



## Final Technical Report

**Award Number:** G20AP00119

**Project Title:** Preservation of MGS Drill Cuttings Collection, Preliminary Inventory of Rescued Coal Cores, and Production of Maps to Support Critical Mineral Resource Identification in Maryland (2020-2021)

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**ABSTRACT:** In its thirteenth year as a recipient of a U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP) grant, the Maryland Geological Survey (MGS) conducted work on three projects aligned with FY2020 NGGDPP Program Priorities – *Priority 1*: preserve geoscience data and materials and *Priority 2*: identify critical minerals resources. The MGS received a no-cost extension for this grant due to restrictions to collection access related to COVID-19 and approval for a change in one co-principal investigator.

*Under Priority 1*, the MGS conducted two projects. *For Project 1A*, MGS repackaged 602 boxes of drill cuttings; performed a detailed inventory of these cuttings; populated an internal database with detailed metadata records; submitted updated NGGDPP-compliant metadata records to Registry of Scientific Collections (ReSciColl); and updated its online collection webpage and interactive Drill Cuttings Mapper. The MGS exceeded project objectives by completing an initial inventory of over 400 additional boxes of drill cuttings. *For Project 1B*, the MGS completed a detailed inventory of ~77 boxes of coal-related core and the data were recorded in a table in the internal core database. The inventory revealed ongoing core degradation that will need to be addressed to preserve the core. Attempts were made to correlate cores with borehole ID/location data from the West Virginia Geological Survey (WVGS) to the extent feasible, however this work is on-going; as a result, metadata is still in progress; once locations can be confirmed, the MGS will submit NGGDPP-compliant metadata to the ReSciColl; and update the MGS Land-Based Core Collection webpage and interactive mapper.

*For Project 2 (Priority 2)*, the MGS participated in a critical mineral regional workshop in September 2020; produced a map and geodatabase of approximate depth to consolidated rock beneath coastal plain deposits in Maryland; produced a map and geodatabase of well locations with deep borehole data and inventoried borehole material in-house at the MGS; and 4) submitted NGGDPP-compliant metadata to a Maryland Critical Mineral Data Collection ReSciColl webpage describing the maps and posted information on the MGS website.

## INTRODUCTION

In 2008, in response to financial incentives offered by the USGS NNGDPP, the Maryland Geological Survey (MGS) began to address the long-term preservation of its data and collections in a formalized, systematic way. With successive NNGDPP funding, the MGS has made strides in preserving its geoscience collections. The MGS FY2020 NNGDPP grant activities included three projects that focused on: the preservation of two groups of geologic materials; and the compilation of Maryland critical minerals data via maps and geodatabase components.

## GRANT GOALS AND RESULTS

The goals and results for each FY2020 NNGDPP grant project are described below. Results include a summary of accomplishments, challenges, and impediments.

### **Project 1A – Preservation of MGS Drill Cuttings Collection**

Project 1A built upon activities to preserve the drill cuttings collection that were conducted during the FY2017 - FY2019 NNGDPP grant cycles.

**Goals:** 1) Re-house ~600 boxes of drill cuttings; 2) perform a detailed inventory of these materials; 3) populate the internal cuttings database with detailed metadata records; 4) submit updated NNGDPP-compliant metadata to the ReSciColl (former National Digital Catalog, NDC); and 5) update its online Drill Cuttings Collection webpage and interactive mapper.

### **Results:**

***Storage Container Remediation:*** The MGS remediated 602 boxes of drill cuttings in varying degrees of deterioration. Originally, boxes of differing quality contained cutting samples in a variety of container types, most commonly ~20-50 paper envelopes/box. As needed, cuttings were transferred to new cuttings paper envelopes. All envelopes were placed in plastic bags (protective sleeves), organized by depth, and put into new heavy, corrugated cardboard boxes, as appropriate. All information from the original containers was transferred manually onto the replacement storage boxes and/or envelopes.

***Detailed Inventory and Borehole Location Identification:*** The MGS staff completed a detailed inventory of the 602 boxes of drill cuttings being re-packaged. Efforts to identify borehole locations for the cuttings was coincident with the inventory process. Many boxes had limited site location information on them, making it difficult to cross reference the cuttings to a borehole location and determine coordinates. In contrast, the MGS staff exceeded expectations in the inventory portion of the project by conducting a preliminary inventory and borehole location search for an additional 447 boxes of cuttings.

Despite the challenges of identifying and locating the source boreholes, the MGS successfully correlated 701 boxes of drill cuttings to 246 unique borehole locations. Work is on-going to determine borehole locations for the remaining boxes. Thanks to successive NNGDPP grants, MGS has inventoried over 3,000 boxes of drill cuttings containing over 64,900 envelopes to date.

***Detailed Internal Database Records:*** The MGS updated its internal drill cuttings database to Access Microsoft 365 (MSO Version 2110), (*Cuttings\_Inventory\_Database\_120519*). This database is split into front end (FE) and back end (BE) components to allow multiple users to perform inventory and data entry on different boreholes concurrently. In the inventory table, *CuttingsInv\_SIMPLE\_Table\_120519*, each cuttings box was entered as a separate record. Each record captures extensive information about the box and contents including, but not limited to, information on sample IDs/aliases, container(s), sample depths, storage location at the MGS and related data sources. When cuttings from multiple drilling sites were found together in one box, a unique record was created for each using the Bx\_SiteIDNum field.

Geographic location information is stored primarily in the *BoreholeCoordinates* table, which was updated as part of this project. This table contains geospatial coordinates for NGGDPP metadata as well as the original coordinates; their source, projection, and accuracy; and the method of coordinate conversion. The *BoreholeCoordinates* table links to the cuttings inventory table via the *db\_BholeID* field in a one-to-many relationship.

**Updated Metadata Submission to the ReSciColl:** With the new format for NGGDPP metadata, the MGS needed to rebuild the previous cuttings collection metadata into to new format so that metadata for work completed during this project period could be added. Updated NGGDPP-compliant metadata for the Drill Cuttings Collection was submitted to the ReSciColl:

<https://www.sciencebase.gov/catalog/item/4f4e4a94e4b07f02db658d7f> .

**Drill Cuttings Collection Webpage and Drill Cuttings Mapper Update:** The MGS is in the process of updating the webpages for the drill cuttings collection and the interactive mapper with information for the newly inventoried cuttings boxes. The collection webpage provides general collection information along with links to the interactive mapper, an Excel table of cuttings metadata, the collection webpage on the ReSciColl, and instructions on how to make an appointment to access the collection ([http://www.mgs.md.gov/publications/mgs\\_data\\_preservation/drill\\_cuttings.html](http://www.mgs.md.gov/publications/mgs_data_preservation/drill_cuttings.html)). The interactive mapper allows users to click on a borehole location and a summary of cuttings available and links to relevant online publications or data. These webpages help increase the collection's visibility and promote public awareness of and access to the collection.

### **Project 1B: Preliminary Inventory of Rescued Coal Cores**

The cores involved in this project were old coal exploration cores from which coal intervals had been removed. Cores were at risk of loss due to threat of disposal and were rescued with help from colleagues at the WVGS.

**Goals:** 1) complete a detailed inventory of ~77 boxes of coal-related core; 2) correlate core samples with borehole ID/location data from the WV Geological Survey (WVGS) to the extent feasible; 3) populate the internal core database with detailed metadata records; 4) submit NGGDPP-compliant metadata to the ReSciColl; and 5) update the MGS Land-Based Core Collection webpage and interactive mapper with the new inventory.

### **Results:**

**Detailed Inventory:** The MGS staff completed a detailed inventory of ~77 boxes of core. In general, most of the coal intervals had been removed and the core represents the bedrock above and below coal seams. Information on the condition of the cores was recorded during the inventory. *NOTE: during the inventory process, it was observed that there appears to be some ongoing alteration/degradation of core particularly in intervals that may contain sulfur. The MGS intends to reach out to others in the NGGDPP community to ascertain potential best practices for arresting this problem and preserving the cores.*

**Borehole Location Correlation and Records Integration:** This work is ongoing; the correlation of locations with boreholes and logs has proved to be more difficult than anticipated.

**Metadata and Online Information:** Due to the challenge of getting accurate locations for the boreholes, the metadata and online mappers have not yet been updated because they rely on having coordinates associated with these materials. This work is on-going but will be posted with updated metadata for the entire land-based core collection per the new NGGDPP metadata protocols.

## **Project 2 – Compilation of MD Critical Mineral Resource Data**

**Goals:** 1) attend a critical minerals workshop; 2) produce a map and geodatabase of approximate depth to consolidated rock beneath coastal plain deposits in Maryland; 3) produce a map and geodatabase of well locations with deep borehole data and inventoried borehole material in-house at MGS; and 4) submit NGGDPP-compliant metadata to a Maryland Critical Mineral Data Collection ReSciColl webpage describing the proposed maps.

### **Results:**

***Critical Minerals Workshop:*** MGS staff prepared for and participated in a critical minerals workshop in September 2020.

### ***Production of Map of Depth to Consolidated Rock Beneath Coastal Plain Deposits in Maryland:***

The MGS produced two 1:500,000 scale maps in digital and GIS formats one depicting the approximate elevation of pre-Cretaceous basement rock beneath coastal plain deposits in Maryland and another of select well locations and associated well data. Geodatabases associated with the digital maps were generated in the GeMS standard. The maps and supporting GIS files are available MGS on the website. To feature these maps and geodatabases compilation products a new collection page titled “Collection of Data Related to Critical Mineral Occurrence in Maryland” was created on the MGS website.

***Metadata Submission to the ReSciColl:*** MGS submitted information and NGGDPP-compliant metadata that describes the two maps and how to access the maps and compiled data.

## **CHALLENGES AND IMPEDIMENTS**

The MGS experienced some significant challenges during the COVID-19 pandemic. Access to collections were at this time quite restricted. In addition, there were some major changes in the MGS staff which affected the teams involved on NGGDPP projects. The MGS appreciates the accommodation that the USGS provided by approving a no-cost extension so that we could strive to complete work on materials and data preservation.

## **USER SUCCESS STORIES/SOCIETAL BENEFITS**

Online and digital data are becoming increasingly valuable as physical access to the collections by the public was challenging as a result of COVID-19 precautions, which impacted a large portion of the reporting period. In addition, as a result of adaptations by the public and researchers during the pandemic, there is a greater interest in digital records and remote access. As part of this grant, information on collections continued to be updated both on the ReSciColl and the MGS webpages.

Use of cuttings and core collection by MGS geologists continued. These collections are of particular interest to MGS geologists working on quadrangle geologic maps and stratigraphy, including work on a project to identify and resolve Mid-Atlantic Coastal Plain stratigraphic conflicts. Because the MGS has inventoried cuttings and core from many of the counties along the Maryland-Delaware line, they can be easily located and used for comparison with cores from the Delaware Geological Survey. Preservation of the collections helps leverage the time- and cost-savings of using existing materials to more fully these investigate geologic issues.

## **CONCLUSIONS**

The MGS FY2020 NGGDPP grant activities included work on three projects focused on: the inventory and preservation of drill cuttings, the inventory of rescued core; and the compilation of critical minerals data into two maps with associated geodatabases. For its Drill Cuttings Collection, the MGS continued its detailed

inventory and re-packaging– completing the fourth cycle of a multi-year effort to properly document, organize, and store the collection. To date the MGS has inventoried over 3,000 boxes of core; this grant cycle the MGS was able to fully inventory and preserve over 600 boxes of cuttings and perform a preliminary inventory over 400 more. As a result over 700 boxes of core were geospatially tied to borehole locations. Related NGGDPP metadata (for child items) was updated in the RESciColl following the current metadata format. The MGS completed an inventory of rescued coal-related core. The core inventory revealed the coal-related cores' apparent vulnerability to geochemical(?) alteration that will require further investigation to determine best practices for preservation. The MGS intends to reach out to others in the NGGDPP community for input. The coal core inventory needs to be tied to borehole coordinates and metadata and online mappers will be updated once that is complete.

The MGS participated in the Critical Minerals workshop during 2020. Information on critical minerals in Maryland was compiled and submitted as proposed. The “Collection of Data Related to Critical Minerals in Maryland” page on ReSciColl was updated to provide information on the maps and information about the collection and the maps are posted on the MGS website at:

[http://www.mgs.md.gov/publications/mgs\\_data\\_preservation/critical\\_minerals.html](http://www.mgs.md.gov/publications/mgs_data_preservation/critical_minerals.html)