

**Significant radioactivity
identified in rock
samples along
Highland Line and
Anderson Lane, Lanark
County, Ontario**



Assay Analysis of Rock Samples Along Highland Line

Presented by Dr. Linda Harvey

October 23, 2024

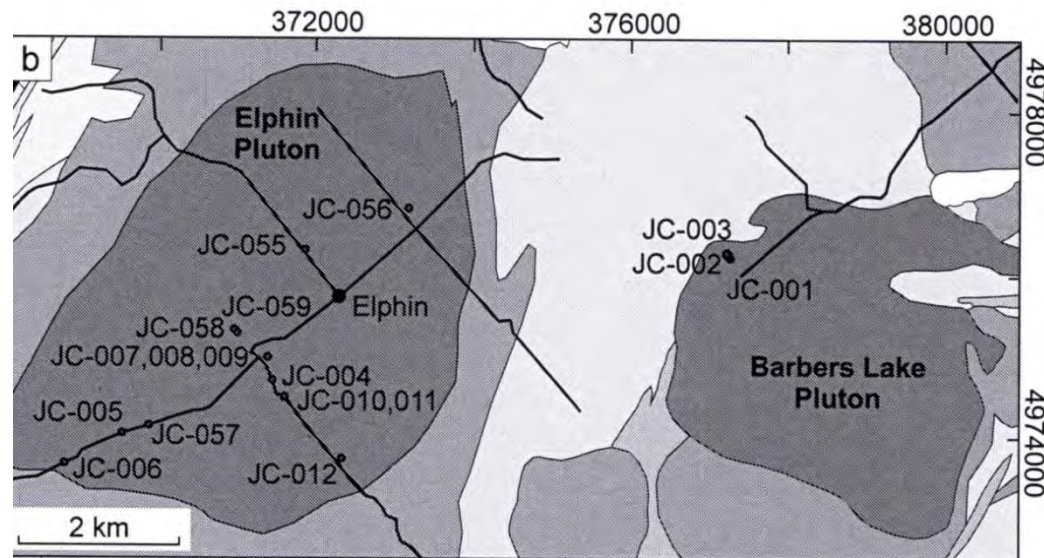
Historical Context

- There is a rock form in the vicinity of Barbers Lake called the Barbers Lake Pluton.
- Dr. Jamie Cutts, at that time a graduate student in Geoscience at Carleton University, did research and revealed high levels of uranium in the Barbers Lake Pluton.
- Our citizen science group undertook to investigate this matter further.

Geological Research by Dr. J. Cutts

Master of Science Thesis, Department of Earth Sciences,
Carlton University, January 2014

“...the Barber’s Lake pluton has thorium and uranium concentration of 25-109 ppm and 5.5-90 ppm, respectively.” (page 32)

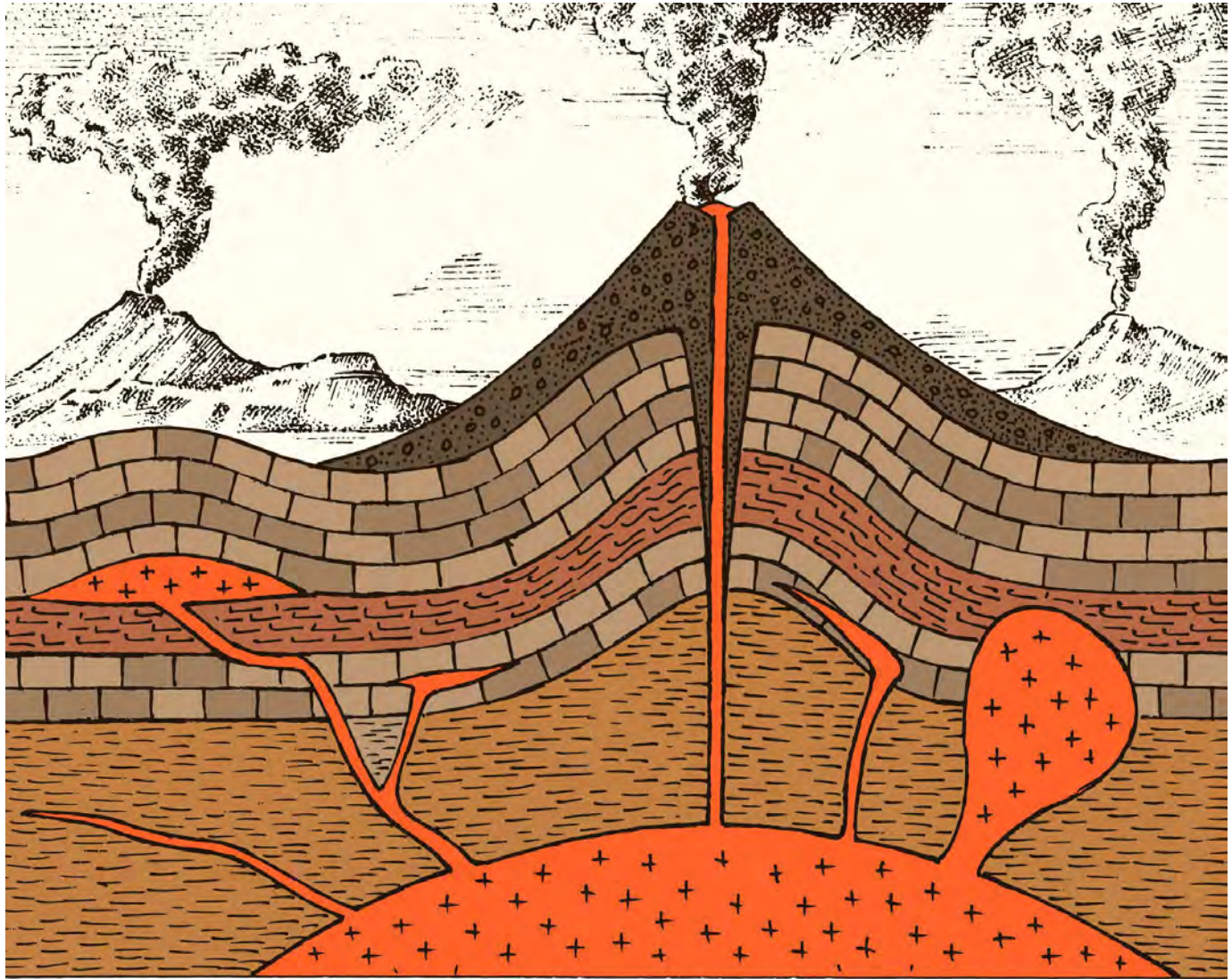


What is a Pluton?

To understand what a pluton is, we must first appreciate that the molten magma which forms in the earth's core can be trapped in large chambers during volcanic activity. This magma cools very slowly underground and may take a million years to cool down and create granite.

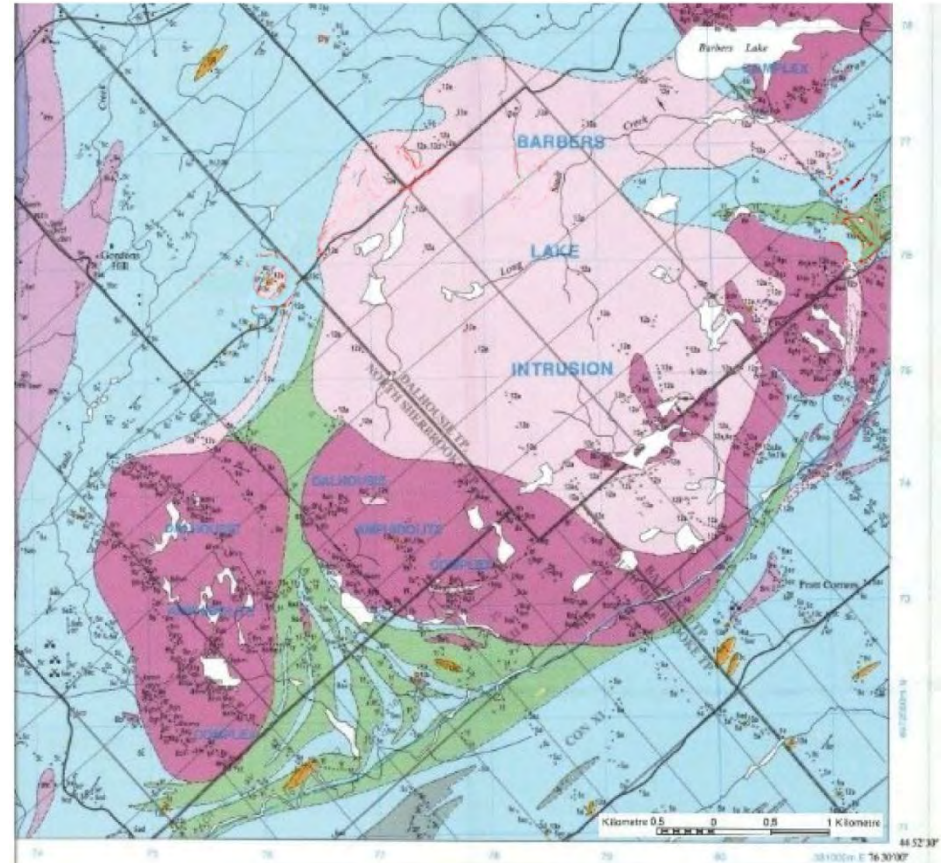
The solidified contents of these large magma chambers are called "plutons." A pluton may be as large as 10 kilometers long and one kilometer wide.

Most plutons in the earth's crust are deeply buried, but a few occur near the surface where, over time, erosion has exposed these massive solidified magma formations.



What is Barbers Lake Pluton?

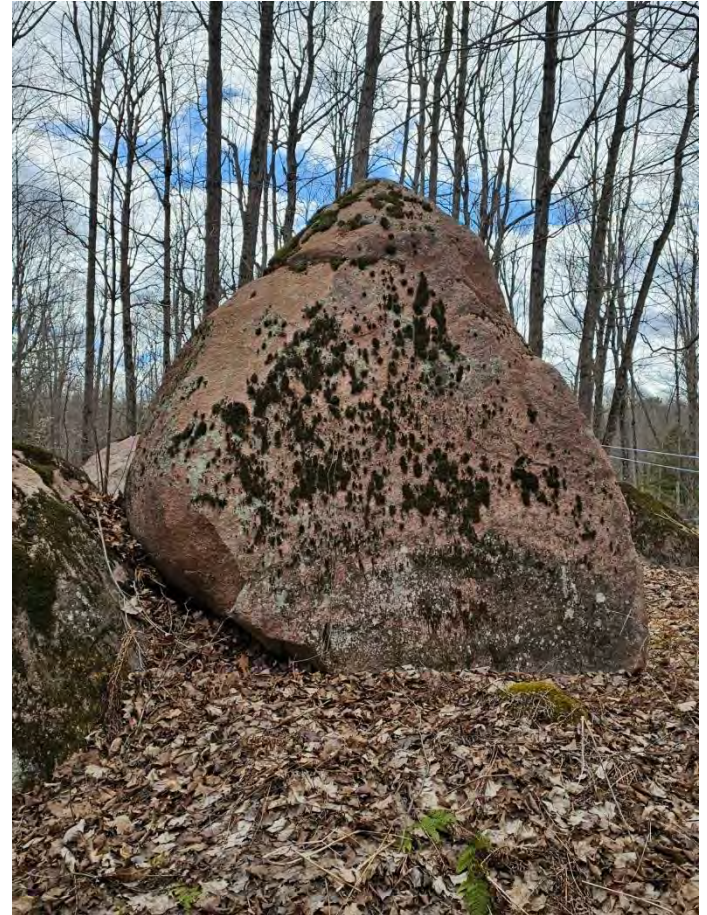
The Barbers Lake Pluton is a large mass of igneous rock that is exposed on the earth's surface near Barbers Lake.



Increased Levels of Uranium

The Barbers Lake Pluton is known to contain increased levels of uranium and associated radioactive minerals.

To investigate the nature of this pluton our group took geiger readings of local rocks and then selected some of these rocks for detailed mineral analysis.



Geiger Counter Readings

March 2024

An Inspector Alert Geiger Counter measured the radioactivity of over two dozen large boulders along Highland Line and Anderson Lane.

The readings were in microsieverts per hour. Background readings were $0.1 \mu\text{s/hr}$. Typical rock readings were within the range of 0.2 to $0.8 \mu\text{s/hr}$, with some as high as $1.6 \mu\text{s/hr}$.

Many readings were 10 times higher than background.

Sample Geiger Counter Readings



Method Used

On April 13, 2024 18 samples were taken from rocks along Highland Line, Anderson Lane and Concession II Dalhousie Road Allowance.

Each of the 18 rock samples were first tested using the Geiger Counter and the radioactivity was recorded. A photo was taken of these readings on the rocks.



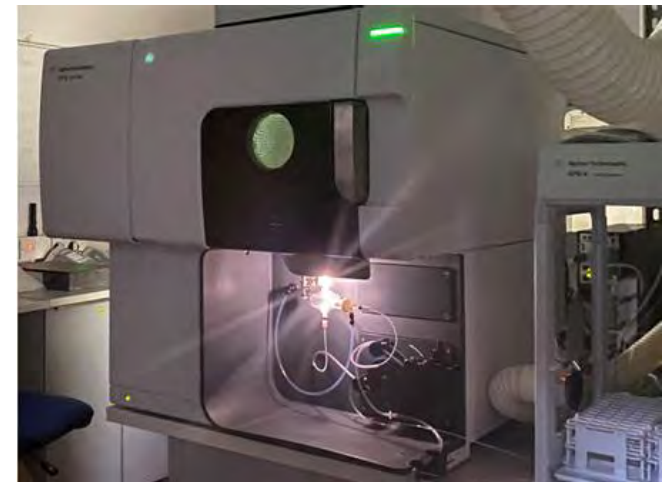
Assay Analysis of Rock Samples

- These samples were individually crushed by SGS Labs in their Lakefield facility
- They were shipped to their lab in Burnaby, BC
- 50 elements were measured per sample



Equipment Used by SGS

- Inductively coupled plasma mass spectrometry (ICP-MS)
- Inductively coupled plasma-optical emission spectroscopy (ICP-OES)



Global Abundances

Our results were compared with a table in Wikipedia.org which gives the estimated abundance in parts per million by mass of elements in the continental crust.

List of abundance by element [edit]

This table gives the estimated abundance in parts per million by mass of elements in the continental crust. The most abundant elements may vary with location by several orders of magnitude.^[7]

Abundance of chemical elements in Earth's (continental) crust [hide]

Z	Element	Symbol	Goldschmidt classification	Abundance (ppm) ^[7]	Production tonnes/year ^[8]
8	oxygen	O	Lithophile	461,000 (46.1%)	10,335,000 ^[9]
14	silicon	Si	Lithophile	282,000 (28.2%)	7,200,000
13	aluminium	Al	Lithophile	82,300 (8.23%)	57,600,000
26	iron	Fe	Siderophile	56,300 (5.63%)	1,150,000,000
20	calcium	Ca	Lithophile	41,500 (4.15%)	18,000
11	sodium	Na	Lithophile	23,600 (2.36%)	255,000,000
12	magnesium	Mg	Lithophile	23,300 (2.33%)	27,700,000
19	potassium	K	Lithophile	20,900 (2.09%)	53,200,000 ^[10]
22	titanium	Ti	Lithophile	5,650 (0.565%)	6,600,000
1	hydrogen	H	Atmophile	1,400 (0.14%)	75,000,000 ^{[11][12]}
15	phosphorus	P	Lithophile	1,050 (0.105%)	226,000,000 ^[13]
25	manganese	Mn	Lithophile	950 (0.095%)	16,000,000
9	fluorine	F	Lithophile	585 (0.0585%)	17,000
56	barium	Ba	Lithophile	425 (0.0425%)	6,000,000 ^[14]
38	strontium	Sr	Lithophile	370 (0.037%)	350,000

Source: https://en.wikipedia.org/wiki/Abundance_of_elements_in_Earth%27s_crust

Results

- Any measured values more than three times the crustal abundances can be highlighted as “locally elevated.”
- Uranium, thorium and bismuth are all locally elevated.
- Silicon was consistently elevated at over 30%, which is expected in granite rock.

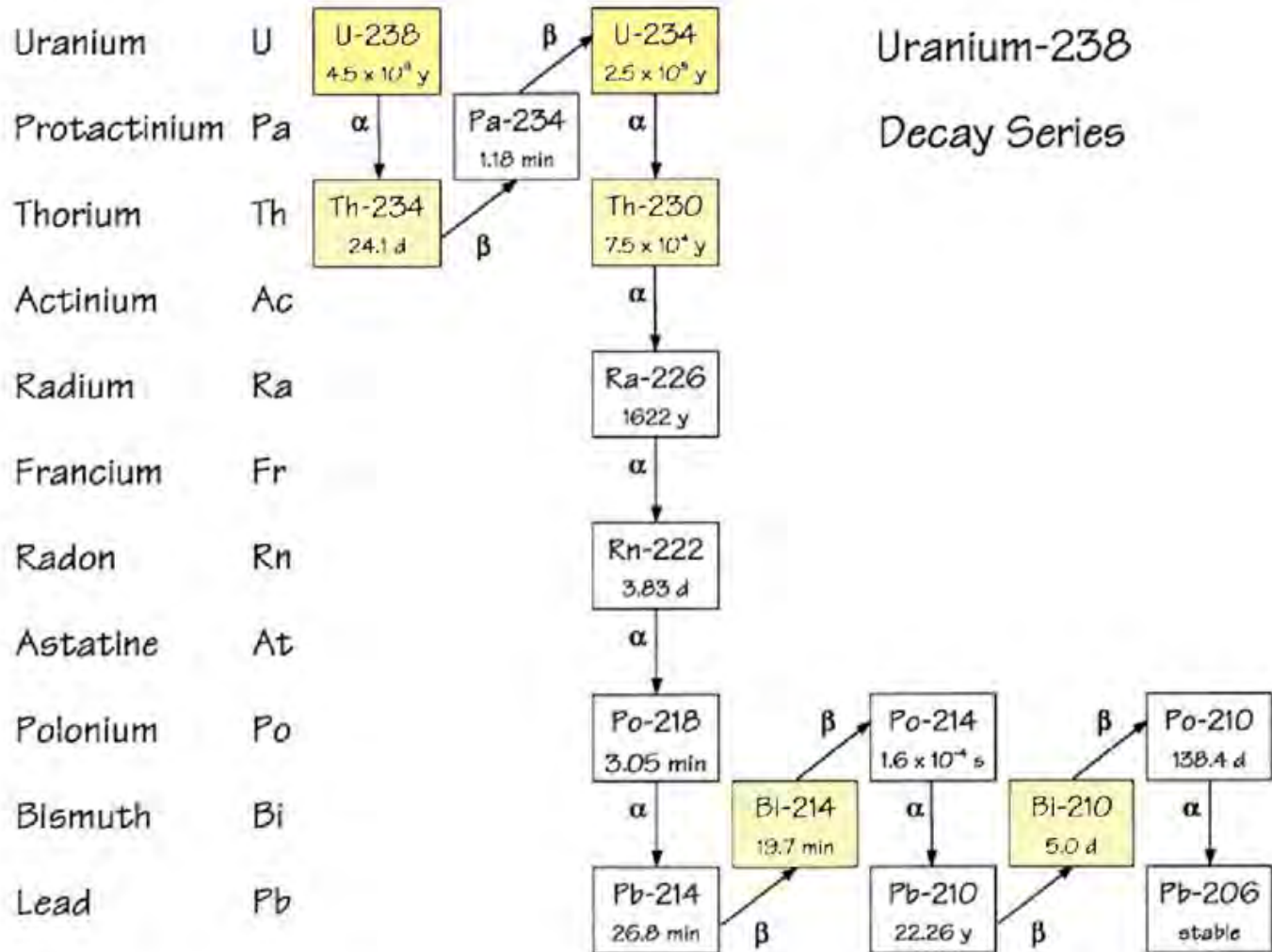
Findings

Sample Number	Uranium (ppm)	Thorium (ppm)	Bismuth (ppm)
	Global abundance 2.7 ppm	Global abundance 9.6 ppm	Global abundance 0.0085 ppm
1	45	101	0.2
2	28	49.2	0.2
3	20	44.8	0.1
4	24	25.2	<0.1
5	8	32.2	0.2
6	16	28.1	0.2
7	19	72.4	<0.1
8	14	57.0	0.1
9	14	46.2	<0.1

Findings

Sample Number	Uranium (ppm)	Thorium (ppm)	Bismuth (ppm)
	Global abundance 2.7 ppm	Global abundance 9.6 ppm	Global abundance 0.0085 ppm
10	32.6	7	<0.1
11	28.9	23	0.2
12	36.4	15	0.1
13	26.2	5	<0.1
14	28.7	7	<0.1
15	49.3	11	<0.1
16	33.4	9	0.1
17	21.5	13	0.5
18	24.7	9	0.2

The Uranium Decay Chain Series




Conclusions

- Our study confirms the presence of locally elevated levels of uranium, thorium and bismuth.
- This implies that there are locally elevated levels of radioactive elements in the decay chain series.
- There is radioactive decay happening in these rock samples along Highland Line and Anderson Lane.

What if...

...One or even two aggregate extractions along Highland Line are approved to go below the water table and expose bedrock?





Such a decision will set up a series of major health-related implications

- Increased exposure to radioactive contaminants
- Increased risk to worker health and safety
- Increased uranium detected in local wells
- Increased genetic and physical damage in organisms
- Increased risk of radioactive dust in the air

Long-term implications

Additional exposure to uranium and the elements of this decay chain makes for lasting and unprecedented changes to the entire watershed, the organisms living in it and beside it, and long-term health implications to the human community.





**Thank you for
your attention**

Any Questions?