

Elliot Lake City Council

April 11, 2016

Rio Algom Limited
Denison Mines Inc.



Rio Algom

enison Mines

Introduction

- **Denison**

- Ian Ludgate, Manager
- Kevin Ramsay, Environmental Manager

- **Rio Algom**

- Debbie Berthelot, Site Manager
- Dave Brown, Site Superintendent



Rio Algom

enison Mines

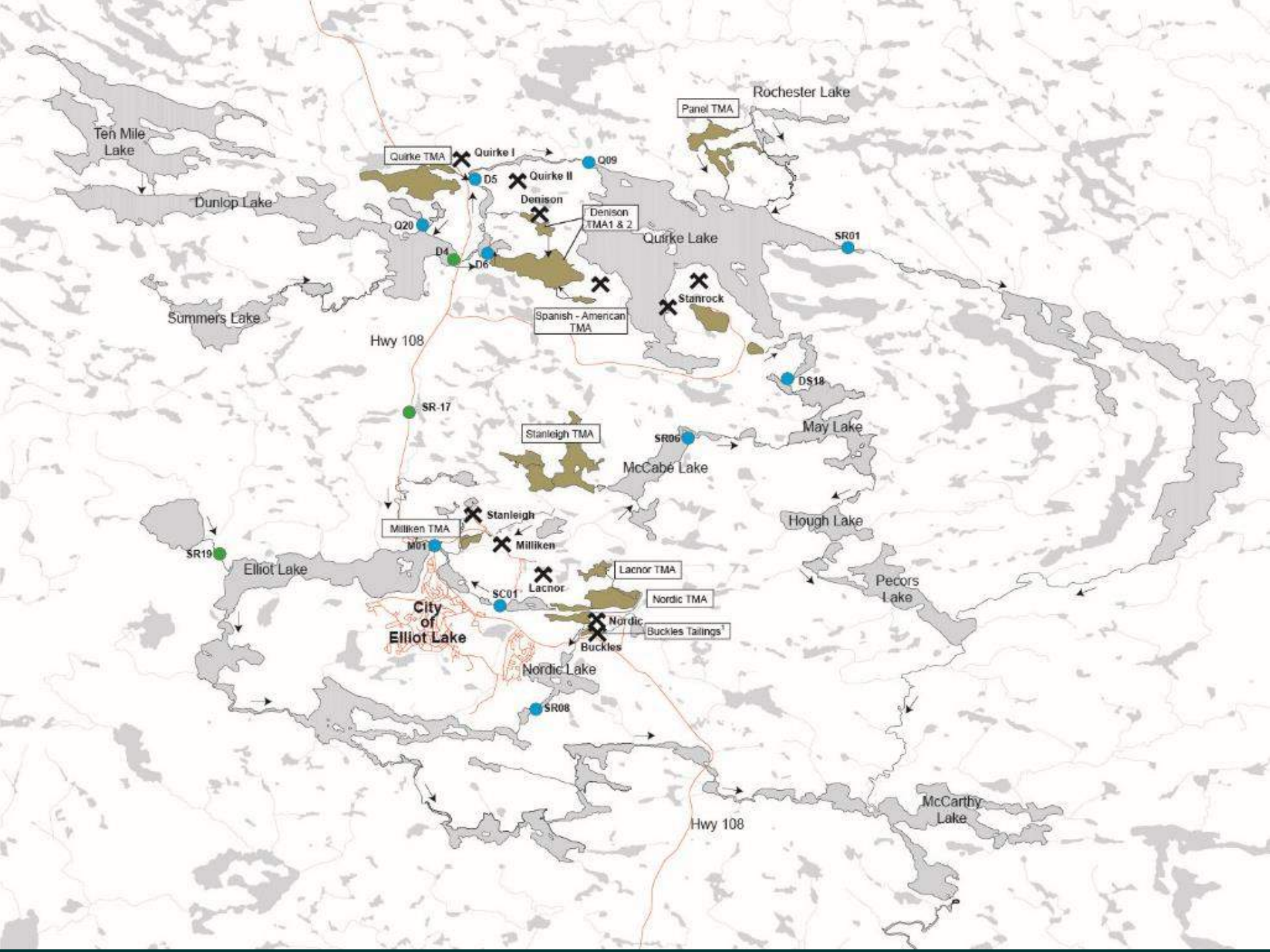
Overview

- **State of the Environment Report**
- **Public dose determination**
- **Dam safety planning**
- **Current activities**
- **Upcoming events**



Rio Algom

 **Denison Mines**



Serpent River Watershed 2010 -2014

Water Quality Guideline Exceedances

Station	# of Samples	Barium	Iron	Manganese ^c	pH	Radium-226	Sulphate ^b	Uranium
		mg/L	mg/L	mg/L	pH units	Bq/L	mg/L	mg/L
Upper limit of Background	Lakes	0.057	0.48	0.095	6.6	0.008	6.4	<0.0005
	Wetlands	0.021	1.68	0.068	5.2	0.006	4.3	<0.0005
Guideline		1.0	0.30	0.80	6.5	1.0	128 - 429	0.015
D-5	20	0%	na	na	0%	0%	0%	0%
D-6 ^d	20	0%	20%	10%	0%	0%	0%	na
DS-18	22	0%	14%	na	0%	0%	0%	0%
M-01	20	0%	5%	na	0%	0%	0%	0%
Q-09	20 to 21	0%	na	na	0%	0%	0%	0%
Q-20	5	0%	na	na	0%	0%	0%	0%
SC-01	5	0%	0%	na	0%	0%	0%	0%
SR-01	5	0%	na	na	0%	0%	0%	0%
SR-06	10	0%	na	na	0%	0%	0%	0%
SR-08	20	0%	na	na	0%	0%	0%	0%

Benchmark applied to lake stations: D-5, D-6, Q-09, Q-20, SR-01, SR-06, SR-08.

Benchmark applied to wetland stations: M-01, DS-18, SC-01.

Benchmark applied to lake and wetland stations.

Serpent River Watershed 2010 -2014

Water Quality Trends

Station ID	Number of Months Used in Common Trend ^b	Barium	Iron	Manganese	pH	Radium-226	Sulphate	Uranium
Reference Stations								
D-4	4	-0.275	0.042	-0.031	-0.062	ND	-0.313	ND
SR-16	4	0.045	-0.125	-0.175	-0.004	ND	0.039	-
SR-17	4	0.389	-0.043	0.367	-0.081	ND	0.039	-
SR-18	2 to 4	-0.177	0.516	0.124	0.137	ND	-0.815	ND
SR-19	4 to 12	-0.139	0.033	-0.297	0.195	ND	-0.652	ND
Exposed Stations								
D-5	12	-0.182	-0.093	-	0.040	-0.322	-0.351	-0.113
D-6	12	-0.206	0.222	-0.129	0.044	-0.179	-0.308	ND
DS-18	12	0.102	0.200	-	-0.347	-0.326	-0.067	-0.104
M-01	12	-0.219	-0.224	-	0.208	-0.619	-0.509	-0.175
Q-09	12	-0.166	-	-	0.058	-0.193	-0.287	-0.335
Q-20	1	-0.154	-	-	0.353	0.034	-0.802	ND
SC-01	1	-0.235	-	-	0.287	-0.689	-0.904	ND
SR-01	1	-0.554	-	-	0.131	-0.820	-0.950	-0.598
SR-06	2	0.977	-	-	0.217	0.479	-0.974	-0.875
SR-08	12	-0.407	-	-	0.057	-0.716	-0.234	-0.571

decreasing trend, significant at $p < 0.05$

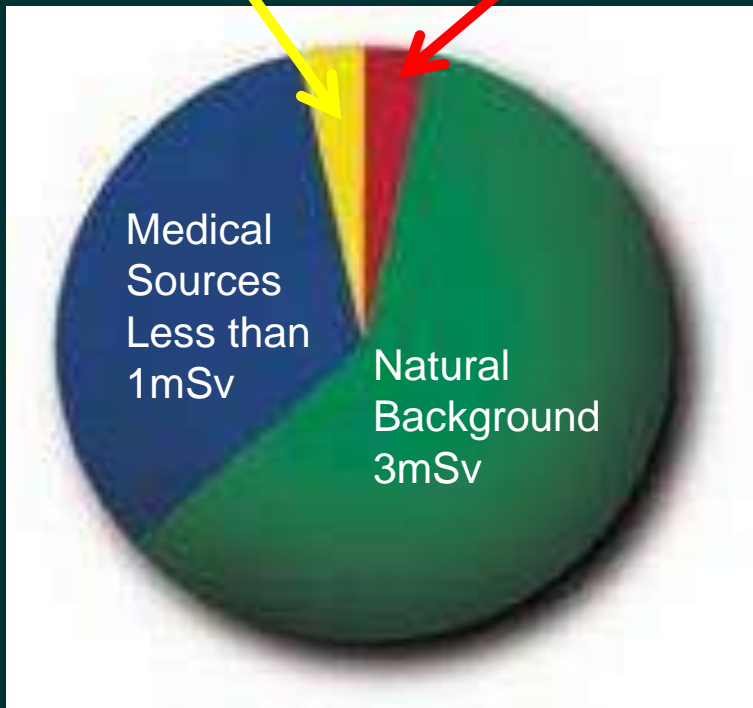
increasing trend, significant at $p < 0.05$

ND = Not Detected. ^a Values are the mean of the monthly values for the period of the trend. ^b Values are the number of months for which the trend was significant at $p < 0.05$.

Radiation Dose Limit

Living at Boundary of
Nuclear Station
Less than 0.05 mSv

Other
Sources
0.4 mSv



- **CNSC public dose limit 1.0 mSv/y**
- **Health Canada Guideline 0.3 mSv/y**
- **0.04 mSv 7 hour flight New York to Paris**
- **0.24 mSv difference in living at sea level or in Denver Co.**
- **0.3 mSv Mammogram**
- **1.4 mSv Lower GI Tract Exam**



Rio Algom

Denison Mines

Upper Limit of Dose for Generic Lake Resident

Consumption Items		Incremental Dose				
		Water (mSv/y)	Fish (mSv/y)	Moose (mSv/y)	Mallard ² (mSv/y)	Total (mSv/y)
Ingestion Rate	Generic Human	1.5	2.92	1	1	-
	SRFN ³	1.5	12.7	12.1	0.37	-
	Units	(L/d)	(kg/y)	(kg/y)	(kg/y)	-
Generic Human Dose by Lake	Quirke ¹ Lake	0.03820	0.04252	0.00307	0.01068	0.09447
	Elliot Lake	0.01780	0.00628	0.00028	0.00000	0.02436
	Nordic Lake	0.01880	0.00649	0.00011	0.00000	0.02540
	McCabe Lake	0.02390	0.00695	0.00346	0.03388	0.06819
	May Lake	0.05740	0.01002	0.00285	0.03268	0.10295
	McCarthy Lake	0.01460	0.00609	0.00052	0.00149	0.02270
SRFN Dose in Watershed	SRFN Current ⁴	0.01110	0.02002	0.01515	0.00269	0.04896
	SRFN Future ⁴	0.01200	0.02026	0.01375	0.00067	0.04668

¹ Quirke Lake data from Minnow, 2012; all other data from Minnow, 2011.

² Incremental dose set at 0 for Elliot and Nordic Lakes where total dose is below background dose.

³ SRFN - Serpent River First Nation Member.

⁴ The current consumption was based on a survey conducted in 2010 of SRFN members and the future consumption was estimated by the SRFN Land and Resource Committee.

Upper Limit of Dose All Sources

Source	Exposure Pathway	Reference	Annual Dose
			(mSv/y)
Radon	200 hours of casual tailings management area access at maximum exposure rate of 0.009 WL	CNSC 2002	0.04
Gamma	200 hours of casual tailings management area access at maximum gamma field	CNSC 2002	0.06
Dietary	1.5 liter water/day; 2.92 kg fish/year; 1 kg waterfowl/year; 1 kg moose/y from May Lake	Minnow 2011	0.103
Total Dose from all sources			0.203
Public Dose Limit			1
Health Canada Guideline			0.3



Representative Public Dose

- Gamma and radon surveys at each of public trails
- Work with City to sample drinking water for radionuclides
- Newsletter and phone survey inquiry hiking trails used, local lake fishing and consumption



Rio Algom

Denison Mines

Dam Safety Planning



- **Currently no residences in flood path of any tailings dam**
- **Work in progress**
 - Risk review sessions with water treatment staff – contingency treatment plan
 - Initiate state of science review for tailings run-out and update dam break analysis key structures
 - Continue to meet periodically with Waterfront Development Committee – informed purchasers



Rio Algom

Denison Mines

Rio – Plant Control Replacement

- Nordic and Pronto complete
- Quirke and Panel before end 2016
- Programmable logic controller (plant computers)
 - Monitor instrumentation & initiate alarms
 - Control lime addition based on pH



Rio Algom

Denison Mines

Rio – Quirke Treatment Plant

- Originally constructed circa 1981
- Key activities
 - No significant change to process or controls
 - Roof replacement
 - Tank failure containment
 - Improve maintenance access
 - Replace barium chloride tanks



Rio Algom

Denison Mines

Rio – Stanleigh Radium Removal

Context

- EA project Ra(t) increase as sulphate decrease but no long-term treatment
- Stanleigh 370 ha; 50% inflow McCabe Lake
- Limited foot print for treatment rate 500 L/s

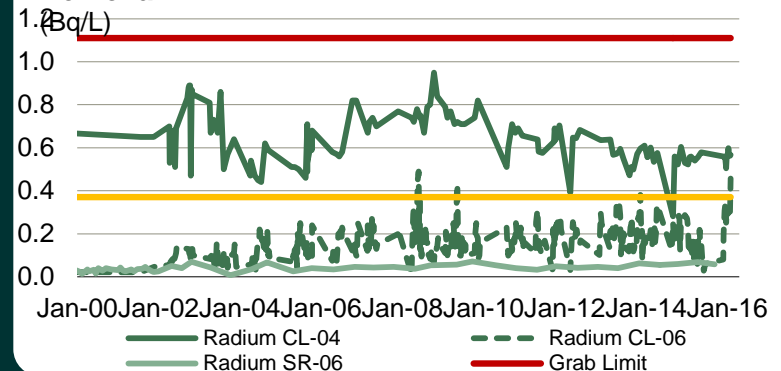
Current Situation

- Periods refractory treatment associated with high inflow/dilution now all year
- Fall deferral treatment to less refractory period – above target operating elevation and 30% risk emergency spillway at 300 L/s

Action Plan

- Floc addition at higher rate – 24 hour mixing pending automixer delivery
- Silt curtain – increase retention
- Long-term treatment modification options

Stanleigh Treatment Plant Total Radium Removal

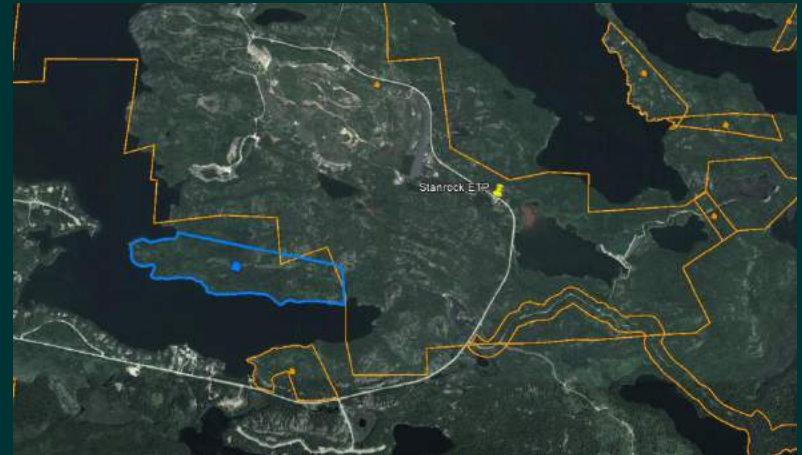


Rio Algom

Denison Mines

Denison – CNSC License Update

- Transitioning of mine licensing with CNSC from UMDL to WFOL
- Development of Environmental Management System
- Transfer of southern portion of the Stanrock CNSC Licensed area to the City of Elliot Lake

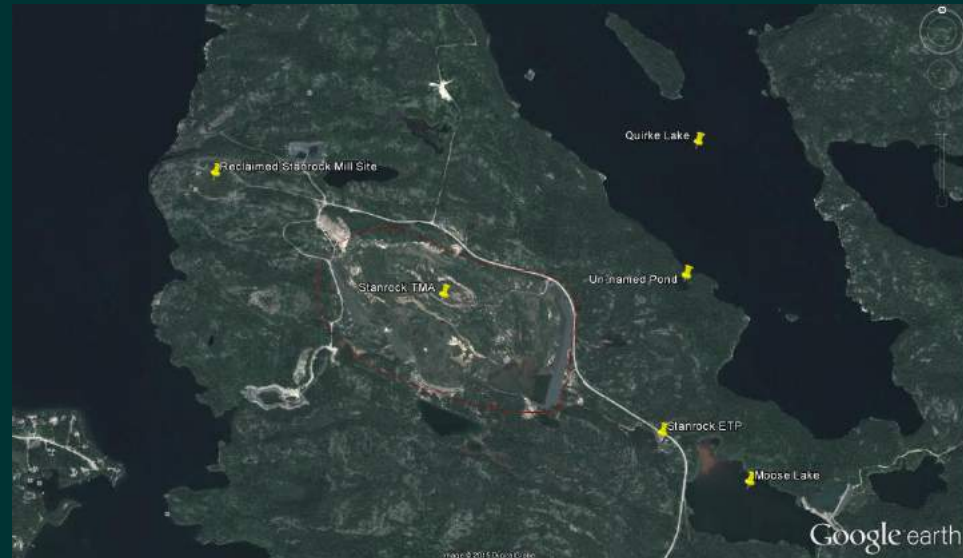


Rio Algom

Denison Mines

Stanrock – Un-Named Pond

- Report of unusual water colour in Un-Named Pond located near Quirke Lake in Q-2, 2015.
- Denison advised the CNSC and other regulators and embarked on a year long sampling program to be followed by an assessment report and recommendations to be presented in Q-4, 2016.



Rio Algom

Denison Mines

Denison – Geodetic Survey

- Perform geodetic survey of dams, instrumentation and site infrastructure
- Will confirm elevations of structures and allow updating and modernizing of geotechnical and environmental monitoring program



Rio Algom

 Denison Mines

The logo for Denison Mines, featuring a green and yellow stylized 'D' icon followed by the text 'Denison Mines' in a grey sans-serif font.

Denison – Dam G Pipeline Trestle Repairs

- Beaver Lake siphon line is used to collect dam seepage water and redirect, via the Dam G lift station, to Stanrock treatment plant before release
- Project will include regrading Beaver Lake siphon line and replacing aging trestle



Rio Algom

Denison Mines

Want to know more?

- **Annual newsletter published to be distributed in June; distributed with The Standard with additional copies at Welcome Centre**
- **Community survey 2016**
 - Information sharing evaluation
 - Site access and fish consumption survey
- **Invite members of public to participate in mine site tours on the 28th and 30th of June and the 5th and 7th of July – please call Darla at 705-848-2287 Ext. 2406 to reserve a seat**
- **Always a phone call away**
 - Denison Mines 705 848 9191
 - Rio Algom Limited 705 848 0111



Rio Algom

 **Denison Mines**

Questions?



Rio Algom



Denison Mines