Refreshing the Alligator River Uranium Field exploration toolkit – Angularli and Such Wow

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The Wellington Range and King River Joint Venture (JV) comprises a group of five contiguous exploration tenements located on the eastern side of the Cobourg Peninsular ~250 km to the east–northeast of Darwin (**Figure 1**) in the Alligator Rivers Uranium Field (ARUF). The focus of current exploration by the JV partners, Vimy Resources (75%, project operator) and Rio Tinto Exploration (25%), is the discovery of a high-grade uranium resource amenable to underground mining.

The JV tenements all overlie the Nimbuwah Domain in the northeastern part of the Pine Creek Orogen. The oldest stratigraphy recognised in the Nimbuwah Domain are the Archaean felsic gneiss of the Njibinjibinj Gneiss, the Arrarra Gneiss and the Kukalak Gneiss (**Figure 2**; Hollis and Glass 2012, Whelan *et al* 2016). These suites of Archean gneisses are unconformably overlain by metamorphosed Palaeoproterozoic sedimentary and volcanic rocks of the Cahill Formation and Nourlangie Schist, part of the Pine Creek Orogen. The rocks of the Archaean basement and the sedimentary stratigraphy of the Pine Creek Orogen underwent moderate- to high-grade metamorphism and deformation during the Nimbuwah Event. The suites of variably eroded Archaean and Palaeoproterozoic rocks are unconformably overlain by the Mamadawerre Sandstone, the basal member of the Mesoproterozoic Kombolgie Subgroup. The entire stratigraphic succession has been intruded by mafic dykes and sills of the Oenpelli Dolerite between 1734–1688 Ma (Whelan *et al* 2016). Variable thicknesses of the Cretaceous Bathurst Island Formation (Money Shoal Basin) unconformably overlie the crystalline Proterozoic basement.

The local geology in the vicinity of the Angularli deposit comprises Cahill Formation unconformably overlain by Mamadawerre Sandstone and poorly consolidated sediments of the Bathurst Island Formation (**Figure 3**). The Angularli uranium mineralisation is hosted by a multiply reactivated and altered deformation corridor, the Angularli Fault Zone (AFZ). The fault zone has a width of up to 100 m, strikes north–northwest (345°) and dips at approximately 60° towards 075˚. The deposit straddles the angular unconformity between the Cahill Formation and the overlying Mamadawerre Sandstone at a depth of

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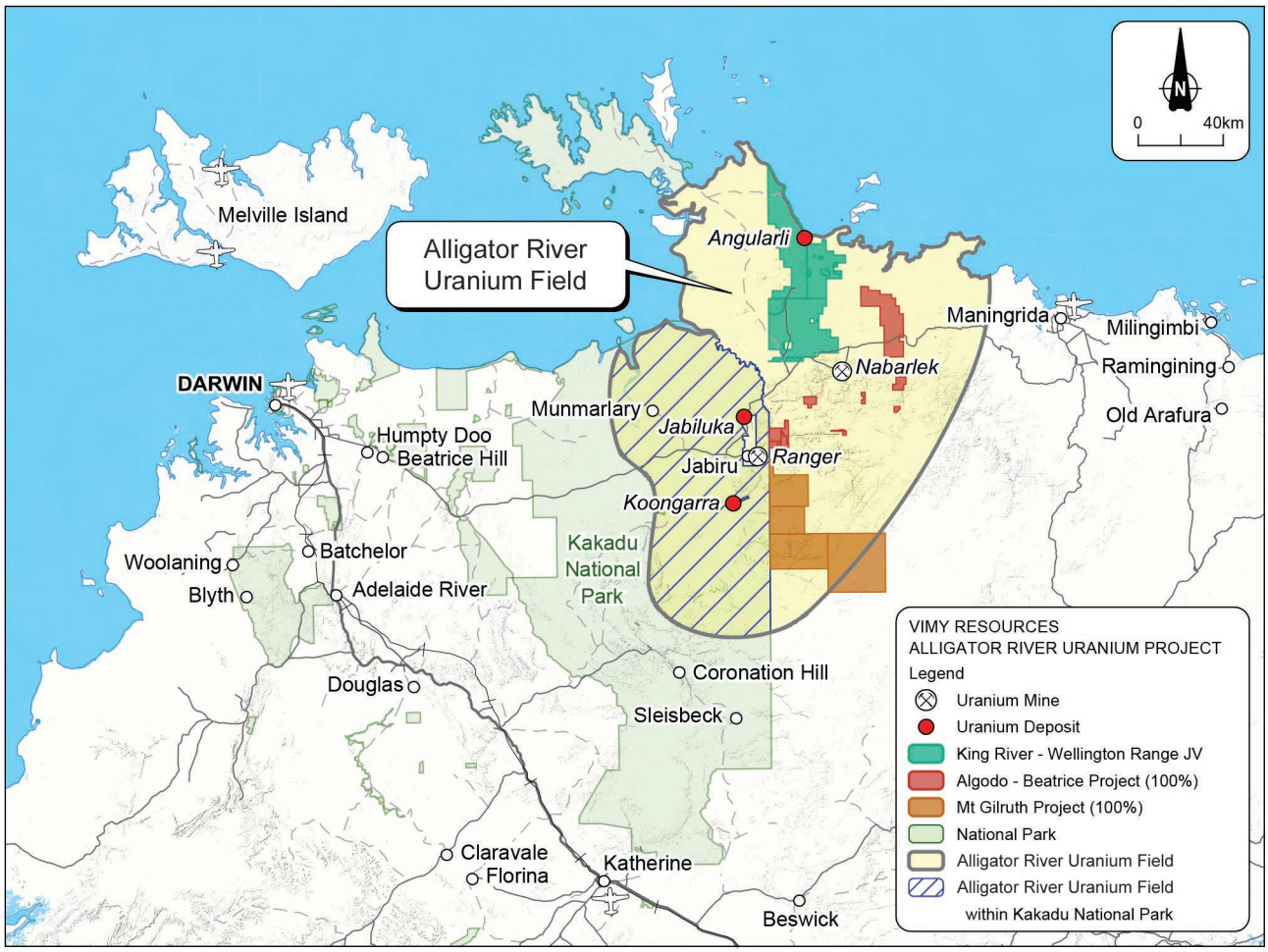

Figure 1. Vimy Resources projects in the Alligator Rivers Uranium Field.

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approximately 250 m below the surface. The Angularli deposit has a south–southeast-plunging, ellipsoidal-shaped geometry and is approximately 315 m × 125 m × 25 m in size. In March 2018, Vimy announced a maiden, inferred-category Mineral Resource of 0.91 Mt at 1.3% U_3O_8 at a cut-off grade of 0.15% U_3O_8 containing 25.9 Mlbs U_3O_8 (Vimy Resources 2018).

Unlike other documented uranium resources in the ARUP, primary uranium mineralisation at Angularli occurs above, at and below the unconformity. The primary uranium resource below the unconformity is hosted within a brittle fracture network overprinting the multiply deformed silica-flooded breccia. The mineralised veins have classic open space fill textures with void spaces lined by botryoidal, amorphous pitchblende and in-filled by fine-grained (<10 µm) euhedral, zoned uraninite crystals, intergrown with intermediate chlorite, white mica, and silica. Several brittle fault strands observed within the silica-flooded breccia extend up into the unconformably overlying Mamadawerre Sandstone. Brecciated sandstone within and marginal to these fault strands host massive pitchblende, chlorite, and silica veins. Evidence of post-mineralisation alteration and re-mobilisation is present in some parts of the lodes with uraninite and pitchblende altered to coffinite and other secondary silicate and oxide species.

The mineralisation hosted below the unconformity is associated with two mineralogically and spatially distinct styles of alteration: a proximal white mica (now sericite),

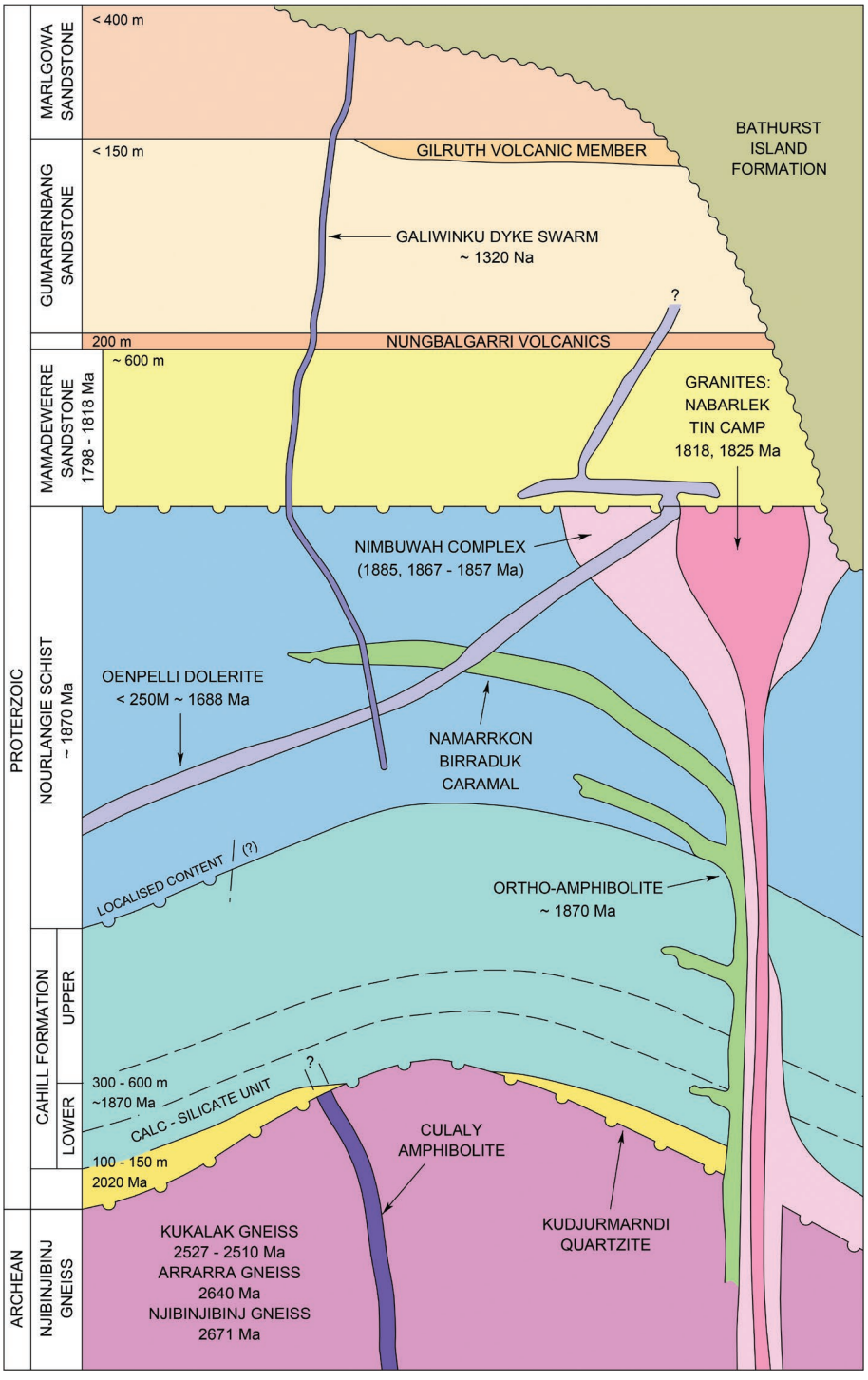
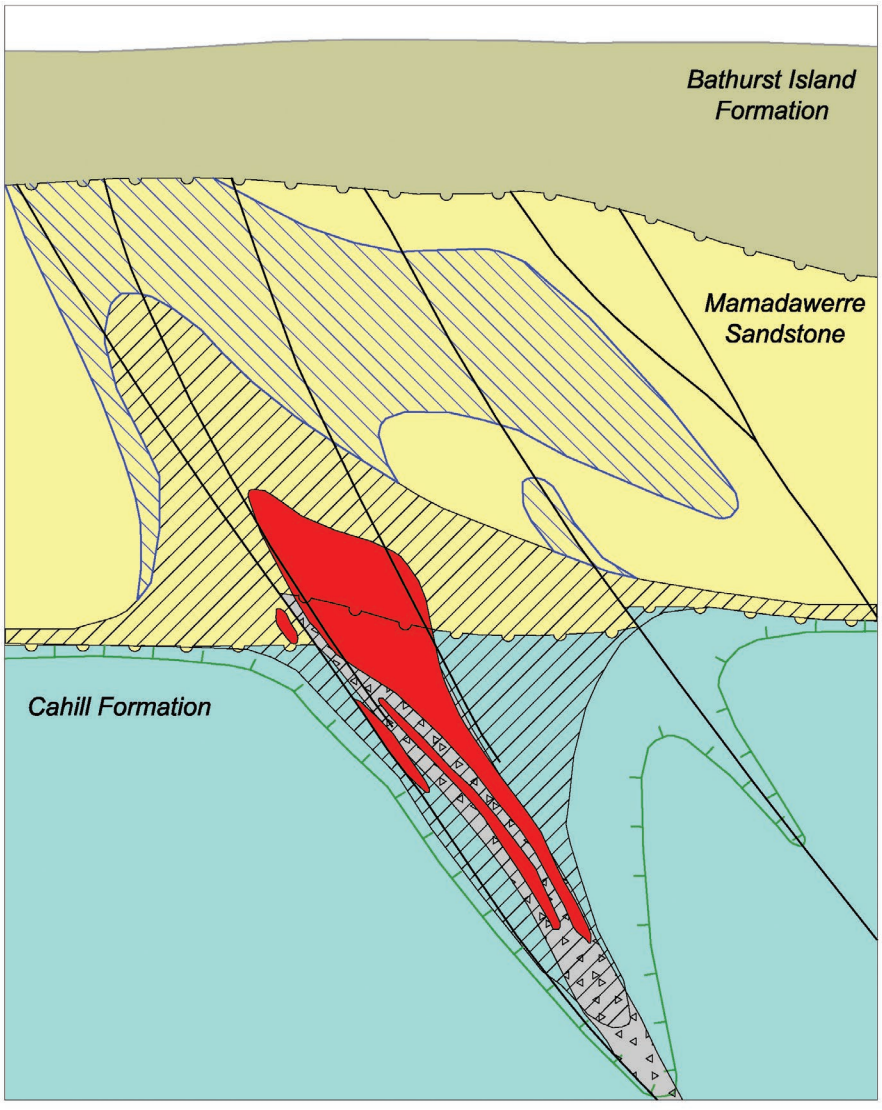


Figure 2. Stratigraphic column for the Nimbuwah Domain of the Pine Creek Orogen.

pyrite and silica alteration; and a distal intermediate chlorite alteration zone. The proximal alteration halo is mapped cross-cutting and in the hanging wall to the silicified breccia zone. This proximal alteration zone is broadly parallel to the upper contact of the silicified breccia, extending 15 to 50 m into the basement. The white mica, pyrite and silica alteration occurs as pervasive replacement of the protolith; in zones, it is sufficiently intense to destroy the primary metamorphic mineral assemblage. The distal intermediate chlorite alteration zone is observed from the outer limit of the white mica halo. The chlorite alteration can extend as far as 200 m into the hanging wall. No obvious hydrothermal alteration was noted in the footwall to the AFZ.

The proximal alteration halo mapped in the overlying Mamadawerre Sandstone is mineralogically very similar to that observed in the basement, comprising an assemblage of white mica–silica–pyrite infilling the sandstone matrix. A distal halo of fracture/fault controlled dravite (Mg-bearing tourmaline) and diaspore extends at least 250 m up into the overlying sandstone above the mineralised pod over a strike length of up to 500 m. A 150 m wide zone of pyrophyllite clay alteration parallel to the unconformity has also been mapped overlying the mineralisation (Smith 2018).

ICP–MS U–Pb dating of uraninite from the basement-hosted veins returned a mineralisation age of 1736 ± 17 Ma for Angularli. Oenpelli Dolerite dykes that are observed within the Angularli alteration zone lack obvious signs of post-intrusion alteration or mineralisation. This implies that the uranium mineralisation predates the Oenpelli Dolerite intrusion.



VIMY RESOURCES
ALLIGATOR RIVER PROJECT

Legend

- Bathurst Island Formation
- Mamadawerre Sandstone
- Cahill Formation
- uranium mineralisation
- silica flooded breccia
- intermediate chlorite alteration
- unconformity
- fault
- dravite (boron) alteration
- silica-sericite-pyrite alteration

Figure 3. Schematic cross-section for the Angularli Deposit.

An improvement in the understanding of the controls on the distribution of mineralisation, the composition and distribution of associated hydrothermal alteration, and geochemical pathfinders at Angularli has resulted in a reassessment of the targeting criteria applied to regional exploration. Higher grade resources (ie Nabarlek and Angularli), which are the primary target of the JV, are hosted by regional scale, steeply dipping, northwest–north-northwest-striking fault zones. These deposits have alteration systems that can extend several hundred metres into the overlying sandstone. Pathfinder geochemical halos (ie boron, gold, copper, lead isotopes etc) in the sandstone above Angularli extend up to and over a kilometre along the strike of the AFZ. Both the alteration and associated geochemical anomalism can be used as exploration vectors for exploring through extensive sandstone cover, effectively reducing the cost of first pass exploration programs in covered terrain.

Exploration efforts between 2016 and 2018 have largely focused on a broad north-northwest-striking, northeast-dipping fault zone (Telstra fault) located near the western margin of the JVs tenement package. As a result of ground reconnaissance, mapping, and rock-chip sampling, the exploration focus was directed in an area where the Telstra fault was mapped cross-cutting interpreted Cahill Formation, unconformably overlain by Mamadawerre Sandstone – an area known as Such Wow (**Figure 4**). Rock chip samples in this area returned elevated uranium, boron (after tourmaline) and pathfinder anomalism co-incident with outcropping dravite and diaspore veins. A surface sampling program was conducted directly to the north of Such Wow in an area where the Mamadawerre Sandstone had been eroded off the basement. As a result, a significant linear uranium anomaly was detected along strike of one of the Telstra Fault strands.

In 2018, the JV completed a first pass, six hole reverse circulation (RC) drilling program at Such Wow to test for the presence of Cahill Formation rock types (amphibolite, metapelite, semi-metapelite and metapsammite) below the Mamadawerre Sandstone, and to demonstrate that the surficial geochemical anomalism translated to structural fertility at depth.

The drilling results confirmed that in the Such Wow area, Mamadawerre Sandstone unconformably overlies metasedimentary rocks consistent with the Cahill Formation. Significant zones of Mg-rich chlorite and phengitic–illite alteration were intersected in faulted semi-metapelite in several holes (**Figure 5**). Elsewhere in the ARUP, Mg-rich chlorite and phengitic alteration are observed in the proximal and distal alteration halos at Ranger, Koongarra and Nabarlek. These zones of basement-hosted alteration are co-incident with significant uranium (**Table 1**), lead, lead isotope and copper anomalism. The JV's best drilling result from Such Wow was 1 m at 1332 ppm U_3O_8 from drillhole ARRC0016.

Additional mapping within the Such Wow Prospect in 2018 identified a 400 m × 200 m, northwesterly-striking zone of intense clay alteration, ~100 m to the east of the RC holes completed in the south of the prospect. This mappable surficial alteration system has been named 'Shiba'. The style and intensity of alteration, along with the tenor of pathfinder geochemical anomalism at Shiba, exceeds that observed in the sandstone escarpment directly to the south of Angularli. Exploration efforts in 2019 will focus on completing a first pass drill-test of the Shiba zone.

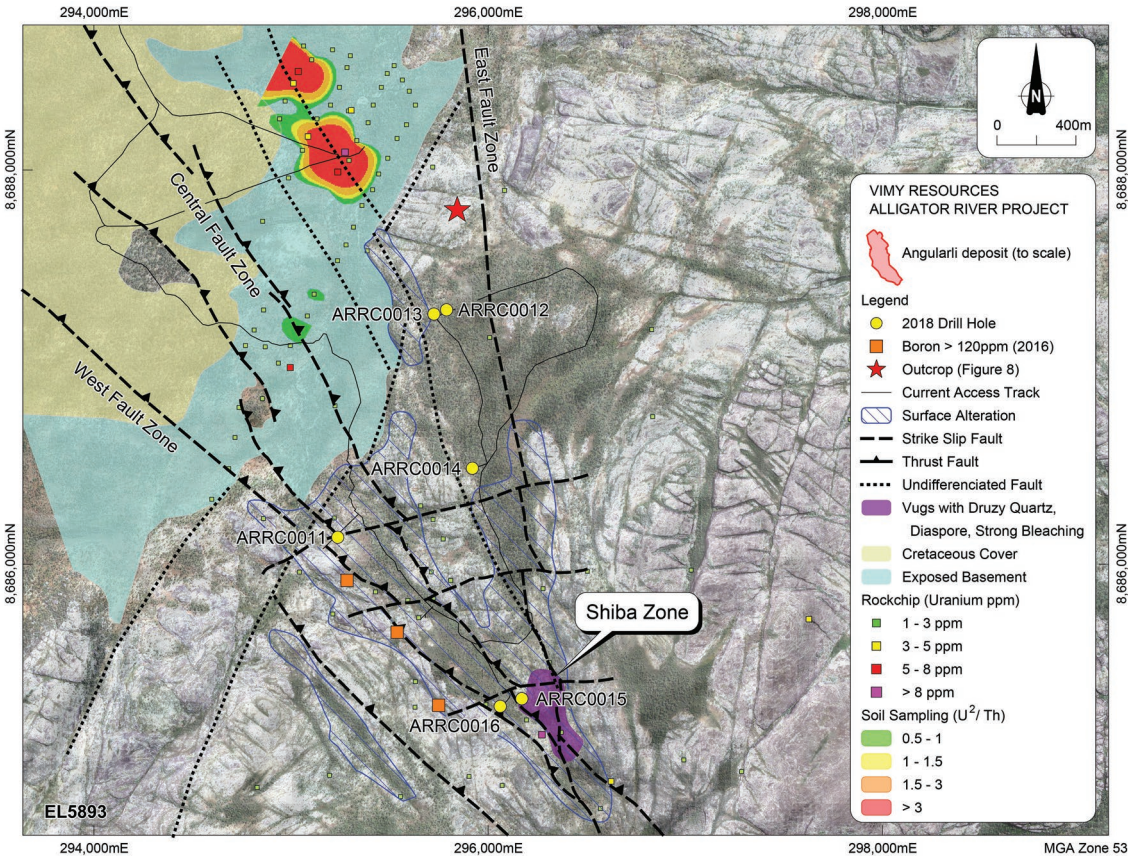


Figure 4. Satellite imagery over the Such Wow and Shiba prospect areas showing location of RC drillholes completed in 2018.

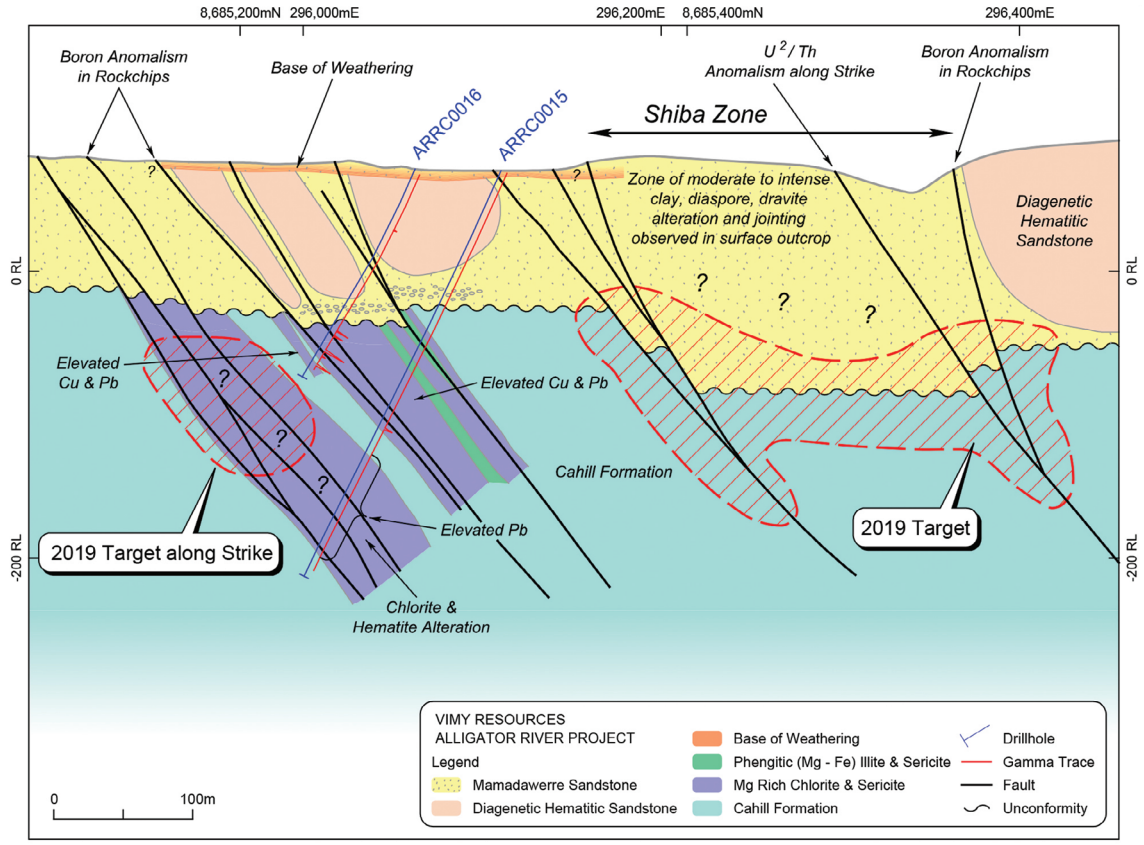


Figure 5. Interpreted cross-section from the Such Wow Prospect showing RC drillholes completed by Vimy Resources in 2018.

Table 1. Uranium intersections from RC drilling completed at the Such Wow Prospect in 2018.

Hole ID	Easting	Northing	RL	Depth	Dip	Azimuth	From (m)	To (m)	Grade[1] (% eU_3O_8)
ARRC015	8685317.6	296110.8	75.9	324	-65	225	203.3	204.1	0.01
ARRC016	8685278.7	296061.4	75.3	168	-65	225	127.0	127.7	0.02
							130.7	131.4	0.02
							142.5	143.0	0.02
							143.4	144.8	0.07
							155.8	156.6	0.03

[1] Elevated radiometric responses interpreted to be related to heavy mineral bands are not reported.

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