

# National Argon Map: an AuScope Initiative

## $^{40}\text{Ar}/^{39}\text{Ar}$ Geochronology Laboratory Sample Submission Form

This form must be completed and returned to Marnie Forster ([Marnie.Forster@anu.edu.au](mailto:Marnie.Forster@anu.edu.au)) before any work can be commenced in the Argon Laboratories.

<b>Person submitting samples:</b> Ian T Graham
<b>Affiliation:</b> UNSW Sydney
<b>Project Title:</b> Age of basaltic intrusions within the Sydney Basin, NSW
<b>Sample Number(s) (including IGSN if one exists):</b> 1701B
<b>Mineral separation required? Yes or No:</b>
<b>Date submitted:</b>

<b>GEOGRAPHIC AREA/ PROVINCE/ BASIN :</b> Sydney Basin	
<b>1:250k SHEET NAME:</b> Sydney	<b>NUMBER:</b> SI/56-5
<b>1:100k SHEET NAME:</b>	<b>NUMBER:</b>
<b>LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94)</b>	
<b>ZONE:</b> 56 H	
<b>EASTING:</b> 302298	<b>NORTHING:</b> 6154840
<b>LATITUDE:</b> 34 43 46.6	<b>LONGITUDE:</b> 150 50 26.4

<b>STRATIGRAPHIC UNIT FORMAL NAME *:</b> Wandrawandian siltstone
<b>STRATIGRAPHIC UNIT INFORMAL NAME:</b>
<b>LITHOLOGY:</b> Foidite

<b>DRILLHOLE ID (if applicable):</b>
<b>PROSPECT (if applicable):</b>
<b>DEPTH FROM (metres):</b>
<b>DEPTH TO (metres):</b>

\* Stratigraphic Unit names can be searched and checked within the Australian Stratigraphic Units Database via the following link: <https://asud.ga.gov.au/>

### Dating Objective

**What is the geological question  $^{40}\text{Ar}/^{39}\text{Ar}$  analysis will address?**

The magmatic age of crystallisation of the dyke and this relates to other dated dykes/sills within the Sydney Basin.

**What type of age(s) are expected? (e.g. magmatic crystallisation, metamorphism, fluid alteration/mineralisation, cooling, shearing etc):**

Magmatic crystallisation

**Mineral target(s) for dating:**

Whole rock as this is an aphanitic variety.

**Estimated  $^{40}\text{Ar}/^{39}\text{Ar}$  age (e.g. Cenozoic, Mesozoic, Paleozoic, Proterozoic, Archean – provide estimated numerical age range if possible):**

The Bumbo Latite member of the nearby Gerringong Volcanic Complex has been dated at 265 ma (Belica et al., 2017). However, Abu-Shamma (2018) showed that it is distinctly different in composition to the Gerringong Volcanics and also published analyses on other dykes within the Sydney Basin. It should be post-265 but that is all that we can say about this one at the present moment.

## Sample Information

**Location description (e.g. a sample of x was collected from y, z km from abc town):**

Sample was collected along a cliff face outcrop to the north of Werri Beach, just south of Gerringong.

**Lithological characteristics (rock description):**

This is a porphyritic Ol-Cpx-Plag phenocrystic basalt with a very fine-grained groundmass and some carbonate-chlorite alteration.

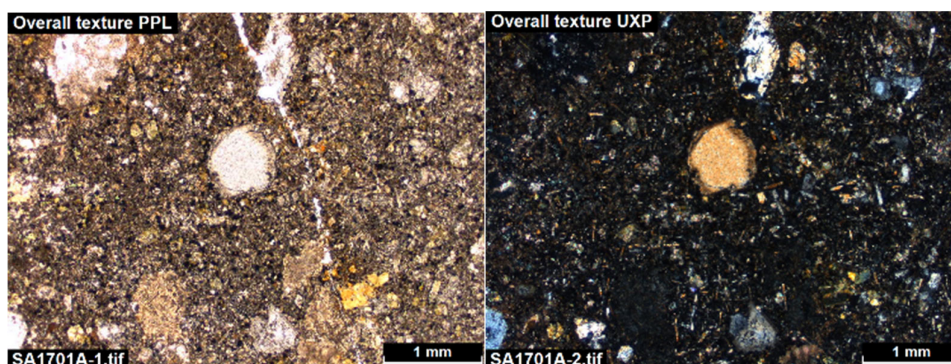
**Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):**

The dyke intrudes the Wandrawandian siltstone (late Early Permian (273-271 Ma)).

**Thin section description (if available):**

Clinopyroxene (fresh and altered) - Skeletal olivine - Plagioclase (fresh and altered) Micro phenocryst /Phenocryst sizes range from 0.1 – 2.5 mm. Phenocryst to groundmass ratio ranges from 1:10 to 1:200. Extremely fine grained to fine grained and contains: Augite/Ti-augite - Plagioclase - Olivine – Opaques.

**Photograph(s) e.g. field site, hand-specimen, photomicrograph:**



**Relevant bibliographic references:**

Abu Shamma, S., 2018: Analysis of Basaltic Dykes and their Xenolith Assemblages from the Gerroa-Kiama Region, New South Wales. Honours thesis (unpublished), University of New South Wales.

Alcorn, C.J., 2016. Zircon geochronology and geochemistry of xenoliths in a Jurassic dyke at Bombo, NSW, Australia: Evidence of deep crustal structure under the Sydney Basin. BSc (Hons) thesis, University of Wollongong (unpublished).

Belica, M.E., Tohver, E., Pisarevsky, S.A., Jourdan, F., Denyszyn, S., and George, A.D., 2017. Middle Permian paleomagnetism of the Sydney Basin, Eastern Gondwana: Testing Pangea models and the timing of the end of the Kiama Reverse Superchron. *Tectonophysics*, 699: 178-198.

Carr, P.F., 1984. The Late Permian shoshonitic province of the southern Sydney Basin. PhD thesis, Department of Geology, University of Wollongong. Wollongong (unpublished). 1-417.

Campbell, L.R, Conaghan, P. J. & Flood R. H. 2001. Flow-field and palaeogeographic reconstruction of volcanic activity in the Permian Gerringong volcanic complex, southern Sydney Basin, Australia. *Australian Journal of Earth Sciences* 48, 357–375.

Harper, L.F., 1905. The geology of the Gerringong District. Records of the Geological Survey of New South Wales 8 (2): 94-107.

Johnson, R.W., Knutson, J., and Taylor, S.R. (eds) (1989). *Intraplate volcanism in eastern Australia and New Zealand*. Cambridge University press.

Offler, R., Zwingmann, H., Foden, J., Sutherland, F.L., and Graham, I.T., 2019. Age and composition of dykes emplaced before and during the opening of the Tasman Sea – source implications. Australian Journal of Earth Sciences 66 (8): 1129-1144.

Wellman, P., and McDougall, I., 1974a. Cainozoic igneous activity in eastern Australia. Tectonophysics 23: 49-65.

Wellman, P., and McDougall, I., 1974b. Potassium-argon ages on the Cainozoic volcanic rocks of New South Wales. Journal of the Geological Society of Australia, 21: 247-272.