

GROUNDWATER EXPLORATION OVER A LARGE IMPACT STRUCTURE IN MANSON, IOWA

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Manson, Iowa lies above a large impact structure that has disrupted the geologic column and complicated the hydrogeology of the area. The Manson Impact Structure (MIS) was formed 74 million years ago when a large meteor struck and the normal sequence of Paleozoic rocks was blasted into the air. A large ring structure of faulted PreCambrian rock was thrust vertically into a large roughly circular central peak surrounded by a large moat structure. The moat was filled by fused glass-like sediment composed of the superheated rocks that had been blasted out of the crater. Vertical displacements are estimated to be on the order of 10,000 feet. This resulted in a large granitic conical structure surrounded by low permeability shale-dominated impact debris called Phanerozoic Clast Breccia (PCB).

The City has two wells drilled in the early 1900s that produce water from what appears to be a zone of brecciated granitic rock, called the Crystalline Clast Breccia (CCB) and a fractured pyroclastic flow material (the Pyroclast Unit). Recently Manson drilled four unsuccessful municipal wells within their city limits in an attempt to produce water from the same aquifer as their existing wells. The drilling results indicated that the existing conceptual model of the MIS was too simplistic to predict where viable aquifer units could be found.

We conducted a detailed gravity and magnetic survey from the Central Peak into the City limits which indicated the presence of smaller horst and graben type structures on the Central Peak that appeared to correlate with the presence of permeable CCB and Pyroclast units. TEM soundings were conducted at selected sites to confirm the location of the faults and the presence of permeable fractured units in the grabens. Three test well locations have been selected and drilling is expected to be completed in early 2018.