce Road South reconnaissance	501675E 5659059N	Grey granite cut by pink pegmatite sample from pink pegmatite
2013CS047	Pipestone Bay north shore Dupont Bay	415173E 5660088N	Pink granitic dike cutting large tonalite granitoid body (Sanborn-Barrie, Skulski and Parker 2004)
2013CS057	Red Lake Extension property (RLX 08-01)	466807E 5650976N	Sample 40.55 m to 40.6 m; narrow pink pegmatite dike; sample contains host granite on each contact
2013CS058	Red Lake Extension property (RLX 08-01)	466807E 5650976N	Sample 42.11 m to 43.57 m; massive pink granite subhedral to euhedral feldspar, grey quartz, 5% biotite
2013CS059	Hwy 804 granitoid	476527E 5603604N	Sill-like mass of pink granitic pegmatite hosted in fine-grained biotite metasedimentary rock; small amount of biotite as only mica; rock contains clots of biotite and garnet that may be digested inclusions
2013CS059A	Hwy 804 clotty granitoid	476527E 5603604N	As 059, but with clots that are a mixture of biotite, tourmaline and garnet with fine-grained quartz and feldspar
2013CS060	Hwy 804 granitoid	467186E 5603669N	Metasedimentary migmatite; sample from white mobilizate phase
2013CS061	Hwy 804 granitoid	481803E 5605152N	Metasedimentary migmatite; sample from white pegmatitic phase; most is quartz and white to cream feldspar and minor biotite
2013CS062	Red Lake Extension property (RLX 09-04)	469505E 5648227N	Sample 32.76 m to 33.08 m pink pegmatitic granitoid with grey quartz segregations (zoning?); quartz is grey in masses, but clear in individual grains; feldspar varies from 5-10 mm to 10 cm; some feldspars show a near schiller iridescence; biotite occurs in small masses and tiny flakes
2013CS063	Red Lake Extension property (RLX 09-04)	469505E 5648227N	Sample 33.08 m to 33.25 m; as 062, but contains a quartz segregation
2013CS064	Red Lake Extension property (RLX 09-04)	469505E 5648227N	Sample 33.25 m to 34.2 m as 062
2013CS065	Red Lake Extension property (RLX 09-04)	469505E 5648227N	Sample 38.32 m to 38.88 m as 062
2013CS072	Red Lake Extension property (RLX 09-09)	463953E 5647263N	Sample 36.12 m to 36.95 m; white to pale-pink pegmatite; most of rock is white to pink feldspar and grey quartz with minor biotite, muscovite and garnet; trace pyrite; feldspar grains up to 3 cm
2013CS073	Red Lake Extension property (RLX 09-09)	463953E 5647263N	Sample 36.95 m to 37.43 m host rock for 072 massive light-grey granitoid; 2 to 5% biotite, quartz, feldspar and minor garnet
2013CS074	Red Lake Extension property (RLX 09-04)	469505E 5648227N	Sample 76.8 m to 77.30 m muscovite-bearing pegmatitic granite; 5 to 10% muscovite; pink to white feldspar and dark grey quartz
2013CS075	Red Lake Extension property (RLX 09-05)	468415E 5649373N	Sample 38.99 m to 39.18 m pink pegmatite; coarse feldspar to 6 cm and some crystal masses greater than 12 cm; biotite-quartz-feldspar with minor pyrite; 2% biotite and minor muscovite
2013CS076	Red Lake Extension property (RLX 09-05)	468415E 5649373N	Sample 39.18 m to 39.67 m as 075
2013CS077	Red Lake Extension property (RLX 09-05)	468415E 5649373N	Sample 39.67 m to 40.05 m as 075 with small amount of pyrite
2013CS080	Meekis showing	370208E 5856764N	Massive pink, biotite-quartz-feldspar granitoid with very minor sulphide minerals
2013CS082	Red Lake Extension property (RLX 07-07) Rotosonic core	465380E 5647817N	Core Box 2: 8.5 cm sample, 60 cm from end of hole; core is badly broken; many pieces rotated in core barrel; pink fine-grained granitoid approx. 2 mm grain size; estimate 5% biotite, 30% quartz; remainder is feldspar
2013CS083	Red Lake Extension property (RLX 07-013) Rotosonic core	465380E 5647817N	Grey granitoid "host rock" cut by pink pegmatite; sample from top of bedrock intersection; 2 to 3 mm grain size, 5% biotite; rest is quartz and feldspar
2013CS084	Red Lake Extension property (RLX 07-013) Rotosonic core	465380E 5647817N	Pink pegmatite dike from same location as 2013CS083; 10 to 15% quartz; rest is feldspar; sample contains contact and a small amount of host rock
2013CS085	Red Lake Extension property (RLX 07-01) Rotosonic core	466352E 5643047N	Sample from Box 1 approx. 1.2 m below top of bedrock; pink, medium-grained granitoid; 10% biotite, foliated parallel to core axis

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Sample	Property or Area	Location*	Description
2013CS088	Red Lake Extension property (RLX 08-04)	467700E 5650368N	Sample 7.98 to 8.70 m; white to light grey pegmatite biotite-quartz-feldspar composition with minor pyrrhotite and pyrite blebs and fine-grained fracture fills
2013CS089	Red Lake Extension property (RLX 08-04)	467700E 5650368N	Sample 10.77 m to 11.2 m; similar to 088
2013CS090	Red Lake Extension property (RLX 08-04)	467700E 5650368N	Sample 6.1 m to 6.5 m; light pink pegmatite from top of hole; biotite-quartz-feldspar composition
2014CSOR08	Mill Road, Red Lake town site	442700E 5652290N	Dome stock granodiorite
2014CSOR10	Ear Falls Airport	472780E 5618440N	Pegmatitic granitoid
2014CS022	Tide Road	420935E 5586128N	Migmatite sample from <i>lit-par-lit</i> pink pegmatite
2014CS023	Tide Road	421205E 5586001N	Migmatite, similar to 022 sample from pegmatitic phase
2014CS024	Tide Road	422121E 5585770N	Pegmatite phase of migmatite
2014CS025	Tide Road	422121E 5585770N	Pegmatite phase of migmatite, similar to 024
2014CS026	Tide Road	424547E 5584197N	Massive pink granitoid with minor pegmatitic phases
2014CS047	Condor Precious Metals Inc. Narrow Lake showing area	509361E 5669692N	White pegmatite with muscovite flakes and small books to 6mm; host is mafic gabbroic/metavolcanic rock
2014CS048	Condor Precious Metals Inc. North Road outcrop	509226E 5668850N	White pegmatitic granite with quartz segregations and distinct pegmatite veins or dikes
2015CS046	Sandy Creek beryl occurrence	478032E 5615710N	White pegmatite from Trench 2; with fluorapatite
2015CS047	Sandy Creek beryl occurrence	478032E 5615710N	Aplitic pegmatite; Trench 2
2015CS048	Sandy Creek beryl occurrence	478032E 5615710N	Beryl-bearing pegmatite; Trench 2, beryl zone
2015CS049	McCombe Pegmatite	590783E 5643697N	Spodumene-bearing pegmatite from Dike 1 (<i>see</i> Breaks, Selway and Tindle 2003 for map)
2015CS050	McCombe Pegmatite basalt with quartz veins	590708E 5643018N	Dark green mafic metavolcanic rock host to pegmatite
2015CS050A	McCombe Pegmatite quartz veins	590708E 5643018N	Quartz vein from same site as 050
2015CS051	Slate Road reconnaissance (Root Lake area)	597903E 5638493N	Light pink pegmatitic dike cutting dark grey migmatitic gneiss. Pegmatite sampled contains 1 cm muscovite books
2015CS052	Slate Road reconnaissance (Root Lake area)	597903E 5638493N	Leucocratic layer in migmatitic gneiss same location as 051. Original lithology was iron formation (sample is 50% Fe ₂ O ₃)
2015CS053	Slate Road reconnaissance (Root Lake area)	599174E 5637344N	Migmatite gneiss outcrop with abundant white pegmatite layers containing muscovite; sample from loose material similar to smooth outcrop
2015CS053A	Slate Road reconnaissance (Root Lake area)	599174E 5637344N	Same as 053
2015CS054	Slate Road reconnaissance (Root Lake area)	599174E 5637344N	Leucocratic phase (pegmatitic) from same outcrop as 053
2015CS055	Slate Road reconnaissance (Root Lake area)	599181E 5637340N	Pegmatite sample from migmatite similar to 054
2015CS056B	“Chicken Chef” outcrop cobble	442398E 5652054N	Granitic cobble in conglomerate unit in Red Lake; sample is grey, medium- to fine-grained granitoid rock, biotite occurs as thin elongate masses of very tiny flakes, distinct foliation shown by alignment of biotite. Cobble is cut by a 3 to 4 mm thick pink fine-grained vein; this material was excluded from the sample analyzed

Sample	Property or Area	Location*	Description
2015CS057	Muscovite from Sandy Creek	478032E 5615710N	Muscovite only mineral; sample from Sandy Creek Trench 2
2015CS058	Wenasaga Road reconnaissance	523799E 5632853N	White pegmatitic granitoid with numerous biotite metasediment septa; sample contains both pegmatite and metasedimentary rock
2015CS059	Wenasaga Road reconnaissance	520253E 5631311N	Pink pegmatitic granitoid
2015CS060	Wenasaga Road reconnaissance	520268E 5631135N	Similar rock to 059
2015CS061	Wenasaga Road reconnaissance	519776E 5629801N	White pegmatite hosted in biotite-bearing metasedimentary rock
2015CS062	Wenasaga Road reconnaissance	517598E 5628254N	Pink to white pegmatite hosted in biotite-metasedimentary rock
2015CS063	Wenasaga Road reconnaissance	532084E 5628254N	Massive pink granitoid
2015CS064	Wenasaga Road reconnaissance	528778E 5641403N	Dark grey fine-grained biotite-metasedimentary migmatite sample from more leucocratic pegmatite phase
2015CS065	Wenasaga Road reconnaissance	516621E 5628011N	Biotite-quartz-feldspar migmatitic metasedimentary rock host to pegmatitic phase
2015CS066	Wenasaga Road reconnaissance	516621E 5628011N	White pegmatite from 065
2015CS069	Buffalo property, pink felsic dike	439819E 5650842N	Buffalo stripped outcrop; very fine-grained pink aplitic dike
2015CS076	Wenasaga Road reconnaissance	510435E 5623504N	Pink pegmatite dike cutting grey diatexite host
2015CS077	Wenasaga Road reconnaissance	510435E 5623504N	Diatexite host to 2015CS076; rock is gneissic with white leucocratic layers
2015CS078	Wenasaga Road reconnaissance	504905E 5621126N	White pegmatite hosted in fine-grained diatexite
2015CS079	Chilcott Road reconnaissance	499262E 5625280N	0.5 m wide pink pegmatite dike cutting dark grey migmatite

*All locations are provided as UTM co-ordinates using NAD83 in Zone 15.

Table 17. Rare earth elements and their crustal abundances (from Castor and Hedrick 2006).

Element	Symbol	Atomic Number	Crustal Abundance (ppm)	
Yttrium	Y	39	22	HREE
Lanthanum	La	57	30	LREE
Cerium	Ce	58	64	
Praseodymium	Pr	59	7.1	
Neodymium	Nd	60	26	
Promethium*	Pm	61	na	
Samarium	Sm	62	4.5	
Europium	Eu	63	0.88	
Gadolinium	Gd	64	3.8	HREE
Terbium	Tb	65	0.64	
Dysprosium	Dy	66	3.5	
Holmium	Ho	67	0.80	
Erbium	Er	68	2.3	
Thulium	Tm	69	0.33	
Ytterbium	Yb	70	2.2	
Lutetium	Lu	71	0.32	

Major element chemistry of the parent granitoid body and resulting pegmatites is significant in determining what, if any, rare metal or REE exploration potential exists. Rare metal pegmatites form from peraluminous granites, whereas REE-bearing pegmatites are associated with peralkaline granites. The affinity of a rock sample is determined by the A/CNK value. This is a molecular ratio $[Al_2O_3/(CaO + Na_2O + K_2O)]$ (Breaks, Selway and Tindle 2003) calculated from the bulk whole rock analysis, where

$$A/CNK = \frac{(\text{wt } \% Al_2O_3 \text{ in sample}/101.96128)}{[(\text{wt } \% CaO \text{ in sample}/56.08) + (\text{wt } \% Na_2O \text{ in sample}/61.979) + (\text{wt } \% K_2O \text{ in sample}/94.197)]}$$

Rare element-bearing pegmatites (e.g., containing any or all of lithium, beryllium, tantalum) are associated with peraluminous granitoid rocks, where $A/CNK > 1$. Rare earth element-bearing pegmatites are associated with peralkaline granitoid rocks, where $A/CNK < 1$. Data examined by Lichtblau et al. (2011) indicate that most granitoid rocks have A/CNK value between 0.9 and 1.1; this range is arbitrarily referred to as “normal” for this survey. This is an arbitrary decision based on a data set of granitoid rocks that are not known to contain rare metal mineralization. Most of the samples in Table 18 are peraluminous, even the “normal” range samples have A/CNK slightly greater than 1. Breaks, Selway and Tindle (2003) indicate $A/CNK > 1.2$ as strongly peraluminous. In Table 18, rock types that are not granitoid do not have A/CNK value indicated.

Table 18. Major element analyses for rock samples collected as part of the granitoid rock reconnaissance study (for sample descriptions, see Table 16).

	Al ₂ O ₃ (wt %)	CaO (wt %)	Fe ₂ O ₃ (wt %)	K ₂ O (wt %)	LOI (wt %)	MgO (wt %)	MnO (wt %)	Na ₂ O (wt %)	P ₂ O ₅ (wt %)	SiO ₂ (wt %)	TiO ₂ (wt %)	Total (wt %)	A/CNK
<i>Detection Limit:</i>	<i>0.02</i>	<i>0.006</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.01</i>	<i>0.002</i>	<i>0.02</i>	<i>0.002</i>	<i>0.04</i>	<i>0.01</i>		
2013CS030	12.6	4.666	15.81	1.06	0.24	3	0.073	3.2	0.211	59.18	0.4	100.44	0.847
2013CS031	14.69	3.373	4.44	0.68	0.64	1.01	0.016	4.62	0.067	71.34	0.13	100.99	1.016
2013CS032	16.39	2.365	5.53	2.22	1.6	2.8	0.061	3.22	0.064	65.81	0.55	100.61	1.369
2013CS033	15.41	3.165	10.36	2.61	1.26	3.07	0.062	3.27	0.441	60.5	0.42	100.57	1.106
2013CS035	15	2.779	2.47	2.44	0.62	0.81	0.041	4.39	0.06	72.05	0.23	100.89	1.008
2013CS036A	16.68	3.68	2.92	1.34	0.57	1.04	0.046	4.66	0.083	69.32	0.27	100.61	1.056
2013CS036B	14.83	0.62	0.36	3.82	0.31	0.04	0.078	5.49	0.016	75.65	<0.01	101.22	1.041
2013CS037	15.05	1.779	0.57	0.85	0.61	0.21	0.042	5.56	0.013	76.7	0.01	101.4	1.132
2013CS039	9.62	1.405	1.12	2.35	0.32	0.24	0.021	2.63	0.038	82.98	0.09	100.82	1.024
2013CS040	16.34	1.91	0.59	4.54	0.46	0.13	0.006	4.37	0.006	72.69	0.03	101.08	1.053
2013CS041	13.85	0.347	0.45	7.66	0.33	0.08	0.006	2.61	0.006	75.61	0.02	100.97	1.055
2013CS047	14.63	0.601	0.51	6.6	0.36	0.13	0.004	3.64	0.05	74.61	0.02	101.15	1.034
2013CS057	13.91	0.807	1.01	6.24	0.52	0.19	0.035	3.27	0.022	74.97	0.09	101.07	1.028
2013CS058	14.18	1.281	1.67	4.94	0.69	0.44	0.028	3.75	0.056	73.69	0.19	100.92	1.028
2013CS059	15.09	0.542	0.21	7.1	0.26	0.05	0.013	3.46	0.206	74.05	0.01	100.99	1.057
2013CS059A	14.82	0.939	1.94	4.22	0.33	0.27	0.408	4.09	0.176	73.4	0.02	100.62	1.144
2013CS060	17.62	2.904	2	2.81	0.53	0.82	0.014	4.85	0.21	68.63	0.22	100.6	1.083
2013CS061	15.8	1.767	3.95	3.16	1.06	1.87	0.047	2.8	0.214	69.49	0.32	100.49	1.41
2013CS062	10.52	0.727	0.44	4.58	0.46	0.08	0.039	2.65	0.003	80.39	0.02	99.91	0.994
2013CS063	0.7	0.115	0.07	0.18	0.18	0.03	0.002	0.25	0.002	98.91	<0.01	100.43	0.861
2013CS064	12.62	0.658	0.42	4.58	0.25	0.06	0.012	3.66	0.002	78.21	0.02	100.49	1.041
2013CS065	13.61	0.8	0.49	4.93	0.32	0.06	0.027	3.91	0.002	76.13	0.03	100.31	1.034
2013CS072	11.86	0.409	0.38	4.79	0.29	0.04	0.034	3.42	0.012	79.64	0.03	100.9	1.031
2013CS073	13.69	0.964	1.11	5	0.48	0.18	0.029	3.69	0.028	75.04	0.12	100.32	1.039
2013CS074	11.64	0.299	0.62	4.11	1.27	0.29	0.023	0.95	0.015	80.76	0.05	100.02	1.788

	Al ₂ O ₃ (wt %)	CaO (wt %)	Fe ₂ O ₃ (wt %)	K ₂ O (wt %)	LOI (wt %)	MgO (wt %)	MnO (wt %)	Na ₂ O (wt %)	P ₂ O ₅ (wt %)	SiO ₂ (wt %)	TiO ₂ (wt %)	Total (wt %)	A/CNK
<i>Detection Limit:</i>	<i>0.02</i>	<i>0.006</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.01</i>	<i>0.002</i>	<i>0.02</i>	<i>0.002</i>	<i>0.04</i>	<i>0.01</i>		
2013CS075	18.65	0.089	0.1	12.3	0.11	<0.01	<0.002	2.86	0.01	66.39	<0.01	100.5	1.034
2013CS076	12.12	0.447	1.02	5.13	0.25	0.14	0.021	3	0.01	78.02	0.09	100.25	1.078
2013CS077	12.59	0.864	0.69	2.87	0.25	0.07	0.01	4.44	0.006	78.58	0.03	100.4	1.054
2013CS080	15.96	2.905	3.91	3.62	0.7	1.34	0.048	3.83	0.223	66.63	0.5	99.65	1.032
2013CS082	13.93	0.86	1.41	5.37	0.22	0.29	0.051	3.57	0.037	74.09	0.14	99.97	1.056
2013CS083	11.23	0.961	2.74	2.63	0.14	0.81	0.057	3.64	0.007	77.55	0.06	99.83	1.064
2013CS084	13.59	0.485	0.84	7.2	0.18	0.22	0.017	2.68	0.012	74.41	0.02	99.65	1.045
2013CS085	15.89	4.077	4.68	4.36	0.65	2.99	0.075	4.06	0.312	62.39	0.53	100.01	0.847
2013CS088	13.82	0.909	0.63	4.48	0.23	0.14	0.027	4.21	0.003	75.42	0.05	99.92	1.033
2013CS089	13.83	1.123	0.81	2.29	0.21	0.16	0.028	5.37	0.011	75.53	0.07	99.43	1.038
2013CS090	15.5	1.844	1.18	4.21	0.42	0.32	0.072	4.2	0.017	72.07	0.08	99.91	1.049
2014CSOR08	14.87	4.942	8.88	0.72	4.14	1.9	0.129	5.31	0.282	58.3	1.22	100.72	0.804
2014CSOR10	15.42	1.904	4.17	2.78	0.9	1.95	0.051	3.18	0.195	68.73	0.4	99.76	1.321
2014CS022	16.54	2.089	1.89	4.72	0.47	0.99	0.014	3.86	0.086	69.39	0.25	100.51	1.088
2014CS023	15.15	2.164	5.34	2.53	0.99	1.97	0.057	3.34	0.07	67.89	0.56	100.14	1.248
2014CS024	15.98	0.817	1.38	7.57	0.56	0.45	0.01	2.9	0.111	70.52	0.17	100.69	1.112
2014CS025	16.94	5.488	8.87	2.03	0.72	7.2	0.115	3.18	0.791	53.82	0.83	100.18	0.974
2014CS026	15.95	1.666	1.62	4.24	0.4	0.56	0.011	4.49	0.089	71.21	0.23	100.54	1.066
2014CS047	14.12	0.414	0.62	2.45	1.3	0.1	0.108	3	0.007	78.29	0.02	100.44	1.699
2014CS048	12.01	0.819	0.34	2.48	0.6	0.14	0.015	4.28	0.008	79.91	0.02	100.64	1.074
2015CS046	17.77	1.124	0.24	0.87	0.84	0.04	0.056	8.58	0.899	69.43	0.01	99.86	1.04
2015CS049	16.09	0.247	0.31	1.09	0.74	0.07	0.091	3.49	0.03	76.78	0.01	98.96	2.187
2015CS050	13.51	13.901	14.5	0.41	1.14	8.41	0.268	0.86	0.041	46.14	0.59	99.87	
2015CS050A	14.76	16.469	13.04	0.45	2.5	6.97	0.253	0.6	0.04	44.11	0.46	99.82	
2015CS051	15.26	0.617	0.9	6.66	0.64	0.24	0.015	3.69	0.161	72.1	0.07	100.42	1.065
2015CS052	1.63	2.43	50.27	0.22	0.5	1.91	0.032	0.47	0.203	43.08	0.06	100.82	0.3
2015CS053	16.34	0.78	0.85	3.31	-1.23	0.35	0.021	1.33	0.252	77.44	0.05	99.51	2.285
2015CS054	15.22	2.22	5.34	2.12	1.89	2.17	0.094	3.02	0.195	67.8	0.48	100.62	1.35
2015CS055	15.13	0.871	0.27	5.82	1.27	0.13	0.009	3.41	0.085	72.56	0.02	99.8	1.127
2015CS056B	16.03	2.603	6.55	2.48	4.75	1.62	0.143	3.78	0.193	61.83	0.45	100.5	1.178
2015CS057	37.45	0.245	1.7	10.5	0.93	0.44	0.049	0.83	0.2	47.64	0.15	100.14	2.868
2015CS058	10.54	0.712	0.47	0.76	5.92	0.2	0.008	3.23	0.05	78.6	0.04	100.53	1.42
2015CS059	16.52	1.088	0.71	4.63	0.61	0.16	0.012	3.74	0.013	72.45	0.12	100.1	1.262
2015CS060	14.41	2.943	2.34	0.82	0.58	0.53	0.024	4.31	0.032	74.82	0.17	101.01	1.082
2015CS061	15.85	2.741	1.65	2.38	0.35	0.55	0.02	4.01	0.043	72.52	0.18	100.42	1.122
2015CS062	16.02	0.678	0.44	7.57	0.5	0.11	0.01	2.77	0.015	71.66	0.03	99.93	1.153
2015CS063	19.26	0.364	1.72	6.13	0.36	0.27	0.101	6.36	0.037	65.39	0.17	100.16	1.089
2015CS064	16.92	2.316	6.12	2.66	0.45	2.53	0.074	2.99	0.136	65.36	0.55	100.23	1.413
2015CS065	17.97	5.3	6.55	1.42	1.24	2.59	0.096	4.22	0.113	60.35	0.59	100.48	0.993
2015CS066	16.35	3.063	2.52	1.25	0.65	0.98	0.034	3.95	0.036	71.35	0.25	100.45	1.22
2015CS069	11.12	0.363	0.58	1	0.46	0.21	0.011	4.24	0.007	82.73	0.06	100.83	1.277
2015CS076	17.82	1.584	1.9	10.12	0.85	0.84	0.021	2.17	0.869	63.96	0.25	100.69	1.031
2015CS077	18.5	3.855	3.55	1.8	0.56	1.79	0.04	4.74	0.238	65.42	0.46	101.01	1.105
2015CS078	17.61	0.348	0.15	9.56	0.41	0.08	0.014	2.23	0.075	70.44	0.02	101.25	1.211
2015CS079	15.32	0.391	0.28	8.64	0.35	0.09	0.014	2.33	0.168	73.69	0.03	101.38	1.11

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario.

Table 19. Rare earth element and scandium analyses for rock samples collected as part of the granitoid rock reconnaissance study (for sample descriptions, see Table 16). Analytical results in **bold** indicate values in excess of crustal abundance for that element. Total REE rounded to 2 decimal places.

	Ce* (ppm)	Dy (ppm)	Er (ppm)	Eu* (ppm)	Gd (ppm)	Ho (ppm)	La* (ppm)	Lu (ppm)	Nd* (ppm)	Pr* (ppm)	Sm* (ppm)	Tb (ppm)	Tm (ppm)	Y (ppm)	Yb (ppm)	Total (ppm)	Sc (ppm)
<i>Detection Limit:</i>	0.12	0.009	0.007	0.0031	0.009	0.002	0.04	0.002	0.06	0.014	0.012	0.0023	0.0019	0.05	0.009		1.1
Crustal Abundance:	64	3.5	2.3	0.88	3.8	50.80	30	0.32	26	7.1	4.5	0.64	0.33	22	2.2		
2013CS030	16.97	1.815	1.01	0.748	2.268	0.345	7.7	0.131	9.47	2.198	2.343	0.31	0.138	10.2	0.903	56.55	10.2
2013CS031	14.91	0.468	0.246	0.341	0.642	0.084	7.09	0.038	4.73	1.381	0.797	0.083	0.035	2.61	0.234	33.69	3
2013CS032	19.04	1.195	0.721	0.641	1.133	0.238	10.04	0.115	7.62	2.111	1.346	0.182	0.103	7.44	0.691	52.62	12.2
2013CS033	39.64	2.52	1.386	1.131	2.707	0.498	19.18	0.164	17.89	4.614	3.288	0.396	0.196	14.74	1.21	109.56	12.6
2013CS035	41.13	2.527	1.504	0.541	2.714	0.499	21.55	0.241	16.2	4.58	3.061	0.419	0.232	15.52	1.606	112.32	4.6
2013CS036A	12.1	0.725	0.408	0.52	0.85	0.141	6.44	0.061	4.96	1.359	0.929	0.123	0.059	4.34	0.396	33.41	4.2
2013CS036B	27.37	5.223	2.654	0.176	5.36	0.922	10.45	0.359	16.44	3.927	5.498	0.866	0.396	31.3	2.677	113.62	3.3
2013CS037	15.2	2.524	1.057	0.074	2.93	0.403	6.04	0.131	8.92	2.14	3.027	0.444	0.153	14.15	0.982	58.18	6.8
2013CS039	27.93	1.25	0.711	0.403	1.517	0.241	16.39	0.128	9.82	2.883	1.701	0.216	0.112	7.61	0.785	71.70	2
2013CS040	5.51	0.438	0.313	0.385	0.393	0.093	3.49	0.077	2.05	0.608	0.432	0.068	0.055	3.01	0.434	17.36	<1.1
2013CS041	13.26	0.326	0.172	0.381	0.516	0.058	8.31	0.03	5.5	1.512	0.759	0.06	0.026	2.05	0.182	33.14	<1.1
2013CS047	12.69	2.929	1.757	0.333	2.203	0.579	6.08	0.228	5.8	1.573	1.811	0.439	0.26	17.89	1.666	56.24	1.3
2013CS057	46.39	3.812	2.005	0.355	3.436	0.694	22.84	0.318	17.99	5.279	3.731	0.62	0.324	22	2.245	132.04	3.5
2013CS058	95.11	2.65	1.422	0.705	3.494	0.485	48.85	0.217	34.14	10.262	5.181	0.469	0.215	15.47	1.427	220.10	3.3
2013CS059	3.6	0.136	0.094	0.458	0.118	0.029	2.45	0.021	1.12	0.334	0.178	0.021	0.018	0.89	0.128	9.59	<1.1
2013CS059A	7.11	1.003	1.382	0.411	0.309	0.295	4.39	0.582	2.36	0.703	0.349	0.094	0.339	9.8	3.351	32.48	4.2
2013CS060	37.75	1.988	0.846	1.4	2.764	0.335	19.52	0.095	16.58	4.455	3.137	0.386	0.107	9.13	0.665	99.16	5.5
2013CS061	42.41	2.197	0.977	1.003	3.073	0.37	21.32	0.121	18.3	4.956	3.608	0.426	0.13	10.17	0.833	109.89	8.2
2013CS062	8.61	4.261	3.626	0.231	2.83	1.009	3.51	0.845	5.23	1.176	1.779	0.57	0.646	36.42	5.084	75.83	2.2
2013CS063	1.05	0.925	0.581	0.044	0.741	0.198	0.33	0.077	1.02	0.201	0.484	0.142	0.085	5.35	0.53	11.76	<1.1
2013CS064	7.04	2.169	1.637	0.185	1.636	0.478	2.95	0.325	3.97	0.931	1.251	0.306	0.275	14.52	2.064	39.74	1.5
2013CS065	4.29	2.176	1.509	0.22	1.585	0.458	1.55	0.33	3.07	0.691	1.226	0.316	0.261	14.28	1.969	33.93	2
2013CS072	26.71	4.036	2.697	0.088	3.091	0.794	11.85	0.71	11.13	3.117	3.052	0.613	0.524	32.06	4.362	104.83	3.4
2013CS073	78.7	2.313	1.372	0.445	2.792	0.444	41.87	0.221	25.21	8.05	3.843	0.404	0.218	14.72	1.478	182.08	2.3
2013CS074	12.87	2.207	1.335	0.173	1.656	0.436	6.4	0.201	5.73	1.544	1.475	0.323	0.212	13.86	1.439	49.86	3.3
2013CS075	2.85	0.117	0.069	0.116	0.127	0.022	2.32	0.008	0.73	0.252	0.159	0.019	0.009	0.82	0.056	7.67	<1.1
2013CS076	33.02	2.336	1.271	0.223	2.85	0.44	15.76	0.192	14.27	3.914	3.342	0.41	0.19	14.67	1.266	94.15	2.8
2013CS077	21.08	2.853	1.856	0.269	2.5	0.574	8.52	0.41	11.41	2.987	2.975	0.448	0.322	22	2.501	80.70	2
2013CS080	79.9	2.808	1.472	1.26	3.716	0.509	35.25	0.197	35.94	9.559	5.97	0.489	0.214	15.47	1.378	194.13	5.5

	Ce* (ppm)	Dy (ppm)	Er (ppm)	Eu* (ppm)	Gd (ppm)	Ho (ppm)	La* (ppm)	Lu (ppm)	Nd* (ppm)	Pr* (ppm)	Sm* (ppm)	Tb (ppm)	Tm (ppm)	Y (ppm)	Yb (ppm)	Total (ppm)	Sc (ppm)
<i>Detection Limit:</i>	<i>0.12</i>	<i>0.009</i>	<i>0.007</i>	<i>0.0031</i>	<i>0.009</i>	<i>0.002</i>	<i>0.04</i>	<i>0.002</i>	<i>0.06</i>	<i>0.014</i>	<i>0.012</i>	<i>0.0023</i>	<i>0.0019</i>	<i>0.05</i>	<i>0.009</i>		<i>1.1</i>
Crustal Abundance:	64	3.5	2.3	0.88	3.8	50.80	30	0.32	26	7.1	4.5	0.64	0.33	22	2.2		
2013CS082	73.33	2.87	1.36	0.438	3.285	0.493	39.33	0.231	24.14	7.611	4.091	0.514	0.206	16.57	1.47	175.94	3.9
2013CS083	70.53	5.173	3.704	2.165	4.688	1.127	35.94	0.721	29.9	8.347	5.371	0.754	0.605	33.83	4.299	207.15	2.5
2013CS084	38.4	4.87	3.234	1.331	3.765	1	18.96	0.598	16.76	4.599	3.7	0.701	0.53	29.68	3.839	131.97	1.7
2013CS085	138.38	4.757	2.361	2.33	6.902	0.856	72.35	0.317	57.96	16.03	9.584	0.872	0.328	24.88	2.099	340.01	8.6
2013CS088	8.48	1.775	1.203	0.33	1.291	0.376	4	0.22	4.05	1.05	1.163	0.244	0.195	11.49	1.401	37.27	2.6
2013CS089	15.57	2.577	1.961	0.305	1.828	0.569	7.76	0.408	6.49	1.789	1.644	0.353	0.339	19.32	2.551	63.46	3.2
2013CS090	17.09	7.068	5.754	0.309	4.213	1.7	8.52	0.966	7.76	2.014	2.469	0.896	0.915	56.55	6.145	122.37	4.2
2014CSOR08														22		22	17
2014CSOR10	46.68	2.516	1.115	0.961	2.972	0.441	23.66	0.116	19.19	5.379	3.511	0.441	0.14	12.33	0.807	120.26	10.6
2014CS022	111.14	1.215	0.316	1.252	3.832	0.154	56.7	0.038	43.52	12.08	6.578	0.332	0.038	4.3	0.236	241.73	3.4
2014CS023	59.73	2.383	1.376	0.961	2.798	0.464	30.66	0.2	23.91	6.566	3.824	0.385	0.199	13.59	1.326	148.37	11.2
2014CS024	183.55	1.764	0.368	1.168	6.627	0.209	83.87	0.037	78.94	21.905	12.773	0.549	0.042	5.48	0.215	397.50	1.5
2014CS025	256.45	4.979	1.735	2.999	10.53	0.745	128.92	0.162	117.53	30.858	17.536	1.111	0.205	22.01	1.188	596.96	15.5
2014CS026	73.62	1.11	0.298	0.797	2.568	0.148	37.64	0.024	28.5	8.128	4.369	0.27	0.03	4.37	0.16	162.03	3.1
2014CS047	25.86	5.185	2.18	0.046	6.038	0.814	8.38	0.291	16.7	3.758	6.444	0.954	0.322	33.15	2.157	112.28	9.1
2014CS048	9.53	3.538	2.507	0.168	2.12	0.78	4.66	0.448	3.81	1.07	1.371	0.473	0.409	25.78	2.934	59.60	2
2015CS046	5.84	0.422	0.238	0.156	0.404	0.076	2.86	0.028	2.17	0.582	0.45	0.068	0.034	2.77	0.225	16.32	<1.1
2015CS049	0.67	0.499	0.067	0.009	0.741	0.043	0.23	0.006	0.35	0.089	0.513	0.144	0.01	2.44	0.054	5.86	<1.1
2015CS050	4.11	2.253	1.499	0.446	1.852	0.502	1.61	0.219	3.75	0.701	1.301	0.319	0.222	13.66	1.484	33.93	37.9
2015CS050A	4.9	2.232	1.541	0.718	1.817	0.482	2.02	0.245	4.04	0.767	1.278	0.321	0.22	14.17	1.551	36.30	31.4
2015CS051	24.26	1.186	0.576	0.294	1.437	0.208	11.08	0.064	8.22	2.397	1.776	0.216	0.08	6.56	0.5	58.86	1.5
2015CS052	14.88	0.997	0.643	0.461	1.047	0.209	5.39	0.108	5.44	1.337	1.026	0.16	0.095	7.17	0.666	39.63	3.1
2015CS053	5.54	1.209	0.634	0.21	0.869	0.213	2.57	0.092	2.44	0.655	0.754	0.182	0.097	7.39	0.65	23.51	4
2015CS054	56.31	2.664	1.623	1.016	3.163	0.54	28.16	0.232	22.15	6.009	3.864	0.434	0.244	15.59	1.56	143.56	14.9
2015CS055	66.47	1.631	0.382	0.909	3.231	0.211	33.11	0.026	26.15	7.078	4.543	0.388	0.036	5.5	0.173	149.84	<1.1
2015CS056B	59.4	1.44	0.65	0.89	2.83	0.244	30.87	0.08	23.86	6.63	3.84	0.333	0.091	6.29	0.55	138.00	2.35
2015CS057	0.13	0.011	<0.007	0.003	0.013	<0.0025	<0.1	<0.002	<0.06	0.018	<0.026	<0.0023	<0.0019	0.07	0.011	0.26	3.6
2015CS058	5.25	0.475	0.235	0.156	0.445	0.081	2.16	0.03	1.73	0.506	0.474	0.079	0.035	2.79	0.223	14.67	1.7
2015CS059	7.23	1.511	0.953	0.458	1.273	0.323	3.3	0.131	3.83	0.914	1.078	0.225	0.141	9.95	0.895	32.21	1.2
2015CS060	25.5	0.742	0.344	0.48	1.416	0.126	9.17	0.067	10.11	2.514	1.974	0.158	0.052	3.86	0.364	56.88	2.8
2015CS061	23.59	0.201	0.1	0.44	0.343	0.036	9.97	0.017	5.15	1.671	0.641	0.041	0.015	1.02	0.104	43.34	1.1

	Ce* (ppm)	Dy (ppm)	Er (ppm)	Eu* (ppm)	Gd (ppm)	Ho (ppm)	La* (ppm)	Lu (ppm)	Nd* (ppm)	Pr* (ppm)	Sm* (ppm)	Tb (ppm)	Tm (ppm)	Y (ppm)	Yb (ppm)	Total (ppm)	Sc (ppm)
Detection Limit:	0.12	0.009	0.007	0.0031	0.009	0.002	0.04	0.002	0.06	0.014	0.012	0.0023	0.0019	0.05	0.009		1.1
Crustal Abundance:	64	3.5	2.3	0.88	3.8	50.80	30	0.32	26	7.1	4.5	0.64	0.33	22	2.2		
2015CS062	13.35	0.343	0.147	0.413	0.832	0.053	7.2	0.021	5.37	1.41	1.152	0.084	0.021	1.55	0.13	32.08	<1.1
2015CS063	158.74	4.763	2.123	1.229	6.501	0.808	54.38	0.259	49.94	13.887	9.166	0.886	0.29	22.74	1.801	327.51	2.1
2015CS064	29.15	2.01	1.293	0.696	1.792	0.413	13.36	0.203	11.27	3.116	2.127	0.292	0.198	11.54	1.319	78.78	14.9
2015CS065	38.5	2.664	1.309	0.897	3.04	0.482	19.18	0.159	15.87	4.182	3.101	0.447	0.186	13.81	1.131	104.96	17
2015CS066	20.48	0.451	0.248	0.48	0.607	0.08	13.91	0.043	6.27	2.031	0.834	0.08	0.036	2.36	0.249	48.16	3.9
2015CS069	43.76	3.27	2.333	0.65	2.985	0.708	16.57	0.411	19.65	5.25	3.818	0.487	0.389	22.81	2.77	125.86	1.6
2015CS076	61.56	8.21	3.658	1.6437	9.706	1.4504	23.86	0.2953	32.61	7.833	9.256	1.47	0.4354	41.62	2.276	205.88	2.9
2015CS077	23.32	0.767	0.273	0.7011	1.361	0.1198	11.76	0.0284	10.08	2.667	1.771	0.1653	0.0334	3.39	0.191	56.63	3.8
2015CS078	7.88	0.108	0.029	1.8258	0.237	0.0118	4.86	0.0028	2.44	0.767	0.395	0.0281	0.004	0.37	0.026	18.99	<1.1
2015CS079	12.84	2.151	1.52	0.3976	1.565	0.4699	5.73	0.2486	5.28	1.453	1.407	0.305	0.2503	14.3	1.698	49.62	1.2

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples analyzed by inductively coupled plasma mass spectrometry (ICP-MS), with the exception of samples 2014CSOR08 and 2015CS056B, which were analyzed using a different ICP-MS package designed for mineralized rocks that have different detection and upper limits and analyzes fewer elements.

* Light rare earth elements (LREE).

Analytical results in **bold** indicate values in excess of crustal abundance for that element. Crustal abundances from Castor and Hedrick (2006).

Table 20. Trace element analyses for rock samples collected as part of the granitoid rock reconnaissance study (for sample descriptions, see Table 16).

	Ba (ppm)	Be (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Ga (ppm)	Hf (ppm)	In (ppm)	Li (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)
Detection Limit:	0.8	0.04	0.47	0.013	0.13	3	0.013	1.4	0.04	0.14	0.0018	0.4	0.08	0.028	0.7	0.18
2013CS030	374.9	1.3	<0.15	0.066	13.24	135	3.408	19.1	14.56	2.4	0.0239	13.2	1.65	3.529	75	6.6
2013CS031	297.8	2.38	0.22	0.049	4.74	50	2.857	8.4	12.25	1.94	0.0066	9.1	1.51	1.973	23.1	9.7
2013CS032	650.6	2.05	<0.15	0.047	16.8	139	3.61	8.2	19.5	4.75	0.0346	19.6	2.15	6.723	48	17
2013CS033	737.6	1.56	<0.15	0.059	13.65	143	5.621	51.9	20.83	3.03	0.048	21.1	1.75	6.316	56.6	12.1
2013CS035	443.8	1.31	0.21	0.025	5.46	49	2.041	2	17.61	3.63	0.0187	22.6	2.32	7.32	10	7.6
2013CS036A	337.7	0.91	0.19	0.033	6.82	42	2.438	2.5	18.91	2.28	0.0107	38.8	1.96	3.442	10.1	5.3
2013CS036B	131.8	1.42	0.15	0.036	1.29	33	0.521	2.4	19.45	2.64	0.0075	3	2.02	9.479	<1.6	13
2013CS037	88.2	2.68	0.19	0.047	1.02	36	0.411	7.7	26.87	1.1	0.0503	9	2.27	18.804	4.5	14.2
2013CS039	489.8	0.65	<0.15	0.014	1.79	75	0.599	2.7	10.31	2.82	0.0097	11.3	3.9	4.428	2.3	11.3
2013CS040	398.9	1.31	<0.15	0.083	0.79	56	0.81	23.5	16.34	1.33	0.0052	9.4	3.17	2.245	<1.6	48.3

	Ba (ppm)	Be (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Ga (ppm)	Hf (ppm)	In (ppm)	Li (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)
Detection Limit:	0.8	0.04	0.47	0.013	0.13	3	0.013	1.4	0.04	0.14	0.0018	0.4	0.08	0.028	0.7	0.18
2013CS041	182.1	0.41	<0.15	<0.013	0.52	38	0.473	8.3	11.84	0.43	0.0032	5.8	2.02	1.519	<1.6	12.5
2013CS047	267.6	1.07	0.17	0.022	0.29	41	2.831	11.1	18.55	1.99	0.0062	2.8	2.38	5.848	<1.6	20.9
2013CS057	315.4	8.14	6.94	0.04	1.1	28	9.354	4.2	23.34	5.31	0.02	41.5	1.5	32.711	<1.6	23.6
2013CS058	733.5	3.17	0.21	0.042	2.32	37	8.346	9.3	19.19	5.02	0.021	96.4	1.98	13.703	2.9	22.3
2013CS059	800.9	0.95	0.17	0.048	0.51	73	2.228	5.4	13.3	0.75	0.0021	6	4.11	0.532	2.4	30.5
2013CS059A	514.1	1.68	<0.15	0.266	1.83	35	2.046	12	15.5	1.09	0.0051	17.9	1.81	1.083	6.7	22.1
2013CS060	858.2	0.39	<0.15	0.085	5.72	40	3.032	7.5	17.91	1.83	0.0225	41.8	1.34	3.594	9.4	28.6
2013CS061	748.9	2.13	0.15	0.077	11.06	110	3.824	25.6	18.75	2.78	0.0298	31.1	2.25	6.243	31.1	23.3
2013CS062	31.4	4.36	<0.15	0.086	0.62	40	13.516	14.3	16.27	9.78	0.0081	15.4	2.23	13.364	<1.6	47.5
2013CS063	3.5	0.61	<0.15	<0.013	0.24	50	0.723	2.7	1.39	<0.14	<0.0018	2.8	2.76	2.229	<1.6	4.7
2013CS064	18.9	4.29	0.69	0.046	0.43	41	13.562	15.5	18.25	2.68	0.01	13.7	2.41	12.962	<1.6	47.6
2013CS065	36.1	5.68	0.16	0.078	0.44	31	16.08	12.6	22.21	4.64	0.011	15.6	1.75	17.314	<1.6	43.5
2013CS072	51.3	2.84	0.17	0.034	0.51	27	14.406	<1.4	21.52	2.23	0.0177	32.5	1.67	44.311	<1.6	25.7
2013CS073	514.8	2.52	0.18	0.059	1.26	29	13.264	2.6	18.15	4.23	0.0151	97.5	1.67	13.166	<1.6	31.6
2013CS074	109.1	1.99	0.74	0.121	2.46	47	8.596	3.5	22.28	1.39	0.0499	47.1	15.85	27.226	4.8	23.4
2013CS075	57.4	0.69	<0.15	0.024	0.14	21	7.775	<1.4	29.06	<0.14	0.0027	3.5	1.27	0.527	<1.6	68.2
2013CS076	111.1	1.62	0.28	0.022	0.5	30	11.441	<1.4	17.78	2.49	0.0114	43	2.57	12.786	<1.6	28.4
2013CS077	51.3	3.39	<0.15	0.953	0.42	31	5.074	37.9	20.66	2.16	0.0254	15.9	2.24	19.964	<1.6	63.8
2013CS080	754.5	1.29	0.59	0.113	8.59	41	2.836	2805.6	18.89	3.87	0.0949	24.4	3.24	10.348	15.3	16.4
2013CS082	499.4	3.4	0.41	0.039	1.46	28	24.845	3.6	20.1	4.06	0.0377	98.7	2.24	22.911	2.3	29
2013CS083	419	2.17	0.17	0.073	1.77	33	6.682	12.7	19.22	17.63	0.0701	60.7	2.14	15.806	2.5	9.5
2013CS084	350.5	2.5	0.2	0.024	1.16	23	5.02	5.4	21.3	5.2	0.0248	13.9	1.33	25.49	2.2	23
2013CS085	1079.6	3.2	0.59	0.098	14.91	115	11.926	18	20.6	7.04	0.0421	83.2	3.14	10.977	42.7	20.1
2013CS088	97.3	3.57	27.27	0.091	0.38	19	9.192	4.9	21.32	1.11	0.0106	27.3	36.21	16.479	<1.6	34
2013CS089	68.2	6.47	12.13	0.029	0.55	27	7.828	12.5	23.95	2.64	0.0133	35.3	20.29	23.861	1.6	25.9
2013CS090	107.1	1.01	<0.15	0.053	1.75	44	1.448	2.7	19.79	3.23	0.0135	20.4	2.43	5.367	3.2	24.2
2014CS022	>1740	0.68	<0.47	0.071	6.59	61	0.384	10.9	18.02	5.11	0.0198	14.4	1.25	4.621	26.2	35.1
2014CS023	548.8	0.81	<0.47	0.091	12.21	165	0.626	34.9	18.66	5.46	0.0357	12.7	1.67	10.36	48.8	21
2014CS024	>1740	0.54	<0.47	0.04	2.71	21	0.449	1.9	17.8	7.38	0.0116	10.3	1.6	2.596	5.3	49.9
2014CS025	1172	2.07	<0.47	0.139	31.39	461	1.238	45.4	23.43	5.24	0.0653	11.2	0.52	11.197	161.9	15.4
2014CS026	780.2	0.83	<0.47	0.056	2.36	21	0.336	7.7	20.74	3.38	0.0152	13.9	0.75	5.598	4.3	36.1
2014CS047	60.8	2.74	<0.47	0.033	0.32	13	2.696	1.5	33.32	2.68	0.0663	5.6	3.05	51.799	1	7.8

	Ba (ppm)	Be (ppm)	Bi (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cs (ppm)	Cu (ppm)	Ga (ppm)	Hf (ppm)	In (ppm)	Li (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)
Detection Limit:	0.8	0.04	0.47	0.013	0.13	3	0.013	1.4	0.04	0.14	0.0018	0.4	0.08	0.028	0.7	0.18
2014CS048	124	1.28	<0.47	0.043	0.59	30	0.36	17.3	15.13	2.47	0.006	6.7	1.72	4.828	1.2	20.3
2014CSOR10	634.5	1.2	<0.47	0.096	13.39	108	5.835	25.1	19.29	2.72	0.0336	25.7	1.89	7.37	41.5	21.9
2015CS046	17.1	184.72	<0.47	0.087	0.46	17	13.334	1.6	25.94	2.29	0.002	63	0.81	25.81	1.9	11.4
2015CS049	3.7	148.68	<0.47	0.057	0.22	19	98.257	<1.4	>58	1.41	0.0096	>207	0.97	72.991	<0.7	4.3
2015CS051	423.6	1.87	<0.47	0.063	1.26	19	4.936	22.2	16.74	1.56	0.0249	11	0.97	5.307	1.3	24.3
2015CS052	73.3	1.46	<0.47	0.063	3.66	37	0.119	1.6	4.85	0.45	0.0118	8	0.92	1.071	11.6	1.7
2015CS053	179.9	4.89	10.71	0.072	2.27	33	2.042	8.1	18.56	1.3	0.0279	6.6	1.45	6.658	7.5	22.7
2015CS054	394.5	10.21	5.33	0.132	16.24	181	7.005	39.6	18.04	3.27	0.0372	45.5	2.77	10.672	52.5	20.7
2015CS055	>1740	0.97	<0.47	0.028	1.34	26	2.131	7.4	11.51	2.45	0.0041	3.7	2.13	0.69	4.5	34.4
2015CS057	29.8	19.94	<0.47	0.121	2.3	40	118.151	2.1	>58	0.34	<0.0018	>207	0.31	176.063	16.1	3.3
2015CS058	47.5	1.33	1.16	0.064	1.21	44	1.522	4.1	15.05	0.51	0.0119	15.1	3.14	3.515	4.7	12
2015CS059	175.8	1.94	<0.47	0.043	0.41	28	1.488	3.7	17.52	2.39	0.0032	5.1	1.37	2.164	1.7	38.4
2015CS060	174.8	1.58	<0.47	0.027	3.98	31	1.423	3.8	18.88	4.65	0.0094	15.6	1.29	2.901	7.4	10.4
2015CS061	964.5	1.08	<0.47	0.027	4.01	27	1.238	3.4	15.95	1.85	0.005	16.9	1.26	2.413	5.5	9.5
2015CS062	1110.7	0.36	<0.47	0.028	0.59	18	0.815	2.8	15.14	1.13	0.0041	8.8	0.79	1.319	2.2	23.4
2015CS063	98.5	4.63	<0.47	0.057	1.28	20	4.192	1.6	21.5	9.3	0.0175	39.5	1.69	16.142	1.8	18.5
2015CS064	918.7	1.55	<0.47	0.077	15.28	167	6.895	39.6	19.17	3.49	0.0431	42.7	1.78	6.305	38.3	21.2
2015CS065	317.6	1.46	<0.47	0.106	18.49	45	1.29	17	21.91	2.83	0.0491	33.9	0.61	7.044	28.3	4.9
2015CS066	159.1	1.65	<0.47	0.036	6.88	31	1.826	5.3	18.82	3.8	0.0137	27.7	1.22	5.154	10.4	7.4
2015CS069	255.1	1.76	<0.47	0.032	1.03	40	0.312	95.5	12.93	3.82	0.0213	2.6	4.02	5.109	1.3	4.6
2015CS076	>1740	0.34	<0.47	0.042	4.59	23	1.917	2.4	16.49	0.59	0.0152	15.9	1.23	6.506	7.1	39.6
2015CS077	435.9	1.71	<0.47	0.032	11.7	38	1.39	13.9	21.91	1.02	0.02	28.2	1.27	5.883	18.7	11.4
2015CS078	>1740	0.31	<0.47	<0.013	0.44	28	0.908	1.6	13.26	0.26	0.0064	4	1.66	0.382	2	58.2
2015CS079	654.3	0.9	<0.47	<0.013	0.33	26	1.202	1.9	11.95	0.78	0.006	2.9	1.57	1.375	0.9	42.4
2015CS056B	100.5	0.21	0.04	0.06	11.76	25	0.3	16	3.92	0.24	0.009	7.45	1.51	0.13	10.4	4.4

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples analyzed by inductively coupled plasma mass spectrometry (ICP-MS), with the exception of sample 2015CS56B, which was analyzed using a different ICP-MS package designed for mineralized rocks that has different detection and upper limits and analyzes fewer elements.

Table 20, continued.

	Rb (ppm)	Sb (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	Ti (ppm)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Zn (ppm)	Zr (ppm)
<i>Detection Limit:</i>	<i>0.11</i>	<i>0.04</i>	<i>0.16</i>	<i>0.6</i>	<i>0.007</i>	<i>0.018</i>	<i>7</i>	<i>0.002</i>	<i>0.011</i>	<i>0.8</i>	<i>0.05</i>	<i>1.8</i>	<i>6</i>
2013CS030	34.87	0.41	0.56	300.2	0.249	3.217	2231	0.115	0.677	75.2	0.23	50	91
2013CS031	24.99	0.24	0.28	411.6	0.211	4.199	766	0.073	0.657	18	0.28	22	73
2013CS032	77.84	0.07	1.21	405	0.43	10.996	3283	0.411	1.616	93.5	0.95	70	188
2013CS033	110.53	0.17	1.44	673.4	0.464	4.963	2570	0.483	1.047	71.7	0.35	81	129
2013CS035	79.28	0.06	1.32	180.6	0.848	7.864	1379	0.327	2.329	23.9	0.15	36	124
2013CS036A	79.05	<0.04	0.66	340.7	0.243	1.386	1656	0.371	0.451	28	0.06	47	91
2013CS036B	144.42	0.04	1.4	47.1	1.735	12.28	50	0.432	4.636	1.3	0.07	7	35
2013CS037	49.33	<0.04	3.78	93	1.685	6.146	111	0.123	2.024	2.4	0.26	16	14
2013CS039	53.96	0.05	0.8	110.6	0.473	7.504	554	0.264	3.014	7	0.05	25	91
2013CS040	79.51	0.04	0.51	151.6	0.384	3.459	216	0.333	1.551	2.7	0.14	36	34
2013CS041	151.19	<0.04	0.37	55.7	0.148	1.353	151	0.648	0.485	<0.8	0.27	8	13
2013CS047	133.97	<0.04	0.5	84.9	1.087	3.789	157	0.665	5.86	1.4	0.15	9	41
2013CS057	331.28	0.36	3.43	98	12.739	15.549	576	1.881	10.024	7.4	0.34	23	120
2013CS058	258.18	0.08	2.15	193.1	1.302	23.411	1221	1.581	5.916	15.6	0.22	34	188
2013CS059	166.55	<0.04	0.72	237	0.119	0.134	61	0.762	0.578	2.1	0.23	<7	19
2013CS059A	107.81	<0.04	1.01	211.4	0.213	0.307	140	0.488	0.83	4.3	0.38	16	26
2013CS060	69.09	<0.04	0.78	635	0.45	4.773	1267	0.371	2.188	25.4	0.72	31	67
2013CS061	104.07	<0.04	0.85	261.6	0.668	6.836	1902	0.572	3.249	58.7	0.35	55	104
2013CS062	324.47	0.12	1.1	26.3	2.528	19.672	169	1.991	24.837	2.1	0.6	22	189
2013CS063	12.99	0.04	<0.16	2.8	0.372	0.425	18	0.082	19.496	<0.8	0.16	<7	<6
2013CS064	320.45	0.09	1.13	28.3	2.307	11.358	171	2.014	17.874	2	0.75	25	61
2013CS065	353.09	0.09	1.36	32.8	2.85	9.653	200	2.14	16.319	1.5	0.71	22	79
2013CS072	387.72	<0.04	3.42	18.9	7.722	9.903	202	2.315	10.993	1.6	0.42	13	34
2013CS073	319.93	0.05	2.28	126.3	1.724	32.72	711	1.962	9.847	6.5	0.3	30	130
2013CS074	190.11	0.54	4.12	28.6	2.999	3.092	302	0.903	7.02	3.6	3.2	30	26
2013CS075	750.46	<0.04	0.44	33.7	0.054	0.329	23	4.313	1.919	<0.8	0.05	<7	<6
2013CS076	314.49	0.05	1.45	38.6	1.252	18.448	562	1.912	16.82	3	0.16	25	55
2013CS077	162.12	0.07	0.82	38.5	4.659	17.948	222	0.989	19.568	1.4	0.24	136	27
2013CS080	118.65	<0.04	1.45	506.9	1.054	15.512	2842	0.567	1.626	47.3	0.78	71	152
2013CS082	383.47	<0.04	4.54	100.5	3.579	30.059	870	2.419	9.159	7.8	0.14	39	134
2013CS083	147.82	<0.04	3.65	91.3	1.327	6.289	438	0.937	2.934	<0.8	0.12	53	639
2013CS084	253.5	<0.04	1.27	73.9	3.433	9.334	182	1.446	4.589	0.8	0.33	17	158
2013CS085	164.3	0.07	1.68	886.3	0.716	18.856	3356	0.899	2.987	77.2	0.73	75	290
2013CS088	285.12	0.05	0.57	68.9	2.255	9.81	349	1.698	17.84	2.4	0.3	22	17
2013CS089	159	0.06	1.01	74.2	3.824	12.837	478	0.967	12.681	3.4	0.22	25	62
2013CS090	111.63	<0.04	0.68	91.4	0.911	11.843	496	0.529	9.33	8.3	0.05	27	87
2014CS022	103.42	<0.04	0.6	618.9	0.176	24.589	1498	0.558	2.01	25.6	<0.05	37	193
2014CS023	90.56	<0.04	0.59	430.7	0.39	11.067	3561	0.584	1.157	81.4	<0.05	62	216
2014CS024	174.17	<0.04	0.71	587.6	0.099	63.406	1021	0.93	1.829	15.9	0.07	27	291
2014CS025	98.59	<0.04	1.98	1182.7	0.447	19.343	5093	0.571	1.124	133.3	<0.05	191	258
2014CS026	104.22	<0.04	1.07	581	0.179	13.476	1465	0.574	2.451	16.9	0.1	36	130
2014CS047	221.44	<0.04	>14	31	14.998	7.011	121	0.674	4.06	3.8	0.68	9	22
2014CS048	60.74	0.05	1.32	42.5	1.446	6.689	126	0.266	5.269	3.3	0.41	8	38
2014CSOR10	93.52	<0.04	1.38	301.3	0.733	7.898	2528	0.591	4.562	66.8	0.55	69	101
2015CS046	97.7	0.04	>14	64.2	22.051	0.452	46	0.518	11.874	1.6	1.25	21	33

	Rb (ppm)	Sb (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Th (ppm)	Ti (ppm)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Zn (ppm)	Zr (ppm)
Detection Limit:	0.11	0.04	0.16	0.6	0.007	0.018	7	0.002	0.011	0.8	0.05	1.8	6
2015CS049	1128.69	1.69	>14	8.7	74.132	1.649	59	6.034	1.935	<0.8	1.31	72	8
2015CS051	254.55	0.06	>14	111.5	0.786	8.491	407	0.81	2.191	2.6	0.3	19	46
2015CS052	8.11	0.05	1.2	33.1	0.202	0.735	364	0.026	0.302	17.2	0.11	17	13
2015CS053	78.28	0.04	4.97	63.6	1.149	2.029	234	0.353	8.207	7.8	5.03	32	28
2015CS054	104.38	<0.04	1.79	263.4	1.958	9.73	2844	0.661	3.364	87.1	0.68	77	125
2015CS055	145.94	<0.04	0.53	300.6	0.109	16.402	116	0.756	4.039	2.7	0.42	9	66
2015CS057	1381.38	<0.04	>14	2.3	38.496	0.08	851	7.976	2.943	22.2	16.81	121	<6
2015CS058	34.17	0.05	1.02	40.2	0.331	1.408	228	0.154	0.744	7.4	0.94	20	14
2015CS059	116.66	0.04	0.53	122.3	0.443	4.838	177	0.51	13.245	2.3	0.34	7	51
2015CS060	27.39	<0.04	0.48	235.3	0.441	5.952	974	0.153	3.796	23.7	0.13	30	134
2015CS061	54.72	0.04	0.56	284	0.217	5.904	1087	0.292	0.263	21.4	0.13	28	65
2015CS062	142.63	<0.04	0.27	159	0.071	5.416	174	0.65	0.477	3.4	0.05	11	24
2015CS063	245	0.09	1.72	85.7	1.321	23.214	1047	1.461	3.834	7.1	2.07	23	453
2015CS064	91.32	0.26	1.36	329.8	0.517	10.248	3361	0.563	3.028	98	1.83	66	133
2015CS065	54.23	<0.04	1.75	286.6	0.484	3.478	3642	0.324	0.289	107.2	0.05	89	106
2015CS066	54.85	<0.04	1.11	228.5	0.537	4.546	1557	0.323	0.69	28.3	0.13	44	146
2015CS069	14.53	0.78	0.31	235.4	1.017	13.746	381	0.058	3.272	3.2	2.12	7	73
2015CS076	181.73	0.05	1.5	507	0.388	5.174	1423	0.897	1.044	21.3	0.16	36	18
2015CS077	71.97	<0.04	1.52	474.7	0.347	0.64	2765	0.43	0.453	53.7	0.08	57	39
2015CS078	183.64	<0.04	0.59	496	0.229	0.903	123	0.936	0.244	3	0.05	4	9
2015CS079	154.58	0.04	0.63	173	0.412	3.379	183	0.774	1.744	2.1	0.18	5	20
2015CS056B	9.71	1.1	0.1	71.54	<0.004	11.01	216.8	0.099		39	0.2	47.09	6.3

Analyses by Geoscience Laboratories, Ministry of Northern Development and Mines, Sudbury, Ontario. All samples analyzed by inductively coupled plasma mass spectrometry (ICP-MS), with the exception of sample 2015CS56B, which was analyzed using a different ICP-MS package designed for mineralized rocks that has different detection and upper limits and analyzes fewer elements.

REE deposits associated with, or hosted by, peralkaline granitoid rocks are described by Richardson and Birkett (1996). The known magmatic deposits occur in ovoid to elongate bodies, from less than 1 km² to several tens of square kilometres in areal extent, which are the final intrusive stages of multi-phase batholith complexes, indicating that fractionation of the parent granitoid magma is an important factor in deposit creation. The main thrust of this sampling program was to identify peralkaline granitoid bodies as a precursor to exploring for potential REE occurrences.

The following quote from Breaks, Selway and Tindle (2003, p.4) indicates the importance of element ratios.

The range in trace element ratios for a fertile granite are 270 to 42 K/Rb, 15 400 to 1600 K/Cs, 48 to 18 200 K/Ba, 1.6 to 185 Rb/Sr, 3100 to 1180 Al/Ga, 64 to 14 Zr/Hf, 1.7 to 50 Mg/Li (Černý 1989). The Mg/Li ratio for bulk whole rock analysis is one of the best indicators of the degree of fractionation of granites and pegmatites. An elevated Mg/Li ratio (e.g., Mg/Li= 50) indicates abundant Mg in a primitive rock, whereas a low Mg/Li ratio (e.g., Mg/Li <10) indicates elevated Li contents in a fractionated rock. Lithium-rich rocks have more economic potential than lithium-poor rocks.

Element ratios Mg/Li, Rb/Sr, K/Cs, K/Rb and Nb/Ta are found in Table 21. Pegmatites with the greatest rare element economic potential will have very low K/Rb, K/Cs, Nb/Ta and Mg/Li ratios (Breaks, Selway and Tindle 2003). The higher the rare element contents in a bulk analysis, the higher the degree of fractionation and the higher the economic potential of the pegmatite (Breaks et al. 2003). Average upper continental crust values for Be (3 ppm), Cs (3.7 ppm), Ga (17 ppm), Li (20 ppm), Nb (25 ppm), Rb (112 ppm), Sn (5.5 ppm) and Ta (2.2 ppm) used by Breaks, Selway and Tindle (2003) are from Taylor and McLennan (1985). A value of 100 ppm Li (5× crustal abundance) or greater is taken as a significant value in examining

trace element data. Richardson and Birkett (1996) indicated that high Rb/Sr value is indicative of peralkaline rocks associated with REE deposits. The trace elements were not treated statistically because of the large number of different rock types. In most cases, the value from the analysis was compared to crustal abundance. In Table 17 (REE analyses), samples in excess of crustal abundance are indicated by bold type; most exceed it by only a small amount. Scandium was listed with the REEs, but was not added into the total REE. All scandium values are close to background levels. In examining the major and trace element data, it is very obvious that peraluminous major element analyses do not always correlate with elevated or significant rare metal trace element values. A similar situation arises for the peralkaline samples and rare earth elements. The peraluminous or peralkaline nature of the rock is important, but it has to be combined with the appropriate element ratios to determine if a granitoid body or its related pegmatites have the potential to host rare element mineralization. All rare metal-bearing pegmatites studied are peraluminous, but not all peraluminous granitoids contain high rare metal values. The peralkaline granitoid-REE connection is similar, but so few were actually identified that little can be said about REE mineral potential.

Table 21. Element ratios determined from analyses of rock samples collected as part of the granitoid rock reconnaissance study (for sample descriptions, see Table 16).

Sample	Mg/Li	Rb/Sr	K/Cs	K/Rb	Nb/Ta	Sample	Mg/Li	Rb/Sr	K/Cs	K/Rb	Nb/Ta
2013CS030	1370.52	0.12	2582.042	252.35	14.17	2013CS089	27.33	2.14	2428.52	119.56	6.24
2013CS031	669.29	0.06	1975.86	225.89	9.35	2013CS090	94.59	1.22	24136.3	313.08	5.89
2013CS032	861.47	0.19	5105.08	236.76	15.63	2014CS022	414.58	0.17	102039.4	378.87	26.26
2013CS033	877.39	0.16	3854.64	196.028	13.61	2014CS023	935.40	0.21	33550.83	231.92	26.56
2013CS035	216.13	0.44	9924.39	255.49	8.63	2014CS024	263.46	0.30	139960.9	360.81	26.22
2013CS036A	161.64	0.23	4562.76	140.72	14.16	2014CS025	3876.60	0.08	13612.33	170.93	25.05
2013CS036B	80.403	3.07	60867.12	219.58	5.46	2014CS026	242.95	0.18	104757.2	337.73	31.27
2013CS037	140.71	0.53	17168.56	143.042	11.16	2014CS047	107.68	7.14	7544.03	91.85	3.45
2013CS039	128.08	0.49	32568.53	361.54	9.36	2014CS048	126.01	1.43	57188.19	338.95	3.34
2013CS040	83.40	0.52	46529.46	474.01	5.85	2014CSOR10	457.55	0.31	3955.13	246.77	10.05
2013CS041	83.18	2.71	134438.8	420.59	10.26	2015CS046	3.829	1.52	541.65	73.92	1.17
2013CS047	279.98	1.58	19353.57	408.97	5.38	2015CS049	2.04	129.73	92.09	8.017	0.98
2013CS057	27.61	3.38	5537.89	156.37	2.57	2015CS050	1067.68	0.11	2331.25	343.45	16.76
2013CS058	27.52	1.34	4913.67	158.84	10.52	2015CS050A	832.30	0.13	2976.6	192.46	18.17
2013CS059	50.25	0.70	26454.55	353.89	4.47	2015CS051	131.57	2.28	11200.98	217.20	6.75
2013CS059A	90.96	0.51	17122.38	324.95	5.08	2015CS052	1439.73	0.25	15347.31	225.19	5.30
2013CS060	118.30	0.11	7693.68	337.64	7.99	2015CS053	319.79	1.23	13456.42	351.02	5.79
2013CS061	362.59	0.40	6860.03	252.07	9.35	2015CS054	287.60	0.40	2512.38	168.61	5.45
2013CS062	31.33	12.34	2813.03	117.18	5.29	2015CS055	211.88	0.49	22672.36	331.06	6.33
2013CS063	64.61	4.64	2066.76	115.03	5.99	2015CS057	12.82	600.60	737.75	63.10	4.57
2013CS064	26.41	11.32	2803.49	118.65	5.62	2015CS058	79.87	0.85	4145.30	184.64	10.62
2013CS065	23.19	10.76	2545.18	115.91	6.08	2015CS059	189.18	0.95	25830.65	329.47	4.88
2013CS072	7.42	20.51	2760.26	102.56	5.74	2015CS060	204.87	0.12	4783.73	248.53	6.58
2013CS073	11.13	2.53	3129.34	129.74	7.64	2015CS061	196.25	0.19	15959.29	361.07	11.12
2013CS074	37.13	6.65	3969.20	179.47	9.08	2015CS062	75.38	0.90	77107.29	440.60	18.58
2013CS075		22.27	13132.94	136.06	9.76	2015CS063	41.22	2.86	12139.38	207.71	12.22
2013CS076	19.63	8.15	3722.29	135.42	10.21	2015CS064	357.30	0.28	3202.61	241.81	12.20
2013CS077	26.55	4.21	4695.57	146.96	4.29	2015CS065	460.72	0.19	9138.10	217.37	14.55
2013CS080	331.17	0.23	10596.43	253.28	9.82	2015CS066	213.35	0.24	5682.85	189.19	9.60
2013CS082	17.718	3.82	1794.29	116.25	6.40	2015CS069	487.06	0.06	26607.4	571.34	5.02
2013CS083	80.47	1.62	3267.43	147.70	11.91	2015CS076	318.58	0.36	43824.36	462.29	16.77
2013CS084	95.44	3.43	11906.55	235.78	7.42	2015CS077	382.77	0.15	10750.16	207.62	16.95
2013CS085	216.71	0.19	3034.93	220.30	15.33	2015CS078	120.61	0.37	87403.57	432.16	1.67
2013CS088	30.92	4.14	4045.99	130.44	7.31	2015CS079	187.14	0.89	59671.42	464.00	3.34
						2015CS056B	1311.28	0.14	68625.83	2120.26	

Northern Iron Corporation's **Karas Lake** property (samples 2013CS030 to 033) is underlain by high metamorphic grade metasedimentary rocks and iron formation at the southern edge of the Uchi Subprovince. The primary rock type is foliated biotite-quartz-feldspar clastic metasedimentary rocks and iron formation intruded by irregular pegmatite dikes. The pegmatites are peraluminous, with sample 2013CS032 being strongly peraluminous, with average values for Rb/Sr (0.19) and Nb/Ta (15.63). However, the other 3 samples show elevated elemental ratios. The rare element and REE values for these samples are only at background levels. It is interpreted these samples do not indicate a high degree of fractionation of the melt.

The **Joyce Road South** area (samples 2013CS035 to 041) was covered by a road traverse across an area of varied granitoid rocks. The major element analyses show that all the samples are normal to slightly peraluminous. Only sample 2013CS037 is deemed peraluminous by the criteria used in this report. Sample 2013CS036B has several REE above crustal abundance, but not more than 2× crustal abundance. The Rb/Sr value for this sample is 3.066, which is significantly higher than the other samples of this group. The other element ratios do not support a high degree of fractionation of the melt.

Sample 2013CS047, from the **Pipestone Bay** area of Red Lake, has a “normal” A/CNK (very slightly on the peraluminous side), no elevated REEs and background level for the rest of the trace elements. This sample site is from a granitic dike that is part of a large batholith complex.

A number of samples were taken from diamond-drill core and bedrock intersections from roto-sonic drilling on the **Red Lake Extension** (RLX) property of TriOrigin Exploration Ltd.. The drilling intersected a variety of granitoid and gneissic rocks. Nineteen samples were collected (samples 2013CS057 and 058, 2013CS062 to 077, 2013CS082 to 2013CS090).

Major element analysis indicates 2 samples, 2013CS063 and 085, are peralkaline (A/CNK = 0.861 and 0.847) and another sample, 2013CS074, is strongly peraluminous (A/CNK = 1.788). Of the 2 peralkaline samples, sample 2013CS063 contains quartz vein material, but sample 2013CS062 from the same rock (but without quartz vein) has A/CNK = 0.994, which is “normal”, but on the peralkaline side. The presence of the quartz may be responsible for the low ratio. Other relevant results include

- samples 2013CS062 and 063 are from the same drill hole and are contiguous: sample 062 contains several elevated REE values, whereas 063 does not
- sample 2013CS085 has elevated REE values and, at 340 ppm, has the third highest total REE in the survey
- sample 2013CS074 has background values for REE and other trace elements
- sample 2013CS058 contains elevated REE with a total REE of 220.097 ppm
- Several samples have values approaching the 100 ppm Li anomalous threshold, such as 2013CS058 (96.4 ppm), 2013CS073 (97.5 ppm), 2013CS082 (98.7 ppm) and 2013CS085 (83.2 ppm). These samples do not have strongly peraluminous A/CNK and 2013CS085 is peralkaline. These samples are all biotite-bearing granitoids.
- Rb/Sr ratios are low, except samples 2013CS072 (20.51) and 2013CS075 (22.27): these are the highest of the RLX samples.
- Mg/Li ratios for many of the RLX samples are less than 50, with sample 2013CS072 being less than 10 (7.42). Sample 2013CS075 does not have a Mg/Li number because the Mg content was at or below the analytical detection limit.

Elevated REE and lithium values in a number of samples indicate that further sampling and analysis of the TriOrigin Exploration Ltd. core is warranted.

Highway 804 extends west from Highway 105 south of Ear Falls. It crosses an area of migmatitic metasedimentary rocks of the English River Subprovince. Samples 2013CS059 to 061 comprised coarse-grained pegmatitic sills and dikes hosted by fine-grained biotite-quartz-feldspar rock. All are peraluminous, with 2013CS061 being strongly peraluminous ($A/CNK = 1.41$). Sample 2013CS059A is moderately peraluminous ($A/CNK = 1.144$) perhaps because of the presence of biotite and garnet mineral clots in the specimen. A slight increase in europium is evident in samples 2013CS060 and 061. A slight increase in lutetium and thulium are also seen in sample 2013CS059A, but the overall total REE is low (<109 ppm).

One sample from the **Meekis Copper showing** (2013CS080) was taken from what is probably a large granitoid complex. It is in the “normal” range for A/CNK (1.032) and shows a slight elevation in REEs and a low Rb/Sr (0.23). The other element ratios do not indicate a highly fractionated rock and the only elevated trace element is, not surprisingly, copper (2805.6 ppm Cu).

Sample 2013CSOR08 was taken from the **Dome stock** in the Red Lake town site. Limited trace element data are available for this sample; only average crustal abundances were obtained: 14 ppm Li, 17 ppm Sc and 22 ppm Y.

The **Ear Falls Airport** sample 2014CSOR010 is a pegmatitic granitoid rock that is strongly peraluminous ($A/CNK = 1.32$), but its elemental ratios do not indicate a highly fractionated rock. In particular, it has a low lithium value (25.7 ppm Li).

The **Tide Road** sampling traverse (samples 2014CS022 to 026) crosses an area of migmatitic metasedimentary rocks that feature large granitoid intrusive bodies, as well as the mobilizate from partial melting. With the exception of sample 2014CS025, all the samples are peraluminous, with 2014CS023 strongly so ($A/CNK = 1.248$). Sample 2014CS025 is in the “normal” A/CNK range, but is more on the peralkaline side ($A/CNK = 0.974$). This sample does show elevated REE and has a total REE of 596.96 (highest of the survey) due to high cerium and lanthanum values. All the samples of this group show at least some significant increase in REE abundance. The other trace elements are at background levels. Elemental ratios do not support a high level of fractionation.

Sampling on the **Condor Precious Metals Inc.** property (2014CS047 and 048) comprised pegmatite dikes hosted by mafic metavolcanic rocks. Sample 2014CS047 contains small muscovite books and 2014CS048 shows evidence of a second phase of narrow pegmatite veins intruding the main pegmatite. A/CNK values indicate both samples are peraluminous: sample 2014CS047 has a high A/CNK values of 1.699. Both samples show REE moderately above crustal abundance. The other trace elements are at background levels, except for Ta (14.998 ppm) in sample 2014CS047, which is higher than the majority of samples in this study. The element ratios do not support a high level of fractionation for these 2 samples.

The **Sandy Creek beryl pegmatite** is a well-known beryl occurrence just east of Highway 105, north of Ear Falls. Four samples were collected (2015CS046, 047, 048 and 057), but only samples 2015CS046 and 057 were analyzed. Sample 2015CS057 is muscovite only. Sample 2015CS046 has a A/CNK value that is “normal” to only slightly peraluminous ($A/CNK = 1.04$). Both analyzed samples display elevated tantalum and tin, and 2015CS046 shows high Be (184.72 ppm), but neither show any more than background REE. The element ratios, particularly Mg/Li and Nb/Ta, indicate this is a highly fractionated pegmatite.

The **McCombe Pegmatite** was also sampled (2015CS049, 050 and 050A). Only sample 2015CS049 was from the pegmatite, samples 2015CS050 and 050A are from the mafic metavolcanic host rock at a distance from the pegmatite. Breaks, Selway and Tindle (2003) described this pegmatite and provided a map of the occurrence. Landore Resources Canada Inc. carried out geochemical sampling and reconnaissance mapping in 2005 (Trebilcock 2007). The pegmatite is well exposed, but the rock surfaces are heavily incrustated by lichen, making property-scale mapping difficult. Elemental ratios in this report and those in Trebilcock (2007) indicate this is a highly fractionated pegmatite. The A/CNK value (2.187) for sample 2015CS049 indicates a highly fractionated pegmatite. None of the samples show elevated

REE, but the trace elements beryllium, lithium and tantalum are higher than crustal abundance. Lithium is over the upper limit of 207 ppm Li for the analytical method, so the Mg/Li value was determined using 207 ppm Li, making the value of the actual ratio much lower than 2. Element ratios for the 2 mafic metavolcanic samples are shown in Table 21, but do not appear useful as exploration aids.

The **Slate Road** area is south of the Root Lake pegmatites on the logging road that accesses the Root Lake area. The area is underlain by migmatitic metasedimentary rocks with abundant mobilizate phases and some pegmatite. Sample 2015CS052 is interpreted as being a metamorphosed iron formation with 50% Fe₂O₃ and very low alumina. The A/CNK value is included in Table 18, but is not meaningful because of the overall composition of the sample. Sample 2015CS051 is from a pink pegmatite dike with muscovite books; the other samples are leucocratic mobilizate material. All are peraluminous, samples 2015CS053, 054 and 055 are strongly so, with sample 2015CS053 having a A/CNK value of 2.285. The element ratios, however, do not support a high level of fractionation and the trace elements are at background levels. The REEs are only slightly above crustal abundance levels in samples 2015CS054 and 055.

The “**Chicken Chef**” outcrop provided a sample of a granitic cobble from a conglomerate unit that forms a significant marker unit related to gold mineralization in the Red Lake camp (Huston assemblage of Sanborn-Barrie, Skulski and Parker 2004). The cobble is a grey granitoid rock. The sample of this rock was subdivided into two because there is a quartz vein as part of the cobble, that was formed prior to the rock being eroded and incorporated in the conglomerate. The sample analyzed is peraluminous (A/CNK = 1.178). Its element ratios do not indicate fractionation. It does not have a Nb/Ta value because tantalum is below the analytical detection limit. The sample has only background trace elements and REEs. A sample of this cobble has been submitted for geochronology to assist in an attempt to determine its source granitoid body.

A pink felsic dike sample was taken from a dike cutting the host rock of **Buffalo gold prospect** in the Dome stock. There are several similar fine-grained dikes that do not appear to be related to the gold mineralization. The outcrop was stripped and washed, and was the subject of a BSc thesis by Pettigrew (1999), who indicated that the Dome stock is granodiorite and the pink dikes are aplite. Gold mineralization is found in late quartz-tourmaline veins and in a carbonate alteration zone along the vein contacts. The outcrop is close to the contact between the Dome stock and the Balmer assemblage mafic metavolcanic rocks of the Red Lake greenstone belt. Sample 2015CS069 is from one of the dikes. It is strongly peraluminous (A/CNK = 1.277), but its element ratios do not indicate a high level of fractionation. The trace elements and REEs are at background levels. Major and trace element results for sample 2015CS069 are similar to those in Pettigrew (1999) for a sample of the pink aplite.

The **Wenasaga Road** is a logging road that extends east-northeast from Ear Falls and crosses a large area of the English River Subprovince, which is predominantly underlain by migmatitic metasedimentary and granitoid rocks. Samples 2015CS058 to 066 and 2015CS076 to 078 were collected along the road. All but 2015CS065 are peraluminous and several are strongly peraluminous (2015CS058: A/CNK = 1.42; and 2015CS: A/CNK = 1.413). Samples 2015CS064 and 065 are biotite-quartz-feldspar restite phases of the migmatite; therefore, their A/CNK values may not be meaningful. The element ratios do not support any of these rocks as being highly fractionated. Any sample from this group that contains a significant amount of the biotite restite phase is peraluminous, except 2015CS065, which is slightly peralkaline. Samples 2015CS063 and 076 show a small enrichment in REEs over the crustal abundance. Sample 2015CS063 is a massive pink granitoid body and 2015CS076 is a pink pegmatite dike cutting diatexitic migmatite. Both are in the “normal” A/CNK range, but slightly peraluminous (A/CNK = 1.089 and 1.031, respectively). The other trace elements are at background levels.

An additional sample (2015CS079) of pink pegmatite cutting migmatite was collected on the **Chilcott Road**, which is a side road that extends several kilometres north of the Wenasaga Road. This sample is peraluminous (A/CNK = 1.11) and has element ratios similar to the Wenasaga Road samples. Trace elements and REEs are at background levels only.

RECOMMENDATIONS FOR EXPLORATION

Rare Metal-Bearing Pegmatites Along the Bear Head Fault

Lithium and lithium-based products bucked global commodity price trends in 2015. Lithium carbonate prices rose 23% in 2015 to approximately US\$8000 per tonne and lithium hydroxide prices rose 25% to approximately US\$10 000 per tonne, driven by strong demand for lithium-ion batteries in high-growth industries, including electric vehicles and energy storage (Talbot 2015).

Rare metal-bearing pegmatites have traditionally been considered as sources of lithium and lithium-bearing industrial minerals. Rare metal pegmatites are typically derived from a parental granite that is peraluminous in bulk composition (Breaks, Selway and Tindle 2003). In the field, they are characterized as silicic (quartz-rich) granitoid rocks hosting aluminum-rich minerals, such as muscovite, garnet and tourmaline. They may occur in areas proximal to subprovince boundaries, intruding adjacent metasedimentary and metavolcanic rocks.

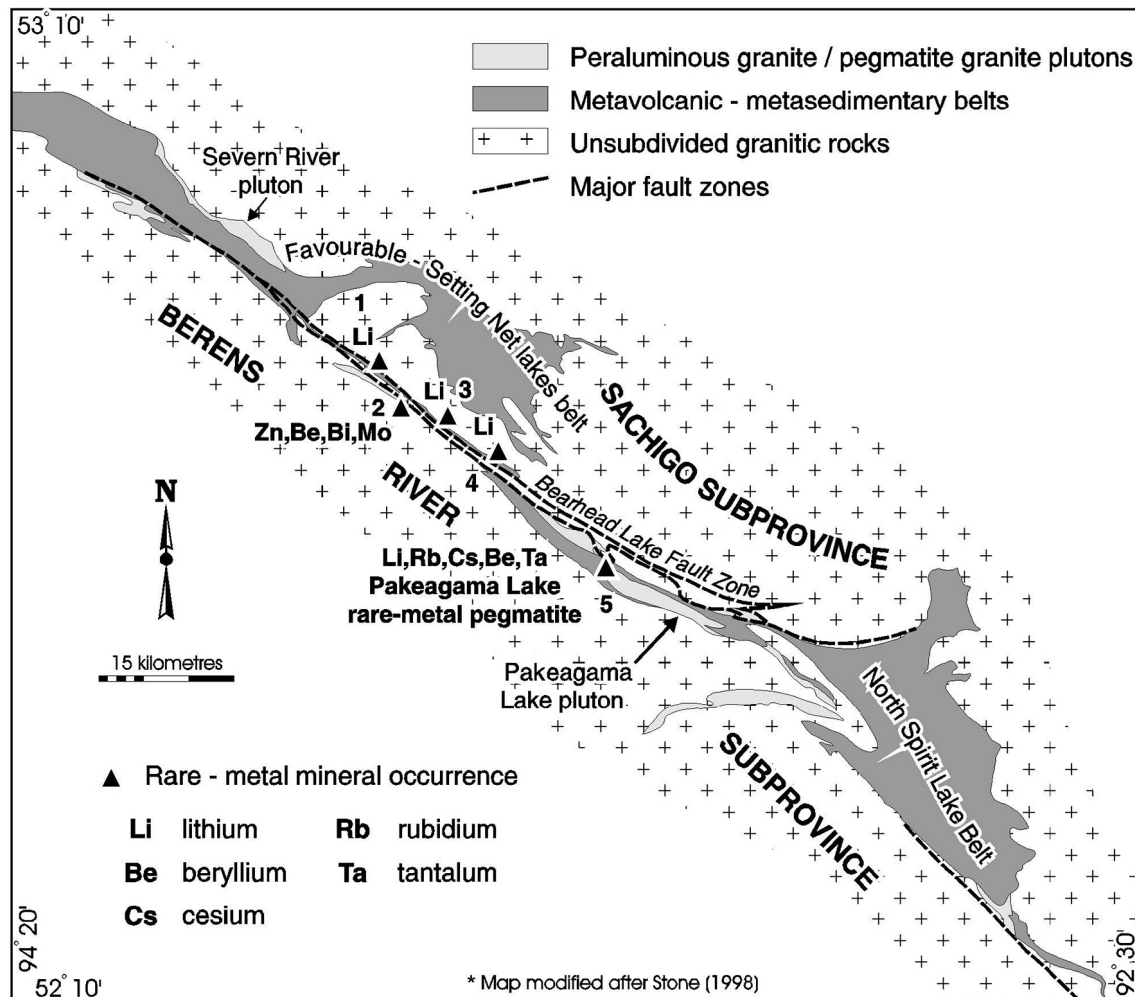


Figure 26. General distribution of peraluminous granite and rare-metal mineralization along the Sachigo–Berens River subprovincial boundary zone. Rare-metal occurrences (*from* Breaks, Tindle and Smith 1998: Figure 24.2): 1 = Bearhead Lake holmquistite; 2 = Mattless Lake zinc-beryllium-bismuth-molybdenum; 3 = Pennock Lake spodumene; 4 = Pennock Lake holmquistite; 5 = Pakeagama Lake Li-Rb-Cs-Ta pegmatite.

A 140 kilometres long linear zone of peraluminous granite bodies was delineated by Stone (1998) along the Bear Head fault, between Favourable Lake and McDowell Lake (Figure 26). Peraluminous granite and pegmatitic granite represent common parental magmas of rare metal mineralization (Breaks, Tindle and Smith 1998). The Bear Head fault separates the Sachigo Subprovince to the north and the Berens Subprovince to the south.

Five rare metal mineral occurrences are known from within the zone (Figure 27). The Pakeagama Lake occurrence is the most advanced: an NI 43-101–compliant resource estimate was completed and a bulk sample was taken in 2015 (*see* “Exploration Activity”, “Northern Greenstone Belts”, “Houston Lake Mining Inc.–PAK Rare Metals Project”). Breaks, Tindle and Smith (1998) stated the Pakeagama pegmatite “represents the second largest complex-type, petalite subtype pegmatite in Ontario, being only surpassed by the Big Whopper pegmatite in the Separation Lake area”.

The other 4 known occurrences lie within 65 km northwest of the Pakeagama Lake deposit and are open for staking:

- MDI53C13SE00089 Bearhead Lake holmquistite occurrence
- MDI53C12NE00012 Mattless Lake Zn-Be-Bi-Mo occurrence: 0.72% Zn, 0.1% Bi, 0.04% Mo, 0.01% Be (Ayres 1970)
- MDI53C12NE00014 Pennock Lake holmquistite occurrence
- MDI53C12NE00013 Pennock Lake spodumene occurrence: 0.52% Li (Ayres 1972)

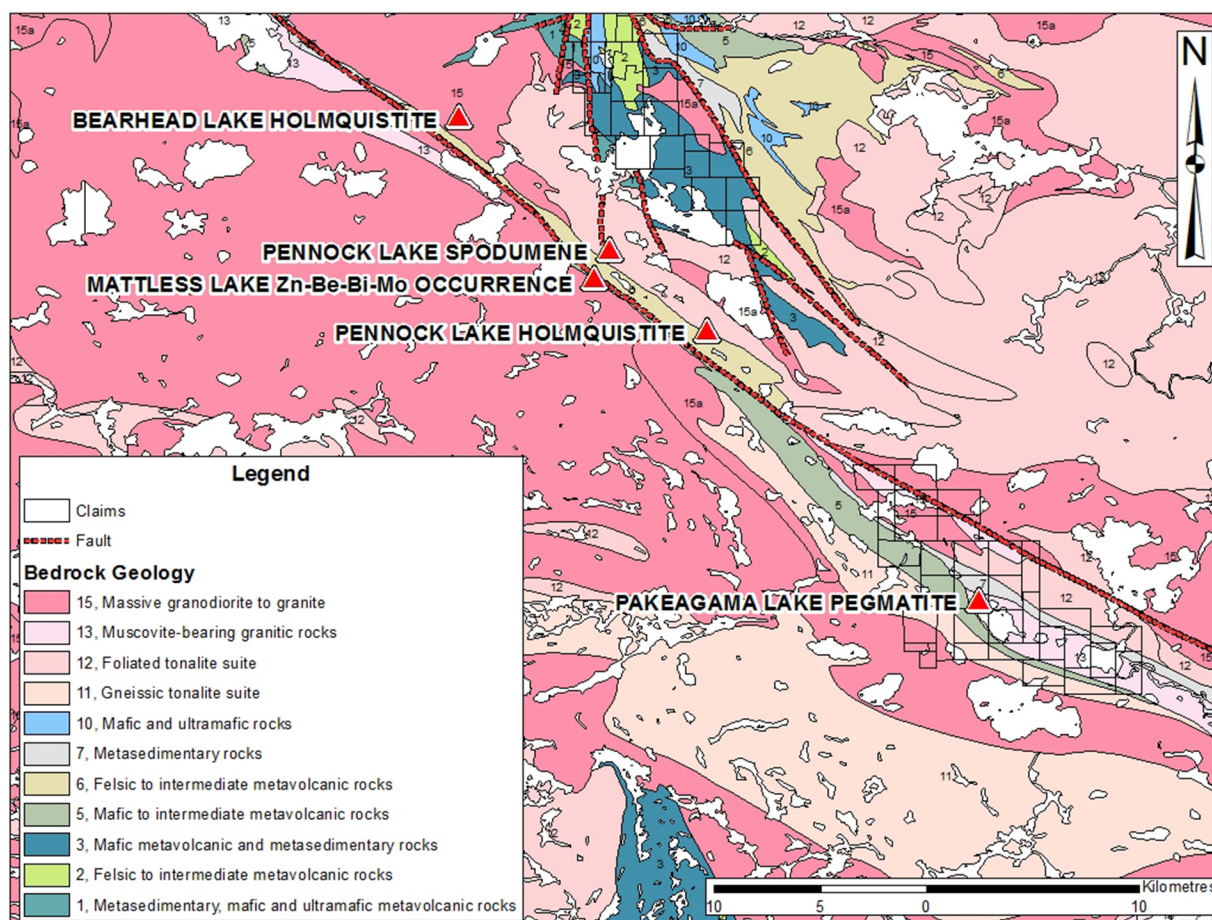


Figure 27. Bedrock geology, locations of rare metal occurrences and claim fabric along the Sachigo–Berens River subprovinces boundary (claim information current to January 16, 2016; bedrock geology from Ontario Geological Survey 2011).

Follow-up exploration is highly recommended in

- the immediate vicinity of these known occurrences,
- in the area underlain by fertile granites in the Favourable Lake area, northwest of the documented occurrences, and in
- the fertile granites southeast of Pakeagama Lake deposit toward McDowell Lake.

Hornby Lake—A Relatively Unexplored Greenstone Belt

The western two-thirds of the Hornby Lake greenstone belt, 125 km north of Red Lake (Figure 28), consist predominantly of mafic to komatiitic, pillowed to massive flows with subordinate mafic and ultramafic intrusive rocks. The eastern third of the belt is underlain by a turbiditic sequence overlain by dacitic pyroclastic rocks that have an age of 2901 ± 2 Ma (Corfu et al. 1998). Geological reconnaissance mapping (Atkinson et al. 1992; Cortis et al. 1988) defined a “back-to-back” relationship between the 2 assemblages. The contact is sharp, linear, strained and mineralized with pyrrhotite and minor chalcopyrite. The age and the overall geological setting are suggestive of the Red Lake greenstone belt volcanic stratigraphy and tectonics.

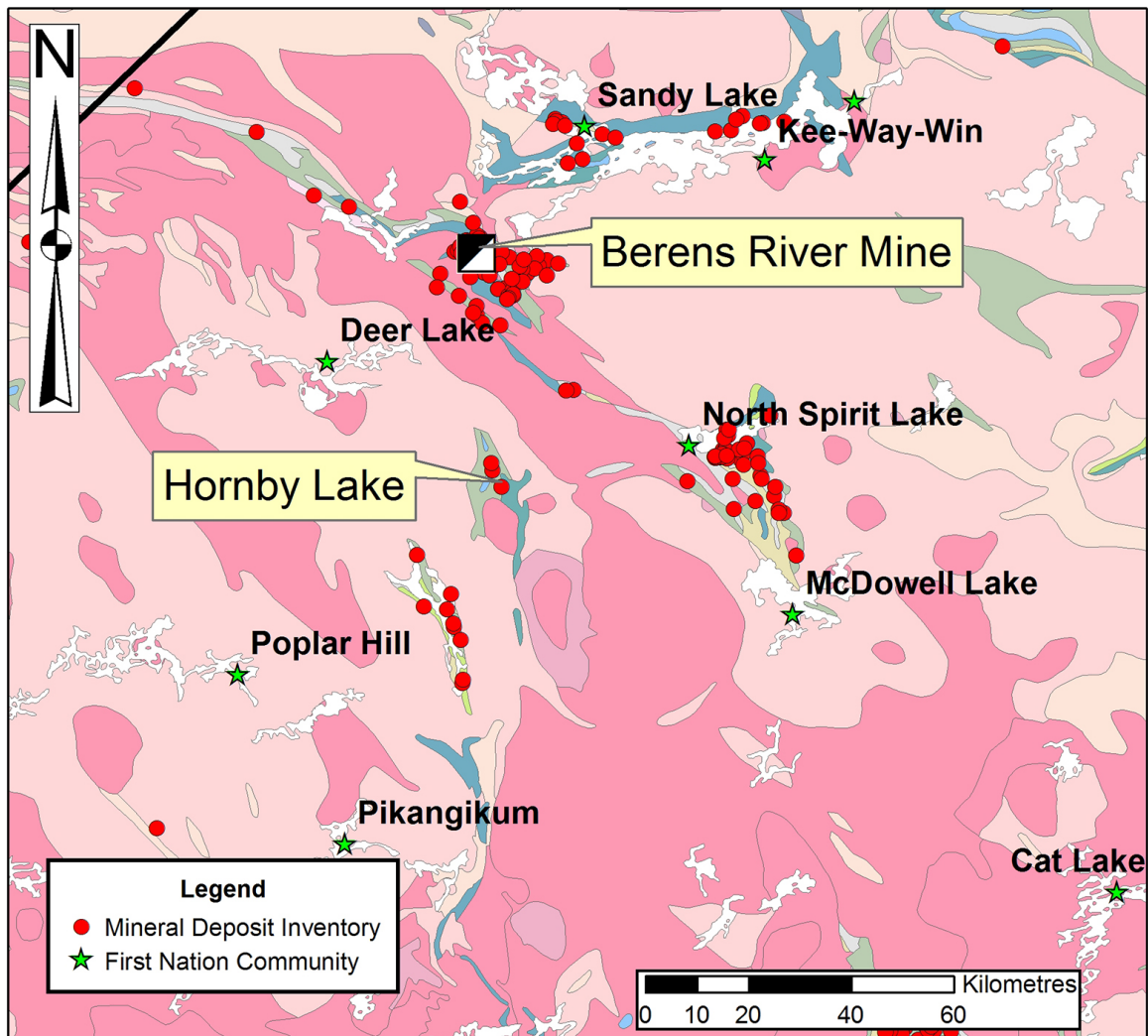


Figure 28. Location of the Hornby Lake greenstone belt, showing mineral occurrences of all commodities.

Assessment work reports detail only 2 brief exploration programs, in the period 1968–1971, which focussed on a sulphide-facies iron formation and a copper-nickel occurrence at a sheared mafic to ultramafic contact (MDI53C05NE00003: Ontario Geological Survey 2015).

The belt offers potential for

- lode gold mineralization associated with areas of high competency contrast localized at mafic–ultramafic rock contacts;
- lode gold in the sulphidized, ductile shear zone separating the 2 assemblages;
- nickel-copper mineralization associated with komatiitic flows;
- volcanogenic massive sulphide (VMS)-style base metal mineralization in the coarse-grained dacitic pyroclastic rocks in the eastern portion of the belt; and potential base metal mineralization associated with magnetite-facies iron formation in the western portion of the belt.

OGS ACTIVITIES AND RESEARCH BY OTHERS

Publications received in the Red Lake Resident Geologist office during 2015 are listed in Table 22. Research activities in the Red Lake District in 2015 are listed below (for locations, *see* Figure 9: location “1” for thesis A; and location “2” for theses B and C). There were no Ontario Geological Survey–Earth Resources and Geoscience Mapping Section (ERGMS) field activities in the Red Lake Resident Geologist District in 2015, but the Mineral Development and Rehabilitation Branch of MNDM carried out diamond drilling at the South Bay Mine in preparation for a major mine rehabilitation project to alleviate acid mine drainage concerns at the site.

- Brigitte Gélinas (Lakehead University) is working on an MSc thesis:
The Geology and Geochemistry of the Laird Lake Property, Red Lake Greenstone Belt, Ontario
- Tina Cliff (University of Manitoba) worked on a thesis:
Alteration and Mineralogical Analysis of the Ore Hosting Lithology of the Far East Zone, Red Lake Gold Mines, Ontario
- Logan Behuniak (Laurentian University) is working on a BSc thesis:
The Nature of Ore-Forming Fluids Associated with Gold Mineralization in the Red Lake Gold District, Ontario

Table 22. Publications received by the Red Lake Resident Geologist’s office in 2015.

Title	Author	Type and Year of Publication
Report of Activities 2015 (print and CD version)	Manitoba Geological Survey	Ministry of Innovation, Energy and Mines, Manitoba Geological Survey, 147p. 2015
Report of Activities, 2014, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora District	A.F. Lichtblau, C. Ravnaas, C.C. Storey, A. Tims, R.L. Debicki, T.K. Pettigrew, A.C. Wilson and J. Wetendorf	Ontario Geological Survey, Open File Report 6301, 2015
Report of Activities, 2014, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	G.D. White, R.M. Cundari, M.R. Brunelle, T.K. Pettigrew, A. Tims and R.L. Debicki	Ontario Geological Survey, Open File Report 6302, 2015
Report of Activities, 2014, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	M.A. Puumala, D.A. Campbell, A. Tims, R.L. Debicki, T.K. Pettigrew and M.R. Brunelle	Ontario Geological Survey, Open File Report 6303, 2015
Report of Activities, 2014, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	P. Bousquet, A. Pace, C.M. Daniels, R.L. Debicki, A.C. Wilson, A. Samuel and A. Yukich	Ontario Geological Survey, Open File Report 6304, 2015
Report of Activities, 2014, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	D.L. Guindon, D.G. Farrow, J. Suma-Momoh, C.M. Daniels, R.L. Debicki, A.C. Wilson, L.A.F. Hall and N. Sabiri	Ontario Geological Survey, Open File Report 6305, 2015

Title	Author	Type and Year of Publication
Report of Activities, 2014, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts and Petroleum Operations	P.J. Sangster, P.S. LeBaron, S.J. Charbonneau, D.A. Laidlaw, R.L. Debicki, A.C. Wilson and L. Fortner	Ontario Geological Survey, Open File Report 6306, 2015
Summary of Field Work and Other Activities, 2015	Ontario Geological Survey Edited by R.M. Easton, A.F. Bajc, S.M. Hamilton, S. Préfontaine, M. Duguet, O.M. Burnham, J.R. Parker and R.D. Dyer	Ontario Geological Survey, Open File Report 6313, 2015
Good Practices in Community Engagement and Readiness	Various	Energy and Mines Ministers' Conference, Sudbury, Ontario, August 2014
Options in Recycling Revenues Generated Through Carbon Pricing	A. Whitmore, E. Mongan and S. Pilloy (eds.)	International Council on Mining and Metals, April 2013
Exploration and Mining Guide for Aboriginal Communities	Anon.	Government of Canada, 2013
Corporate Social Responsibility Checklist for Canadian Mining Companies Working Abroad	Natural Resources Canada	Natural Resources Canada, 2015
Collecting Fluorescent Minerals	S. Schneider	Schiffer Publishing Ltd., 2010
Summary of Activities 2014, Canada–Nunavut Geoscience Office	D. Mate (ed.)	Canada–Nunavut Geoscience Office, 190p., 2015
Exploration and Mining in British Columbia, 2014	G. Clarke (dir.)	Ministry of Energy and Mines, British Columbia Geological Survey, Information Circular 2015-02, 2015
Saskatchewan Geological Survey, Open House 2014, Abstract Volume	Saskatchewan Geological Survey	Saskatchewan Geological Survey, 2014
Geology of Gem Deposits, 2 nd edition	L.A. Groat (ed.)	Mineralogical Association of Canada, Short Course Volume 44, 2014
Safety Guidelines for Mineral Exploration in Western Canada, 5 th edition	Environment, Health & Safety Committee, AMEBC	Association for Mineral Exploration British Columbia, 2013
The Southern Appalachians: A Changing World (DVD)	United States Geological Survey	United States Geological Survey, 2006
Reports of the US Geological Survey Global Resource Assessment Project: Copper, Platinum Group Elements, Potash (CD)	Various	United States Geological Survey, January 2015
Mineral Deposit Model Reports: All Commodities (CD)	Various	United States Geological Survey, January 2015
Tectonic and Metallogenic Model for Northeast Asia (CD)	W.J. Nokleberg (ed.)	United States Geological Survey
Basics of Mining Law – Selected Jurisdictions (CD)	Globalaw TM	GlobalMine the mining practice group of GLOBALAW Network, 2015
Explore–Discover–Develop Overviews: Geology, Exploration, Mining (CD)	Newfoundland and Labrador Geological Survey	Newfoundland and Labrador Geological Survey 2015
A Selection of Current Research and Other GSNL Articles on Gold, Base Metals, Rare Earths, Uranium, Granophile Elements (Mo, W, Sb) and More (CD)	various	Newfoundland and Labrador Geological Survey 2015
Minerals and Metals Factbook – 2014	Natural Resources Canada	Natural Resources Canada 2015
Four Billion Years and Counting: Canada's Geological Heritage	R. Fensome, G. Williams, A. Achab, J. Clague, D. Corrigan, J. Monger and G. Nowlan (eds.)	Canadian Federation of Earth Sciences, 2014
Geology of Mineral Resources	M. Jebrak and E. Marcoux	Geological Association of Canada, 2014
Petrology and Geochemistry of the Dickenson–Campbell Diorite, Red Lake	K. Dumoulin	BSc Thesis, Lakehead University, Thunder Bay, Ontario, 2015
Ontario Airborne Geophysical Surveys, Magnetic and Electromagnetic Data, Grid and Profile Data (ASCII and Geosoft® Formats) and Vector Data, Gullrock Lake Area—Purchased Data	Ontario Geological Survey	Ontario Geological Survey, Geophysical Data Set 1245, 2015

Title	Author	Type and Year of Publication
Airborne Magnetic and Electromagnetic Surveys, Colour-Filled Contours of the Residual Magnetic Field and Electromagnetic Anomalies, Gullrock Lake Area—Purchased Data	Ontario Geological Survey	Ontario Geological Survey, Map 60 441, 2015
Airborne Magnetic and Electromagnetic Surveys, Shaded Colour Image of the Second Vertical Derivative of the Residual Magnetic Field and Keating Correlation Coefficients, Gullrock Lake Area—Purchased Data	Ontario Geological Survey	Ontario Geological Survey, Map 60 442, 2015
Airborne Magnetic and Electromagnetic Surveys, Colour-Filled Contours of the EM Decay Constant and Electromagnetic Anomalies, Gullrock Lake Area—Purchased Data	Ontario Geological Survey	Ontario Geological Survey, Map 60 443, 2015
The Hemlo Gold Deposit, Ontario, Canada: Principal Deposit Characteristics and Constraints on Mineralization	T.L. Muir	Ore Geology Reviews, v.21, nos.1-2, p.1-66, 2002
Volcanic-Associated Massive Sulfide Deposits: Processes and Examples in Modern and Ancient Settings	C.T. Barrie and M.D. Hannington (eds.)	Society of Economic Geologists, Reviews in Economic Geology, v.8, 1999
Geophysics and Geochemistry in the Search for Metallic Ores	P.J. Hood (ed.)	Proceedings of Exploration '77, Geological Survey of Canada, Economic Geology Report 31, 1979
Survey of Predecessor and Defunct Companies 1985	The Financial Post Corporation Service Group	Maclean Hunter Limited, 1985
Survey of Predecessor and Defunct Companies 1991	The Financial Post Publications	The Financial Post Publications, 1991
Thermodynamic Properties of Mineral and Related Substances at 298.15K (25.0°C) and One Atmosphere (1.013 Bars) Pressure and at Higher Temperatures	R.A. Robie and D.R. Waldbaum	United States Geological Survey, Bulletin 1259, 1968
Magmatic Ore Deposits in Layered Intrusions – Descriptive Model for Reef-Type PGE and Contact-Type Cu-Ni-PGE Deposits	M.L. Zientek	United States Geological Survey, Open-File 2012-1010, 2012
Index to Published Reports, Maps and Digital Data, 2011–2014	Ontario Geological Survey	Ontario Geological Survey, Miscellaneous Paper 177 (Supplement 2011–2014), 2015
Geographic Index to Published Reports, Maps and Digital Data, 2011–2014	Ontario Geological Survey	Ontario Geological Survey, Miscellaneous Paper 178 (Supplement 2011–2014), 2015
Quebec Mining Review 2014/2015	S. Wiwierski (ed.)	DEL Communications Inc., 2014
North of 60° Mining & Exploration Review	C. Peters (ed.)	DEL Communications Inc., 2015
Manitoba Mining Review 2015	L. McLean and S. Wiwierski (eds.)	DEL Communications Inc., 2014
Manitoba Mining Review 2015–2016	L. McLean (ed.)	DEL Communications Inc., 2015
Northern Prospector: The Annual Mining & Exploration Review 2014–2015	C. Peters (ed.)	DEL Communications Inc., 2014
Northern Prospector: The Annual Mining & Exploration Review 2015–2016	C. Peters (ed.)	DEL Communications Inc., 2015
Nunavut Mineral Exploration, Mining and Geoscience Overview 2014	Mineral Resources Division	Aboriginal and Northern Affairs Canada, 2015
Institute on Lake Superior Geology, 61st Annual Meeting, Dryden, Ontario, Proceedings, Part 1 - Program and Abstracts, v.61	M.C. Smyk (ed.)	Institute on Lake Superior Geology, 2015
Institute on Lake Superior Geology, 61st Annual Meeting, Dryden, Ontario, Proceedings, Part 2 - Field Trip Guidebook, v.61	A. MacTavish and P. Hollings (eds.)	Institute on Lake Superior Geology, 2015

MINERAL DEPOSITS NOT BEING MINED

Table 23. Mineral deposits not being mined in the Red Lake District in 2015.

Abbreviations				
AF	Assessment Files	MDIR	Mineral Deposit Inventory record	
CAMH	<i>Canadian and American Mines Handbook</i>	MLS	Mining Lands, Sudbury	
CMH	<i>Canadian Mines Handbook</i>	MR	Mining Recorder	
GR	Geological Report	NM	<i>The Northern Miner</i>	
MDC	Mineral Deposit Circular [No.15-]	OFR	Open File Report	
.....	[formerly Mineral Resources Circular, No.1-14]	PC	Personal Communication	

Deposit Name (NTS/MDI)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Abino Bateman, Balmer and Dome townships (52N/04SW00335)	Au	<u>Total granodiorite zone:</u> : Drill-indicated tonnage 405 162 tons 0.203 opt Au from 3 subzones	AF (McClellan 1976)	Patent
Aiken-Russet Baird Township (52K/13NW00037)	Au	Total resource in Vein #3 of 22 715 t @ 0.17 opt Au	AF (Kuryliw 1967)	Patent
Alcourt (Copper Man, Hanson-Campbell) Fairlie Township (52N/04SW00003)	Au	<u>Resource:</u> Potential of 20 000 tonnes of 0.45 ounces of Au per tonne from 1959-1960 diamond drilling <u>No. 1 vein:</u> 17 000 tonnes of 0.2429 ounces of Au per tonne from 1959-1960 diamond drilling and 1981 sampling program	AF (Tilsley 1981)	Patent
Anco Mine Dome Township (52N/04SW00019)	Au	<u>Resource:</u> 50 000 tons of "Excellent Grade" (0.35 ounces of Au per ton?)	Energy, Mines and Resources Canada (1990)	Patent
Bathurst Mine Skinner Township (52N/07SW00003)	Au	<u>Resource:</u> 80 000 tons of 0.587 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Leased
Bear Head Lake Prospect (53C/12NW00061)	U ₃ O ₈	<u>Resource:</u> 978 810 tons of 0.06% U ₃ O ₈ to a depth of 500 feet	MDC 25 (Robertson and Gould 1983)	Staked Claim
Berens River Mine (Golsil, Zahavy) (53C/13SE00011)	Au, Ag, Pb, Zn	<u>Resource:</u> <u>No. 1 zone:</u> 75 000 tons of 0.10-0.2 ounces of Au per ton 4.0-5.0 ounces of Ag per ton <u>No. 3 zone:</u> 713 249 tons indicated of 0.249 ounces of Au per ton, 4.83 ounces of Ag per ton, 0.67% Pb, 1.03% Zn, 268 964 tons inferred of 0.287 ounces of Au per ton, 4.73 ounces of Ag per ton, 1.05% Pb, 1.37% Zn at 0.15 opt Au cut-off to 750 m level	AF (Bevan 1983)	Staked Claim
Bluffy Lake (52K/14SE00004)	Fe	<u>Resource:</u> 21 000 000 tons at 22.86% Fe	Breaks et al. (1976)	Staked Claim
Borland Lake (53D/16NE00006)	Ag, Au	<u>Probable Resource:</u> 502 412 tons of 8.09 ounces of Ag per ton and 0.02 ounces of Au per ton	Massive Resources Ltd., Preliminary Prospectus, Aug. 6, 1987	Staked Claims
Buffalo Red Lake Heyson Township (52N/04SW00009)	Au	<u>Resource:</u> 421 728 tons of 0.139 ounces of Au per ton drill-indicated in 1980	AF (Kita 1988)	Patent
Cochenour Bruce Channel Project Dome Township	Au	<u>Inferred Resource (NI 43-101-compliant):</u> 9.05 Mt at 11.18 g/t Au	(Goldcorp Inc., February 14, 2014, Management's Discussion and Analysis for the Year ended December 31, 2013)	Patent
Cochenour-Willans Mine Dome Township (52N/04SW00018)	Au	<u>Resource:</u> Proven and probable 173 000 tons of 0.51 ounces of Au per ton; possible resource 274 000 tons of 0.59 ounces of Au per ton	NM - Dec. 12, 1994, p.7	Patent, Licence of Occupation

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Deposit Name (NTS/MDI)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Cole Gold Mine Ball Township (52M/01SE000182)	Au	<u>Resource</u> : 119 780 tons of 0.41 ounces of Au per ton probable and indicated	AF (Wilton 1973)	Patent, Licence of Occupation
Consolidated Marcus Dome Township (52N/04SW00022)	Au	<u>Resource</u> : 60 000 tons of 0.18 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent
Copper Lode A-Rexdale Group Prospect (52K/15NW00019)	Cu, Ag	<u>Resource</u> : 236 424 tons of 1.94% Cu, 1.22 ounces of Ag per ton or 425 612 tons of 1.56% Cu, 0.98 ounces of Ag per ton or 854 007 tons of 1.01% Cu, 0.57 ounces of Ag per ton	AF (Archibald 1970); MP 152 (Atkinson, Parker and Storey 1991)	Staked Claim
Copper-Lode D Belanger Township (52K/15NW00019)	Cu, Zn	<u>Resource</u> : 36 000 tons of 0.26% Cu, 7.58% Zn	AF (MacDougall 1996)	Leased
Copper-Lode E Belanger Township (52K/15NW00019)	Cu, Ag	<u>Resource</u> : 160 000 tons of 8.28% Zn, 1.02% Cu, 0.39 ounces of Ag per ton	AF (Archibald 1970)	Leased
Dixie Creek (52K/13SE00003)	Au	<u>Resource</u> : 417 000 tons of 0.12 ounces of Au per ton	MDIR	Staked Claim
Dixie 3 Prospect (52K/14NW; MDI000000000290)	Cu, Zn	<u>Resource</u> : 91 000 tons of 10.0% Zn, 1.0% Cu	AF (MacDougall 1995)	Leased - Mining Rights Only, Staked Claim
Dixie 18 Prospect (52K/14NW00010)	Zn	<u>Resource</u> : 110 000 tons of 0.5% Cu, 12.5% Zn, 0.57 ounces of Ag per ton	AF (King and Petrie 1998)	Staked Claim
Garnet Lake Arrow Zone (52K/15NW00017)	Zn, Cu, Ag, Au	<u>Indicated Resource (NI 43-101-compliant) 3% Zn equivalent cut-off</u> : 2 071 000 t of 5.92% Zn, 0.75% Cu, 0.58 g/t Au, 21.1 g/t Ag, Indium average value 34.6 g/t <u>Inferred Resource (NI 43-101-compliant) 3% Zn equivalent cut-off</u> : 120 552 t of 2.60% Zn, 0.56% Cu, 0.40 g/t Au and 18.6 g/t Ag	Carter (2007)	Staked Claim
GAZ Bateman Township (52N/04NE; MDI000000000249)	Au	<u>Resource (NI 43-101-compliant)</u> : 1 400 000 t of 8.0 g/t Au, in 5 lenses	Wolfden Resources Inc., news release, Feb. 23, 2005	Staked Claims
Gold Eagle Mine (Western Discovery zone) Dome Township (52N/04SW00020)	Au	<u>Resource (NI 43-101-compliant)</u> : 309 000 t at 16.67 g/t Au (uncut)	Micon International (Pressacco 2004)	Patent
Grassett Prospect Earngey Township (52N/02SE00009)	Au	<u>Resource</u> : 78 295 tons of 0.22 ounces of Au per ton (Part of the Hill-Sloan-Tivy Vein)	Energy, Mines and Resources Canada (1990)	Patent
Griffith Mine (52K/14SW00002)	Fe	<u>Resource</u> : 120 000 000 tons of 29% Fe	GR 82 (Shklanka 1970)	Staked Claims
Hasaga Mine Heyson Township (52N/04SW00007)	Au	<u>Resource</u> : C Block (below 1800 feet) - 200 203 tons of 0.192 ounces of Au per ton (Ferguson 1968) <u>Stopes</u> - 41 430 tons of 0.104 ounces of Au per ton <u>Pillars</u> - 6365 tons of 0.134 ounces of Au per ton	GR 56 (Ferguson 1968)	Patent
Hill-Sloan-Tivy Earngey Township (52N/02SE00008)	Au	<u>Resource</u> : 296 000 tons of 0.219 ounces of Au per ton (Grassett Prospect Resource may be included in total)	AF (Germundson 1995)	Patent
Horseshoe Island (52N/08NW00020)	Au	<u>Resource</u> : 893 508 tons of 0.14 ounces of Au per ton	<i>Northwest Prospector</i> , March/April 1990, p.27	Staked Claim
Howey Mine Heyson Township (52N/04SW00036)	Au	<u>Resource</u> : 780 000 tons of 0.08 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent, Licence of Occupation
Jackson-Manion Mine Dent Township (52N/02SW00003)	Au	<u>Resource</u> : 40 000 tons of 0.5 ounces of Au per ton	NM - Mar. 14, 1985, p.21	Patent

Deposit Name (NTS/MDI)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Joy–New zone (Diamond Willow zone, Creek zone) (52K/14NW; MDI00000000255)	Cu, Zn	<u>Resource</u> : 300 000 tons of 4% combined Cu+Zn	AF (Lewis 1994)	Staked Claim
Kesaka Lake (52K/16NW00012)	Fe	<u>Resource</u> : 312 500 000 tons of 31.1% Fe to a depth of 100 feet	MRC 11 (Shklanka 1968)	Staked Claim
Laverty (Thrall) Heyson Township (52N/04SW00085)	Au	<u>Resource</u> : 790 000 tons of 0.08 ounces of Au per ton (Gillies 1982) <u>Indicated Resource (NI 43-101-compliant)</u> : 395 000 t of 2.56 g/t Au on a portion of the Laverty dike zone (Harron and Puritch 2010); This property is included in the North Madsen property	AF (Gillies 1982) report (Harron and Puritch 2010)	Patent
Lingman Lake (53F/15SW00002)	Au	<u>Resource</u> : 1 172 753 tons of 0.20 ounces of Au per ton in all zones at 5.0 foot minimum width and a cut-off grade of 0.08 ounces of Au per ton	AF (McPhee 1989)	Patent
Madsen Mine Baird Township (52K/13NW00008)	Au	<u>Indicated Resource (NI 43-101-compliant)</u> : 3 236 000 t at 8.93 g/t Au <u>Inferred Resource (NI 43-101-compliant)</u> : 788 000 t at 11.74 g/t Au	Claude Resources Inc., news release, Dec. 7, 2009	Patent
May–Spiers Ball Township (52M/01SE00023)	Au	<u>Resource</u> : 30 000 tons of 0.09 ounces of Au per ton	AF (Bayne 1981)	Staked Claim
McCombe (Root Lake) (52J/13NE00004)	Li ₂ O	<u>Resource</u> : 2.3 million tons of 1.3% Li ₂ O to the 500-foot level	MP 90 (Breaks 1979)	Patent, Licence of Occupation
McFinley Mine Bateman Township (52N/04SE00005) <i>see also “Phoenix Project F2 Zone”</i>	Au	<u>Inferred Mineral Resource</u> : 334 007 tons <i>in situ</i> at an average grade of 0.20 opt Au to a depth of 400 feet; distributed as follows: <u>FWC-3 zone</u> : 3875 tons of 0.50 ounces of Au per ton <u>C zone</u> : 10 520 tons of 0.87 ounces of Au per ton <u>FWC-1+2</u> : 30 600 tons of 0.24 ounces of Au per ton <u>C-2 zone</u> : 128 700 tons of 0.11 ounces of Au per ton <u>C-3 zone</u> : 36 562 tons of 0.19 ounces of Au per ton <u>WL zone</u> : 10 500 tons of 0.49 ounces of Au per ton <u>403 zone</u> : 5000 tons of 0.80 ounces of Au per ton <u>BX zone</u> : 2000 tons of 0.84 ounces of Au per ton <u>D zone</u> : 106 250 tons of 0.15 ounces of Au per ton <u>Resource Estimate</u> : 890 000 tons at an in-place grade of 0.21 ounces of Au per ton to a depth of about 1700 feet	AF (Hogg 2002)	Patent, Licence of Occupation
Mount Jamie Todd Township (52M/01SE00012)	Au	<u>Resource (Gordon)</u> : <u>Main zone</u> : 47 048 tons of 0.425 ounce Au per ton <u>No. 2 Shaft area</u> : 25 360 tons of 0.37 ounce Au per ton <u>Resource (Bevan)</u> : <u>No. 1 Shaft Area</u> : 23 920 t of 14.70 g/t Au (measured and indicated) 4100 t of 13.60 g/t Au (inferred) <u>No. 2 Shaft Area</u> : 3582 t of 9.67 g/t Au (indicated) <u>Central Area</u> : 7817 t of 11.79 g/t Au (inferred) <u>East Boundary Zone</u> : 9072 t of 13.13 g/t (inferred) <u>Surface Stockpile</u> : 1269 t of 6.86 g/t Au	AF (Gordon 1988) Bevan (2010)	Patent
New Faulkenham Mines Ltd. (Faulkenham Lake) Baird Township (52K/13NW00006)	Au	<u>Resource</u> : 15 000 tons of \$15.00 per ton ore (0.428 ounces of Au per ton at \$35.00 per ounce Au)	AF (Holbrooke 1958)	Patent
North Spirit Lake (Crown Trust) (53C/07NW00025)	Fe	<u>Resource</u> : 1.3 million tons per vertical foot of 33.94% Fe	MRC 11 (Shklanka 1968); GR 150 (Wood 1977)	Patent, Leased

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Deposit Name (NTS/MDI)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
North Madsen Dome and Heyson Townships (53K/13NW, 52N/04SW)	Au	<u>Measured Resource (NI 43-101-compliant):</u> Main Zone: 18 052 860 t of 1.26 g/t Au Lavery Dyke – Dyke: 634 190 t of 0.80 g/t Au Lavery Dyke – Granodiorite: 951 090 t of 1.80 g/t Au <u>Indicated Resource (NI 43-101-compliant):</u> Main Zone: 2 967 800 t of 1.08 g/t Au Lavery Dyke – Dyke: 546 100 t of 0.80 g/t Au Lavery Dyke – Granodiorite: 324 000 t of 1.53 g/t Au <u>Inferred Resource (NI 43-101-compliant):</u> Main Zone: 5 385 000 t of 1.00 g/t Au Lavery Dyke – Dyke: 944 000 t of 0.88 g/t Au Lavery Dyke – Granodiorite: 324 000 t of 1.53 g/t Au Buffalo – Disseminated: 1 954 000 t of 1.08 g/t Au Buffalo – Quartz-tourmaline: 2 698 000 t of 0.97 g/t Au	McCracken and Harder (2011)	Patent
Northgate Prospect Earngey Township (52N/02SE00013)	Au	<u>Resource:</u> 64 600 tons of 0.28 ounces of Au per ton	AF (Zinn 1984)	Staked Claim
Ogani Lake (52K/15NE00012)	Fe	<u>Resource:</u> 100 000 000 tons of 21.6% Fe	MRC 11 (Shklanka 1968)	Open
PAK Pegmatite Pakeagama Lake area (53C/11SW)	Rare Metals	<u>Indicated Resource (NI 43-101-compliant):</u> 2.45 million tonnes 1.815 Li ₂ O equivalent <u>Inferred Resource (NI 43-101-compliant):</u> 5.91 million tonnes Li ₂ O equivalent	Houston Lake Mining Inc., news release, Jan. 28, 2015	Staked Claim
Papaonga Lake (52K/16NE00006)	Fe	<u>Resource:</u> 13 500 000 tons of 31.06% Fe	MDIR	Open
Phoenix Project F2 Zone Bateman Township (52N/04SE; MDI000000001374)	Au	Preliminary Economic Assessment: <u>Measured + Indicated Resource (NI 43-101-compliant):</u> 4.12 Mt @ 8.52 g/t Au <u>Inferred Resource (NI 43-101-compliant):</u> 7.45 Mt @ 9.26 g/t Au	Bernier et al. (2013)	Patent, Licence of Occupation
Rahill-Bonanza Deposit Dome Township (52N/04SW00065)	Au	<u>Inferred Resource (NI 43-101-compliant):</u> 1.59 Mt @ 7.6 g/t Au	Harron (2009)	Patent
Red Crest (Red Summit) Todd Township (52M/01SE00011)	Au	<u>Resource:</u> 47 439 tons of 0.269 ounces of Au per ton (uncut grade) (Horwood 1945) 38 000 tons of 0.3 ounces of Au per ton	NM - Mar. 14, 1985, p.21; ODM Annual Report (Horwood 1945)	Patent
Redaurum Baird Township (52N/04SW00047, 52N/04SW00048, 52N/04SW00049)	Au	<u>Possible Resource:</u> <u>14A zone:</u> 243 750 tons of 0.22 ounces of Au per ton 26 250 tons of 0.20 ounces of Au per ton <u>No. 2 zone:</u> 137 500 tons of 0.18 ounces of Au per ton <u>No. 3 zone:</u> 102 500 tons of 0.18 ounces of Au per ton <u>Camp zone:</u> 24 750 tons of 0.13 ounces of Au per ton	AF (Barclay 1986)	Patent
Richardson (Kostynuk Bros. Mine) (52N/09SW00002)	Au	<u>Resource:</u> 700 000 tons of 0.2 ounces of Au per ton inferred Resource	OFR 5835 (Parker and Atkinson 1992)	Patent
Rowan Todd Township (52M/01SE00013)	Au	<u>Resource:</u> 10 900 tons of \$23.00 per ton ore (0.657 ounces of Au per ton at \$35.00 per ounce) (Bishop 1939); 798 000 t of 4.7g/t Au (Hy Lake Gold Ltd.)	AF (Bishop 1939); Hy Lake Gold Inc., news release, Oct. 21, 2010	Patent
Sachigo River Mine Aljo Lake Area (53J/11SW00002)	Au	<u>Resource:</u> 6000 t of 10 g/t Au for No. 1 Vein	Hawkins (2009)	Patent; withdrawn from staking
Sanshaw (Whitehorse Island) Dome Township (52N/04SW00014)	Au	<u>Resource:</u> 175 000 tons of 0.20 ounces of Au per ton	NM - June 11, 1953	Patent, Licence of Occupation
Setting Net Lake (53C/13SE00066)	MoS ₂	<u>Resource:</u> 100 000 000 tons of 0.09% MoS ₂	MDIR NM - Mar. 23, 1973	Staked Claims

Deposit Name (NTS/MDI)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Sidace Lake Gold Property (Coli Lake) (52N/05SE; MDI00000001360)	Au	<u>Indicated Resources (NI 43-101-compliant):</u> Main Discovery Zone: 1 119 500 t of 3.0 g/t Au, Upper Duck Zone: 247 600 t of 4.19 g/t Au <u>Inferred Resources (NI 43-101-compliant):</u> Main Discovery Zone: 1 677 200 t of 3.01 g/t Au, Upper Duck Zone: 425 800 t of 4.11 g/t Au	Power-Fardy and Breede (2009)	Staked Claims
Sol d'Or Honeywell Township (52N/07SE00007)	Au	<u>Resource:</u> 8565 tons of 0.57 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Staked Claim
Springpole Lake Prospect (52N/08NW)	Au	<u>Preliminary Economic Assessment (NI 43-101-compliant resource):</u> Open pit indicated: 128.2 Mt @ 1.07 Au, 5.7 g/t Ag Open pit inferred: 25.7 Mt @ 0.83 g/t Au, 3.2 g/t Ag	Arseneau et al. (2013)	Patent, Staked Claims
Starratt-Olsen Mine Baird Township (52K/13NW00011)	Au	<u>Resource:</u> 15 000 tons of 0.45 ounces of Au per ton	NM - July 26, 1973	Patent
Trout Bay Zinc Pit zone Mulcahy Township (52M/01SE00166)	Zn, Cu, Pb, Ag, Au	<u>Resource:</u> <u>West zone:</u> 13 776 tons of 4.75% Zn, 0.68% Cu, 0.94 ounces of Ag per ton <u>East zone:</u> 124 760 tons 7.86% Zn, 1.5% Cu, 0.24% Pb, 1.7 ounces Ag per ton, 0.007 ounce of Au per ton	MP 147 (Atkinson, Parker and Storey 1990); Preliminary Map P.567 (Riley 1969); MDIR	Patent (Mining Rights Only), Leased (Mining Rights Only, Licence of Occupation
Uchi Mine Earngey Township (52N/02SE00007)	Au	<u>Resource:</u> 214 000 tons of 0.147 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent
Wilmar Mine Dome Township (52N/04SW00017)	Au	<u>Resource (from OFR 5558 unless otherwise indicated):</u> <u>Diorite Dike zone:</u> 140 000 tons of 0.21 ounces of Au per ton <u>East Breccia zone:</u> 31 500 tons of 0.32 ounces of Au per ton (Proven) 50 500 tons of 0.25 ounces of Au per ton (Probable) 1 777 000 tons of 0.24 ounces of Au per ton (Possible) <u>Carbonate zone:</u> 25 000 tons of 0.17 ounces of Au per ton (Probable) 7500 tons of 0.15 ounces of Au per ton (Possible) <u>West Granodiorite zone:</u> 3.15 to 4.5 million tons of 0.076 to 0.131 ounces of Au per ton (Energy, Mines and Resources Canada 1990) <u>Granodiorite zone:</u> 5 700 000 tons of 0.10 to 0.15 ounces of Au per ton	OFR 5558 (Durocher, Burchell and Andrews 1987); Energy, Mines and Resources Canada (1990)	Patent
Woco Vein Earngey Township (52N/02SE; MDI00000000289)	Au	<u>Resource:</u> 21 263 tons of 0.80 ounces of Au per ton	AF (Germundson 1995)	Staked Claims
Young, H.G., Mines Ltd. Balmer Township (52N/04SE00015)	Au	<u>Resource:</u> 270 000 tons of 0.31 ounces of Au per ton	OFR 5558 (Durocher, Burchell and Andrews 1987)	Patent

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

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

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHWEST REGION

Land Use Planning Activities

The northwest Regional Land Use Geologist, based in Thunder Bay, co-ordinates input into land use planning activities in the Thunder Bay South, Thunder Bay North and Red Lake–Kenora Resident Geologist districts. Andrew Tims, *P.Geo.*, and Ryan Tuomi, *P.Geo.*, filled this position throughout 2015.

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

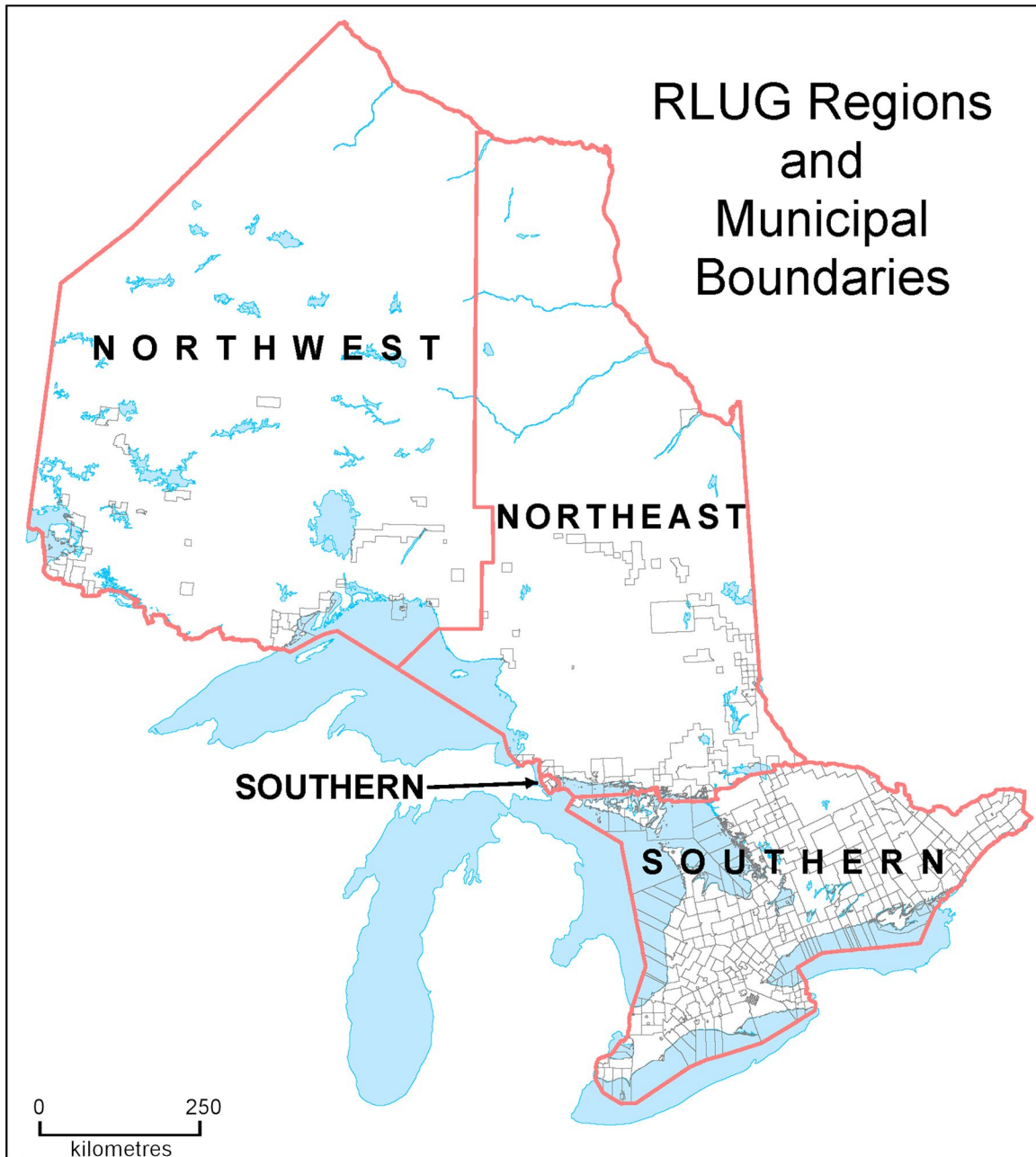


Figure 29. Extent of Regional Land Use Geologists' areas of responsibility (red lines indicate the regional boundaries; grey lines indicate the municipal boundaries).

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

- mineral-related values and economic opportunities;
- natural geological and mining-related hazards;
- renewable and non-renewable energy sources; and
- 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 2015, the northwest Regional Land Use Geologist dealt with a variety of land use planning issues throughout the northwest region. The following sections summarize the work that was done.

CROWN LANDS

The Ministry of Northern Development and Mines (MNDM) 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 Use Policy Atlas

The Crown Land Use Policy Atlas contains area-specific land use policies for Crown lands in central and northern Ontario, to the northern limit of forestry activities in the province. These policies are established under the authority of the *Public Lands Act*.

During the year, MNRF proposed an amendment to the Crown Land Use Policy Atlas in the Thunder Bay District. This amendment was to add an Enhanced Management Area in the Loon Lake area of McTavish Township. The northwest Regional Land Use Geologist reviewed the proposed Enhanced Management Area to ensure that mineral potential, mineral industry activity and mining-related hazards are identified and considered in the amendment process.

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*, including the *Mining Act*. The northwest Regional Land Use Geologist provided input into the development of the Lac Seul Forest Management Plan 2011–2021, Phase 2 in 2015.

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 (www.efmp.lrc.gov.on.ca/eFMP/home.do).

Far North Land Use Planning

The Far North Land Use Planning Initiative is about working with First Nations to identify where development can occur and where land will be dedicated to protection in the Far North of Ontario. The Far North encompasses 42% of Ontario's land mass in areas 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). Detailed information about Far North Land Use Planning and the *Far North Act* is available (see www.ontario.ca/page/far-north-land-use-planning-initiative).

All but a few First Nation communities are working on a range of land use planning activities, although they are not all at the same stage in the planning process. In northwestern Ontario, Pikangikum, Cat Lake, Slate Falls, Pauingassi and Little Grand Rapids First Nations have all completed land use plans. Deer Lake First Nation has completed its Terms of Reference, and a draft land use plan. Eabametoong, and Mishkeegogamang (working jointly), Marten Falls, Wawakapewin and Webequie First Nations all have Terms of Reference. Other communities are working on gathering information for their planning areas, and learning about the land use planning process.

In 2015, the northwest Regional Land Use Geologist

- participated in Community Based Land Use Planning discussions with MNRF regarding the use of “Provincially Significant Mineral Potential” determinations as outlined by Wilson et al. (2008);
- provided comments on the Deer Lake First Nation Draft Plan, including draft land use designations;
- provided a regional geological description to be contained in the Marten Falls First Nation Draft Plan;
- met with Webequie, Eabametoong, Mishkeegogamang, Deer Lake, Marten Falls, Wawakapewin, Constance Lake and Aroland First Nations in their communities and in Thunder Bay to discuss the use of geoscience in regard to decisions relating to community health, safety, mineral potential, aggregate and infrastructure development, and groundwater while doing land use planning;
- attended the Keewaytinook Okimakanak Lands and Resources Forum, the Matawa Community Based Land Use Planning Workshop, and MNRF’s “Planning Together IV” Land Use Planning Workshop and discussed mineral potential with a number of communities;
- contributed geoscience information for MNRF’s draft Far North Land Use Strategy;
- completed a gap analysis on existing mineral exploration industry “Best Practices” taken from legislation, regulations and guidelines, which was compared to the Cat Lake–Slate Falls Best Management Practices Manual; and
- produced an informational graphic illustrating the relationship of mineral exploration activities to existing regulations and guidelines.

In addition, work on the geoscience atlases, with information about more than 20 geoscience-related themes, continued in 2015. The boundaries of the atlases were standardized to align with the map coordinates used by National Topographic System (NTS) maps. This allowed maps to be prepared before communities finalized their planning area boundaries, and allowed a standard scale to be used for the maps in all atlases. Maps from one atlas can now be aligned with maps from an adjacent atlas. The atlases were also enhanced by simple explanatory notes and photographs for each of the themes in the atlas.

Copies of the atlases were provided to representatives of Deer Lake, Marten Falls, Wawakapewin, Constance Lake, Aroland, Webequie, Eabametoong, Mishkeegogamang, Fort Severn, Kee-Way-Win, Sandy Lake and Pikangikum First Nations in Ontario, as well as representatives of First Nations with adjoining territory in Manitoba.

Withdrawal Orders

Other work related to Crown land use in the northwest region included reviews of 4 applications for withdrawal of lands from staking under Section 35 of the *Mining Act*. Some applications were for surface rights only and some were for mining rights only, but most were for both surface and mining rights. The requests were made by Ministry of Transportation (MTO) and MNRF for a wide range of reasons, including

- Stormy Lake #25, Bending Lake Area, aggregate quarry (MTO);
- Medicine Stone Lake, aggregate quarry (MTO);
- Revell River, Highway 17 realignment (MTO); and
- McTavish Township, creation of cottage lots (MNRF).

Reviews by the northwest Regional Land Use Geologist ensured that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions were made.

Aggregates

The northwest Regional Land Use Geologist ensured that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions were made regarding 7 Category 9 (pit above water) and Category 11 (quarry above water) aggregate pit applications received from MNRF.

Parks and Conservation Reserves

The northwest Regional Land Use Geologist ensured that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions were made regarding the proposed expansion of the Ruby Lake Forest Reserve, and the final stages of establishing the Lake Superior National Marine Conservation area.

MUNICIPAL AND PRIVATE LANDS

The Ministry of 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). When requested, the northwest 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 was last modified in 2014. The revision includes enhanced provisions to help ensure that municipal Official Plans recognize mining operations and areas with significant mineral potential, so that they can be protected from incompatible land uses.

Along with colleagues in the southern and northeast regions and the Land Use Policy and Planning Coordinator, the northwest Regional Land Use Geologist provided facilitation support at a regional training session for municipal staff to highlight main areas of policy changes in the PPS 2014.

As a participant in MMAH's one-window service for Official Plans and their amendments, the northwest Regional Land Use Geologist provided comments, mineral values mapping and other input as required for Official Plans and Official Plan Amendments for the municipalities of Greenstone, Machin, Kenora, Oliver–Paipoonge, Neebing, Ear Falls, Atikokan, Manitouwadge and Nipigon.

In addition, information was provided, and reviews were done, in conjunction with 18 subdivision and consent applications, as listed in Table 24. Although such decisions are normally made by municipal governments, most of the area of the northwest 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 MNDM.

Table 24. Municipal planning initiatives with MNDM input, northwestern Ontario, 2015.

Consent (Severance) and Subdivision Applications	Completed Official Plans and Related Initiatives	Official Plans and Related Initiatives Under Development
Consent, Hagey Township, District of Thunder Bay	Greenstone, Municipality of	Atikokan, Town of
Consent, Sand Lake, District of Kenora (2)	Kenora, City of	Ear Falls, Township of
Consent, Lake of the Woods, District of Kenora (2)	Machin, Township of	Manitouwadge, Township of
Consent, Worthy Lake, District of Thunder Bay (2)	Nipigon, Township of	Neebing, Municipality of
Draft Plan of Subdivision, Wenscott Developments, Thunder Bay		Oliver Paipoonge, Municipality of
Plan of Subdivision, Lerome Lake, District of Rainy River		
Consent, Lac des Mille Laes, District of Thunder Bay		
Consent, Yellow Girl Bay Area, District of Kenora		
Consent, Aubrey Township, District of Kenora		
Consent, Manitou River, District of Rainy River		
Consent, Burditt Lake, District of Rainy River		
Consent, Boys Township, District of Kenora		
Consent, Shuniah Township, District of Thunder Bay		
Consent, Pine Portage Bay of Lake of the Woods, District of Kenora (2)		

FIRST NATIONS

In addition to doing work related to Far North land use planning, the northwest Regional Land Use Geologist participated in several events: Mining Week at Ginoogaming First Nation; a Community Based Land Use Planning Workshop for Matawa communities; Career Day and Mining Week at Lac Seul First Nation; and career fairs at Constance Lake, Wabauskang and Pikangikum First Nations.

In 2015, the northwest Regional Land Use Geologist provided information on mineral occurrence sites, past or present mining and exploration activity, geology and mineral potential on 7 Treaty Land Entitlement Claim sites located in northwestern Ontario.

Other Activities

The northwest Regional Land Use Geologist also undertook other related work in 2015, as outlined below.

INVESTMENT READY SITES

Ontario's "Investment Ready: Certified Site" program, operated by the Ministry of Economic Development, Employment and Infrastructure promotes an inventory of sites that may be of interest to potential investors and purchasers. It pre-screens the suitability of sites for development, and provides detailed information about the sites' access to utilities and transportation, and their environmental status. In 2015, the northwest Regional Land Use Geologist provided information for 2 candidate sites for certification in northwestern Ontario.

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, with regard to initiatives including 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 northwest 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 2015, feedback was provided for reviews of 3 Class EA projects and 1 amended project for the following projects within northwestern Ontario:

- Highway 17 improvement study in the area of Revell River;
- Wataynikaneyap (Pickle Lake) Transmission Line Terms of Reference;
- culvert rehabilitation on Ozone Creek, Highway 17; and
- Highway 11/17 four-lane expansion in the Municipality of Shuniah (amendment).

ENVIRONMENTAL REGISTRY

The Environmental Registry is an online resource that contains public notices about environmental matters being proposed by all Ontario government ministries covered by the Environmental Bill of Rights. The public notices contain information about proposals including new acts, regulations, policies and programs; plans to change or eliminate existing ones; and plans to issue permits for a wide range of activities across Ontario.

The northwest Regional Land Use Geologist monitored the Environmental Registry and compiled and distributed a monthly summary of postings of interest to MNDM staff.

GUIDANCE MATERIALS

In 2015, the northwest Regional Land Use Geologist was called upon by partner ministries to review and provide input on proposed new or updated policies, and/or supporting guidance materials. Comments were prepared and submitted for the following

- Crown Land Use Policy Atlas amendment in McTavish Township; and
- draft implementation guidelines for PPS policies related to mineral values, mining operations and mining-related hazards.

LOCAL CITIZENS COMMITTEES

The northwest Regional Land Use Geologist met with mineral industry representatives from various local citizens' committees from across northwestern Ontario to review local issues related to the different Forest Management Plans and to help facilitate communicate between the regional committee members.

CONFERENCES

The northwest Regional Land Use Geologist engaged with mineral sector clients at the annual Institute on Lake Superior Geology Meeting in Dryden, the Northwestern Ontario Mines and Minerals Symposium in Thunder Bay, the "What Lies Beneath" Geraldton Exploration Forum, and the Ministry of Municipal Affairs and Housing Northwestern Ontario Regional Fall Conference.

MINERAL DEPOSIT COMPILATION GEOLOGIST—NORTHWESTERN ONTARIO

The Mineral Deposit Compilation geologists (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 Northern Development and Mines is using the most up-to-date information in making land-use planning and policy decisions. T.K. Pettigrew is the current northwestern Ontario MDCG.

Throughout the year, emphasis was placed on updating annual production figures for producing mines in the Red Lake, Thunder Bay North and Thunder Bay South districts as well as reserve and resource estimates for properties in advanced exploration. During much of the year, focus was placed on updating MDI records of developed deposits with reserves that are not yet in production. Adrian, Marks and Sackville townships were updated for a summer 2015 mapping project conducted by the Ontario Geological Survey. In the latter half of the year, the area of the Coldwell Complex in Thunder Bay South District was updated.

Total changes to the provincial MDI database, completed by the MDCG—Northwestern Ontario, in 2015 included 168 updated records, 11 records deleted and 34 new records. A breakdown, by office, of the provincial records revised is provided in Table 25.

Table 25. Mineral Deposit Inventory records revisions in 2015.

Resident or District Office	Updates	Deletions	New
Kenora	29	2	0
Red Lake	34	1	5
Thunder Bay North	47	3	6
Thunder Bay South	58	5	23
Total	168	11	34

The MDI database is a dynamic compilation of over 19 000 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.

The MDI database was updated in February 2016 (Ontario Geological Survey 2016) 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 with data discovery through a graphical interface (keyhole mark-up language (.kml) files for use with applications, such as Google Earth™ mapping service).

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**Ontario Geological Survey
Regional Resident Geologist Program**

Red Lake Regional Resident Geologist (Kenora District)—2015

by

C. Ravnaas and J. Wetendorf

2016

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Red Lake Regional Resident Geologist (Kenora District)—2015

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INTRODUCTION

The Kenora District extends east from the Manitoba border to Savant Lake and south to the international border. It encompasses the towns of Kenora, Vermilion Bay, Dryden, Ignace, Sioux Lookout, Savant Lake and Fort Frances, and a number of First Nation communities of Treaty 3 affiliation.

Dimension stone continued to be produced in the Kenora District in 2015. No metallic mineral production was recorded in the District. Gold, copper, nickel, iron and rare elements (sometimes referred to as rare metals) were the commodities targeted by most of the exploration activity in the Kenora District.

Despite the downturn in the exploration sector, there were a number of notable exploration and development highlights in the Kenora District in 2015.

2015 was a milestone year for the Kenora District. New Gold Inc. received approval from the Canadian Environmental Assessment Agency (CEAA) and the Ontario Ministry of Environment and Climate Change (MOECC) for the development of the Rainy River gold-silver deposit, and to formally start mine development on May 15, 2015. Construction and development continued in 2015 with expected completion in 2017.

Based on successful results from sustained exploration activity, several companies have undertaken scoping, Preliminary Economic Assessment, prefeasibility or feasibility studies. These include the 1) Big Whopper lithium deposit, Separation Rapids property (Avalon Rare Metals Inc.); 2) Cameron gold deposit, Cameron Lake property (Coventry Resources Inc. and Chalice Gold Mines Limited); 3) Goliath gold deposit, Goliath property (Treasury Metals Inc.); and 4) Rainy River gold-silver deposit, Rainy River property (New Gold Inc.).

In 2014, Treasury Metals Inc. submitted an Environmental Impact Statement on the Goliath gold deposit to CEAA and MOECC. On April 15, 2015, the CEAA confirmed the Goliath Project Environmental Impact Statement conformed to CEAA guidelines.

Avalon Rare Metals Inc. continued market studies to determine if the lithium-petalite concentrates extracted from bulk samples collected from the Big Whopper deposit meet customers' performance requirements.

The majority of exploration activity conducted in the district concentrated on projects that had already received substantial work in the recent past. In 2015, significant gold exploration programs continued on the 1) Cameron deposit, Cameron property (Chalice Gold Mines Ltd.); 2) Goldlund deposit, Goldlund property (Tamaka Gold Corporation); 3) Goliath deposit, Goliath property (Treasury Metals Inc.); and 4) Rainy River deposits, Rainy River property (New Gold Inc.).

In 2015, revised Mineral Reserve and Resource Estimates were released for the Cameron deposit (Chalice Gold Mines Ltd.) and on the Goldlund deposit (Tamaka Gold Corporation).

In 2015, NuVision Resources ULC continued to secure private funding to cover exploration expenditures on its Cat Key gold-zinc property and Canstar Resources Inc. continued work on the Kenora gold property.

Diamond-drilling programs were initiated on the Allen copper-nickel-iron property (Sierra Iron Ore Corporation) and at the Lobstick Bay gold property (StrikePoint Gold Inc.) in 2015.

Work completed within the Kenora District and filed for assessment credit, or otherwise provided, is shown in Table 2. A total of 18 exploration projects were conducted by mineral exploration companies and individual prospectors during the year (Table 1).

The authors note that, for ease of reading, all Web addresses were accessed on January 30, 2016, unless otherwise noted.

MINING ACTIVITY

There was no production of either base or precious metals in the Kenora District in 2015. Production continued from 4 granite quarries in 2015. The quarries are keyed by letter to Figure 2.

Nelson Granite Ltd.

Nelson Granite Ltd. (www.nelsongranite.com/) continued year-round production from 4 established stone quarries in the Kenora District during 2015 (*see* Figure 2).

Production continued at the **Docker Township quarry** (V), 10 km southwest of Vermilion Bay. Homogeneous, medium-grained, pink granite is produced from a granite plug, which is part of the Dryberry batholith. The majority of the stone produced is used in the monument industry and is sold as “Vermilion Pink”. In 2015, approximately 5857.6 m³ (206 861 feet³) were produced (C. Spence, Nelson Granite Ltd., personal communication, 2016).

The company also continued to produce stone from their **Forgotten Lake quarry** (W) on the eastern side of Forgotten Lake, approximately 35 km north of Kenora and 10 km north of Redditt. The green, feldspar-megacrystic “Pine Green” stone was used as monument and building stone. A total of 2008.4 m³ (70 927 feet³) were produced in 2015 (C. Spence, Nelson Granite Ltd., personal communication, 2016).

The **Redditt quarry** (X) is located approximately 10 km southwest of the Forgotten Lake quarry and 3 km west of Redditt. The stone from the quarry is white, feldspar-megacrystic granite and marketed as “Bimini” and was used as monument and building stone. A total of 303.5 m³ (10 718 feet³) were produced in 2015 (C. Spence, Nelson Granite Ltd., personal communication, 2016).

Production continued at the **Red Deer Lake quarry** (Y) in 2015. The quarry is located near Red Deer Lake, approximately 40 km northeast of Kenora and 12.6 km east of the Forgotten Lake quarry. The stone is marketed as “Red Deer Brown” or “Canadian Mahogany”. A total of 2180.1 m³ (76 991 feet³) were produced for use as monument and building stone (C. Spence, Nelson Granite Ltd., personal communication, 2016).

EXPLORATION ACTIVITY

A complete summary of exploration activity, including prospecting, is provided in Table 1. The extent of staking is shown in Figure 1. Significant exploration programs were conducted in the Kenora District in 2015 and are largely based on exploration success from previous years' work. Described below are programs with significant exploration expenditures and/or results. Programs are keyed with numbers to Table 1 and Figure 2.

Activities presented in Table 1 are grouped into 4 sections, each representing different stages of program activity.

- Success from several years of exploration activity results in projects entering the construction and initiation of the **Mine Development Stage**. Exploration activity continues to occur on the property.
- Once a company initiates an economic review of potential production, such as a Preliminary Economic Assessment, this is presented in the **Economic Analysis Stage** section of the table.
- Exploration efforts that focus on upgrading the National Instrument (NI) 43-101–compliant or historical mineral resource estimate of a deposit on the property are presented in the **Resource Delineation Stage** section of the table.
- The remaining majority of the exploration activity is presented in the **Exploration Stage** section of the table.

Table 1. Exploration activity conducted in the Kenora District in 2015. Locations illustrated in Figure 2.

Abbreviations			
AEM	Airborne electromagnetic survey	IBA	Impact and Benefits Agreements
AM	Airborne magnetic survey	IP	Induced polarization survey
Bulk	Bulk sampling program	IS	Public information sessions
CC	Channel cutting	Lc	Line cutting
Comp	Compilation of historical work	MDA	Mine Development Activities
DDC	Condemnations diamond drill hole(s)	Met	Metallurgical studies
DDE	Extension of historical diamond drill hole(s)	MMI	Mobile Metal Ion sampling program
DDH	Diamond drill hole(s)	MRE	Mineral Resource Estimate (NI 43-101)
DDR	Diamond-drill holes (relogging historical holes)	MS	Marketing studies
EA	Environmental Assessment study	OVD	Overburden drill hole(s)
EBS	Environmental baseline studies	PEA	Preliminary Economic Assessment study
EIS	Environmental Impact Statement	PD	Project Description
ES	Engineering drill-hole studies	Pr	Prospecting
FN	First Nation Agreements	RPT	Report technical NI 43-101
GC	Geochemical survey	Samp	Sampling (other than bulk)
GL	Geological survey	Str	Stripping

No.	Company/Individual (Occurrence Name or Property)	Township/Area (Commodity)	Exploration Activity
MINE DEVELOPMENT STAGE			
1	New Gold Inc. (<i>Rainy River deposit</i> on Rainy River property)	Richardson Township (Au, Ag, Cu, Zn, Pt, Pd)	EA, Permitting, Mine Development and Construction, DDH 4-1209m, Samp
ECONOMIC ANALYSIS STAGE			
2	Avalon Rare Metals Inc. (<i>Big Whopper deposit</i> on Separation Rapids property)	Patterson Lake area (Li, Cs, Rb, Ta)	MS, Access Road permitting and rehabilitation
3	Chalice Gold Mines Ltd. (<i>Cameron deposit</i> on Cameron Lake property)	Rowan Lake area (Au)	RPT, MRE, Comp, GL, Pr, MMI, Str, CC, Samp, DDR 771-30,000 samples, structural and alteration studies, staking
4	New Gold Inc. (<i>Intrepid gold zone</i> on Rainy River property)	Richardson Township (Au, Ag, Cu, Zn)	Option from Bayfield Ventures Ltd., plan to release updated MRE

No.	Company/Individual (Occurrence Name or Property)	Township/Area (Commodity)	Exploration Activity
5	Treasury Metals Inc. (Thunder Lake deposit on Goliath property)	Zealand Township (Au)	DDH 24-6456m, DDE -2 52 m, 95 DDR 92 (2091 samples), bottle roll testing, Samp, continued EA, EBS and Feasibility Study
RESOURCE DELINEATION STAGE			
6	Global Cobalt Corporation (Werner Lake deposit on Werner Lake mineral belt property)	Rex–Werner lakes area (Co, Cu, Ni, Pt, Pd)	RPT
7	Tamaka Gold Corporation (Goldlund deposit on Goldlund property)	Echo Township (Au)	MRE, Comp, DDH 15-2360m, Samp
EXPLORATION STAGE			
8	Burt, D and Bundy, D. (Olympian property)	Code Township (Au, Cu)	Pr, Samp, staking
9	Canstar Resources Inc. (Kenora property)	Jaffrey Township (Au)	GL, Pr, Str, CC, Samp, Staking
10	Chalice Gold Mines Ltd. (Rainy River property)	Blue, Morley, Nelles, Pattullo, Shenston and Tail townships (Au, Ag, Cu, Zn)	Comp, Samp
11	Chalice Gold Mines Ltd. (West Cedartree property)	Dogpaw Lake area (Au)	GL, Pr, MMI, structural and alteration studies, Samp
12	Glatz, A. and Riives, J. (Turtlepond property)	Turtlepond Lake area (Au)	Pr, Samp
13	Independence Gold Corp. (Savant Lake property)	Poisson Lake area (Au)	Pr, Samp, Staking
14	King’s Bay Gold Corporation (Menary property)	Menary Township (Au)	Samp, bulk sampling permit extended
15	Numax Resources Inc. (Mine Centre property)	Bliss Lake area (Fe, Ti)	Part of property optioned to NuVision Resources ULC
16	NuVison Resources ULC (Cat Key property)	Bliss Lake area (Au, Cu, Zn)	Comp, IP, Str, CC, GL, Pr, Samp
17	Sierra Iron Ore Corporation (Allen property)	Dobie Township (Cu, Ni, Fe)	RPT, GC, GL, DDH 6-2010m, Samp
18	StrikePoint Gold Inc. (Lobstick property)	Lobstick Bay Area (Au)	DDH 3-1040m, Samp

Table 2. Assessment files received in the Kenora District in 2015.

Abbreviations	
AEM	Airborne electromagnetic survey
AM	Airborne magnetic survey
DDH	Diamond-drill hole(s)
EM	Electromagnetic survey
GC	Geochemical survey
GL	Geological survey
GM	Ground magnetic survey
Lc	Line cutting
OVD	Overburden drill hole(s)
Pr	Prospecting
Res	Resistivity survey
Samp	Sampling (other than bulk)
Str	Stripping
Tr	Trenching

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Bad Vermilion Lake Area	NuVision Resources ULC	2014	DDH, GL, Samp	2.55859	52C10NE PPP-1
Boyer Lake Area	Manitou Gold Inc.	2013	Pr, Samp, GC	2.55993	52F07NE SSS-11
Bridges Township	Geofortune Resources Corp.	2014	Samp, Pr	2.55514	52F13SE LL-2
Dogpaw Lake Area	Cameron Gold Operations Ltd.	2014	AM	2.55640	52F05SW SSSS-2
Dogpaw Lake Area	Cameron Gold Operations Ltd.	2014	GM, AEM, GL	2.55639	52F05SW SSSS-3
Dogpaw Lake Area	Metals Creek Resources Corp.	2014	Pr, Samp, GL	2.55674	52F05SW QQQQ-10

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Dogpaw Lake Area	Metals Creek Resources Corp.	2013	Pr, Samp, GL	2.55671	52F05SW QQQQ-11
Dogpaw Lake Area	Metals Creek Resources Corp.	2015	Pr, Samp	2.56065	52F05SW QQQQ-12
Echo Township	Tamaka Gold Corporation	2013–2014	DDH, Samp	2.55506	52F16NW 143
FourBay Lake Area	Tasca Resources Ltd.	2013	Pr, Samp	2.55461	52J02SW 123
FourBay Lake Area	Tasca Resources Ltd.	2014	Pr, Samp	2.55460	52J02SW 122
Glider Lake Area	877578 Ontario Ltd.	2015	Pr, Samp	2.56000	52K07SW A-11
Glider Lake Area	877578 Ontario Ltd.	2015	Pr, Samp	2.56089	52K07SW A-12
Haycock Township	Canstar Resources Inc.	2014	GC, Samp	2.55684	52E16SW SS-1
Haycock Township	Canstar Resources Inc.	2014	GC, Samp	2.55964	52E16SW SS-2
Haycock Township	Canstar Resources Inc.	2015	Pr, Samp	2.56067	52E16SW SS-3
Haycock Township	Canstar Resources Inc.	2015	Pr, Samp	2.56081	52E16SW SS-4
Haycock Township	Clark, G.	1983–1987	GC, EM, GM, Lc, Samp	donated	52E16SW X-16
Jaffray Township	Pioneer Construction Inc.	2015	DDH, Samp	2.56170	52E16SW P-1
Kawashagamuk Lake Area	Gehrels, P.	2014	Str, Pr, Samp	2.55455	52F08NW MM-1
Kawashagamuk Lake Area	Gehrels, P.	2013	Pr, Samp	2.55451	52F08NW MM-2
Little Turtle Lake Area	NuVision Resources ULC	2014	GL, GM, EM	2.55709	52C15SE R-2
Little Turtle Lake Area	NuVision Resources ULC	2014	GL, Lc, GM, EM, GC, Samp	2.55680	52C15SE R-3
Little Turtle Lake Area	NuVision Resources ULC	2014	Str, Samp, GL	2.55862	52C15SE R-4
Little Turtle Lake Area	NuVision Resources ULC	2014	GC, Samp	2.55710	52C15SE R-5
Lobstick Bay Area	Healey, D.	2014	Pr, Samp	2.55907	52F05NW GG-1
Lower Manitou Lake Area	Healey, D.	2014	Pr, Samp	2.56229	52F07SW O-1
Lower Manitou Lake Area	Manitou Gold Inc.	2013	Pr, GL, Samp	2.55976	52F07SW N-5
Lower Manitou Lake Area	Manitou Gold Inc.	2014	Lc, GL, GC, Pr, Samp	2.55959	52F07SW N-6
McCubbin Township	Parkside Resources Corp.	2014	Pr, Samp	2.55586	52J07NE 58
McGillis Township	Lanthier, G.	2014	GL, Pr, Samp	2.55381	52J08NW 59
Melick Township	Clark, G.	1984	Lc, GL, GM, IP, Tr, Samp	donated	52E16SW X-17
Nelles Township	Coventry Resources Inc.	2014	OVD, Samp	2.55491	52D16SW C-2
Nelles Township	Coventry Resources Inc.	2014	OVD, Samp	2.55490	52D16SW C-3
Pattullo Township	Coventry Resources Inc.	2014	OVD, GC, Samp	2.55764	52D16SE L-3
Pattullo Township	Coventry Resources Inc.	2014–2015	OVD, Samp	2.56031	52D16SE L-4
Penassi Lake Area	Tasca Resources Ltd.	2014	Pr, Samp	2.55458	52G14NE 74
Poisson Township	Parkside Resources Corp.	2014	Pr, Samp	2.55604	52J07NE 59
Revell Township	Gehrels, P.	2014	Pr, Tr	2.55600	52F09SE V-1
Rowan Lake Area	Cameron Gold Operations Ltd.	2012–2014	DDH, GC, Samp	2.55724	52F05SE BBBB-6
Rowan Lake Area	Cameron Gold Operations Ltd.	2010–2011	DDH, Pr, Samp	2.55658	52F05SE BBBB-7
Rowan Lake Area	Cameron Gold Operations Ltd.	2012–2013	GC, GL, Pr, Samp	2.55524	52F05SE BBBB-8
Rowan Lake Area	Cameron Gold Operations Ltd.	2014	GC, Samp	2.55991	52F05SE BBBB-9
Rowan Lake Area	Cameron Gold Operations Ltd.	2014	DDH, Pr, Samp	2.56016	52F05SE BBBB-10
Shoal Lake Area	Hood, W.	2014	GL, Pr, Samp	2.55444	52E10SW ZZ-1
Squash Lake Area	Auxin Resources Ltd.	2013	Str, Pr, GL, Samp	2.55807	52J02SE 150
Squash Lake Area	Auxin Resources Ltd.	2013	DDH, Str, Pr, Samp	2.55979	52J02SE 151
Wabigoon Township	Prouty, K.	2013–2015	Str, Pr, Samp	2.56328	52F14NW H-1
Zealand Township	Treasury Metals Inc.	2011–2012	DDH, GL, Samp	2.55706	52F15SE JJ-6

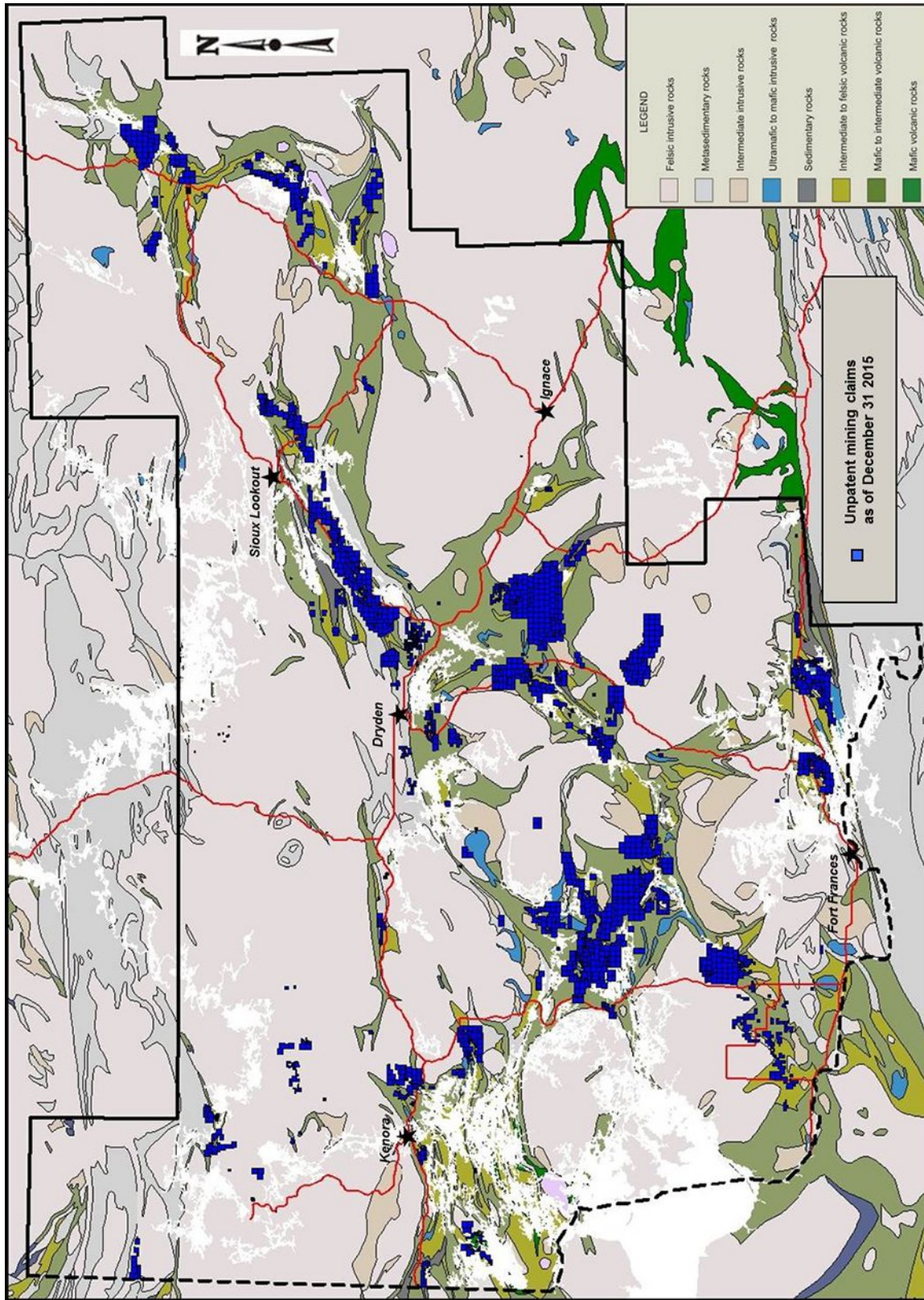


Figure 1. Extent of staking in the Kenora District as of December 31, 2015 (bedrock geology from Ontario Geological Survey 2011).

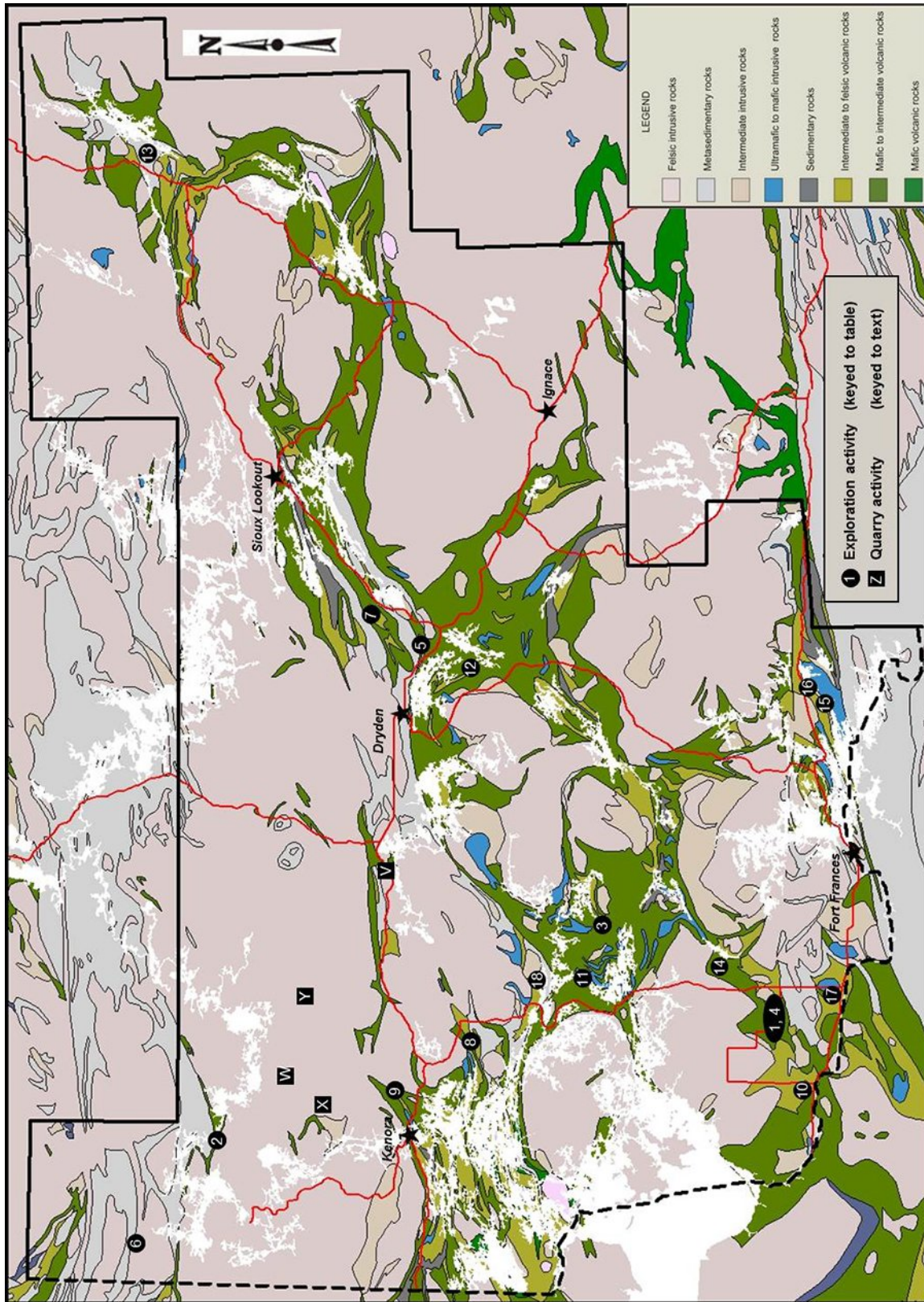


Figure 2. Location of exploration (numbers: see Table 1) and quarrying activity (letters: see “Nelson Granite Ltd.”) conducted in the Kenora District in 2015 (bedrock geology from Ontario Geological Survey 2011).

Mine Development Stage

New Gold Inc. (<http://newgold.com/Home/default.aspx>; see Figure 2, location 1) continued work at the Rainy River gold-silver project in Richardson Township, approximately 55 km northwest of Fort Frances. In 2015, activities focussed mainly on development of the Rainy River gold-silver deposit.

The Canadian Environmental Assessment Agency and the Ontario Ministry of Environment and Climate Change separately completed their detailed assessments of the Rainy River project and subsequently announced their respective decisions. The Federal Environmental Assessment approval was granted on January 12, 2015, and the Provincial approval was granted on January 29, 2015. Receipt of these approvals enabled the company to apply for other permits through the development and operational phases of the project and to begin its preliminary development work at site in early 2015 (New Gold Inc., news release, January 30, 2015).

New Gold Inc. completed a friendly take-over bid to acquire all shares of Bayfield Ventures Corp. This take-over included all of Bayfield Ventures Corp.'s mineral properties (New Gold Inc. and Bayfield Venture Corp., news releases, January 1, 2015). New Gold plans to update its mineral resource and reserve estimates for its Rainy River deposits to incorporate the additional mineral resources on the Burns Block (New Gold Inc., news release, September 14, 2015). The Burns Block property is adjacent to the eastern boundary of New Gold Inc.'s Rainy River deposit's conceptual open pit.

New Gold Inc. concluded Impact and Benefits Agreements with Rainy River First Nation and Naicatchewenin First Nation. New Gold Inc. also concluded Participation Agreements with Big Grassy First Nation and Métis Nation of Ontario. New Gold Inc. continued discussions with other Aboriginal groups to complete additional agreements (New Gold Inc., Management Discussion and Analysis, February 19, 2015).

A ground-breaking ceremony was held at New Gold Inc. Rainy River property on May 15 to mark the start of construction on the Rainy River Gold Project. New Gold Inc. continued engineering and procurement work for the project. Some of the significant activities (Figure 3) that were initiated in 2015 included the following (New Gold Inc., Management Discussion and Analysis, October 28, 2015; New Gold Inc., Corporate Presentation, September 2015):

- commencement of pre-stripping and open-pit development
- construction of mine access road north of processing plant
- delivery and assembly of some mine equipment
- detailed engineering
- plant site earthworks
- powerline construction
- process plant construction
- re-alignment of Highway 600 south of proposed open-pit
- tailing and water management facilities
- approval of Closure Plan
- construction of temporary construction facilities

In 2015, the development capital expenditures on the Rainy River Project were \$241 million. The total project development expenditures on the project, as of December 31, 2015, were \$312 million. New Gold also mentions “in 2016, the company plans to spend approximately \$500 million on the development of Rainy River with the balance [of the \$877 million estimated development expenditures] to be spent in the first half of 2017” (New Gold Inc., news release, February 17, 2016).

In 2015, because of its development activities on the Rainy River deposit, New Gold Inc. focussed its exploration activity on areas immediately adjacent to the deposit. New Gold Inc. mentioned “the team’s focus is currently being directed toward prospective target areas located within a few kilometres of the central mine development area. To date, four areas with good potential to host significant gold mineralization in the subsurface have been identified. A 2,500 metre reconnaissance drilling campaign to test these targets is scheduled to commence during the coming months” (New Gold Inc., news release, September 14, 2015).

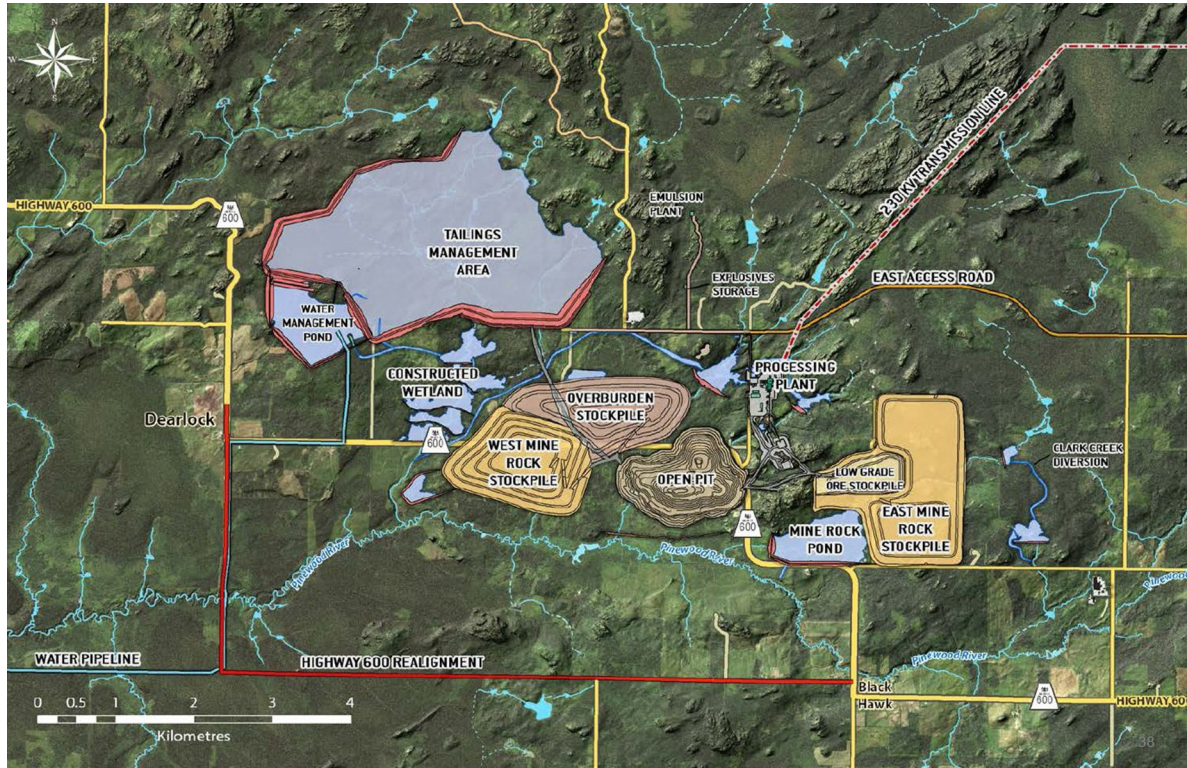


Figure 3. Rainy River gold-silver deposit proposed mine workings and infrastructure (from New Gold Inc., Corporate Presentation, December 2015, p.38).

Economic Analysis Stage

Avalon Rare Metals Inc. (<http://avalonraremetals.com>; see Figure 2, location 2) continued evaluation of the rare metal potential of the Big Whopper deposit at the Separation Rapids property in the Paterson Lake area, approximately 57 km north of Kenora. In 2014, metallurgical laboratory test work produced a 20 kg sample of high-lithium petalite concentrate with low iron content. This petalite concentrate has been “evaluated by several potential customers in the glass and ceramics industry in North America, Europe and Asia who have expressed interest in a high-purity product” (Avalon Rare Metals Inc., news release, September 3, 2014).

In 2015, Avalon Rare Metals Inc. initiated a \$750 000 pilot plant program. Part of this program involved shipping an additional 30 t of pegmatite, which had been collected from the Big Whopper deposit in 2006, to a processing facility in Germany to produce approximately one tonne (1 t) of lithium petalite concentrate (Avalon Rare Metals Inc., news release, October 8, 2015). Avalon mentioned (Avalon Rare Metals Inc., Management Discussion and Analysis, January 14, 2016) that this petalite concentrate will be used for 3 purposes:

1. to deliver further product samples to potential customers in the glass/ceramics industry who have already tested and approved smaller samples;
2. to provide initial test samples to a number of new potential customers; and
3. to generate concentrate for additional process development work with the objective of producing high- purity lithium chemical products for the lithium ion battery manufacturing business.

If this concentrate meets the customers’ performance requirements, Avalon Rare Metals Inc. plans to collect additional bulk samples to produce approximately 800 t of lithium-petalite concentrate. In preparation for collecting these bulk samples, rehabilitation work was completed on the access road to the Big Whopper deposit (Avalon Rare Metals Inc., news release, October 18, 2015). To process this larger sample, Avalon Rare Metals Inc. mentioned “looking at potential sites for establishing future production facilities in the Kenora area, including at the Separation Rapids Project site itself” (Avalon Rare Metals Inc., news release, August 17, 2015).

Chalice Gold Mines Limited (<http://chalicegold.com>; see Figure 2, location 3) continued their aggressive work on the Cameron Lake gold project, approximately 29 km southeast of Sioux Narrows. The Cameron project includes the Cameron Lake and West Cedartree properties. The Cameron Lake gold deposit is located on the Cameron Lake property.

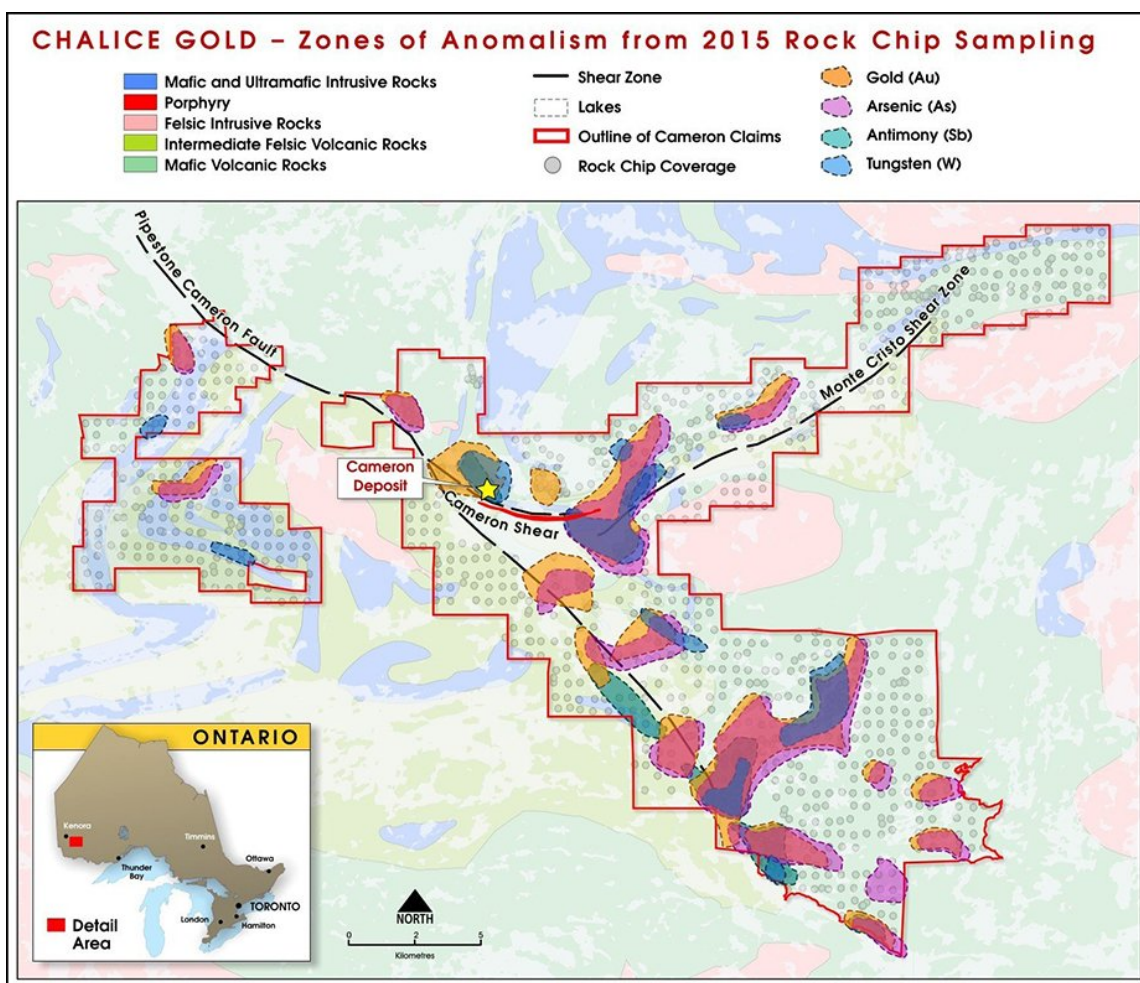


Figure 4. Geology and location of anomalous zones identified from the prospecting and sampling program conducted on the Cameron Lake project (from Chalice Gold Mines Limited, news release, December 7, 2015).

Chalice Gold Mines Limited initiated a reconnaissance prospecting and rock sampling program covering the extent of the Cameron Lake project. Approximately 1893 grab and chip samples were collected during this program. More than 20 anomalous zones were identified based on elevated values of gold, arsenic, antimony and tungsten (Figure 4) (Chalice Gold Mines Limited, news release, December 7, 2015).

In 2014, Chalice Gold Mines Limited initiated a Mobile Metal Ion (MMI™) soil sampling geochemical survey over parts of the Cameron Lake project. Based on these results, the MMI™ sampling program continued in 2015. The 2015 MMI™ soil sampling geochemical survey was completed in 6 areas on the Cameron Lake project. These areas were selected based on the results from the reconnaissance prospecting and rock sampling program. The analytical results from approximately 510 MMI samples, which were collected during this program, will be released in 2016 (Chalice Gold Mines Limited, news release, December 7, 2015).

In 2015, overburden was removed and exposures pressure-washed at 14 sites. These sites cover 10 areas on the Cameron Lake project. Samples were collected from channel-cuts that were completed on the hydrothermally altered, sulphide-bearing parts of the exposures. Chip-samples were collected from the remaining parts of exposures. In total, 579 samples were collected from these 14 exposures. Figure 5 illustrates the location of these exposures and presents selected gold values from this sampling program (Chalice Gold Mines Limited, news release, December 7, 2015).

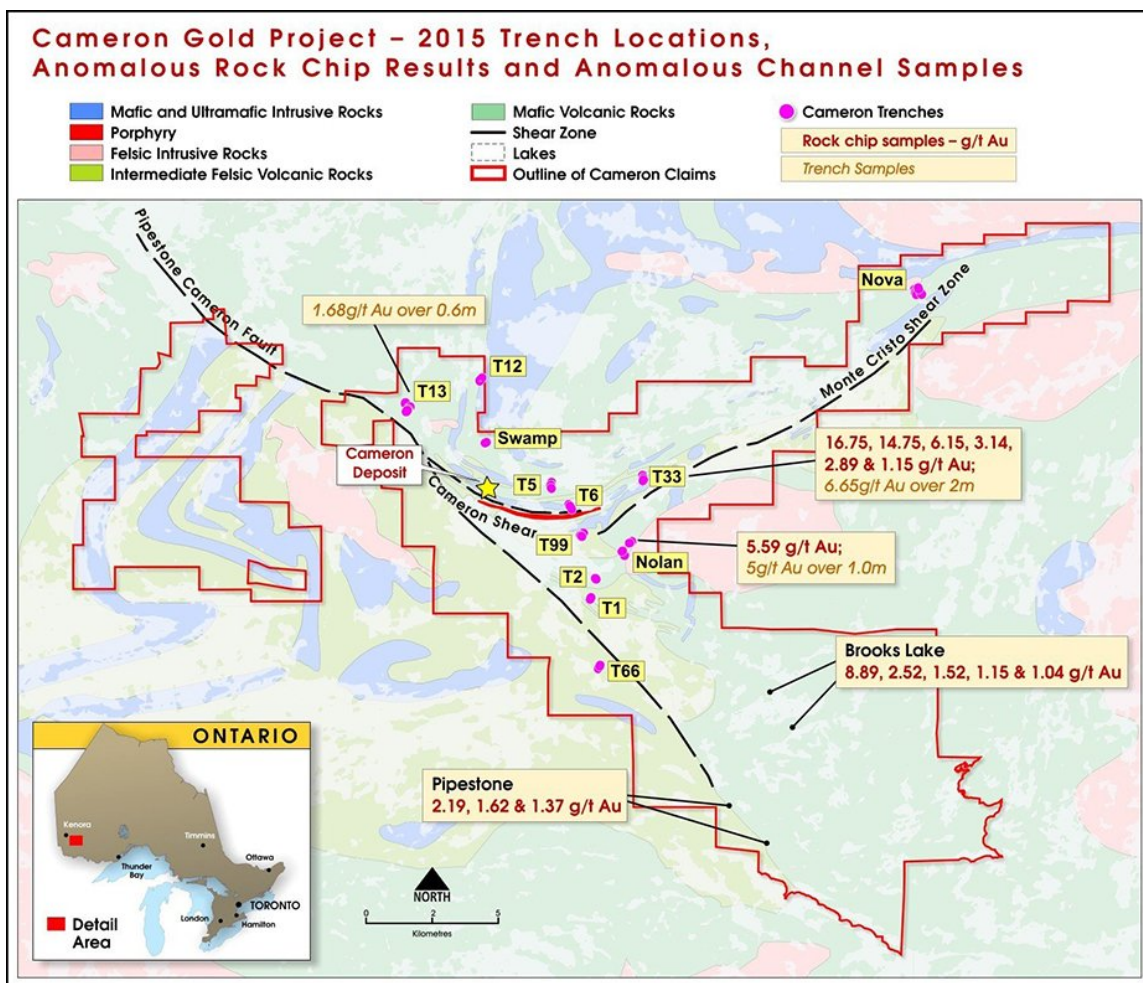


Figure 5. Geology, selected assay results and location of pressure-washed exposures on the Cameron Lake project (from Chalice Gold Mines Limited, news release, December 7, 2015).

In 2015, 771 historical diamond-drill holes, totalling 103 000 m, which tested the Cameron Lake gold deposit, were re-logged. Approximately 31 000 samples, mainly collected from drill core that had not been originally sampled, were submitted for analysis. The results from these samples were included in the updated Cameron Lake gold deposit mineral resources estimate (Table 4; Chalice Gold Mines Limited, news release, November 16, 2015).

Chalice Gold Mines Limited announced an updated mineral resource estimate (MRE) for the Cameron Lake gold deposit in 2015 (*see* Table 4). The resource estimate presented in Table 4 is based on a diamond-drilling database that includes 444 surface and 508 underground drill holes, totalling 118 808 m (Chalice Gold Mines Limited, news release, November 16, 2015). This revised estimate upgraded the 2014 resources values (Table 3).

Table 3. Historical mineral resource estimate of the Cameron Lake deposit (cut-off grade: open pit 0.5 g/t Au and underground 1.75 g/t Au; Ball 2014).

Resource Category	Tonnes	Gold (g/t Au)	Gold (ounces)
Measured	3 029 000	2.33	227 000
Indicated	5 976 000	1.90	365 000
Total Measured and Indicated	9 005 000	2.40	592 000
Inferred	6 590 000	2.69	569 000

Table 4. Revised mineral resource estimate of the Cameron Lake deposit (cut-off grade: 0.5 g/t Au; Chalice Gold Mines Limited, November 16, 2015).

Resource Category	Tonnes	Gold (g/t Au)	Gold (ounces)
Measured	3 723 000	2.64	316 000
Indicated	4 101 000	1.92	253 000
Total Measured and Indicated	7 824 000	2.26	569 000
Inferred	14 464 000	1.91	894 000

In 2015, Chalice Gold Mines Limited initiated an alteration study on the Cameron Lake project area (Chalice Gold Mines Limited, news release, December 7, 2015). The 4294 rock samples analyzed during this study were collected from

- grab and chip samples collected during reconnaissance prospecting program;
- channel-cut and chip samples collected from pressure-washed exposures;
- selected samples from 242 diamond-drilling holes completed between 2010 and 2012 by Coventry Resources Ltd.

These samples were analyzed using a PANalytical ASD Inc. TerraSpec® Halo mineral identifier. ASD Inc. TerraSpec® indicates that this mineral identifier is “a full-range NIR spectrometer measuring the visible and short wave infrared regions (350-2500 nm) that produces immediate on-instrument results”. This unit also “allows you to immediately identify alteration minerals” (*from* ASD Inc., www.asdi.com/products/terraspec/terraspec-halo-mineral-identifier). Chalice Gold Mines Limited also mentioned that, based on this analysis, “anomalous white mica and Al-chlorite results were being combined with rock geochemistry to prioritize targets for follow-up in 2016” (Chalice Gold Mines Limited, news release, December 7, 2015).

In 2015, Chalice Gold Mines Limited completed a structural study on the Cameron Lake project. Structural bedrock mapping was completed at selected exposures on the project. Chalice Gold Mines Limited mentioned that “the results, combined with the outcome of the summer’s [historical diamond-drill holes] re-logging and in-fill [reconnaissance prospecting] sampling program on the Cameron deposit, have significantly improved the Company’s understanding of the mineralisation controls on the property” (Chalice Gold Mines Limited, news release, December 7, 2015).

Additional work is planned for 2016.

Treasury Metals Inc. (www.treasuremetals.com; see Figure 2, location 5) continued work on the Goliath gold-silver project in Zealand Township, approximately 20 km east of Dryden. A majority of the effort in 2015 targeted the mineral potential of the Goliath gold deposit.

A 31-hole, Phase II diamond-drilling program, totalling 8769 m, was initiated in 2014. It was designed to test the mineralized zones within the Goliath deposit conceptual open-pit and underground resource. These drill holes mainly targeted the C zone, but also tested the Footwall B, Main and D zones (Table 5). The drilling program was also designed to upgrade Inferred Resources to the Measured and Indicated Resource categories and to test the extension of gold-bearing zones at the Goliath property. Twenty-four of these drill holes were completed in 2015.

Treasury Metals Inc. continued a 2014 program of extending historical diamond-drilling holes to test mineralized zones adjacent to the Main zone. In 2015, an additional 2 drill holes were deepened (see Table 5).

Table 5. Significant assay results from the 2015 diamond-drilling programs testing zones at the Treasury Metals Inc., Goliath deposit (RE indicates a deepened drill hole).

Drill Hole	Interval (m)	Gold (g/t)	Zone	Source (Treasury Metals Inc., news release, date)
TL15-389	3.0	11.67	Main	March 25, 2015
TL15-396	2.5	7.93	Main	April 15, 2015
TL15-400	3.6	6.68	Hanging Wall	April 15, 2015
TL10-116RE	6.0	6.08	Hanging Wall	May 27, 2015
TL15-381	3.0	24.18	B	March 25, 2015
TL15-390	1.0	286.23	B	April 15, 2015
TL15-397	2.0	2.07	C	April 15, 2015

In 2015, Treasury Metals Inc. also initiated a program of re-logging and sampling core from 95 historical diamond-drill holes. In total, 2090 samples were collected from intervals of drill core that had not been sampled. This program successfully identified mineralized sections of drill core. A 5.0 m interval in drill hole TL08-53 returned a value of 4.53 g/t Au and a 6.0 m section in drill-hole TL10-116 graded 6.08 g/t Au (Treasury Metals Inc., news release, May 27, 2015).

Treasury Metals Inc. announced an updated mineral resource estimate on the Goliath deposit in 2015 (Table 7). This revised estimate upgraded the 2011 resource values (Table 6). The estimates presented in the tables are combined values for both the underground and open-pit resources.

The data for the upgraded mineral resources estimate presented in Table 7 were derived from 6134 diamond-drill holes. This diamond drilling was completed by Teck Resources Inc. (1990 to 1998) and Treasury Metals Inc. (2008 to 2015; Puritch et al. 2015).

Table 6. Historical mineral resource estimate of the Treasury Metals Inc. Goliath deposit (cut-off grades: surface 0.5 g/t Au and underground 1.5 g/t Au) (Treasury Metals Inc., news release, November 9, 2011).

Category	Tonnes	Au (g/t)	Au (ounces)	Ag (g/t)	Ag (ounces)
Total Measured and Indicated	9 140 000	2.6	760 000	10.4	3 070 000
Total Inferred	15 900 000	1.7	870 000	3.9	1 990 000

Table 7. Revised mineral resource estimate of the Treasury Metals Inc. Goliath deposit (cut-off grades: open pit 0.35 g/t AuEq¹ and underground 1.90 g/t AuEq; Treasury Metals Inc., news release, August 29, 2015).

Category	Tonnes	Au (g/t)	Au (ounces)	Ag (g/t)	Ag (ounces)
Total Measured and Indicated	20 554 000	1.69	1 114 400	6.4	4 245 000
Total Inferred	3 470 000	2.96	330 100	8.3	928 000

¹ $AuEq (g/t) = Au (g/t) + \frac{Ag (g/t) \times Ag price (\$/oz) \times Ag mill recovery (\%)}{Au price (\$/oz) \times Au mill recovery (\%)}$

In 2015, a gold-anomalous area northeast of the Goliath deposit, identified from a Mobile Metal Ion (MMI™) geochemical survey which was completed in 2014, was tested with 2 diamond-drill holes. These drill holes did not intersect any significant mineralization (Treasury Metals Inc., news release, May 27, 2015).

In 2015, Treasury Metals Inc. also completed a cyanide bottle roll testing program. Cyanide bottle roll testing is the industry standard first step in assessing the gold recovery possible by cyanide leaching (for further information, *see* SGS SA, www.sgs.ca, *under* Mining | Metallurgy and Process Design | Cyanidation Technologies | Cyanide Leaching | Cyanide Bottle Roll Test). A total of 1000 g of diamond-drill core was submitted for testing. The sample for this testing was collected from the assay laboratory rejects that were returned to Treasury Metals Inc. after the original gold analysis of 19 drill holes. The rejects from the sample intervals, from these holes, which originally graded less than 5.0 g/t Au, were selected as part of this testing program. The 1000 g sample submitted for testing was collected from 374 reject samples. Treasury Metals Inc. indicated the results of the cyanide bottle roll testing indicated that 58% (228 samples) of the samples experienced a gain in gold in the range of 0 to 3.26 g/t Au (Treasury Metals Inc., news release, May 27, 2015).

In 2014, Treasury Metals Inc. initiated the permitting and approval process for developing the Goliath deposit. On April 15, 2015, the Canadian Environmental Assessment Agency (CEAA) confirmed the Goliath Project Environmental Impact Statement conforms to CEAA guidelines (Treasury Metals Inc., news release, April 27, 2015). As part of the Environmental Assessment process, Treasury Metals Inc. completed the 30-day public comment period. Based on the response from this comment period, Treasury Metals Inc. mentioned that “there are up to 238 days remaining on the clock which has stopped June 30, 2015 as a results of CEAA submitting to the Company a series of Informational Requests and comments” (Treasury Metals Inc., Management and Discussion and Analysis, November 30, 2015, p.3). Treasury Metals Inc. continues to review these requests for information and is in the process of preparing the responses.

In 2015, Treasury Metals Inc. also initiated a Feasibility Study on the Goliath deposit. The environmental baseline study, initiated on the Goliath deposit in 2010, continued in 2015. Environmental baseline studies included wildlife, ecosystem, soil, vegetation, fish habitat, sediment and water-quality surveys (Treasury Metals Inc., Management and Discussion and Analysis, November 30, 2015).

Significant Exploration Stage

Tamaka Gold Corporation (www.tamakagold.com; *see* Figure 2, location 7) continued work on the Goldlund gold property, approximately 38 km northeast of Dryden. Since 2007, exploration efforts have identified 6 major gold-bearing zones over an 800 by 3000 m area. The intermediate intrusive rocks that contain primary gold-bearing structures generally trend easterly and dip steeply to the south. Secondary structures are contained within these primary structures. These secondary structures strike north-northeast and have a shallow dip to the west. Generally, the secondary structures contain higher grade gold, whereas the primary structures return lower-grade mineralization (Zellerer 2013).

In 2013, Tamaka Gold Corporation released a NI 43-101-compliant technical report on the Goldlund project and this included a mineral resource estimate on the Goldlund gold deposit (Table 8). This estimate is based on 93 diamond-drill holes, totalling 10 475 m.

In 2015, Tamaka Gold Corporation announced a revised mineral resource estimate on the Goldlund gold deposit (Table 9). This revised estimate upgraded the 2013 resources values (*see* Table 8).

Table 8. Historical mineral resource estimate (cut-off grade 0.05 g/t Au) of the Goldlund gold deposit, Tamaka Gold Corporation (Zellerer 2013).

Resource Category	Tonnes	Gold (g/t)	Gold (ounces)
Measured and Indicated	19 000 000	1.30	791 000
Inferred	42 500 000	0.78	1 070 000

Table 9. Revised mineral resource estimate (cut-off grade 0.05 g/t Au) of the Goldlund gold deposit, Tamaka Gold Corporation (Tamaka Gold Corporation, news release, January 22, 2015).

Resource Category	Tonnes	Gold (g/t)	Gold (ounces)
Measured and Indicated	20 100 000	1.97	1 274 000
Inferred	40 500 000	2.12	2 760 000

In 2015, a 15-hole diamond-drilling program, totalling 2360 m, continued to test the gold-bearing zones and structures identified on the property. The results of this drilling program will be released in 2016 (B. Baker, Tamaka Gold Corporation, personal communication, January 25, 2016).

Exploration Activity Stage

Canstar Resources Inc. (<http://canstarresources.com>; see Figure 2, location 9) acquired by option and staking the Kenora gold project, 20 km northwest of Kenora (Figure 6). Reconnaissance prospecting efforts have identified numerous mineralized areas in the project area. Based on its prospecting efforts, Canstar Resources Inc. has interpreted several structural trends that could be related to gold mineralization (see Figure 6). Grab samples collected during these programs have returned values up to 283.35 g/t Au (Table 10) (Canstar Resources Inc., news release, October 26, 2015).

Table 10. Significant assay results from the grab sampling program completed on the Kenora gold project.

Gold (g/t Au)	Structural Trend	Source (Canstar Resources Inc., news release, date)
283.35	New Showing	October 26, 2015
15.72	New Showing	October 26, 2015
65.10	Aviator	January 14, 2016
35.30	Aviator	July 28, 2015
44.80	Triumph	July 28, 2015
15.76	Westin	October 26, 2015
14.80	Hilly Lake	December 3, 2015
3.36	Black Sturgeon	October 26, 2015

Manual removal of overburden, pressure washing, channel cutting and sampling were completed in 6 areas along several of the structural trends on the Kenora gold project. An 18.0 m interval collected from the Main showing on the Aviator structural trend returned 1.97 g/t Au (see Figure 6) (Canstar Resources Inc., news release, December 3, 2015).

The mineralized zones identified from these sampling programs are adjacent to the boundary of felsic intrusive rocks. These zones, commonly associated with the proposed structural trends, can be situated within the intrusive and mafic metavolcanic rocks, and along their contacts (see Figure 6). Canstar Resources Inc. mentioned “alteration and shearing is evident at the outcrop scale, as is a notable association of higher gold content where increased sulphides are observed. The Company believes this sulphide association will aid as a targeting characteristic for a geophysical program” (Canstar Resources Inc., news release, December 3, 2015).

Additional work is planned for 2016.

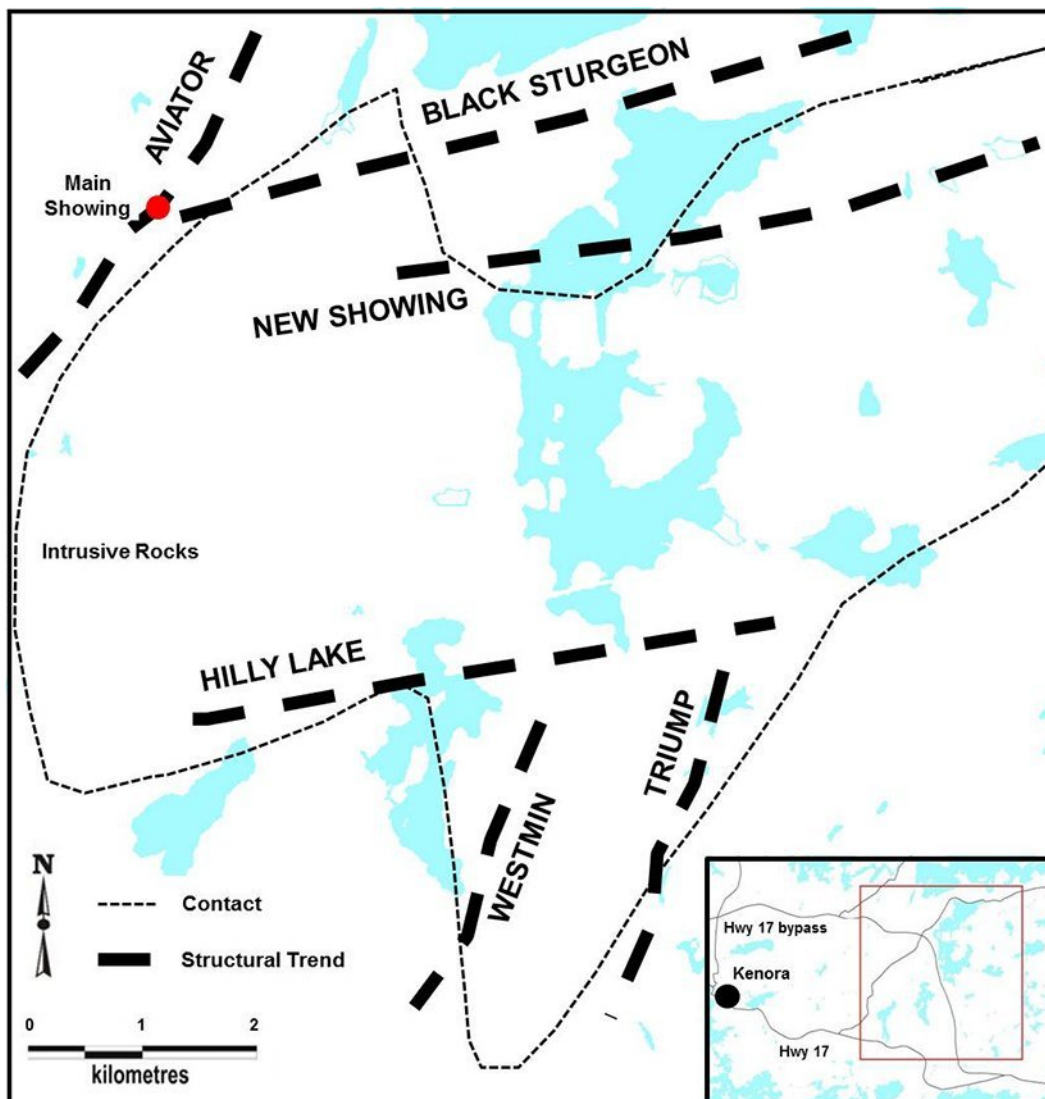


Figure 6. Location of structural trends and intrusive rocks on the Kenora gold project (from Canstar Resources Inc., Corporate Presentation, November 5, 2015, www.canstarresources.com). Inset map shows property location relative to Kenora.

NuVision Resources ULC (see Figure 2, location 16) continued work on the lode gold and volcanogenic massive sulphide Cat Key property, 10 km west of Mine Centre. Private funding was used to cover the 2015 exploration expenditures (M. Reiter, NuVision Resources ULC, personal communication, January 13, 2015).

In 2014, a 104 line-kilometres control grid, with 200 m line spacing, was established over the property. In 2014, 1789 soil and humus samples were collected at 50 m intervals utilizing this grid. These samples were submitted for analysis utilizing soil gas hydrocarbon (SGH) geochemical methodology. From the SGH results, 22 anomalous areas were identified. In 2015, time-domain resistivity and induced polarization surveys were completed on 32 line-kilometres of this grid. From these surveys, 8 conductive areas were identified. These geophysical surveys were designed to test several of the SGH anomalous areas. (M. Reiter, NuVision Resources ULC, personal communication, January 13, 2015)

In 2015, mechanical removal of overburden, pressure washing, channel cutting and sampling were completed at 15 anomalous areas that had been identified from the soil gas hydrocarbon, domain

resistivity and induced polarization surveys. The results of samples collected from these anomalous areas will be released in 2016 (M. Reiter, NuVision Resources ULC, personal communication, January, 2016).

Exploration efforts in 2014 continued to examine the mineral potential at the Thompson, Porphyry, 54-20 and L84E South zones on the Cat Key property. In 2015, mechanical removal of overburden and pressure washing increased the size of exposures previously excavated in 2014. The new areas were channel cut and sampled. Hydrothermal alteration and mineralization, interpreted by the company to be both lode gold and volcanogenic massive sulphide-related, was identified at these exposures. A 1.5 m interval collected from the Porphyry zone returned a value of 6.12 g/t Au. A 1.5 m section from the 54-20 zone graded 15.2 g/t Au. A 1.5 m interval collected from the L84E South zone returned 11.0 g/t Ag, 0.26% Pb and 0.25% Zn (A. Raoul, NuVision Resources ULC, personal communication, January 15, 2016).

Additional work, including diamond drilling, is planned for 2016.

StrikePoint Gold Inc. (www.strikepointgold.com; see Figure 2, Location 18) initiated an exploration program at the Lobstick Bay property, 20 km east of Sioux Narrows. The Lobstick Bay fluorite-gold occurrence was tested by a previous operator with a diamond-drilling program in 1986. StrikePoint Gold Inc. acquired the property based on a drill hole completed during this program, which graded 0.63 g/t Au over 38.9 m and another 11.0 m down-hole section, which returned 0.30 g/t Au (StrikePoint Gold Inc., news release, June 24, 2014).

In 2015, a control grid was established over the part of property surrounding the fluorite-gold occurrence. An induced polarization (IP) geophysical survey was completed utilizing this grid. StrikePoint Gold Inc. stated “that the [IP] survey was able to identify both chargeability and resistivity anomalies to a depth of 230 to 400 m” (StrikePoint Gold Inc., news release, June 24, 2014).

A 3-hole, 1040 m diamond-drilling program, which was designed to test these geophysical anomalies, was completed in 2015. StrikePoint Gold Inc. concluded that the assay results (Table 11) indicated the first phase of drilling had been successful in delineating broad zones of gold mineralization (StrikePoint Gold Inc., news release, February 2, 2016). Additional work is planned for 2016.

Table 11. Assay results from diamond drilling completed at the Lobstick Bay fluorite-gold property (J. Florek, StrikePoint Gold Inc., personal communication, February 8, 2016).

Drill Hole Number	Interval (m)	Sample Length (m)	Gold (g/t)
LB15-01	196.0 – 231.0	35.0	0.68
	<i>including</i>		
	196.0 – 211.3	15.3	1.25
LB15-02	163.0 – 184.5	21.5	0.24
	193.0 – 225.2	32.2	0.39
	296.0 – 334.0	38.0	0.87
	<i>including</i>		
	316.0 – 334.0	18.0	1.54
LB15-03	123.0 – 218.0	95.0	0.44
	<i>including</i>		
	124.0 – 154.0	30.0	0.82

DISTRICT GEOLOGIST STAFF AND ACTIVITIES

The Kenora office was staffed in 2015 by C. Ravnaas, *P.Geo.*, District Geologist; J. Wetendorf, District Geological Assistant; and Cassandra Olinyk, summer student assistant (Summer Experience Program).

Kenora staff attended the following conferences and symposia:

- Prospectors and Developers Association of Canada convention held in Toronto – March
- Northwestern Ontario Mines and Minerals Symposium in Thunder Bay – April
- Ontario Geological Survey (OGS) Branch meeting held in Sudbury – November
- Manitoba Mining and Minerals Convention held in Winnipeg, Manitoba – November (Kenora and Red Lake RGP staff compiled a poster illustrating the metal producers and significant exploration activity in Northwestern Ontario for the OGS booth)

Kenora staff attended the following workshops, presentations and/or training courses:

- C. Ravnaas attended “An Explosion of Geochemical Data” workshop at the Prospectors and Developers Association of Canada Convention, Toronto – March
- J. Wetendorf attended and completed the course: “Writing Effective Briefing Materials” held in Kenora – March
- RGP Health & Safety Day in Thunder Bay – April
- Ground-breaking ceremony held at New Gold Inc. Rainy River gold-silver deposit site – May
- Institute on Lake Superior Geology (ILSG) 62nd Annual meeting held in Dryden – May
- Bear Awareness training delivered by Ministry of Natural Resources and Forestry held in Kenora – June
- Certified ATV Training Course held in Kenora – June
- C. Ravnaas and C. Olinyk completed CPR/First Aid Training with St. John Ambulance, Kenora (certification valid until: July 7, 2018) – July
- Greenstone Mineral Exploration Forum in Geraldton, which highlighted mineral potential and exploration activity in the Greenstone region – July
- New Gold Inc. Rainy River Project Mining Information Session delivered by New Gold Inc. President Robert Gallagher in Thunder Bay – July
- RGP–NW meeting held in Thunder Bay – October
- C. Ravnaas attended the “Geology and Mineral Potential of Manitoba’s Mineral Belts: Thompson Nickel Belt” workshop in Winnipeg, Manitoba – November
- J. Wetendorf received Certificate of Completion for the Administrative Professionals Learning & Development Program (APLDP) – June to November
- J. Wetendorf researched and prepared a PowerPoint® presentation, “The Critical Mind”, with Theresa Stephens, Northern Development Advisor, for delivery to OPS audiences – December

Kenora staff completed the following webinar/e-learning courses:

- All webinar/e-learning courses mandatory for the RGP program
- Creating Accessible Documents (AODA) in Word, Outlook®, PowerPoint® and Excel®
- C. Ravnaas reviewed 24 freehold patents that were in forfeiture for non-payment of taxes
- J. Wetendorf successfully completed: Project Management Fundamentals course

Presentations delivered by Kenora staff:

- prepared and presented an activity poster, rock samples, and exploration opportunity handouts at the Northwestern Ontario Mines and Minerals Symposium held in Thunder Bay – April
- delivered a presentation of exploration activity conducted in the Kenora District at the Northwestern Ontario Mines and Minerals Symposium held in Thunder Bay – April
- delivered a geological tour of the Pidgeon molybdenite exposure to approximately 25 participants at the Institute on Lake Superior Geology meeting in Dryden – May (Kenora staff compiled tour guides for examination of several bedrock exposures at the Pidgeon molybdenum and Flambeau gold exposures)

Other Activities:

- Cassandra Olinyk was hired from May 19 to August 21 under the Summer Employment Program and assisted with office and field projects
- Kenora staff inventoried diamond-drill core stored in a facility in Sioux Narrows – July
- J. Wetendorf created the cover page design for the “2015–2016 Recommendations for Exploration” for print (requested by Anthony Pace) – October
- C. Ravnaas updated 8 mineral resource estimates presented in the “Kenora Mineral Deposits Not Being Mined” table in the Mineral Deposit Inventory (MDI) database and created 3 new stone MDI records
- Kenora District Office staff responded to approximately 845 telephone inquiries and facilitated 325 office visits by exploration clients

PROPERTY EXAMINATIONS

In 2015, 27 property and field examinations were conducted by the Kenora District Geologist's Office staff (Table 12; Figure 7).

Table 12. Property and field examinations conducted by the Kenora District Geologist in 2015. Locations are keyed to Figure 7.

Number	Client – Occurrence
1	Avalon Rare Metals Inc. – Big Whopper Li-Cs-Rb deposit
2	Canstar Resources Inc. - Sturgeon Au occurrence
3	Glatz, A. and Riives, J. – East Shaft Au occurrence
4	Glatz, A. and Riives, J. – Quartz Hill Au occurrence
5	Glatz, A. and Riives, J. – West Shaft Au occurrence
6	Hollings, P. – Duport Au deposit
7	Hollings, P. – Shoal Lake komatiite exposures
8	Meade, S. – Dogpaw Lake Au Prospect
9	MPH Ventures Corp. – Pidgeon Mo deposit
10	New Gold Inc. – Rainy River Au-Ag deposit
11	NuVision Resources ULC – L54E Au prospect
12	NuVision Resources ULC – Thompson East Au prospect
13	NuVision Resources ULC. – Thompson Porphyry Au prospect
14	Staff examination – Dash Lake Au occurrence
15	Staff examination – Dash Lake Narrows Au occurrences
16	Staff examination – Flambeau Au occurrence
17	Staff examination – Ghost Lake Li-Cs-Rb-Ta area
18	Staff examination – Mavis Lake Li-Cs-Rb-Ta prospect
19	Staff examination – Aaron Lake area stone potential
20	Staff examination – Experimental Lakes Road area stone potential
21	Staff examination – Jones Road area stone potential
22	Staff examination – Red Deer Road area stone potential
23	Staff examination – Sand Lake area stone potential
24	Staff examination – Vermilion Lake Road area stone potential
25	Staff examination – Whitedog Road area stone potential
26	Staff examination – Widow Au occurrence
27	StrikePoint Gold Inc. – Lobstick Bay Au occurrence

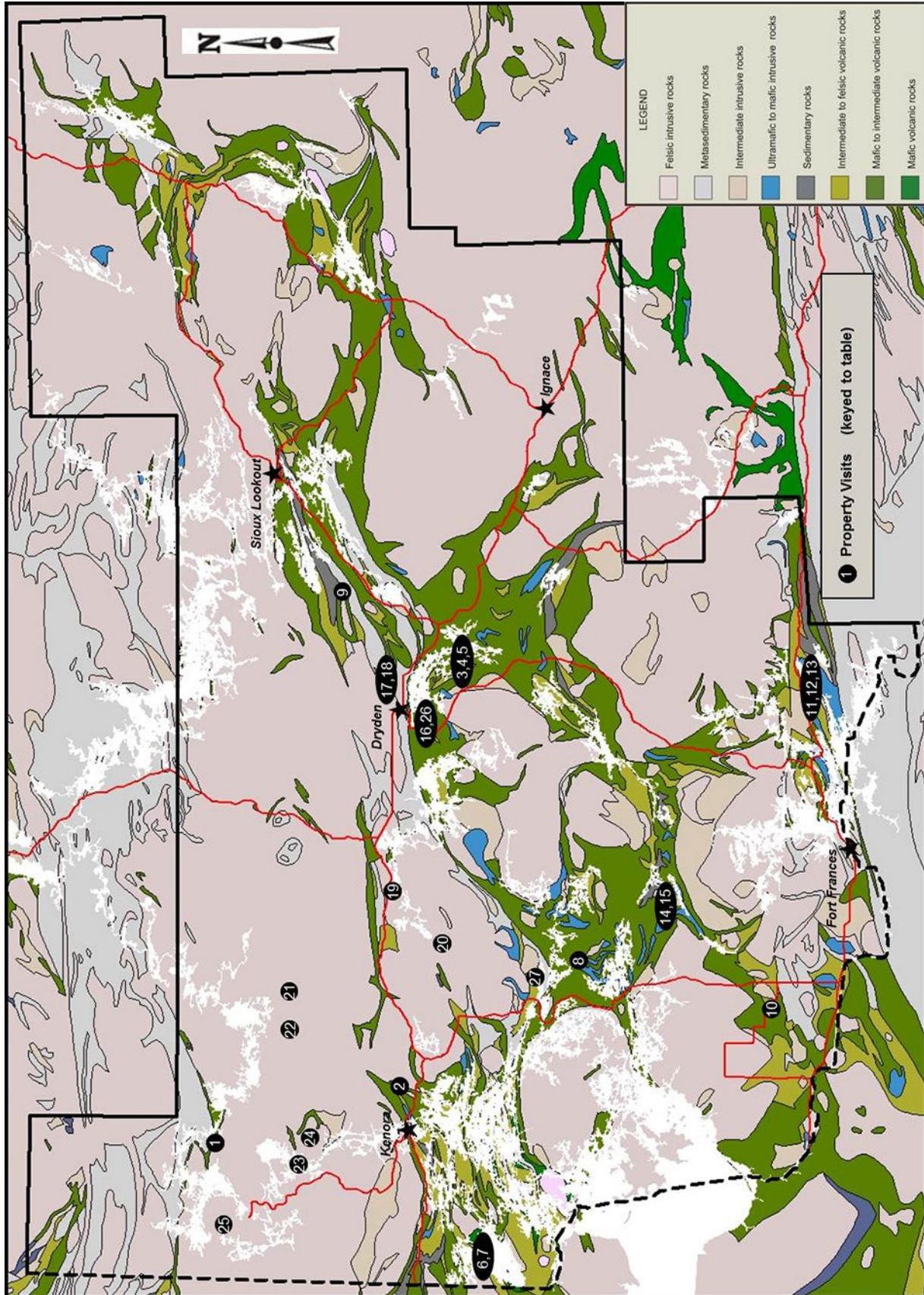


Figure 7. Property visits and field examinations conducted in the Kenora District in 2015 (bedrock geology from Ontario Geological Survey 2011). Locations listed in Table 12.

Pidgeon Molybdenum Exposure

The Pidgeon property is in the eastern part of the Lateral Lake felsic intrusive stock (Figure 8) midway between Dryden and Sioux Lookout. The main exposure is located 8.8 km east of Highway 72 and can be accessed via the Kathlyn logging road. The Kathlyn road junction with Highway 72 is 32 km south of Sioux Lookout.

In 1954, a 35 m deep adit was excavated to test the mineral potential of molybdenite-bearing quartz veins (Colvine and McCarter 1977). MPH Ventures Corp. acquired the Pidgeon molybdenum property in 2007. An exploration program was initiated in 2007, focussing on the Pidgeon molybdenum deposit. Busch (2008) and Duke (2012) provide adequate summaries of historical activities and mineralized zones identified from exploration programs completed on the property.

A 30 m wide zone containing molybdenite is situated in the eastern part of the Lateral Lake stock and appears to parallel the contact with supracrustal rocks. The extent of the mineralized zone was outlined based on results of exploration programs conducted by MPH Ventures Corp. (Figure 9). Mineralization can be traced for 2 km in a northeasterly direction and has a dip of approximately 45° to the southeast (Busch 2008).

In 2012, MPH Ventures Corp. released a mineral resource estimate on the Pidgeon deposit. The Indicated Resource is 2 660 000 t grading 0.117% Mo and the Inferred Resource is 12 390 000 t grading 0.084% Mo (MPH Ventures Ltd., news release, September 13, 2012; Duke 2012).

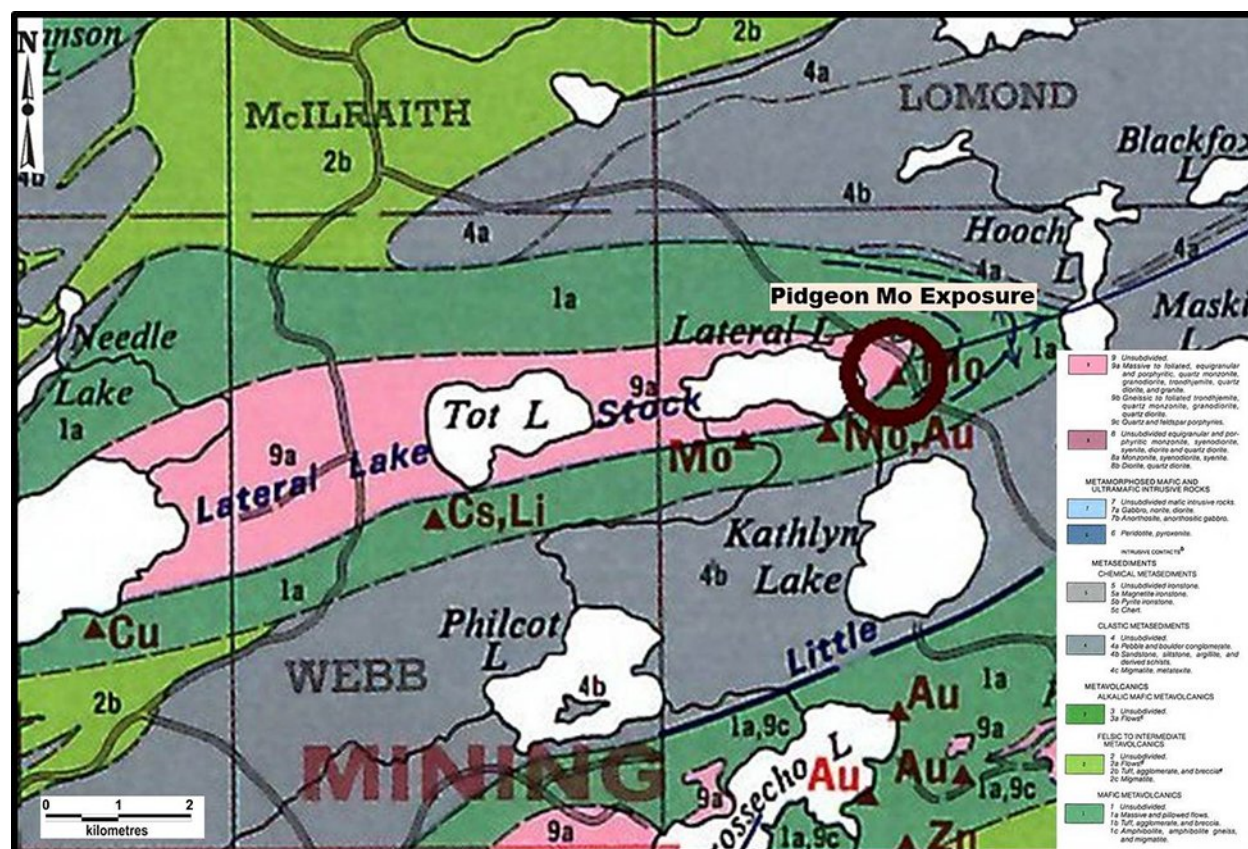


Figure 8. Regional geology and location of Pidgeon molybdenite exposure (bedrock geology from Blackburn 1978).

The last phase of activity completed by MPH Ventures Corp. was mechanical removal of overburden, pressure washing, channel sampling and detailed mapping of the main mineralized exposure on the Pidgeon property. This lies in the central part of the mineralized zone and is situated above the historical adit (Figures 9 and 11).

ROCK TYPES

The exposure is mainly underlain by granodiorite and quartz monzonite. Busch (2008, p.9) mentioned that these felsic intrusive rocks are “coarse-grained and consist of quartz, albite plagioclase, orthoclase, microcline and biotite, with minor chlorite, muscovite, carbonate, sericite, sphene, epidote and apatite”. Colvine and McCarter (1977, p.207) stated that “foliation varies from indistinct in the centre of the Lateral Lake Stock to very strong on the margins, producing a finely banded to gneissic texture through separation of biotite, quartz and feldspar bands” trending 042° and dipping 80° east in the main exposures. Magmatic phases are interpreted to have resulted in the formation of the pink and grey-white compositional banding (Busch 2008). The pink banding is dominantly quartz and feldspar, whereas gray bands are composed almost entirely of feldspar. The felsic intrusive rocks are cut by pegmatite and numerous randomly trending quartz veins.

The purpose of this study, conducted by C. Ravnaas of the Resident Geologist Program–Kenora, was to determine why some of the felsic intrusive rocks in the exposure contain molybdenite, whereas other parts of the main outcrop, with similar composition to the molybdenite-bearing rocks, do not contain mineralization. A majority of the samples collected during this study were from molybdenite-bearing felsic intrusive rocks. Molybdenite-bearing quartz veins were not sampled. Four samples, representing the unaltered and non-mineralized compositional banding, were also collected (Table 13).

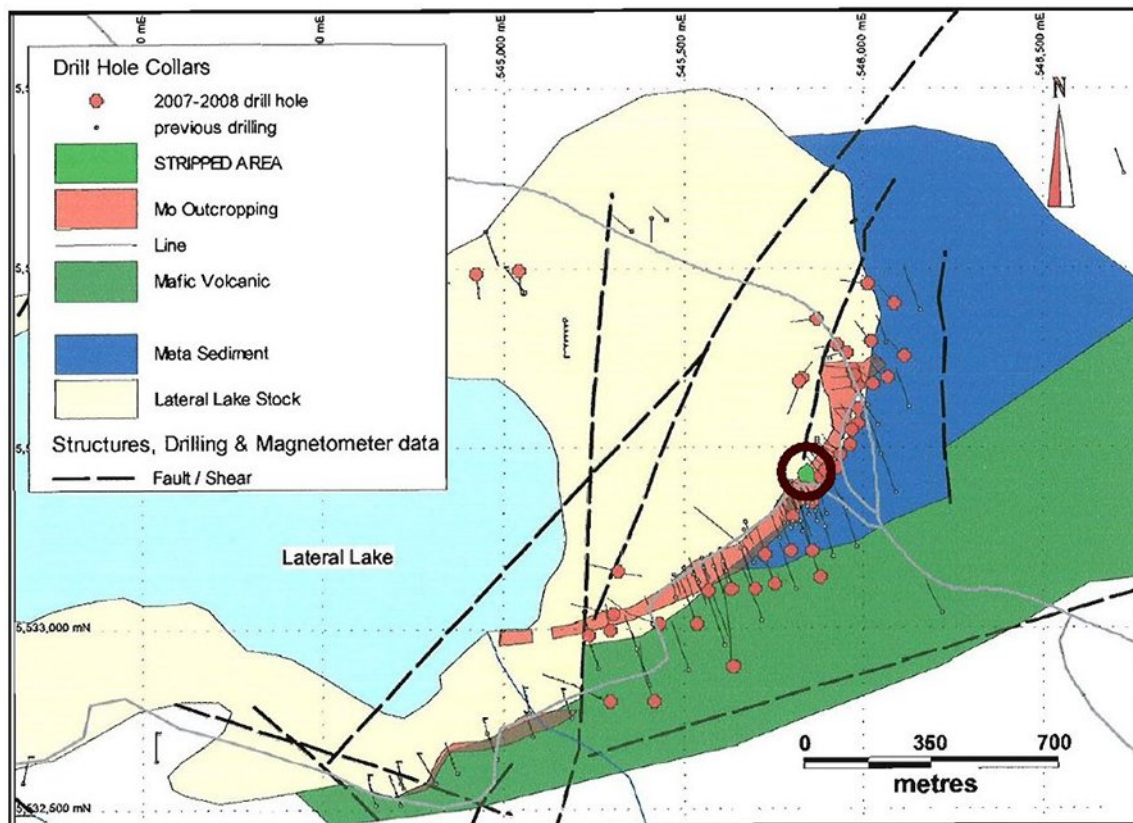


Figure 9. Bedrock geology, location of mineralized zone, location of main molybdenum-mineralized exposure (black circle) and MPH Ventures Corp. diamond-drill holes (from Busch 2008).

The samples of felsic intrusive rocks collected from the exposure have been plotted on a primitive mantle–normalized rare earth element (REE) plot (Table 14; Figure 10). Two suites have been identified, based on the differences in REE slopes (*see* Figure 10). Sample 05, the pegmatite, is probably a different intrusive event than the other felsic intrusive rocks collected during this study.

Table 13. Rock types, unique features and molybdenum values of samples collected from the main Pidgeon exposure.

Sample	Rock Type	Unique Feature	Mo (ppm)	Pyrite (%)
01	Mainly feldspar	Compositional banding gray banding	4.96	0
02	Quartz and feldspar	Compositional banding pink banding	4.83	0
03	Mainly feldspar	Compositional banding gray banding	3.28	0
04	Quartz and feldspar	Compositional banding pink banding	5.49	0
05	Pegmatite	Coarse-grained disseminated molybdenite	>44.00	0
06	Monzonite	Coarse-grained disseminated molybdenite	>44.00	0
08	Monzonite	Fine-grained disseminated molybdenite	35.27	0
09	Monzonite	Coarse-grained disseminated molybdenite	>44.00	1
10	Monzonite	Coarse-grained disseminated molybdenite	>44.00	5
11	Monzonite	Coarse-grained disseminated molybdenite	>44.00	0

Units used: ppm - parts per million, % - percent.

Table 14. Rare earth element values (ppm) of samples collected from the main Pidgeon exposure.

Sample	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Yb	Lu
01	3.33	11.19	1.23	5.36	1.20	0.36	0.83	0.09	0.42	0.07	0.18	0.17	0.03
02	5.77	11.17	1.08	3.64	0.62	0.14	0.42	0.05	0.27	0.05	0.18	0.22	0.04
03	2.46	6.81	0.89	3.73	0.98	0.34	0.74	0.09	0.44	0.07	0.20	0.18	0.03
04	2.55	6.53	0.48	1.81	0.33	0.10	0.24	0.03	0.14	0.03	0.10	0.14	0.02
05	0.39	0.67	0.09	0.36	0.29	0.03	0.07	0.01	0.06	0.01	0.03	0.03	0.01
06	2.77	5.75	0.68	2.55	0.54	0.18	0.33	0.04	0.19	0.04	0.10	0.12	0.02
08	4.80	12.88	1.38	5.57	1.18	0.35	0.81	0.10	0.47	0.08	0.22	0.22	0.03
09	6.82	13.05	1.45	5.03	0.98	0.29	0.67	0.08	0.42	0.08	0.22	0.24	0.04
10	9.36	17.82	2.03	7.47	1.62	0.41	0.90	0.10	0.53	0.09	0.26	0.23	0.04
11	7.85	15.28	1.62	5.53	1.04	0.26	0.61	0.07	0.34	0.06	0.16	0.17	0.03

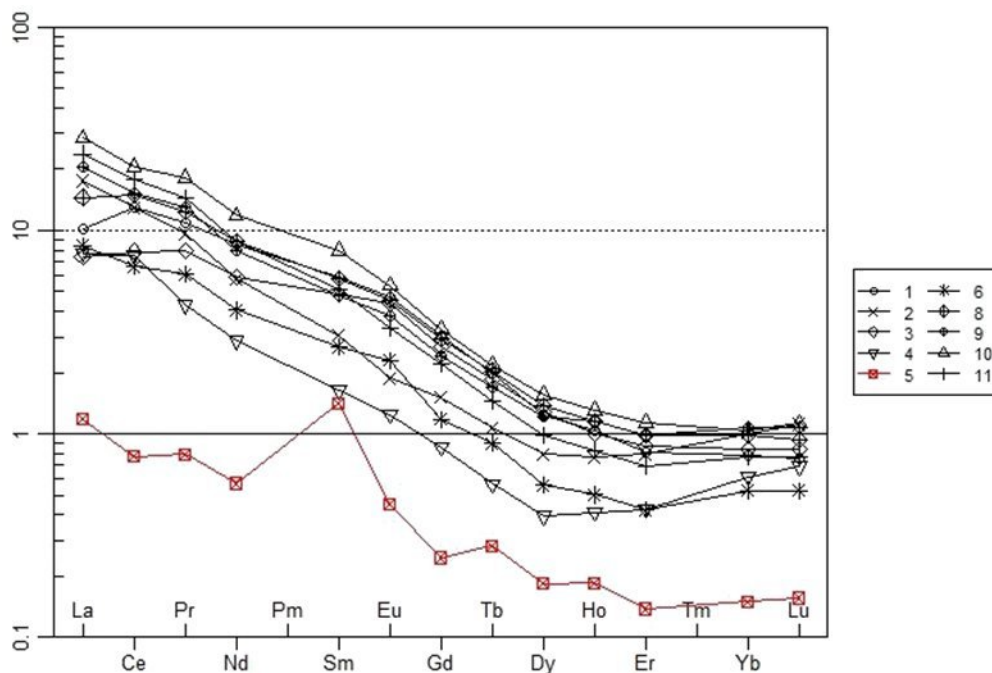


Figure 10. Primitive mantle–normalized plots of samples collected from Pidgeon exposure (*after* Nakamura 1974; Janoušek, Farrow and Erban 2006).

STRUCTURE

The contact of the Lateral Lake stock with the supracrustal rocks at the main exposure trends 070° and dips 45° southeast (*see* Figure 11). The compositional banding, which trends 042° and dips 80° east in the exposure, is not parallel to the contact of supracrustal rocks. This banding is overprinted by all other features in the exposure.

Prominent fractures in the exposure have a strike of 110° and dip to the northwest. The dip of this dominant fracture set, near the boundary with supracrustal rocks, is 045° northwest and increases to 60° northwest farther from the contact. The spacing of the fracture sets varies from 1 to 5 m.

A second prominent fracture pattern has a trend that varies between 030° and 080°. These fractures consistently dip 40° north. There also appears to be an increase in the number of fractures in exposures farthest from the supracrustal rocks. This second set overprints the 110° trending fractures.

The sloping edges of the outcrop, located in the western part of exposure, near the adit entrance, appear to represent the second set of northeasterly trending, 40° north-dipping fractures. A similar outcrop feature, the slope of the exposure approximately 15 m south of the adit, also appears to be the 40° north-dipping fracture (*see* Figure 11). These slopes are interpreted to represent the footwall portion of individual fractures. Disseminated flakes of molybdenite were observed along the sloping surfaces.

These prominent 045 to 060° trending, 40° north-dipping fractures appear to have formed before the hydrothermal event that resulted in the formation of quartz veins. There are also other randomly trending fractures cutting the exposure. A weaker set of north-northeast-trending, vertically dipping fractures overprint the prominent 045° to 060° trending, 40° north-dipping fractures and quartz veins.

An intriguing feature to note is that the contact of the Lateral Lake felsic stock and supracrustal rocks, which dips 45° southeast, is opposite to the dips of the all fracture sets in the exposure.

QUARTZ VEINS

Quartz fills some of the fractures in the study area. The quartz veins trend in random directions and have cut all rocks types. The quartz veins appear to be coeval and possibly formed during a single progressive event. Quartz is not present in the 110° trending set, or in the north-northeasterly trending, vertically dipping fractures. Quartz veins are not present in the area of the contact between intrusive and supracrustal rocks. Nevertheless, quartz veins or remnants of veins are often found in the northeast-trending, 40° north-dipping fracture set.

The large, easterly trending quartz vein in the central part of exposure cuts the prominent 110° trending fracture set (*see* Figure 11). Testing the mineral potential of this vein was the reason for excavating the adit in 1954.

MINERALIZATION

In the main Pidgeon exposure, molybdenite mineralization occurs in the quartz and pegmatite veins and as disseminated flakes in the felsic intrusive rocks. Molybdenite is disseminated, occurs within fractures and can be concentrated along boundaries of quartz veins. Not all quartz veins contain molybdenite. Busch (2008, p.13) mentioned:

molybdenite is very clotty in the quartz veins and pegmatites with a preference for the boundary between quartz and pegmatite and the boundary between the pegmatite and the aplite. These clots are aggregates up to 3 cm by 30 cm of near-solid molybdenite. Molybdenite also occurs as finer disseminations and more evenly distributed adjacent to veins.

Aggregates of molybdenite can be found in some quartz veins. A majority of this mineralization is fine grained. McDonald (2006) studied a molybdenite occurrence in a geological setting similar to the Pidgeon deposit in Redvers Township, approximately 60 km to the west. Here, molybdenite occurs along the fractures and grain boundaries of quartz veins and is disseminated in adjacent felsic intrusive rocks. Additional studies will have to be completed to determine if the molybdenite occurs as flakes along fractures or is interstitial in the quartz at the Pidgeon exposure.

Fine-grained, disseminated flakes of molybdenite are found in a majority of the prominent northeasterly trending 40° north-dipping fractures (*see* Figure 11). Molybdenite can locally occur in microfractures that cut the felsic intrusive rocks adjacent to the 40° north-dipping fractures. These molybdenite-bearing fractures usually only extend for a few centimetres into the adjacent rocks. Molybdenite is not present in any of the prominent 110° trending fractures. Molybdenite is also not present in the north-northeast-trending, vertically dipping fractures.

Some parts of the Pidgeon exposure contain concentrations of coarse-grained molybdenite. These zones of unique mineralization can contain up to 15% disseminated molybdenite, with rosettes ranging up to 1 cm in diameter. In 2015, a sample was collected from this molybdenite-bearing zone. The sample contained several rosettes of molybdenite that were used to obtain an age of 2694±12 Ma (S.E. Zurevinski, Lakehead University, personal communication, January 27, 2016) using the Re/Os method.

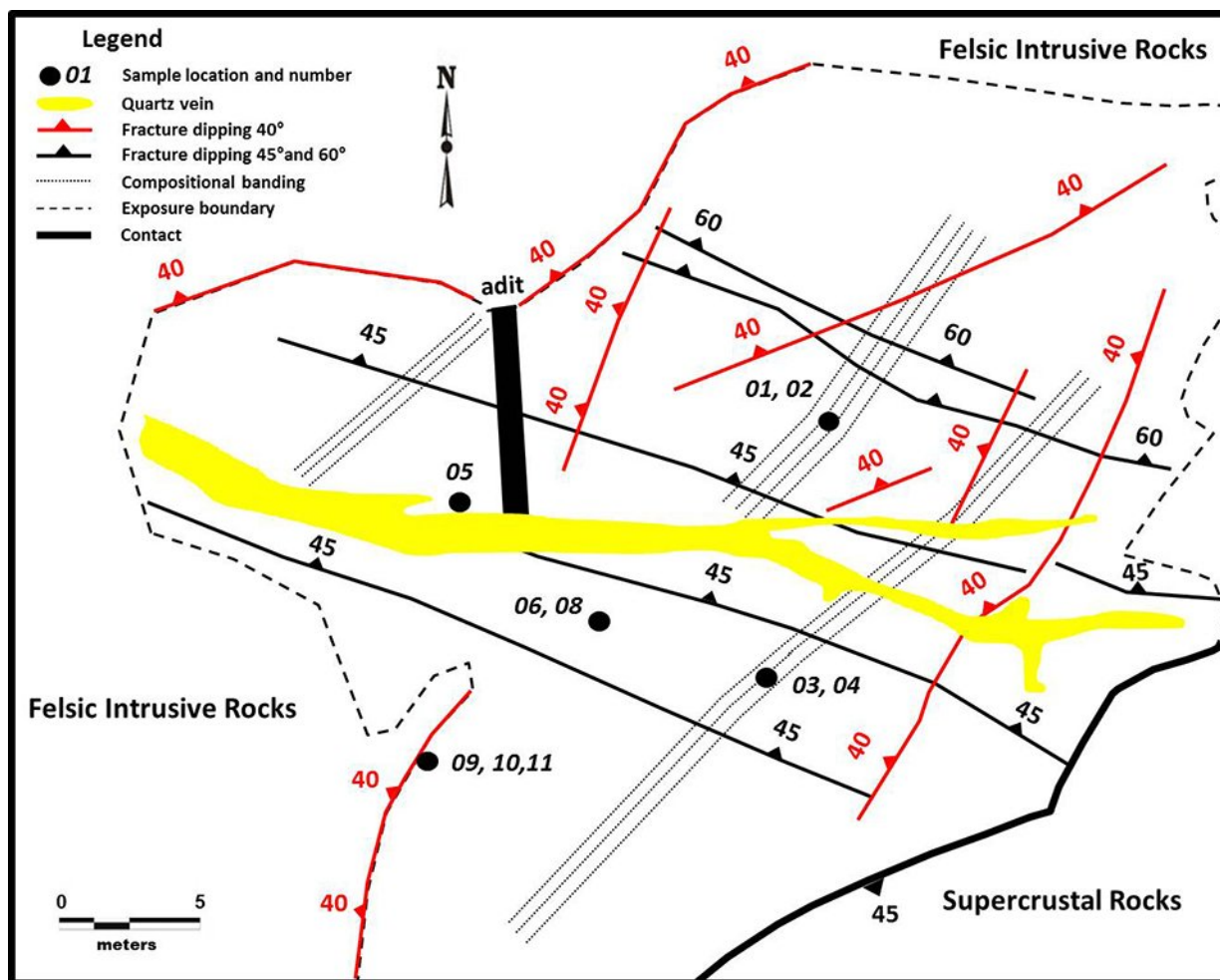


Figure 11. Structural features, compositional banding, adit, large quartz vein and sample locations at the Pidgeon exposure (*modified from* Busch 2008).

Busch (2008, p.39) mentioned that “fluorite, amethyst, epidote and tourmaline were reported in the drill logs but were not directly related to molybdenum mineralization”. Selected trace elements (Table 15) of samples collected during this study illustrate a positive correlation with anomalous molybdenite mineralization. A weak positive correlation with molybdenite mineralization, based on samples collected from MPH Ventures Corp., is shown by selenium, thorium and uranium (Busch 2008).

Molybdenite and other anomalous elements (*see* Table 15) could have been introduced into the felsic intrusive rocks during or after the development of the quartz veins and possibly before the development of the north-northeasterly trending, vertically dipping fractures. Additional studies are proposed to test these interpretations.

Table 15. Rock types and selected trace element values (in parts per million (ppm)) with a correlation with molybdenite mineralization of samples collected from the Pidgeon exposure by Resident Geologist Program staff in 2015.

Sample	Rock Type	Mo	As	Bi	Cd	Cu	Pb	Rb	S	Sb	Zn
01	Mainly feldspar	5.0	<6.00	<0.47	0.03	9.0	13.2	85.5	200	0.1	41.0
02	Quartz and feldspar	4.8	<6.00	<0.47	0.02	6.7	12.7	101.0	<130	0.1	13.0
03	Mainly feldspar	3.3	<6.00	0.5	0.02	11.5	12.9	78.5	319	0.0	38.0
04	Quartz and feldspar	5.5	<6.00	0.5	0.02	8.3	8.9	75.6	443	0.1	5.0
05	Pegmatite	>44.00	57.0	6.4	<i>0.013</i>	6.8	15.8	224.8	14136	<i>0.1</i>	<i>7.0</i>
06	Monzonite	>44.00	15.0	16.3	<i>0.013</i>	16.6	88.9	171.8	4366	<i>0.3</i>	<i>7.0</i>
08	Monzonite	35.3	<6.00	<0.47	<i>0.003</i>	27.0	13.0	104.5	223	0.1	25.0
09	Monzonite	>44.00	7.0	21.3	<i>0.013</i>	91.2	29.3	114.7	>16000	<i>0.2</i>	<i>6.0</i>
10	Monzonite	>44.00	61.0	>47.0	<i>0.013</i>	179.2	132.1	103.6	>16000	<i>0.4</i>	<i>8.0</i>
11	Monzonite	>44.00	21.0	3.3	<i>0.013</i>	26.0	22.9	103.1	5470	<i>0.3</i>	<i>15.0</i>

Bold are representative of samples with enriched elements; *italic values* are representative of depletion compared to other collected samples.

UNIQUE MINERALIZING EVENT

Coarse-grained rosettes of molybdenite, which returned the highest molybdenum values, were found at sample locations 6, 9, 10 and 11 (*see* Tables 13, 15 and 16; *see* Figure 11). The composition of the rocks at the sample sites, although very similar to all other felsic intrusive rocks in the exposure, appears to have a higher amount of orthoclase feldspar. These were the only locations at the exposure where evidence of this unique mineralizing event could be found. All other molybdenite observed in the exposure, including that within quartz veining, is considerably finer grained.

Selected trace and major elements (Tables 15, 16 and 17) illustrate distinct enrichment and depletion when comparing analytical values of mineralized to non-mineralized felsic intrusive rocks. These zones of unique mineralization are not found within or adjacent to quartz veins, pegmatite, fractures or fracture–joints sets and this variance does not appear to be related to hydrothermal alteration.

The samples collected from these unique mineralized zones illustrate possible enrichment of potassium compared to the non-mineralized samples (*see* Tables 16 and 17). This compositional difference could represent different varieties of feldspar created during crystallization of the felsic intrusive rocks. Additional studies will have to be completed to determine why these coarse-grained rosettes of molybdenite formed in the potassium-rich parts of the exposure.

RECOMMENDATIONS

Exploration efforts should target the depth extension of mineralization found within the 40° north-dipping fracture set. The trend of these fractures in the felsic intrusive rocks is opposite to the contact of the supracrustal rocks and the proposed dip of the Pidgeon molybdenite-mineralized zone. The potassium-enriched parts of the felsic intrusive rocks could host additional coarse-grained molybdenite.

Table 16. Unique features of samples sites and other selected trace element values (in parts per million (ppm)) of samples collected from the Pidgeon exposure by Resident Geologist Program staff in 2015.

Sample	Unique Feature	Mo	Ba	Ca	Cs	K	Mn	Na	Rb
01	Compositional banding gray banding	5.0	672	11608	34.4	17902	177	>31000	85.5
02	Compositional banding pink banding	4.8	254	5518	22.5	26380	106	30363	101.0
03	Compositional banding gray banding	3.3	606	10851	33.1	18886	173	>31000	78.5
04	Compositional banding pink banding	5.5	118	3132	21.3	25176	34	29109	75.6
05	Coarse-grained disseminated molybdenite	>44.00	1560	<i>358</i>	26.5	>45000	<i>6</i>	<i>12263</i>	224.8
06	Coarse-grained disseminated molybdenite	>44.00	1085	<i>614</i>	<i>18.6</i>	>45000	<i>14</i>	<i>25531</i>	171.8
08	Fine-grained disseminated molybdenite	35.3	499	9336	33.3	20179	137	>31000	104.5
09	Coarse-grained disseminated molybdenite	>44.00	839	<i>457</i>	8.7	>45000	<i>5</i>	<i>16727</i>	114.7
10	Coarse-grained disseminated molybdenite	>44.00	832	<i>690</i>	<i>9.9</i>	36345	<i>6</i>	<i>23756</i>	103.6
11	Coarse-grained disseminated molybdenite	>44.00	750	2061	<i>14.6</i>	28846	34	>31000	103.1

Bold are representative of samples with enriched elements; *italic values* are representative of depletion compared to other collected samples.

Table 17. Major element values (in percent) of samples collected from Pidgeon exposure by Resident Geologist Program staff in 2015.

Sample	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	Na ₂ O	K ₂ O	MnO	P ₂ O ₅	TiO ₂	BaO	LOI
01	71.73	16.08	1.42	0.54	2.04	5.01	2.40	0.03	0.05	0.23	0.07	0.77
02	75.07	13.76	0.79	0.22	0.98	4.33	3.41	0.02	0.01	0.11	0.03	0.46
03	72.52	15.34	1.45	0.50	1.89	4.74	2.58	0.03	0.05	0.20	0.06	0.76
04	77.18	13.42	0.48	0.12	0.59	4.29	3.36	0.01	0.00	0.08	0.01	0.55
05	<i>65.02</i>	17.12	0.50	0.23	<i>0.09</i>	<i>1.94</i>	10.49	<i>0.00</i>	0.03	0.07	0.17	1.06
06	<i>63.62</i>	16.91	0.89	0.16	<i>0.13</i>	3.82	8.33	<i>0.01</i>	0.01	0.09	0.12	1.05
08	71.57	15.91	1.27	0.51	1.59	5.02	2.64	0.02	0.04	0.25	0.05	0.84
09	73.87	12.68	2.89	0.18	<i>0.11</i>	<i>2.43</i>	6.05	<i>0.00</i>	0.02	0.17	0.09	1.81
10	<i>69.88</i>	14.58	1.51	0.23	<i>0.15</i>	<i>3.54</i>	4.95	<i>0.01</i>	0.05	0.18	0.09	1.65
11	70.65	16.08	0.79	0.31	<i>0.38</i>	5.00	3.82	<i>0.01</i>	0.03	0.13	0.08	1.26

Bold are representative of samples with enriched elements, *italic values* are representative of depletion compared to other collected samples

RECOMMENDATIONS FOR EXPLORATION

Rare Metal Potential of Granitic Pegmatites

Pegmatites are known to host a number of economic commodities such as lithium, tantalum, tin, rubidium, cesium and ceramic-grade feldspar and quartz. Several areas in the Kenora District have potential for these rare metals (sometimes referred to as “rare elements”), based on favourable geological setting and historical exploration activity.

REGIONAL GEOLOGICAL SETTING

Granitic pegmatites with potentially economic concentrations of rare metals are typically found along regional-scale faults that are often associated with subprovince and terrane boundaries (Figure 12). Pegmatites are commonly situated adjacent to metasedimentary rocks and a fertile parental felsic intrusion (Selway, Breaks and Tindle 2005). Fertile granites are late syntectonic to post-tectonic, felsic intrusions (Breaks, Selway and Tindle 2003).

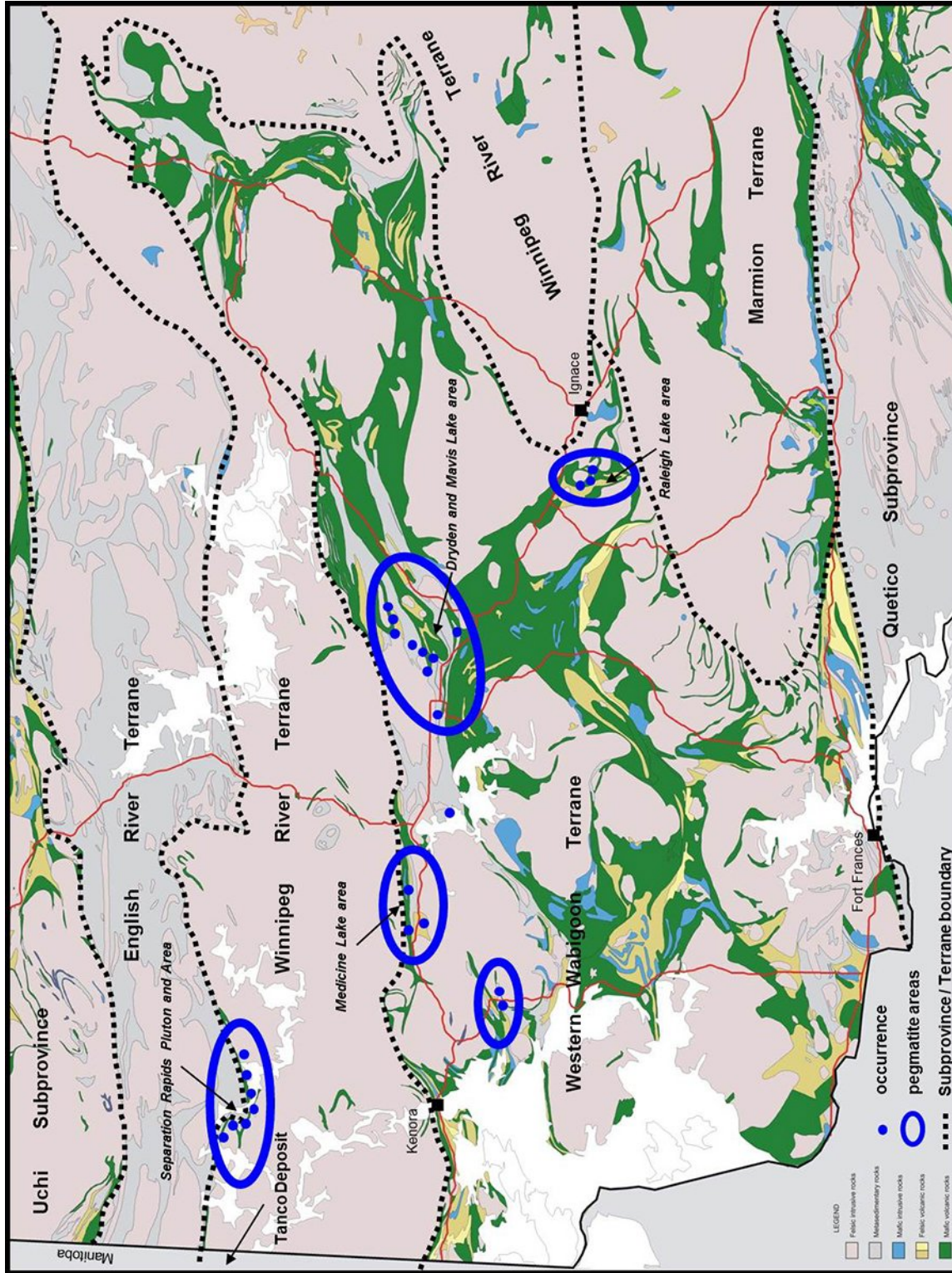


Figure 12. Bedrock geology, showing subprovince and terrane boundaries, pegmatite bodies and location of rare metal occurrences in the Kenora District (modified from Ontario Geological Survey (2011) and Stott et al. (2010)).

RARE METAL-BEARING PEGMATITE

Pegmatites that host economic concentrations of rare metals are derived from fertile parent granite. Lithochemical anomalies (Li, Cs, Rb, Ta, Nb, Sn, F, B, Be, Tl and Ge) typically associated with rare metal-enriched pegmatites are distributed over an area of 10 to 20 km² within a 10 km radius of the fertile granite (Figure 13). The pegmatite with the greatest economic potential is commonly distal to the parent granite (Selway, Breaks and Tindle 2005). There are numerous rare metal-bearing minerals associated with pegmatite; Table 18 provides a list of the common rare metal-bearing minerals.

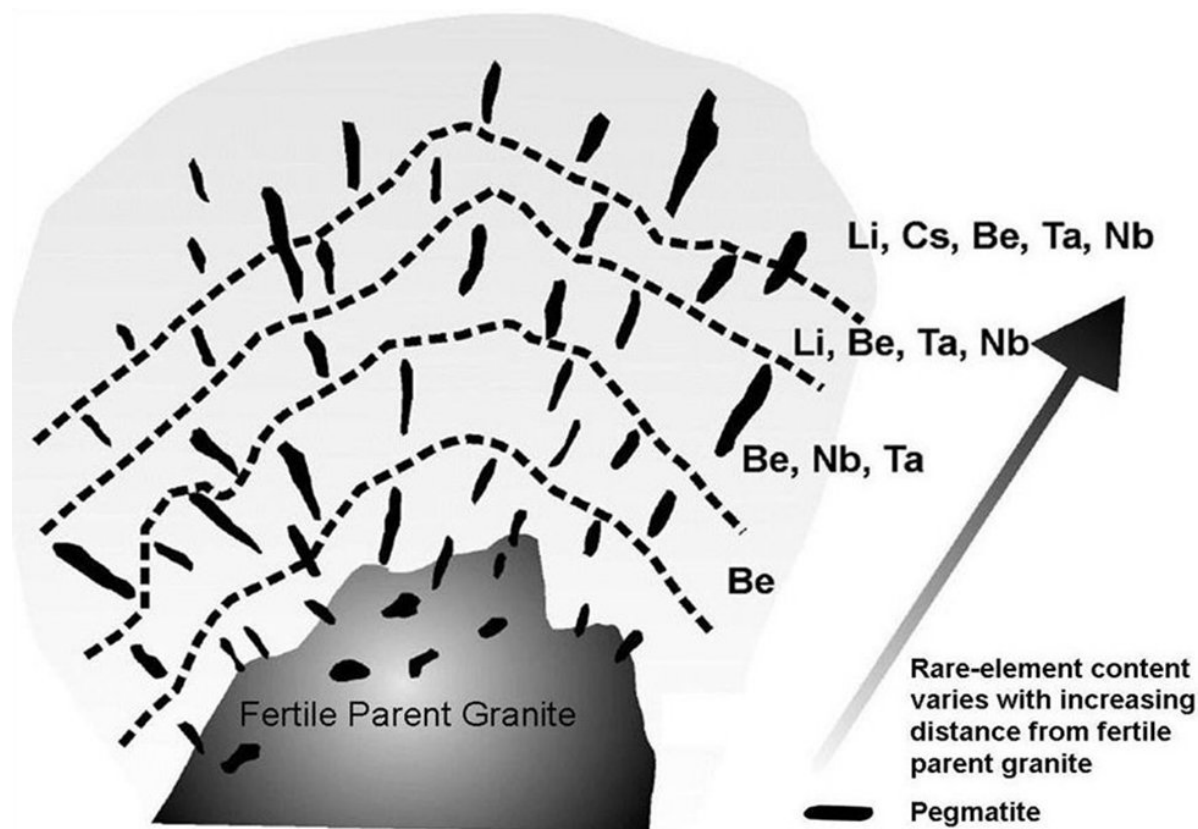


Figure 13. Spatial distribution of rare metal mineralization and pegmatites related to fertile parent granite (*modified from Breaks, Selway and Tindle 2003*).

Table 18. Common rare-metal ore minerals hosted in pegmatite (*after Selway, Breaks and Tindle 2005*).

Symbol	Metal	Ore Minerals
Be	Beryllium	Beryl
Cs	Cesium	Pollucite
Li	Lithium	Petalite, spodumene, lepidolite, amblygonite
Nb	Niobium	Columbite-tantalite, pyrochlore
Rb	Rubidium	Potassium feldspar, muscovite (Li-mica)
Sn	Tin	Cassiterite
Ta	Tantalum	Columbite-tantalite, rutile, wodginite

Table 19. Statistically derived, lithogeochemical anomaly threshold values from the Separation Rapids project, Tantalum Mining Corporation Limited (*modified from Galeschuk 1999, p.15*).

Rock Type	Background (max. value in ppm)			Possible Anomalous (ppm)			Anomalous (ppm)			Highly Anomalous (min. value in ppm)		
	Li	Cs	Rb	Li	Cs	Rb	Li	Cs	Rb	Li	Cs	Rb
Pegmatite	< 50	< 12	< 230	50–116	12–16	230–321	116–381	16–126	321–3393	> 381	> 126	> 3393
Felsic intrusive	< 27	< 7	< 302	27–42	7–15	302–485	42–86	15–29	485–1769	> 86	> 29	> 1769
Mafic intrusive	< 46	< 4	< 30	46–54	4–6	30–38	54–335	6–15	38–134	> 335	> 15	> 134
Felsic volcanic	< 17	< 3	< 76	17–39	3–6	76–160	39–110	6–22	160–407	> 110	> 22	> 407
Mafic volcanic	< 36	< 2	< 72	36–56	2–6	72–101	60–228	6–40	101–485	> 228	> 40	> 485

Significant exploration activity, targeting rare metal potential, has been conducted in the Separation Rapids area, north of Kenora. Galeschuk (1999) proposed anomaly threshold values (Table 19), based on lithogeochemical results, from samples of various rock types collected during exploration programs conducted by Tantalum Mining Corporation Limited on their Separation Rapids rare metal property.

EXPLORATION TECHNIQUES

In many cases, the fertile granite is not exposed at surface; the only surface expression associated with these intrusive rocks is the rare metal-bearing pegmatites themselves. Rare metal-bearing pegmatites are non-magnetic and contain insufficient metallic minerals to be conductive. They typically do not contain radioactive minerals and may not have a sufficient specific gravity to allow them to be distinguished from the host rocks utilizing gravity surveys (Galeschuk and Vanstone 2005). Survey techniques typically used in metallic mineral exploration will not be useful in the search for fertile granites and pegmatites.

The emplacement of pegmatite is accompanied by the alteration and development of a rare metal-enriched aureole within the adjacent host rocks. Galeschuk and Vanstone (2005) stated: “The best metals with respect to aureole thickness and intensity are Li, Cs, B, Sn, Be and Rb, with the latter metal forming smaller, less intense aureoles (Beus et al. 1968)”. This mobility of metals associated with pegmatite emplacement can be a valuable asset when developing exploration programs. Selway, Breaks and Tindle (2005) and Galeschuk and Vanstone (2005) provided summaries of the use of lithogeochemistry as a detection method to define buried pegmatite.

Geological mapping, structural studies, lithogeochemical sampling, testing of B horizon soil samples utilizing the Enzyme LeachSM analytical technique, and biogeochemistry are some exploration techniques that have been applied to evaluate the rare metal potential of an area. Galeschuk and Vanstone (2005) provided summaries and comparisons of several of these exploration techniques that targeted buried rare metal-bearing pegmatite bodies near the Tanco Li-Cs-Rb-Ta deposit in southeastern Manitoba. Galeschuk and Vanstone (2005, p.163) concluded that the “use of lithogeochemical surveys as a primary exploration tool in the search for buried rare-metal pegmatite has resulted in the documentation of number of lithogeochemical anomalies that remain unexplained after drill testing”. Based on this study, Galeschuk and Vanstone (2005, p.172) concluded

... Tanco has moved away from lithogeochemistry and is placing increasing emphasis on soil geochemistry and the Enzyme LeachSM method as its primary exploration tool. The geochemistry is used in conjunction with geological and structural mapping in an integrated exploration approach.

RECOMMENDATIONS

Granitic pegmatite systems associated with known rare metal occurrences in the Kenora District are located near the Winnipeg River terrane boundary, adjacent to metasedimentary rocks, and commonly hosted by supracrustal rocks (*see* Figure 12). Publications that discuss the geological setting, mineralization and assay results of these pegmatite areas are presented in Table 20.

A regional approach to identify additional fertile granites and mineralized pegmatite examines the geological settings associated with typical emplacement of rare metal–enriched, granitic pegmatite systems. Unexplored areas situated adjacent to known rare metal occurrences and along the extent of the Winnipeg River terrane boundary, illustrated in Figure 12, are prime locations to identify additional pegmatite.

These occurrences are commonly identified from the analytical results of lithochemical samples collected from exposed pegmatite during government geoscience studies and mineral exploration activities (*see* Table 20). The exploration techniques discussed previously should be applied in these areas to target additional mineralized pegmatite.

Recommendations to locate “new” granites and pegmatites associated with rare metal mineralization:

- explore adjacent to known pegmatites and/or rare metal occurrences
- restrict the search to areas near subprovince and terrane boundaries and major faults
- while pegmatites are often proximal to fertile parent granites, the pegmatite with the greatest economic potential may be distal to the parental granite
- target pegmatites hosted in supracrustal rocks, especially metasedimentary rocks
- examine and sample all pegmatite exposures that have the potential to host mineralization

Table 20. Known pegmatite fields and groups in the Kenora District and related references that summarize the rare metal potential of these areas.

Pegmatite Area	Reference(s)
Dryden Pegmatite Field	Breaks (1981, 1989)
Graphic–Tower Lakes Pegmatite	Breaks, Selway and Tindle (2001, 2003)
Gullwing–Tot Lakes Pegmatite Group	Breaks and Janes (1991) Breaks and Kuehner (1984) Breaks and Moore (1992) Breaks, Selway and Tindle (2001, 2003, 2005) Selway, Breaks and Tindle (2005)
Mavis Lake Pegmatite Group	Breaks (1993)
Medicine Lake Pegmatite	Breaks and Janes (1991) Breaks, Selway and Tindle (2001, 2003)
Separation Rapids Pegmatite Group	Breaks and Tindle (1996, 1997, 2001) Breaks, Selway and Tindle (2005) Breaks, Tindle and Smith (1999) Selway, Breaks and Tindle (2005) Tindle, Breaks and Webb (1998) Tindle and Breaks (1998, 2000)
Raleigh Lake Pegmatite	Breaks (1993)
Wabigoon–Winnipeg River Subprovince Boundary Area	Breaks, Selway and Tindle (2001, 2003, 2005) Selway, Breaks and Tindle (2005)
Regional Studies on Pegmatite	Breaks (1981, 1982, 1993, 2005)

OGS ACTIVITIES AND RESEARCH BY OTHERS

Two Ontario Geological Survey, Earth Resources and Geoscience Mapping Section (OGS–ERGMS) field projects and a joint university–research study were conducted in the Kenora District in 2015. Figure 14 illustrates the location of these projects.

- A. S.R. Meade (OGS–ERGMS) initiated a multi-year structural and stratigraphic mapping project in the Kakagi Lake–Rowan Lake area, Kakagi–Rowan Lakes greenstone belt (Meade 2015a);
- B. S.R. Meade (OGS–ERGMS) conducted uranium-lead zircon geochronological study of the eastern portion of the Central Volcanic belt, Sioux Lookout greenstone belt (Meade 2015b);
- C. M. Pelletier (Institut National de la Recherche Scientifique–Centre Eau, Terre, Environnement) P. Mercier-Langevin (Geological Survey of Canada), D. Crick (New Gold Inc.), J. Tolman (New Gold Inc.), G.P. Beakhouse (OGS–ERGMS) and B. Dubé (Geological Survey of Canada), as part of the Targeted Geoscience Initiative 4, Lode Gold project of Natural Resources Canada, continued research focussing on the style, geometry, timing and structural controls of ore distribution and grade at the New Gold Inc. Rainy River project (Pelletier et al. 2014).

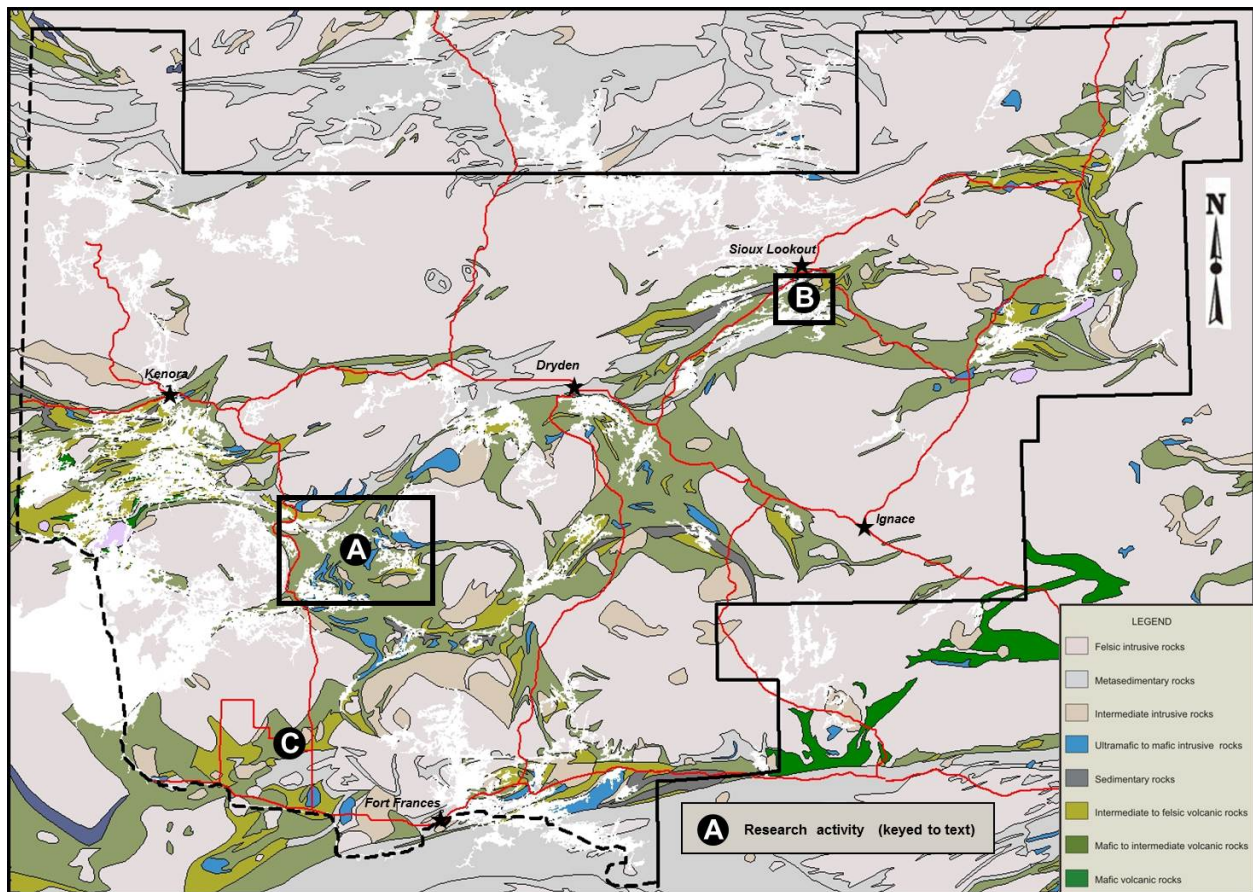


Figure 14. Location of OGS and university projects conducted in the Kenora District in 2015, keyed to text (bedrock geology from Ontario Geological Survey 2011).

MINERAL DEPOSITS NOT BEING MINED

Table 21. Mineral deposits not being mined in the Kenora District. Locations illustrated in Figure 15.

		Abbreviations			
AF	Assessment Files	MLS	Mining Lands, Sudbury		
CMH	<i>Canadian Mines Handbook</i>	MR	Mining Recorder		
GR	Geological Report	NM	<i>The Northern Miner</i>		
MDC	Mineral Deposit Circular [No.15–] [formerly Mineral Resources Circular, No.1–14]	OFR	Open File Report		
MDIR	Mineral Deposit Inventory record	PC	Personal Communication		
		SMDR	Source Mineral Deposit Record		

No.	Deposit Name (NTS – MDI #)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of Feb. 29, 2016)
1	Angel Hill Zone (52F/05SW - 140)	Au	Inferred Resource*: 106 400 t @ 2.97 g/t Au	Houston Lake Mining, news release, Oct. 20, 2005	Active
2	Bad Vermilion Lake–Seine Bay (52C/10NW - 031)	Fe, Ti, V	Possible Resource: 1 200 000 tons at 15% TiO ₂ and 45% Fe	NM 08/15/85, p.3 (Beaver Energy Resource)	Inactive
3	Bending Lake Josephine Cone (52F/08SE - 004)	Fe	Mineral Resource Estimate*: Indicated: 185.2 Mt @ 29.59% magnetite Inferred: 151.4 Mt @ 30.38% magnetite	Arnold, Horan and Gharapetian (2011)	Active
4	Big Master (52F/07NE - 002)	Au, Ag	Production: 2565 oz Au and 184 oz Ag from 14 470 tons Possible Resource: 123 000 tons @ 0.30 opt Au Based on 1967 drilling: 30 000 tons @ 0.36 opt Au	Beard and Garratt (1976, p.9) CMH, 1988–1989, p.92 (Canamerica Precious Metals Inc.)	Active
5	Big Whopper (52L/07SE - 030)	Li, Cs, Rb, Ta	Indicated 8.9 Mt and Inferred 2.7 Mt both grading 1.34% Li ₂ O and 0.30% Rb ₂ O	Avalon Ventures Ltd. 1999 Annual Report	Active
6	Cameron (52F/05SE - 008)	Au	Resource Estimate*: Open Pit Category (cut-off 0.5 g/t Au): Measured: 3 723 000 t @ 2.64 g/t Au Indicated: 4 101 000 t @ 1.92 g/t Au Total: 7 824 000 t @ 2.26 g/t Au Inferred: 14 464 000 t @ 1.92 g/t Au	Chalice Gold Mines Ltd., news release, Nov. 16, 2015	Active
7	Cates (52F/13SE - 065)	Zn, Ag	Possible Resource: 5.83 Mt @ 0.5% Zn and 0.5 opt Ag	AF 52F/13SE M-1 to M-6 (Noranda) and AF 52F/13SE B-1 to B-6 (Rio Algom)	Inactive
8	Cedar Island and Extension (52E/10SW - 017)	Au	Resource Estimate* (cut-off 1.0 g/t Au) Indicated: 1.00 Mt @ 4.18 g/t Au Inferred: 3.050 Mt @ 3.25 g/t Au	Everton Resources Inc., news release, Feb. 4, 2010	Inactive
9	Dobie (52C/12NW - 011)	Cu, Ni	Possible Resource: 5 000 000 tons @ 0.28% Cu and 0.24% Ni	AF 52C/12NW B-3 Falconbridge Ltd. 1966	Inactive
10	Dogpaw (52F/05SW - 012)	Au	Resource Estimate* (cut-off 0.5 g/t Au): Indicated: 247 000 t @ 3.02 g/t Au Inferred: 64 000 t @ 2.28 g/t Au	Chalice Gold Mines Ltd., news release, July 28, 2014	Active
11	Dubenski (52F/05SW - 013)	Au	Resource Estimate* (cut-off 1.0 g/t Au) Indicated: 806 000 t @ 2.28 g/t Au Inferred: 392 000 t @ 1.44 g/t Au	Coventry Resources Inc. news release, Dec. 9, 2013	Active
12	Duport (52E/11SE - 002)	Au	Production: 4672 oz Au, 1143 oz Ag from 1287 tons Resource Estimate*: Indicated: 424 000 t @ 13.4 g/t Au Inferred: 387 000 t @ 10.7 g/t Au	Beard and Garratt (1976, p.11) Halo Resources Ltd., news release, Aug. 19, 2005	Inactive

No.	Deposit Name (NTS – MDI #)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of Feb. 29, 2016)
13	East Burns - Intrepid (52D/16SE - 1043)	Au, Ag	Resource Estimate at Western and East Burns - Intrepid zones * (cut-off grades: open-pit 0.35 g/t AuEq and underground 2.50 g/t AuEq) Open Pit Category above 500 m: Indicated: 1 253 000 t @ 1.0 g/t Au, 14.7 g/t Ag Inferred: 2 788 000 t @ 1.2 g/t Au, 14.4 g/t Ag Underground Category: below 500 m: Indicated: 79 000 t @ 7.9 g/t Au, 37.0 g/t Ag Inferred: 195 000 t @ 7.4 g/t Au, 43.0 g/t Ag	Bayfield Ventures Corp., news release, Jan. 14, 2014	Active
14	East Cedartree (52F05SW – 142)	Au	Resources Estimate * (cut-off 1.0 g/t Au) Indicated: 434 505 t @ 3.91 g/t Au Inferred: 294 155 t @ 3.21 g/t Au	Metalore Resources Ltd., news release, Mar. 14, 2012	Active
15	Elora (52F/07NE - 015)	Au	Production: 1370 oz Au and 296 oz Ag from 13 766 tons Resource Estimate: Possible: 228 500 tons @ 0.18 opt Au Inferred: 5000 tons @ 0.10 opt Au	Beard and Garratt (1976, p.15) Neilson and Bray (1981, p.37, Table 8)	Active
16	F-Group (52G/14SE - 004)	Cu, Zn, Pb, Ag	Original Reserves (Dec. 1978): 630 000 t @ 8.10% Zn, 0.98% Cu, 0.49% Pb, 1.80 opt Ag Indicated Reserves (Dec. 1982): 200 000 t @ 8.20% Zn, 0.80% Cu, 0.60% Pb, 1.80 opt Ag	CMH 1979–1980, p.194 (Noranda) CMH 1982–1983, p.254 (Noranda)	Inactive - Rehabilitated
17	Foley Mine (52C/10NE - 032)	Au	Production: 855 oz Au, 149 oz Ag from 568 tons Resource Estimate: Possible: 40 000 t @ 0.5 opt Au Inferred: 400 000 t @ 0.5 opt Au	Beard and Garratt (1976, p.16) NM 09/25/80 (Seaforth Mines Ltd.); Schnieiders and Dutka (1985, p.194)	Inactive
18	Goliath (52 F/15SE - 053)	Au	Resource Estimates* for zones at deposit (combined open pit and underground) (cut-off grades: open-pit 0.35 g/t AuEq and underground 1.90 g/t AuEq) Measured and Indicated: 20 554 000 t @ 1.69 g/t Au, 0.6 g/t Ag Metal Content: 1 114 400 oz Au, 1 165 800 oz Ag Inferred: 3 470 000 t @ 2.96 g/t Au, 8.3 g/t Ag Metal Content: 330 100 oz Au, 928 300 oz Ag Bulk Sampling: 438 oz Au and 1161 oz Ag from 2365 tonnes	Treasury Metals Inc., news release, Aug. 28, 2015 Corona Gold 1999 Annual Report	Active
19	Goldlund (52F/16NW - 004)	Au	Production: 111 891 t @ 0.15 opt Au (Dec. 84) Reserve Estimate*: (cut-off 0.5 g/t Au) Measured and Indicated: 20.1 Mt @ 1.97 g/t Au for 1 272 000 oz Au Inferred: 40.5 Mt @ 2.12 g/t Au for 2 760 000 oz Au	AF 52F/16NW 081 Tamaka Gold Corporation, news release, Jan. 22, 2015	Active
20	Gordon Lake (52L/07NW - 004)	Cu, Ni, PGE	Production: 1.6 Mt @ 0.78% Ni, 0.41% Cu and 0.026 opt Pd (Dec. 1971) Indicated Reserves (1971): 170 420 tons @ 0.85% Ni and 0.35% Cu	Parker (1998, p.121)	Inactive - Rehabilitated
21	High Lake– Evenlode (52E/11NE - 061)	Mo, Au	Possible Resource: 200 000 t @ 0.63% MoS ₂	Davies and Smith (1988, p.114)	Inactive

KENORA DISTRICT—2015

No.	Deposit Name (NTS – MDI #)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of Feb. 29, 2016)
22	Kenbridge (52F/05NE - 047)	Ni, Cu	Resource Estimates*: Open Pit: above 150 m level Measured & Indicated: 4.46 Mt @ 0.42% Ni, 0.23% Cu Underground: below 150 m level Measured: 206 000 t @ 0.85% Ni, 0.43% Cu Indicated: 2 469 000 t @ 0.97% Ni, 0.51% Cu Inferred: 118 000 t @ 1.38% Ni, 0.88% Cu	Canadian Arrow Mines Ltd., news release, Aug. 19, 2008	Inactive
23	Lockhart Lake (52C/10NW - 033)	Zn, Cu, Au, Ag	Possible Resource: 6.1 Mt @ 1.06% Zn, 0.27% Cu, 3.2 g/t Ag, 0.006 g/t Au	AF Minnova 1989 - 52C/10NE Y-6	Inactive
24	Lyon Lake (52G/15NW - 007)	Cu, Zn, Pb, Ag	Original Reserves: 3.945 Mt @ 6.53% Zn, 1.24% Cu, 0.63% Pb, 3.42 opt Ag and 0.01 opt Au Indicated Reserves: 0.695 Mt of 10.34% Zn, 0.75% Cu, 1.62% Pb and 5.96 opt Ag	CMH 1979–1980, p.194 (Noranda) CMH 1990–1991, p.332 (Noranda)	Inactive - Rehabilitated
25	Marchington Road (52J/07SE - 016)	Cu, Zn, Pb, Ag	Possible Resource: 150 000 tons @ 0.98% Cu, 3.11% Zn, 1.16% Pb, 1.97 opt Ag	Umex Inc. AF 52J/7SW 0024	Inactive
26	Mattabi (52G/15SW - 002)	Cu, Zn, Pb, Ag	Original Reserves: 13.66 Mt @ 7.50% Zn, 0.80% Cu, 0.77% Pb and 3.10 opt Ag Indicated Reserves: 0.387 Mt of 0.13% Cu, 9.28% Zn, 0.58% Pb and 1.77 opt Ag	Trowell (1983, p.4) CMH 1988–1989, p.338 (Noranda)	Inactive - Rehabilitated
27	Mavis Lake (52F/15SE - 038)	Li, Ta	Possible Resource: 500 000 tons of 1% LiO ₂	Storey (1990, p.151)	Inactive
28	Maybrun (52F/05NE - 008)	Cu, Au	Resource Estimate* for the Maybrun Zones: Main Indicated: 7 366 000 t @ 0.41% Cu, 0.64 g/t Au Main Inferred: 1 738 000 t @ 0.30% Cu, 0.115 g/t Au Footwall Inferred: 5 400 000 t @ 0.18% Cu, 0.94 g/t Au North Inferred: 3 454 000 t @ 0.25% Cu, 0.67 g/t Au	Opawica Exploration Inc., news release, July 16, 2009	Inactive
29	McKenzie–Gray (52C10NE - 050)	Au	Possible Resource: 98 701 tons @ 0.30 opt Au	Larouche (1992)	Inactive
30	Mikado (52E/10SW - 006)	Au	Resource Estimate* (cut-off 1.0 g/t Au) : Indicated: 968 300 t @ 4.18 g/t Au Inferred: 3 014 000 t @ 3.25 g/t Au	Everton Resources Inc., news release, Mar. 1, 2010	Inactive
31	Norpax (52L/06NE - 016)	Ni, Cu	Possible Resource: 1 010 000 tons @ 1.2% Ni, 0.5% Cu	Parker (1998, p.128)	Inactive
32	North Kaskaweogama (52J/07NW - 016)	Fe	Possible Resource: 405 000 tons at 28% Fe	Shklanka (1968, p.443)	Inactive
33	North Pines (52K/01SE - 005)	S	Production: 500 000 t at 28% Fe (1909–1921)	Johnston (1972, p.36)	Inactive
34	North Rock – Beaverpond (52C/11NE - 029)	Cu	Possible Resource: 1 020 458 tons @ 1.17% Cu	Poulsen (1984, p.50)	Inactive
35	Pidgeon Molybdenum (52F/16NW - 043)	Mo	Resource Estimate* (cut-off grade 0.04% Mo) Indicated: 2.66 Mt @ 0.117% Mo Inferred: 12.39 Mt @ 0.084% Mo	MPH Ventures Ltd., news release, Sept. 13, 2012	Inactive
36	Purdex A-D (52E/11NE - 017)	Au	Possible Resource: 226 800 t grading between 8.57 g/t Au and 10.28 g/t Au	Sears (2006)	Inactive

No.	Deposit Name (NTS – MDI #)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of Feb. 29, 2016)
37	Rainy River Au-Ag Zones (52D/16SE – 004)	Au, Ag	Resource Estimate all zones at Rainy River Deposit*: <u>Total Combined for Deposits</u> Open Pit: cut-off 3.0 g/t AuEq Underground: cut-off 2.5 g/t AuEq Proven and Probable: 103.250 Mt @ 1.15 g/t Au, 2.80 g/t Ag Metal Content: 3 814 000 oz Au, 9 433 000 oz Ag Resource Estimate all zones at Rainy River Deposit including Intrepid zone*: <u>Total Combined for Deposits</u> Open Pit: cut-off 0.30 g/t Au Underground: cut-off 2.50 g/t Au Measured and Indicated: 83.26 Mt @ 0.98 g/t Au, 3.50 g/t Ag Metal Content: 2613 000 oz Au, 9 319 000 oz Ag Inferred: 23.166 Mt @ 1.01 g/t Au, 2.2 g/t Ag Metal Content: 53 000 oz Au, 1 606 000 oz Ag	New Gold Inc., news release, Feb. 17, 2016 New Gold Inc., news release, Feb. 17, 2016 Hardie et al. (2013)	Active
	34 Zone	Pt, Pd, Ni, Cu	Indicated Resource*: 145 000 t @ 0.66 g/t Au, 0.26 g/t Pt, 0.67 g/t Pd, 3477 ppm Ni, 2414 ppm Cu		
	Silver Zone	Au Ag	Indicated Resource*: cut-off 0.35 AuEq 1 535 000 t @ 0.41 g/t Au, 25.03 g/t Ag		
38	Richard Lake (52F/13SW - 044)	U	Possible Resource: 650 000 tons of 0.10% U ₃ O ₈	Pryslak (1976, p.46)	Inactive
39	Scramble (52E/16SW - 091)	Au	Possible Resource: 150 000 t @ 0.24 opt Au Drill estimated: 70 000 oz Au (cut-off 0.05 opt Au)	Parr and Kuehnbaum (1990)	Inactive
40	St. Anthony (52J/02SE - 003)	Au	Possible Resource: 37 800 tons @ 0.18 opt Au Production: 331 069 tons @ 0.19 opt Au	Ferguson, Groen and Haynes (1971, p.295)	Inactive
41	Sturgeon Lake (52G/15NW - 004)	Cu, Zn, Pb, Ag	Original Reserves (Dec. 1974): 2.10 Mt @ 10.64% Zn, 2.98% Cu, 1.47% Pb, 6.14 opt Ag, 0.021 opt Au Indicated Reserves (Dec. 1978): 599 000 t @ 2.34% Cu, 8.98% Zn, 1.30% Pb, 5.17 opt Ag, 0.018 opt Au	Trowell (1983, p.4) CMH 1980–1981, p.102 (Falconbridge)	Inactive - Rehabilitated
42	Vanlas (52F/10NW - 032)	Au	Possible Resource: 100 000 t @ 0.20 opt Au	Power Expl. Inc. AF 52F/10NW UU-1	Inactive
43	Wendigo (52E/09NE - 003)	Au, Ag, Cu	Produced: 67 423 oz Au, 14 762 oz Ag and 1.89 million lbs of Cu from 20 054 t tailings: 61 970 t @ 0.027 opt Au	SMDR 001350 Davies and Smith (1988, p.352)	Inactive
44	Werner Lake Cobalt (52L/07NW - 003)	Co, Cu	Resource Estimates* Proven Resource: 140 031 t @ 0.47% Co and 0.26% Cu Probable Reserves: 40 829 t @ 0.25% Co and 0.43% Cu Indicated Resource: 51 456 t @ 0.13% Co and 0.20% Cu Inferred Resources: 507 412 t @ 0.31% Co and 0.29% Cu Production: recovered 389 363 lbs of Co (1932, 1940–1944); grades 2% Co and 0.75% Cu	Puget Ventures Inc., news release, Apr. 2, 2009 Thomson et al. (1954, p.37)	Inactive

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

This table contains tonnage and grade estimates, referred to as “resource” (estimated, possible, and proposed), that were determined at various times by methods largely unreported. The values of these resource estimates were calculated prior to the reporting standards required by National Instrument 43-101.

* Resources estimate values presented as measured, indicated or inferred are in compliance with the reporting standards required by National Instrument 43-101.

$$\text{AuEq (g/t)} = \text{Au (g/t)} + \frac{\text{Ag (g/t)} \times \text{Ag price (\$/oz)} \times \text{Ag mill recovery (\%)}}{\text{Au price (\$/oz)} \times \text{Au mill recovery (\%)}}$$

Wilson et al. (2008) present the minimum grade and tonnage thresholds for the deposits presented in this table.

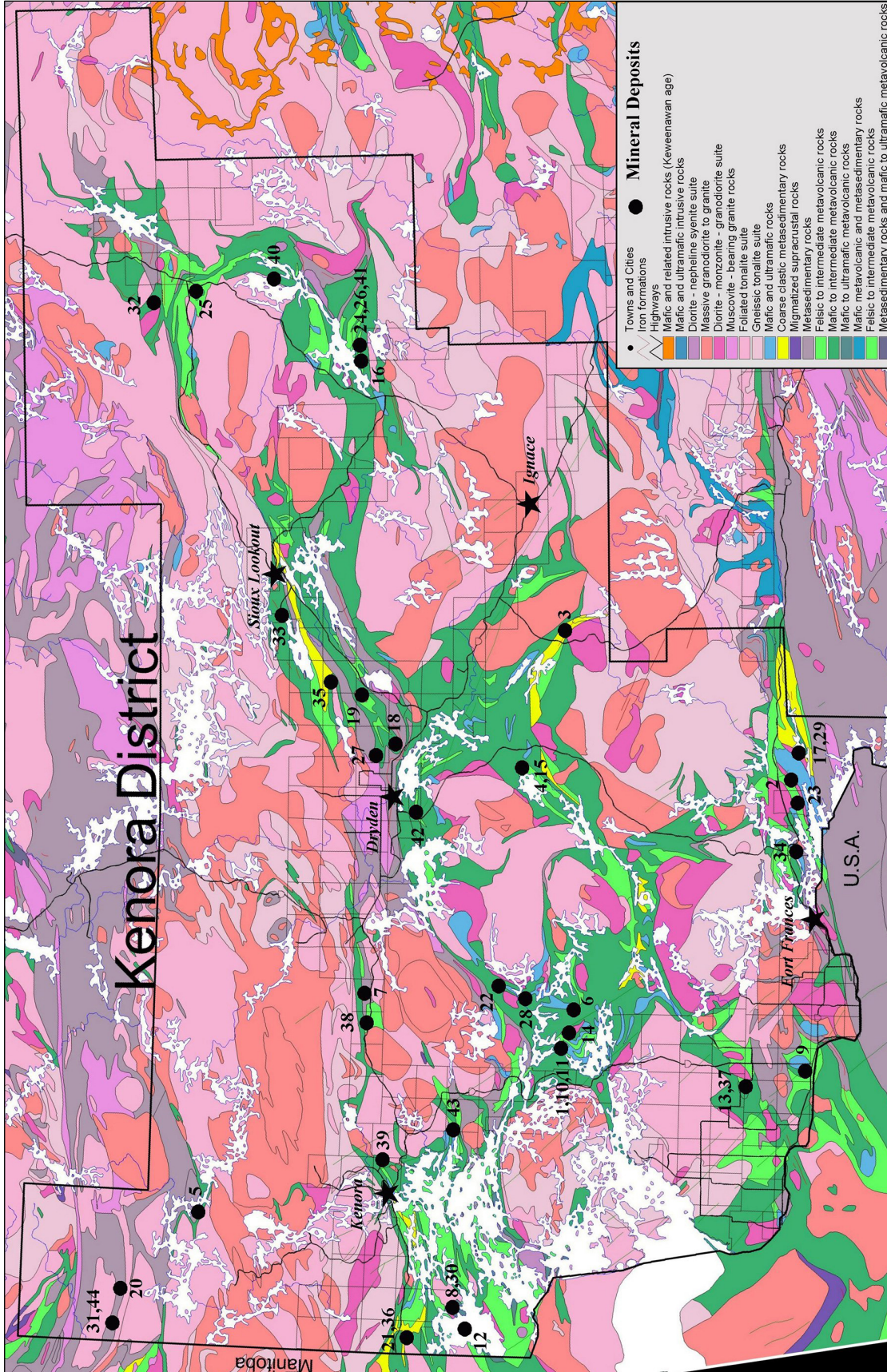


Figure 15. Location of mineral deposits not being mined in the Kenora District, keyed to Table 21 (bedrock geology from Ontario Geological Survey 2011).

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHWEST REGION

The activities of the Regional Land Use Geologist are described *in* “Regional Land Use Geologist Activities—Northwest Region” in the Red Lake District report of this volume.

MINERAL DEPOSIT COMPILATION GEOLOGIST—NORTHWESTERN ONTARIO

The activities of the Mineral Deposit Compilation Geologist are described *in* “Mineral Deposit Compilation Geologist—Northwestern Ontario” the Red Lake District report of this volume.

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Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
<i>SI Unit</i>	<i>Multiplied by</i>	<i>Gives</i>	<i>Imperial Unit</i>	<i>Multiplied by</i>	<i>Gives</i>
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

	<i>Multiplied by</i>	
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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