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Final Technical Report

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Project Title: National Digital Catalog (NDC) Metadata Updates, Preservation of MGS Drill Cuttings Collection, Preliminary Inventory of Rescued Guilford Materials, and Compilation of MD Critical Mineral Resource Data (2019-2020)

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ABSTRACT: In its twelfth 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 four projects aligned with three FY2019 NGGDPP priorities: *Priority 1*: update National Digital Catalog (NDC) records; *Priority 2*: preserve geoscience data and materials; and *Priority 3*: identify critical minerals resources. MGS received a no-cost extension for this grant due to restrictions to collection access related to COVID-19.

For Project 1 (Priority 1), MGS fulfilled its grant objectives by reviewing existing records for the 37 MGS collections residing on the NDC and updating descriptions and metadata, as appropriate. MGS revised several collection names to better reflect contents and updated collection descriptions.

Under Priority 2, MGS conducted two projects and participated in the Data Rescue and Preservation Workshop, in September 2019, in Golden, CO. To fulfill grant objectives for *Project 2A*, MGS purchased supplies for and repackaged 752 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 NDC; and updated its online collection webpage and interactive Drill Cuttings Mapper. *For Project 2B*, the MGS met grant objectives of conducting a preliminary inventory of core and cuttings boxes rescued in the autumn of 2018 from a deteriorating storage garage; however due to container fragility, a full identification/inventory of all items could not be completed. Further inventory will need to be coordinated with careful repackaging.

For Project 3 (Priority 3), MGS fulfilled its grant objectives by participating in a critical mineral regional workshop in September 2019; identifying, compiling, and as needed, digitizing data related to critical minerals in Maryland; providing an Excel template and digital map(s) summarizing available data and areas with critical minerals potential; and creating a collection page on the NDC describing information about Maryland's critical mineral resources.

INTRODUCTION

In 2008, in response to financial incentives offered by the USGS NGGDPP, the Maryland Geological Survey (MGS) began to address the long-term preservation of its data and collections in a formalized, systematic way. With successive NGGDPP funding, the MGS has made great strides in preserving its geoscience collections. The MGS FY2019 NGGDPP grant activities included four projects focused on: an update of NDC records; the preservation of two groups of geologic materials; and the compilation of Maryland critical minerals data.

GRANT GOALS AND RESULTS

The goals and results for each FY2019 NGGDPP grant project are described below. Results include a summary of accomplishments, challenges, and impediments.

Project 1 – NDC Metadata Updates

Goal: ***Review metadata records for the 37 MGS collections currently residing on the NDC; delete any previous entries that no longer serve a purpose; and update collection information for remaining entries.***

Result: ***NDC metadata update for MGS collections***.
The MGS reviewed the collections residing on the NDC. No previous entries were deleted; however, a number of collections were retitled to convey collection content more clearly and to better group some related collections. These changes should help increase findability. Collection summaries were updated as necessary to better describe the collection and its status. Contact information, related external resources, material request information and additional information were updated or revised as appropriate. For some collections, there is NDC metadata for child items in the collection as well as older metadata about the overall collection itself. Both files were retained for now because each provides different information about the collection. For many collections, a detailed inventory has not been completed and there are no child items documented via an NDC metadata file yet. Note that one new collection, *Collection of Data Related to Critical Minerals in Maryland*, was added through Project 3 of this grant.

Project 2A – Preservation of MGS Drill Cuttings Collection

Project 2A built upon activities to preserve the drill cuttings collection that were conducted during the FY2017 and FY2018 NGGDPP grant cycles.

Goals: ***(1) Purchase supplies to re-house ~750 boxes of cuttings; (2) re-house ~750 boxes of drill cuttings; (3) perform a detailed inventory of these same ~750 boxes of drill cuttings; (4) populate an internal database with detailed metadata records; (5) submit updated NGGDPP-compliant metadata records to NDC; and (6) update the MGS online Drill Cuttings Collection webpage and interactive Drill Cuttings Mapper.***

Results:
Supplies Purchased: To complete re-packaging of 752 boxes of cuttings, the MGS purchased 500 heavy, corrugated cardboard boxes and 20,000, 2-mil plastic bags. These were used with existing supplies and materials at the MGS including thousands of drill cuttings paper envelopes.

Storage Container Remediation: The MGS remediated 752 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 752 boxes of drill cuttings. 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. Despite this challenge, the MGS successfully correlated 648 boxes of drill cuttings to 222 unique borehole locations. Work is on-going to identify borehole locations for the remaining 104 boxes. Thanks to successive NGGDPP grants, MGS has inventoried over 1,999 boxes of drill cuttings containing over 43,500 envelopes to date.

Detailed Internal Database Records: The MGS updated its internal drill cuttings database to Access Microsoft 365 (MSO Version 2110), (renamed *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 NDC*:** Updated NGGDPP-compliant metadata for the Drill Cuttings Collection was submitted to the NDC:
https://www.sciencebase.gov/catalog/item/4f4e4a94e4b07f02db658d7f .

Drill Cuttings Collection Webpage and Drill Cuttings Mapper Update: The MGS updated 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 NDC, and instructions on how to make an appointment to access the collection (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 2B – Preservation of MGS Drill Cuttings Collection

Goals: ***Perform a preliminary inventory of approximately 100 core boxes and 260 cuttings boxes rescued from a deteriorating storage facility in 2018.*** Specifically, MGS proposed to (1) create an internal MGS Guilford database consisting of data fields useful to collection users and required for inclusion to NDC; (2) perform a detailed inventory and internal database records of the core and cuttings; (3) research borehole IDs and geographical locations of the source boreholes; (4) identify cores/cuttings in deteriorating boxes/envelopes that require storage remediation; and (5) submit NGGDPP-compliant metadata records to NDC.

Results: ***Preliminary Inventory of Core and Cuttings Rescued in 2018***

The MGS set up an internal database with tables for collection inventory and conducted a preliminary inspection and inventory to identify contents to the extent feasible. Nearly all of the cores and cuttings will require storage remediation. Preliminary research on some borehole IDs and geographical locations was undertaken for IDs that could be identified. The fragility of most containers prevented thorough examination, identification, and detailed inventory; some of these steps will need to be revisited coincident with repackaging (which was not proposed as part of this grant but is underway as part of a subsequent NGGDPP grant).

Nevertheless, the preliminary inventory did provide some key insights to the materials. It appears that core and the cuttings in this collection would be best integrated in the respective drill cuttings and land-based core collections of the MGS – rather than be a separate collection. Cuttings appear to be largely from deep boreholes/wells in western Maryland; core is mainly rock core west of the coastal plain. Due the collection's overall condition which limited the detailed inventory, NGGDPP-compliant metadata could not be completed for these materials in the grant period. Once the detailed inventory is completed, it will be used to create NDC metadata to be incorporated into the appropriate collections.

Project 3 – Compilation of MD Critical Mineral Resource Data

Goals: ***Support the identification and prioritization of focus areas for critical minerals.*** Specifically, the MGS proposed to (1) participate in a critical mineral regional workshop; (2) identify and provide digital published and unpublished mineral resource information for critical minerals that may have geologic potential in Maryland; (3) describe data types available for critical mineral deposits/occurrences and provide data to USGS in the provided Microsoft Excel template; (4) identify and provide in digital formats available drill core data and information for areas with the potential for hosting critical minerals; (5) provide a map in GIS and digital formats summarizing occurrence potential of critical minerals in Maryland together with supporting references; and (6) submit metadata to the NDC describing Maryland's critical mineral resources.

Results: The MGS participated in a regional two-day critical minerals workshop in September 2019 and compiled mineral resource information related to the occurrence potential of critical minerals in Maryland. The compilation included available published and unpublished materials (e.g., reports, maps, field notes, databases, data files). Information was cataloged on a spreadsheet with fields for title, author, publication date, subject location, authoring agency, and list of critical minerals. Publicly available drill core data (digital and paper records) were compiled in spreadsheets with fields for well location, date drilled, total depth, formations

encountered and unit depths. Relevant materials that had not been digitized were scanned. Relevant maps were georeferenced in ArcMAP. Digital copies (georeferenced where applicable) are available either directly via the MGS website or upon request.

As required, early in the project, a preliminary summary of information related to existing or potentially occurring critical minerals in Maryland was assembled digitally in a USGS-provided Microsoft Excel template, the Mineral Resource Data Form, and submitted to Nick Karl, the specified USGS contact. The MGS also produced a 1:1,000,000 scale, 11" x 17" map in digital and GIS formats that summarizes known and potential occurrences of critical minerals in Maryland.

A new Collection of Data Related to Critical Minerals in Maryland was established on the NDC: (https://www.sciencebase.gov/catalog/item/611e8ebfd34e40dd9c019c8f?community=National+Digital+Catalog). The webpage provides downloadable copies of Maryland's Mineral Resource Data Form, the spreadsheet of compiled reference materials and metadata.

USER SUCCESS STORIES/SOCIETAL BENEFITS

Online and digital data have become all the more valuable as physical access to the collections by the public was essentially eliminated as a result of COVID-19 precautions, which impacted most of the reporting period. As part of this grant, information on collections continued to be updated both on the NDC 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 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 FY2019 NGGDPP grant activities included work on four projects focused on: an update of NDC records; the inventory and preservation of two groups of geologic materials (drill cuttings and 2018 rescued materials); and the compilation of critical minerals data. Existing NDC records of Maryland collections were reviewed and updated. Many collections have yet to be inventoried so there is no item level metadata. For its Drill Cuttings Collection, the MGS continued its detailed inventory and re-packaging– completing the third year of a multi-year effort to properly document, organize, and store the collection. Related NGGDPP metadata (for child items) was updated in the NDC. The preliminary inventory of materials rescued from Guilford storage in 2018 underscored their fragility, but also revealed they should be integrated into relevant existing cuttings and core collections. Due to container fragility, a detailed inventory will need to be coincident with re-packaging; the corresponding NDC metadata will be created at that time. Information on critical minerals in Maryland was compiled and submitted as proposed. A new "Collection of Data Related to Critical Minerals in Maryland" page containing summary information and data compilation files was set up on the NDC.