THE USGS FLYNN CREEK CRATER DRILL CORE COLLECTION: PROGRESS ON A WEB-BASED PORTAL AND ONLINE DATABASE FOR THE PLANETARY SCIENCE COMMUNITY. T. A. Gaither[1], J. J. Hagerty [1], and M. Bailen [1], [1]U.S. Geological Survey, Astrogeology Science Center, 2255 N. Gemini Drive, Flagstaff, AZ, 86001, email: tgaither@usgs.gov.

Introduction: Flynn Creek crater is a ~3.8 km diameter, >200 m deep, flat-floored impact structure that formed ~360 Ma in what is now north central Tennessee (36°17' N, 85°40' W) [1-4]. Between 1967 and 1979, USGS scientist Dr. David Roddy conducted a drilling program at Flynn Creek crater, which is an invaluable terrestrial analog for the study of planetary impact cratering dynamics [5,6]. The drilling program produced more than 3.8 km of nearly continuous core from 18 separate bore holes (**Figure 1**) [7]. These samples are now contained in 2,621 standard core storage boxes at the USGS in Flagstaff, Arizona.

Given the modern financial and logistical difficulties inherent in conducting thorough drilling campaigns at impact craters, and the importance of this unique geologic collection to investigations of terrestrial impact craters as planetary analogs, we are providing access to the USGS Flynn Creek Crater Drill Core Collection (FCCDCC) for the scientific community via a web-based portal and online database. This electronic, searchable, publicly available website and database will allow interested researchers to explore the drill cores and data, and request samples for their own investigations.

Here we report our progress on construction of this web-based portal and online database, including: 1) initial compilation of archive location codes, drill core numbers, and depth intervals for over 2600 core sample boxes into the project database, 2) digital conversion of original drilling documentation and ingestion into the project database, and 3) construction of the initial website for the web-based portal.

Flynn Creek Crater Geology: Detailed surface and subsurface studies indicate that the Flynn Creek impact structure is a complex, flat-floored impact crater, with a central uplift and terraced crater rim [1 – 4]. Confirmation of an impact origin for the Flynn Creek structure came in 1966 with the discovery of shatter cones in exposures of the central uplift [8]. Remnants of the ejecta blanket, which contains crudely inverted stratigraphy, are present within a large graben along the southern rim. The rocks involved in the deformation are Ordovician-aged carbonates (i.e., limestone and dolomite) that overlie crystalline basement [2].

Rationale for Preservation and Planned Work: Scientific studies at Flynn Creek crater during the 1960's and 1970's [1-2, 7-15] laid the groundwork for understanding structural deformation during marine target impact crater formation, but the cores have remained inaccessible and unstudied since that time. Recent advances in numerical modeling and analytical techniques for terrestrial impact crater analog studies have provided unprecedented details on the formation of complex impact crater morphology, impact melting of sedimentary targets, mineral shock metamorphism, and impact-induced hydrothermal activity at Flynn Creek crater. The potential for an impact-induced hydrothermal system at Flynn Creek crater isof considerable scientific interest because of the implications for the origin and evolution of life on early Earth[16-17], and possibly on Mars [18-20].

Preservation of this unique geologic collection and increased access to the samples by the scientific community will enable further detailed study of impact cratering processes and products (**Figure 2**). The website and online database are the first steps of a multi-year project whose overarching goal is to combine petrographic and microbeam imaging techniques, bulk rock and microbeam geochemical analysis, and numerical modeling to reconstruct the origin and evolution of Flynn Creek crater. This intentionally broad approach will use iterations between complementary techniques to address multiple, critical issues regarding the effects of carbonate melting, shock deformation, and impact-induced hydrothermal activity within the crater.

The USGS FCCDCC Web-based Portal and Online Database: Modeled after the USGS Meteor Crater Sample Collection web portal and online database (http://astrogeology.usgs.gov/facilities/meteor-crater-sample-collection), the USGS FCCDCC web-based portal and online database will facilitate the scientific community's access to this unique suite of geologic samples, data, and ArcGIS layers. The website will feature an interactive map of Flynn Creek crater with links to the drill core documentation and database, a downloadable ArcGIS package, and core sample request forms, such that researchers will be able to identify, request, borrow, and utilize samples and data from Flynn Creek crater.

Project Implementation: We have developed an Excel-based project database of descriptive information for the collection, currently consisting of drill core number, original core box number, archive location code, approximate latitude and longitude, drill core location in crater (central uplift, crater floor,

crater rim), and core depth interval for each of the ~2600 sample boxes. We have digitized the original drilling notes for drill holes 1-3 and are incorporating them into the database. Construction of the Flynn Creek interactive website has begun with a basic webpage (http://astrogeology.usgs.gov/facilities/flynn-creek-crater-sample-collection), providing geologic and historical information about the crater and drill core collection, and relevant references. The finalized website will contain an interactive map of the crater and surrounding terrain, with layers to view topographic and geologic maps, satellite imagery, and clickable icons for each drill hole that link to appropriate the database entries. A downloadable ArcMap package and sample request forms will be available for interested researchers.

As we move into the sample analysis task of our project, we will further document the condition of the drill cores, general lithologic descriptions, geologic unit designations, and types of macroscopic shock features, if present (shatter cones, brecciated minerals /clasts). SEM/microprobe images and data, thin section photomicrographs, and other information for the samples will be made available via the online database.

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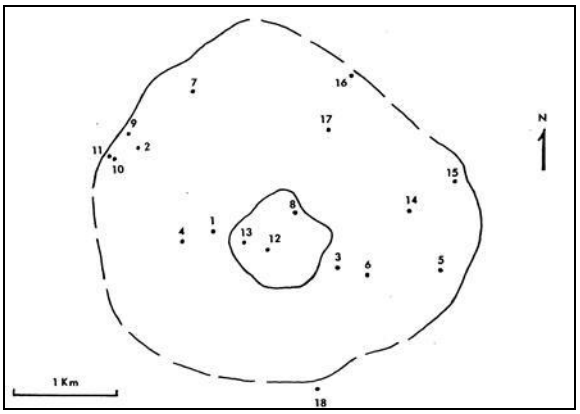

Figure 1. Drill hole locations of the 1967 and 1978-1979 USGS drilling campaigns at Flynn Creek crater. Outer line shows the location of the top of the crater wall and the inner line shows the location of the base of the central uplift. Figure modified from Roddy [7].

Figure 2. Impact breccia from drill hole number 7 (approximate depth 606 m), northwest portion of the crater (see Figure 1).