The magnesite deposits are not associated with any known structural features. *In situ* brecciation is common and virtually all the drill core from the Winchester deposits, as well as the open cuts at Huandot, show extensive brecciation to the extent that there is very little material that is not brecciated (**Figure 8**). In many instances, the brecciated pieces can be put back together and are therefore derived locally. The size of brecciated fragments ranges from a few cm to almost half a meter. The interstices between the brecciated fine to medium magnesite fragments are filled by coarse to very coarse white magnesite or calcite. The coarse white magnesite has very sharp contacts with the host rock. Along this contact, the host rock appears to be dark brown, in comparison to the centre of the host fragments, which are light brown to brownish grey. This may suggest iron enrichment by percolating fluids along the margins of the magnesite fragments prior to infilling of the veins and open spaces with white coarse magnesite. A later generation of open-space fill is seen at places. This involves angular fragments of black shale in a fine carbonate matrix infilling fractures in the previously brecciated magnesite. The black shale fragments in this instance are not locally derived and may represent fragments of the Whites Formation, which were dropped down vertical cavities or fractures and cemented by a carbonate matrix. The resulting cavity fill material has a sharp contact with the host rock. Other fragments include medium crystalline magnesite and probably quartz. This type of breccia could be interpreted as relatively recent karst fill.

Fluid inclusions in magnesite represent moderate to hypersaline CO_2-CH_4-bearing aqueous fluids trapped at temperatures in the range 100-400°C (average 153°C). Calculated pressure from the fluid inclusion data is about 1.5 kbars (hydrostatic). These magnesite deposits were previously interpreted as recrystallised sedimentary magnesite (Bone 1983), but could also represent hydrothermal replacement of dolomite by magnesium-rich brines (Ahmad *et al* in prep). The latter hypothesis results in a net volume decrease. This volume decrease may be the cause of *in situ* brecciation of the magnesite ore. In certain places the overlying strata collapsed, giving rise to a variety of breccia types. The space between the fragments was subsequently infilled by late coarse rhombic magnesite.

Figure 8. Magnesite breccia from Mount Grace Resources' Winchester Magnesite Deposit.

Stop 1-5 Burrell Creek Formation
Location: Batchelor Hayes Creek Region 1:100 000 Special MGA 746439mE, 8517238mN

The Burrell Creek Formation (Finniss River Group) is a monotonous succession of greywacke, siltstone and shale deposited in high-energy, deeper marine environments towards the end of sedimentation. It conformably overlies the Mount Bonnie Formation (South Alligator Group) and comprises interbedded shale, siltstone, greywacke, volcanilithic conglomerate and rare felsic to intermediate volcanics. Olive green to brown shale, slate, phyllite and siltstone are typically laminated to thinly bedded and form about 50% of the formation. Within the contact metamorphic aureole of post-tectonic granites, cordierite and andalusite can be seen. Fine to coarse greywacke forms either thin interbeds within the shale and siltstone or massive graded beds up to 1 m thick. Commonly, the AE, BCE and CE divisions of the Bouma Sequence are present. Based on textures and sedimentary structures, this succession is interpreted as a submarine fan deposit, in which turbidity flow was the main mechanism of sediment transport. Conglomerate horizons contain sub-rounded to rounded quartz granules, pebbles and in places, cobbles of sublitharenite fragments in a sandy matrix. In the vicinity of Mount Hayward, the conglomerate also contains large angular clasts of phyllite and metagreywacke and smaller clasts (less than 5 mm) of spherulitic metaphyllite and metadacite.

Fine-grained sediments in the Burrell Creek Formation commonly preserve a slaty cleavage that is axial planar to large-scale, tight to isoclinal, north- to northwest-trending regional D_3 folding.

The Burrell Creek Formation is extensively exposed from the eastern margin of the Litchfield Province to the South Alligator River Valley. The thickness of the formation is difficult to establish, but it has been suggested that it is at least 1000 m thick (Pietsch and Stuart-Smith 1987).