Geoheritage and the redevelopment of Hornsby Quarry, Hornsby NSW — a case study of the geoconservation of an internationally significant Jurassic diatreme

Without discounting the importance of ex situ collections of fossils and crystals in museums, cores from type sections, and building stones, elements of geoheritage significance are mainly conserved in the natural environment. They can range in scale from crystals and fossils to bedding, cliffs and terranes (see Figure 2 in Brocx & Semeniuk 2007). From a location perspective, sites of geoheritage significance occur in a variety of landscape and climatic settings, and geological provinces. Each may carry with it relatively simple processes and products, or an array of complicated and interacting processes and products. Thus, there is quite a variety of recognised sites of geoheritage significance in the world. Some are significant because of their crystals and fossils, some because of their large-scale attributes (such as structural/tectonic features), and some because of the collective ensemble of a suite of large-scale to fine-scale features involving geological, geomorphological, lithological, and pedological attributes. Geoheritage thus addresses the importance of geological sites in their complexity and diversity; in their scientific, cultural and educational values; and for reference and research.

Frequently, features of geoheritage significance are well exposed at cliff faces. This can be in a natural setting, such as the Muderup limestone in coastal WA, a road cut (eg, State Circle in Canberra), a mining site or a quarry (eg, the Hornsby diatreme exposed at the Hornsby Quarry, in the northern suburbs of Sydney). Often, former quarries become degraded or are infilled, and are lost to the community and for science and education. The Hornsby Quarry, a site of international geoheritage significance, was under threat due to proposed redevelopment as a public recreational area after being filled with more than one million cubic metres of spoil (predominantly crushed Hawkesbury Sandstone) from the construction of the NorthConnex tunnel in northern Sydney.

Fortunately, due to a written submission to the Environmental Impact Statement (EIS) for the Sydney NorthConnex Infrastructure Project by the GSA (NSW) Geoheritage Committee, and oral and written submissions made on behalf of the Geological Society by geoheritage experts and specialists to the Sydney North Planning Panel, the remainder of the redevelopment of the Hornsby Quarry is set to take into account the geoheritage values of the Hornsby diatreme.

Overview of the dish-like structure of the Hornsby diatreme. Image courtesy Ian Percival
On 8 May 2020, following oral submissions by Ian Percival, Trudi Semeniuk, Vic Semeniuk and myself, representing the GSA and other community organisations, the Sydney North Planning Panel issued a Project Deferral Notice. The notice acknowledged that while the Planning Application provided a substantial amount of information, "several key issues of significant public interest are sufficiently unresolved". At points 4 and 5 of The Record of Deferral, reference is made to the need to obtain further information on the volcanic diatreme such that the diatreme "can be clearly identified on relevant plans and cross sections and the Panel needs advice from the Applicant regarding how the diatreme is incorporated in the proposal in terms of the level of fill, treatment, rehabilitation and protection whilst appropriately reflecting its geological significance". The Panel recommended that this work be undertaken in consultation with the geological societies who have the appropriate expertise in this field. Subsequently, a formal invitation was extended to the GSA for geoheritage experts and specialists to attend an on-site meeting facilitated by the Project Manager of the Major Projects in the Design & Construction section of Hornsby Shire Council.

The field inspection focused on the east face (which prominently displays the dish structure, surge deposits, rock lenses, breccia layers, lapilli and other geological attributes). However, some of the other quarry faces potentially display additional volcanogenic phenomena that complement or add to those mentioned above. In particular, the adjoining face extending to the south is significant in showing the contact of the diatreme with the sedimentary rocks of the Sydney Basin through which it intruded. Previous geological investigations of the entire site have revealed the presence of slumped bedding, sandstone dykes, surge and pebble-rich layers, and a great variety of ejecta associated with the violent intrusion. This includes basalt bombs with chilled margins, lithic fragments of charcoal in breccia layers, accretionary lapilli and xenoliths. As many of these geological features were recorded when the quarry was operational, it is unknown what remains of them, or whether new structures and volcanogenic phenomena will be revealed as covering vegetation and unstable spoil heaps are removed during redevelopment of the site.

In the matter of geoconservation, a bilateral agreement between the Commonwealth and the NSW Governments sets out how the NSW Government is responsible for assessing projects that are likely to impact on matters of national significance. In that context, the Hornsby diatreme should have been afforded protection as a component of the scope of works from the outset of the redevelopment project. It is also disappointing that in spite of the thorough submission in 2015 to the Development EIS on the national to international geoheritage significance of the Hornsby diatreme (submitted by Ian Percival, as Co-convenor of the GSA (NSW) Geoheritage Committee), the site was initially assessed by planning decision-makers with no expertise in geoheritage as being of local significance.

As mentioned above, four of the GSA's geoheritage experts provided oral submissions to the Sydney North Planning Panel's planning teleconference on the Hornsby Quarry and its diatreme. Following these submissions, the Sydney North Planning Panel, Hornsby Council, and the planning consultant engaged by the council to independently assess their Development Application for the quarry site, have now recognised the need to consider the geoheritage significance of the 'Jurassic Park' (a reference to the known age of the diatreme) that is right in its own backyard. The rightful place of the Hornsby diatreme is the centrepiece of the redevelopment. It will no doubt be a remarkable tourist drawcard if properly protected and promoted, with suitable interpretation and allowing public access as well as areas restricted for research/educational purposes.

I would like to acknowledge with thanks the various contributions of time and expertise that led to the positive outcome referred to in the Project Deferral, the recent site visit, and text within the body of this article. These GSA members have already been mentioned above, but without the collective contributions of Ian Percival, Armstrong Osborne, Trudi Semeniuk and Vic Semeniuk, the Hornsby diatreme would not have been included in the Planning Deferral as being a matter of geoheritage significance to be taken into account in planning and management.

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REFERENCE