



# Johnston Lake Project

## Athabasca Basin, Saskatchewan

The Johnston Lake Project is 100% owned by Denison Mines Corp. After the incorporation of the Gumbboot claim (formerly of Pitchstone Exploration) the project was essentially returned to its original state as staked by Interuranium in the 1980's.

The Johnston Lake property comprises of seven claims located in the eastern Athabasca Basin in northern Saskatchewan centered 23 kilometres northwest of the Cigar Lake mine and 43 kilometres west of Points North Landing. The property is accessible in the winter by a winter road extending from the Cigar Lake Mine and passing through the Darby project. Air access is by helicopter and float-or ski-equipped fixed wing aircraft from either Points North, La Ronge or from Otter Lake (345 kilometres).

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### Geology

The property is underlain by Athabasca Group sandstones which in overlies metamorphic rocks of the Mudjatik Domain. The metasediments on the Johnston Lake property consist of variably pyritic and graphitic pelites to semi-pelites and pegmatites. Graphitic metasediments are the primary exploration targets on the property. The depth to the unconformity ranges between 560 metres in the north to 710 metres in the south.

## Historical work

### Pre-2004

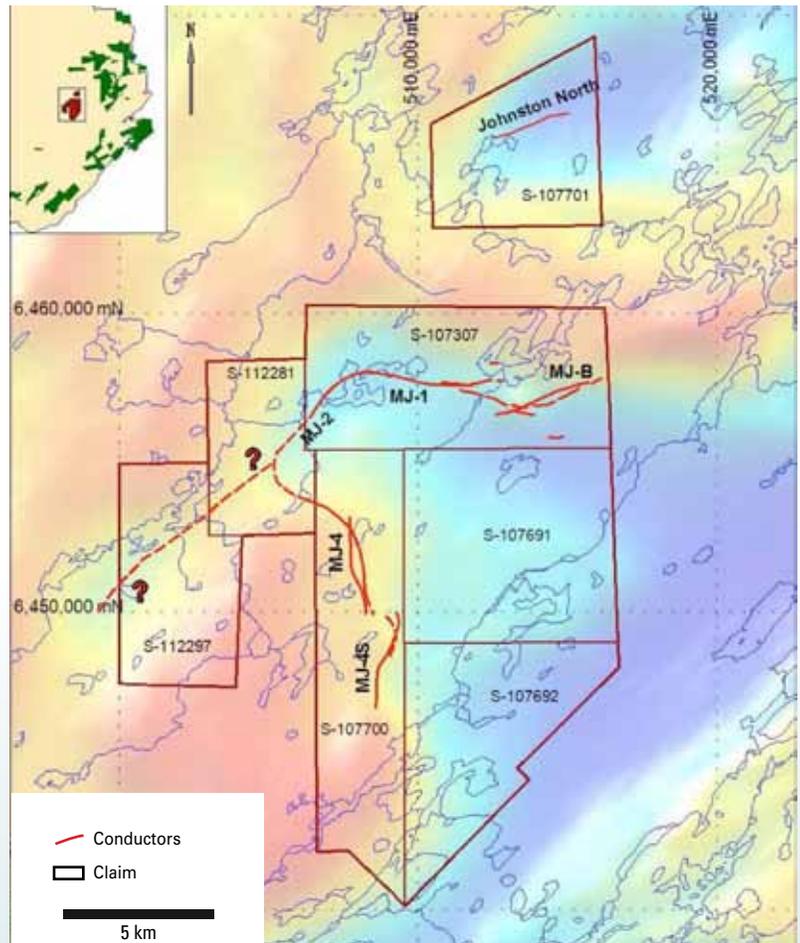
The earliest significant exploration in the project area was by Interuranium, who flew a GEOTEM survey in 1986 after staking what was then known as the Mullins-Johnston Project. Three conductive zones were identified and followed up with moving loop UTEM surveys between 1987 and 1990. The conductors were named MJ-1, MJ-2 and MJ-4 (Figure 1).

In 1989-1990 Interuranium drilled holes MJ-01 through MJ-06 on the MJ-1 and MJ-4 conductors and confirmed the presence of graphitic basement lithologies (Figure 2). Several of the holes intersected variously altered sandstone with elevated pathfinder element values and/or hydrothermally altered basement. Most noteworthy was hole MJ-03 which intersected 2,295 ppm U-p over 0.5 metres in hydrothermally altered upper basement. Also of note was hole MJ-06, which intersected fractured and altered basal sandstone and hydrothermally altered graphitic gneiss containing up to 865 ppm U-p. Both of these holes are located near the middle of the MJ-1 conductor.

Cogema took over operatorship in 1992 and completed 38 line-km of moving loop UTEM surveys in 1996 which revealed that the MJ-1 conductor was interrupted by an interpreted north-south structural offset near its middle and east of holes MJ-03 and MJ-06. The eastern portion of the conductor was renamed MJ-1B.

Cogema followed up the UTEM results in 1997 by systematically drill testing the conductors, with emphasis on the MJ-1 – MJ-1B system. Drill hole MJ-07 tested central portion of the MJ-1 conductor, intersecting strongly altered lower sandstone and highly anomalous base metal concentrations (Ni-p to 37,200 ppm/0.4 m, Co-p to 40,800 ppm/0.2 m) and elevated uranium in the upper basement are centered on a narrow zone of discordant, multiphase, sub-horizontal veining approximately 10 metres below the unconformity. Hole MJ-08 and MJ-09 tested the north and south ends of the offset between the MJ-1 and MJ-1B conductors respectively. MJ-08 intersected 2,067 ppm U-p over a 1.1 metre interval straddling the unconformity which included a two centimeter fault gouge with pitchblende and secondary uranium minerals. MJ-09 intersected weakly altered sandstone and strongly paleoweathered basement with little structure and no graphite. A 25 metre unconformity offset is present between the 800 metre spaced holes, supporting the geophysical interpretation of a structural break between the MJ-1 and MJ-1B conductors. Hole MJ-10 tested the point of peak conductivity on the MJ-1B conductor and an illite anomaly identified by a 1990 boulder survey. The hole intersected intervals of hydraulic breccias and tilted blocks 100 to 200 metres above the unconformity and intervals of unconsolidated sand and clay in the lower 100 metres of sandstone above strongly bleached and clay-altered quartz-feldspar-biotite gneiss. No conductive lithology was intersected despite targeting a conducting bright spot. MJ-11 followed up on alteration and mineralization intersected in hole MJ-03 by testing the (interpreted) up dip side of the alteration and mineralization in the earlier hole. MJ-11 intersected significantly weaker alteration and geochemistry than MJ-03 50 metres to the south and identified an eight meter step down in unconformity elevation relative the MJ-03. Later work by Pitchstone would show MJ-11 actually targeted the down dip side of MJ-03 leaving the prospective up-dip side untested. MJ-12 was drilled 1.2 kilometres south of hole MJ-04, the only other hole on the north-south MJ-4, and intersected moderately to strongly altered lower sandstone with locally elevated uranium, strongly graphitic basement, and elevated uranium pathfinder elements in the upper basement.

In 2000-2001 moving loop surveys were completed on the MJ-2 conductor, the southwest extension of the western MJ-1 conductor. Hole MJ-13, drilled at the point of flexure between the MJ-2 and MJ-4 conductors, intersected graphitic pelites in the basement but no significant alteration or structure. Hole MJ-14 targeted the point of flexure in the MJ-2 – MJ-4 conductor system and intersected significant zones of quartz dissolution in the upper sandstone to 98 metres and in short, sporadic intervals in the lower 160 metres. No other alteration was observed and basement was strongly graphitic pelitic gneiss. A composite sample of the upper one meter of basement contained 81.8 ppm U-p, 1,780 ppm V-t, and 689 ppm Sr-t. Subsequently, the Mullins-Johnston project claims were allowed to lapse.



## 2004 – Present

In 2004 Denison Mines staked most of the former Mullins-Johnston project and Pitchstone Exploration staked one claim covering the north-south MJ-4 conductor. Pitchstone completed three profiles of MLTDEM over the MJ-4 conductor and a 1,674 line-km airborne magnetic survey. Three follow-up drill holes (GB07-01 to -03) failed to intersect conductive lithologies. GB07-02 was drilled east of MJ-12.

Denison identified the Johnston Lake North conductor by a 2005 MEGATEM survey over the Johnston Lake North claim. The airborne survey was followed up with a fixed loop Time Domain EM survey in 2006.

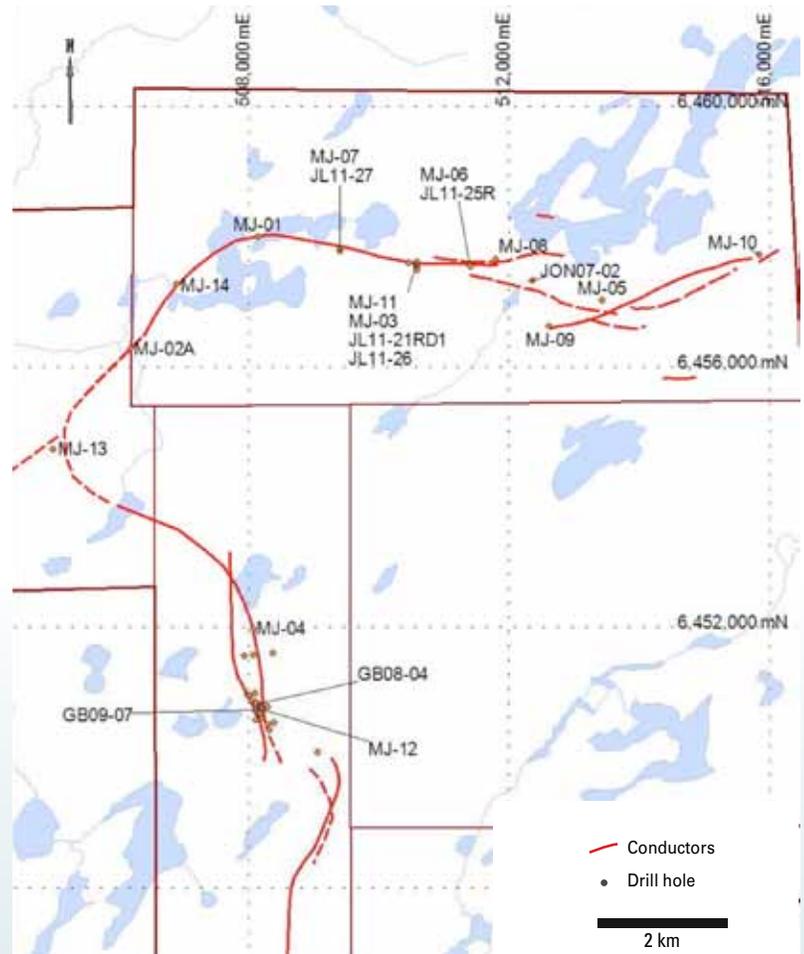
In 2007 Denison attempted two of three planned holes near the structural offset between the MJ-1 and MJ-1B conductors and between holes MJ-08 and MJ-09. Unconsolidated sand resulted in JON07-01 being abandoned at 233 metres. JON07-02 did not encounter significant alteration, structure or mineralization but did intersect meter-scale zones of graphitic pelitic gneiss in the basement.

In 2008 Pitchstone drilled hole GB08-04 west of GB07-02 and intersected significant structure, alteration and elevated pathfinder elements in the lower sandstone and graphitic pelite at the unconformity. Continuing to move west, hole GB09-07 intersected 15,600 ppm U-p along with similar levels of base metals (i.e. up to 98,900 ppm Ni-p/0.3 m and 45,400 ppm Co-p/0.6 m) in basal sandstone above intensely altered basement. Between 2009 and 2011 Pitchstone completed twenty follow up holes within a few hundred metres of GB09-07, intersecting several significant but weaker uranium concentrations over narrow intervals and identifying a significant alteration package in the lower sandstone that remains open to the north and south. Broadly speaking, the results of these drill holes suggest exploration efforts on the MJ-4 conductor should be focused to the south of existing drilling. A 2009 resistivity survey was completed at Gumboo. While the survey was not optimal, the results indicated a moderate to strong resistivity low directly associated with the MJ-4 conductor offset.

In 2009 Denison optioned the Johnston Lake Project to Pitchstone Exploration who completed six drill holes on the MJ-1 and Johnston Lake North conductors. Five of the holes focused on following up results from holes MJ-03, MJ-06, and MJ-07 and on the MJ-1 conductor. Hole JL10-22 was drilled to test the Johnston Lake North conductor in 2010 but intersected no significant results.

Pitchstone drilled hole JL10-17 80 metres east and along strike of MJ-03. Results were disappointing compared to MJ-03 but oriented core measurements determined that basement dipped north (it was previously interpreted that basement dipped south), indicating MJ-11 and JL10-17 were located down-dip of MJ-03. Hole JL10-21RD1 drilled to test the unconformity in south of MJ-03 and intersected sandstone and basement alteration comparable to the historic hole. The upper basement was intensely altered and averaged 286 ppm U-p and 479 ppm Cu-p over the upper 0.9 metres. Basement is largely augen-textured graphitic pelitic gneiss and faulting is present with associated graphite, pyrite and chalcopyrite. Hole JL11-26 tested unconformity south of JL10-21RD1. While alteration, structure and mineralization in the sandstone and basement were notably weaker and the unconformity was lower than the holes to the north, many pathfinder elements were more abundant in the lower sandstone than in JL10-21RD1. Basement was dominated by augen-textured graphitic pelitic gneiss. A significant graphitic structural zone was intersected between 668 and 682 metres. A two metres zone centered 15 metres below the unconformity with several graphitic slips contained up to 300 ppm U-p, 1,030 ppm As-p, 503 ppm Co-p and 315 ppm U-p. Fracturing and faulting is present near the bottom of the hole within augen-textured graphitic pelitic gneiss.

JL11-25R was drilled to test the up-dip projection of altered and graphitic basement intersected well below the unconformity in MJ-06. A 30 metre zone of moderate alteration and faulting centered 60 metres above the unconformity was intersected which contained elevated U, Cu, and some REEs. Notably, the entire sandstone column averages more than 70% modal illite (calculated). The unconformity at 576.6 metres was 21 metres higher than in MJ-06 50 metres to the northwest. Basement was dominated by weakly to moderately altered, highly sheared, augen-textured, graphitic pelitic gneiss. A zone of elevated radioactivity more than 60 metres below the unconformity contained up to 1,090 ppm U-p and is locally rich in REE's (i.e. 5,730 ppm Ce, 2,220 ppm La, 3,470 ppm Nd, 1,900 ppm Sr over 0.1 metres associated with sericitization). Immediately below the radioactive zone was a major, nine meter fault zone which included variably brecciated paragneiss, milky quartz veins up to 1.5 metres and graphitic fault breccias up to 20 centimetres thick. The fault zone locally contained elevated REE values.



JL11-27 was drilled to follow up on highly anomalous base metal mineralization in the basement of MJ-07 (76,000 ppm As-p and 37,200 Ni-p / 0.4 m, 40,800 ppm Co-t / 0.2 m), and intersected the unconformity 34 metres north-northeast of that hole. Upper sandstones were grey, poorly competent and geochemically anomalous; between 170 and 182 metres decimeter-scale black stained zones surrounding fractures with intensely bleached envelopes contained up to 1.73

ppm U-p, and a composite sample from 196 to 215 metres contained 3.2 ppm As-p. Pyrite and secondary quartz coated fractures between 116 and 131 metres. Alteration similar to MJ-07 was intersected in the lower 27 metres of sandstone where the core was highly broken and weakly to intensely altered. The basal five metres was largely unconsolidated and contained weak hematite and limonite. 200 cps (SPP2) was measured at the unconformity at 650.1 metres. Basement was dominated by augen-textured graphitic pelitic gneiss. Immediately below the unconformity was 4.3 metres of intense alteration which averaged 910 ppm U-p in the upper 0.9 metres and included 0.1 metres of 3,240 ppm U-p associated with brick red hematite. The transition to weaker clay alteration at 655 metres coincided with the top of a two meter strongly hematized zone. One meter of intense sericitization beginning at 668.5 metres averaged 2,546 ppm As-p, 1,518 ppm Co-p and 972 ppm Ni-p and terminated at a highly graphitic fault contact with a 3.3 meter quartz vein.

## Potential

The Johnston Lake project has excellent exploration potential and is under-explored. Approximately 24 kilometres of conductor strike have been defined and an additional 6 kilometres area inferred to extend southwest of hole MJ-13. Geochemistry and PIMA results indicate that the sandstone has been subjected to significant hydrothermal alteration, and drill holes have intersected significant structures in the sandstone and offsets in the unconformity elevation. Ductile and brittle structures in the basement with associated alteration and/or mineralization indicate reactivated ancient structures are present which have served as fluid flow pathways.

The MJ-4 / MJ-4S and MJ-1 / MJ-1B conductors are both disrupted by lateral offsets. Analysis of regional magnetic patterns suggests the two offsets (and potentially the western termination of the MJ-1B conductor) may be related to a northeast trending regional structure. Drilling results from both the MJ-1 and MJ-4 conductors indicate that pathfinder element levels and illite abundance in the sandstone and unconformity elevations trend upward toward the conductor offsets. Drilling results on the MJ-4 conductor (the Gumboot holes) suggests the best results are located adjacent to unconformity steps attributed to inferred cross structures. If these cross structures exist, they may be related to the major NE trending structure mentioned above.

The primary drawbacks at Johnston Lake are the depth the unconformity, which results in increased costs and time required to drill a hole relative to projects closer to the edge of the Athabasca, and a lack of good resistivity data. The unconformity depth drawback could be significantly mitigated by completing resistivity surveys over the project to generate high confidence geophysical targets.

Drilling has identified several targets identified by drilling which warrant follow-up. In order of descending priority, they are:

- The up-dip projection of alteration, structure and mineralization in the JL11-25R / MJ-06 area;
- The area around the offset in the MJ-1 conductor which includes follow up to MJ-08 and MJ-05;
- The areas immediately east and south of GB11-30 and the offset in the MJ-4 conductor with the associated lower sandstone resistivity low;
- The area around MJ-10;
- The area south of JL11-26;
- The area around MJ-07 and JL11-27

## Future work planned

- A radon survey in conjunction with a lake bottom sediment survey will be completed over the northwest portion of Richardson Lake and southwest portion of Crooked Lake in summer 2013. Additional core sampling for both gold and uranium analyses will also be completed as part of the summer program.
- \$1 million follow-up diamond drilling program is planned for winter 2014. The primary focus of the 2014 drilling program will be to further define the uranium mineralization intersected in the RL-13-16 area and to test additional targets identified on the Hatchet Lake property.

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Please view [www.denisonmines.com](http://www.denisonmines.com) to view the Company's Annual Information Form and Quarterly Exploration and Development Updates and Financial Statements for further information.



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