CONNOLLY BASIN IMPACT STRUCTURE, WESTERN AUSTRALIA. E. M. Shoemaker, J. B. Plescia and C. S. Shoemaker, U. S. Geological Survey, 2255 N. Gemini Drive, Flagstaff AZ 86001.

Introduction: The Connolly Basin impact structure occurs in the Gibson Desert of Western Australia (23° 33' S; 124° 45' E) [1,2]. The structure is ~9 km in diameter, surrounded by a topographic rim 25-30 m high and contains a small playa. A central uplift ~1 km across has a minimal topographic expression of ~5 m and scattered exposures of bedrock. The rim is breached on the southwest by a drainage. Geologic maps have been produced at two scales; a regional map of the overall structure (Figure 1) and a detailed map of the central uplift (Figure 2) based on mapping by EMS and CSS over the course of several years [1, 2].

Regional Geology: The structure is surrounded by widespread Tertiary lateritic soil; exposures of older units are rare [3]. To the northeast, ~5 km, is an exposure of Early Cretaceous Samuel Formation (Figure 1); additional outcrops of the Samuel Formation occur farther north and exposures of the Lampe Bed, Bejah Claystone, and Samuel Formation occur in the Traeger Hills ~35 km southwest. Connolly Basin lies near the boundary between the Canning Basin to the northeast and the Officer Basin to the southwest. Within the structure the surface is largely covered with Quaternary materials, and bedrock is exposed only in scattered outcrops in a ring ~3 km across and in the central uplift.

Central Uplift: Bedrock within the central uplift consists of a number of units and exhibits a complex structure (Figure 2). Units include an outer sandstone unit (ledge-forming sandstone) that forms a continuous ring around the northeast and northern margins and is discontinuously exposed to the southwest. Within the sandstone ring are units of siltstone and fine sandstone. The rocks exposed in the central uplift are provisionally assigned to the Patterson Formation of Early Permian age, or possibly they could correlate with the Grant Group of the Canning Basin section.

The ledge-forming sandstone is a resistant medium to coarse grained sandstone with local stringers of coarse sandstone and very rare conglomerates. It is pervasively crushed with shear planes and veinlets of crushed rock. On a microscopic scale, the quartz grains are fractured and lie within a matrix of fine to very fine splintered grains. Structural attitudes in the sandstone, the general morphology, and local beds of conglomerate and siltstone indicate the dips are quite steep to overturned and that the units are puckered into small steeply-plunging tight folds. The ledge forming sandstone is replicated by thrust faults in several places on the north and west flanks. Outcrops of the unit occur all the way to the center of the structure. Siltstone and a well-bedded fine sandstone occur interior to the ledge forming sandstone. Attitudes within the unit are easy to determine as it weathers into well-defined platy slabs and chips. Locally, attitudes are coherent and define the deformation. A fine-sandstone unit occurs on the northeast side of the central uplift, but becomes progressively less well defined on the north and northwest sides. This unit seems to be transitional between the shale unit of the core and the ledge sandstone. Breccia occurs within the central uplift; at least four different types are observed but difficult to distinguish. All are recognizable by the presence of abundant angular clasts (one to few cm across) of sandstone, siltstone and claystone set in a matrix of crushed quartz. An impact breccia forms a thick sheet with a nearly horizontal basal contact and may represent material developed along the margin of the transient cavity or it may represent distributed-shear along faults.

Geophysical Studies: Regional gravity data [3] show Connolly Basin lying just south of the gravity high that separates regional lows associated with the Canning Basin to the north and the Officer Basin to the south. Those reconnaissance data show only broad highs and lows presumably reflecting the deep crustal structure. Values are -35 to -40 mGal adjacent to Connolly Basin. Detailed gravity data were collected as part of our work along two orthogonal lines (one north-south; one east-west), coincident with seismic reflection profiles [4,5]. The central uplift is marked by a pronounced gravity high of + 1.6 to 2.0 mGal. This high is surrounded by a narrow annular low 0.5 km across with 0.3 mGal of relief, in turn surrounded by an annular gravity high having 0.3 to 0.5 mGal of relief. The central gravity high results from a positive density contrast of the rock of the central uplift with respect to the surrounding rocks ($\Delta\rho$ = +0.06 to 0.07 g cm^{-3}). Within the structure, surrounding the central uplift, two layers are modeled, a deeper layer - the impact breccia - with a negative density contrast ($\Delta\rho$ = -0.08 g cm^{-3}) and an overlying crater-filling sandstone with a positive density contrast ($\Delta\rho$ = + 0.1 to 0.13 g cm^{-3}). Seismic reflection data were obtained in 1981. Strong, nearly horizontal reflectors are present at depths of 0.7 to 0.8 seconds beneath the margin and interior, but rise by a few hundredths of a second and are offset near the central uplift. At shallower depths (0.5 sec) the reflectors are strongly disrupted and indicate tiling, folding, and disruption over a wide area beneath the basin.

References: [1] Shoemaker E. and Shoemaker C. (1985) *Meteoritics, 20*, 754-756. [2] Shoemaker E. M. and Shoemaker C. S. (1989) *LPS XX 1008-1009*. [3] Crowe R. W. A. (1979) Morris, Western Austra-

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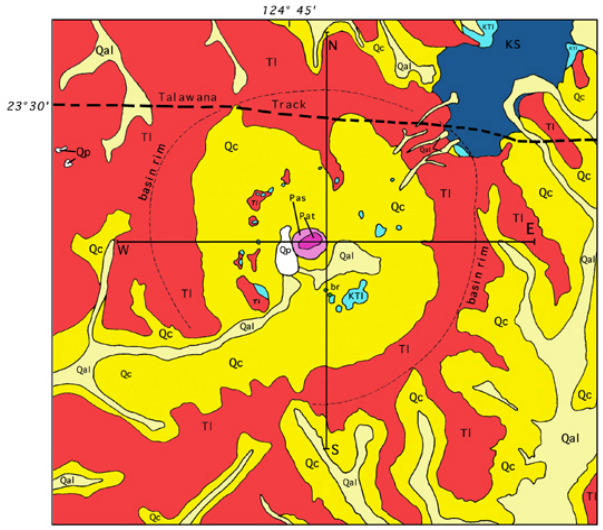

Figure 1. Regional geologic map. Yellow units (Qc) are alluvial materials; orange units (Tl) are lateritic soil; blue units are the Samuel Formation.

Bedrock units of the central uplift are colored purple and blue and are illustrated in detail in Figure 2. Location of the two seismic and gravity profiles are indicated by the solid lines. Map is ~15 km across.

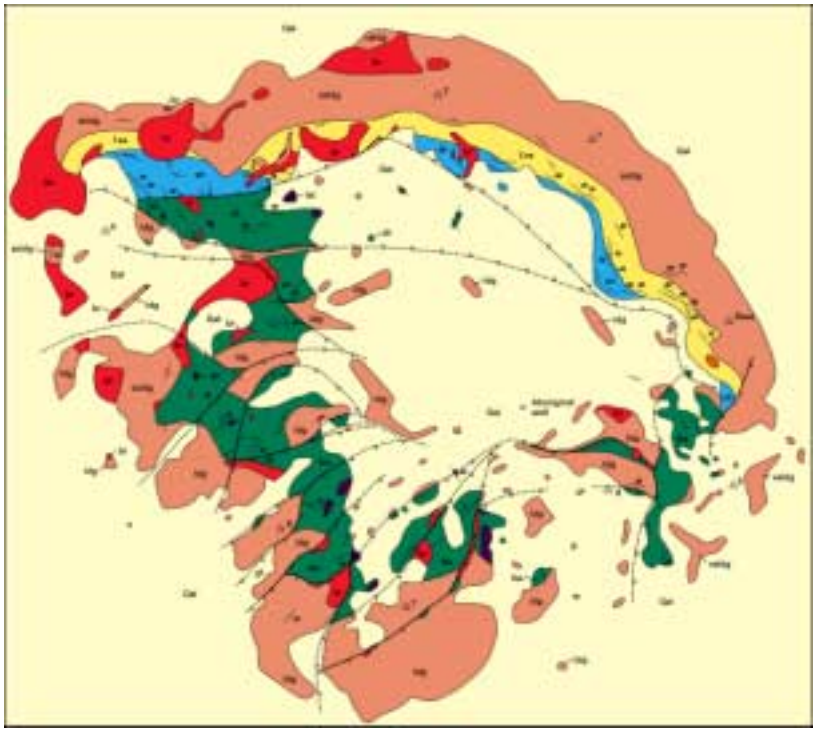

Figure 2. Geologic map of the central uplift. Brown units - ledge forming sandstone; yellow - fine sandstone; blue - shale; green - sandstone; orange - breccia. Map is ~ 1 km across.