Award Information

Title of FY 2023 Proposal: 2023-2024 Maryland Data Preservation: Drill Cuttings-Washed Subsamples, Digital Borehole Geophysical Logs, Chesapeake Bay Bay-bottom Geophysical Data, and Critical Minerals Samples

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Abstract

The Maryland Geological Survey proposed four projects for the U.S. Geological Survey National Geological and Geophysical Data Preservation Program fiscal year 2023. Three projects focused on the Program's Priority 1; one project focused on Priority 3.

Priority 1 - Preservation of geoscience data and materials

The purpose of the three Priority 1 projects was to preserve select collections of physical geologic samples and digital geophysical data and increase accessibility of these collections for future use. Project 1A preserved vials of washed rock chips and sediments from subsurface drilling ("drill cuttings"). The project included replacing storage boxes and vials, as needed, inventorying samples, and determining the locations of the source boreholes. Project 1B involved inventorying digital geophysical logs and determining source borehole locations (and key publications, if applicable). Project 1C cataloged existing Chesapeake Bay bay-bottom geophysical digital data, rescued digital data initially stored on CD/DVDs, consolidated digital files onto servers that are then redundantly backed up on external hard drives, and identified general areas of coverage. Project 1C data, collected between 2002-2022, consists of raw side-scan sonar and sub-bottom seismic survey data that are collected concurrently. For all three Priority 1 projects, the Maryland Geological Survey completed detailed inventories. Deliverables included information about the collections submitted to the online Registry of Scientific Collections (ReSciColl) for the national program as well as detailed summary data and finding aids on the Maryland Geological Survey website. These projects preserved, identified, and promote collections that would be costly to recollect and that contain valuable subsurface information key to the increased understanding of Maryland's geologic resources. Intended beneficiaries include industry, consultants, government agencies (federal, state, and local), the academic community, and the public, who currently use collections and data held by the Maryland Geological Survey in a variety of projects.

Priority 3 - Critical Minerals Data Preservation

The purpose of the Priority 3 project was to generate geochemical analytical data from select rock samples in areas that may contain critical minerals. For Priority 3, the Maryland Geological Survey

prepared 50 samples for analysis by the U.S. Geological Survey, which is providing analyses for major elements and a select 60-element list to support minor and trace element analyses including the rare earth elements. Maryland samples came from existing collections and are representative of Piedmont locations identified as having potential for hosting critical minerals. The Maryland Geological Survey prepared an inventory of the samples, their source location and description. Deliverables included metadata about this collection, which was submitted to the ReSciColl and linked to the Maryland Geological Survey's collection webpage. It is expected that this sample collection information will link to the laboratory data when available. This project contributes to the understanding of critical mineral resources in Maryland and the U.S. Intended beneficiaries include industry, consultants, government agencies (federal, state, and local), the academic community, and the public.

Preservation Activity Summary

The goals and results for each FY2023 NGGDPP grant project are described below. Results include a summary of accomplishments, challenges, and impediments; some complications and challenges are noted separately. Table 1 summarizes some of the deliverables proposed and delivered with the links to the ReSciColl collection and related MGS webpage(s)/finding aid(s), if applicable.

PROJECT 1A – Preservation and Inventory of Drill Cuttings – Washed Subsamples

Goals: 1) Remediate ~236 boxes containing thousands of glass vials of washed subsamples of drill cuttings; 2) perform a detailed inventory of these items; 3) identify/confirm borehole identifiers (IDs) and coordinates; 4) create and submit updated NGGDPP-compliant metadata to the Registry of Scientific Collections, ReSciColl (former National Digital Catalog, NDC); and 5) update MGS collection webpages.

Results:

Storage Container Remediation: The MGS remediated 232 boxes and >16,000 vials of washed cuttings. Boxes and vials in varying degrees of deterioration and of a variety of sizes, were assessed so that custom replacements were in-house at the start of the work (not purchased as part of this project). Custom boxes were replaced as needed. Cuttings from cracked/broken glass vials were transferred to new vials as appropriate. All information from the original containers was transferred manually to the labels of replacement storage boxes and/or vials. All boxes received new top and side labels. Vials were packed with protective foam pieces as needed to minimize potential for future breakage.

Detailed Inventory: MGS staff created a new inventory table in order to effectively record the unique characteristics of this subset of drill cuttings. A detailed inventory for the 232 boxes and associated vials was completed by entering information about the borehole/site ID, vial depth ranges, and condition and type of each container, storage location. The table entries were reviewed for accuracy and completeness.

Borehole ID/Location Research: Efforts to confirm borehole IDs were coincident with the inventory process and built upon some of the preliminary inventory work of the previous grant. Confirmation of borehole locations/coordinates are still in progress and need additional research.

Metadata Submission to ReSciColl: Due to the distinct storage and sample characteristics, a new ReSciColl collection was created (separate from the main drill cuttings collection) (link in Table 1). MGS is working with USGS to get the item-level metadata prepared and uploaded to ReSciColl.

MGS Collection Webpages: The Drill Cuttings Collection webpage was updated to include a summary of this subset of drill cuttings samples. The related mapper and links to ReSciColl will be updated once the item-level metadata is prepared.

PROJECT 1B: Inventory of Digital Borehole Geophysical Logs

Goals: 1) complete a general internal inventory of digital geophysical logs, their formats (scan, digital, LAS, txt formats etc.), types and groupings; (2) identify/confirm presence of borehole IDs and coordinates and identify data gaps; 3) consolidate collection components and backup digital components; 4) create and submit metadata to ReSciColl; 5) update an MGS collection webpage and geophysical log mapper.

Results:

File Assessment and Inventory Table Design: A general internal assessment of digital geophysical logs on network drives and individual computers (file locations, formats, types and groupings) was completed. The design of the collection inventory table used for paper logs was modified to effectively capture digital geophysical log inventory information; the design also took into account relevant aspects of existing related templates (e.g., USGS borehole template) and web applications/tables (e.g., USGS GeoLog Locator).

Detailed Inventory: A detailed systematic inventory of 4,239 files of digital geophysical logs was completed. Approximately 3,575 logs are from sites in Maryland; approximately 664 are from sites in surrounding states. The inventory captures information on the log header including but not limited to IDs, log types, depths (tops and bottoms of individual logs in the file), logging company/person, location of site, data type, log quality, and file location.

Borehole ID/Location Research: Efforts to confirm or identify borehole locations for the logs are still in-progress.

Metadata Submission to ReSciColl: A new ReSciColl collection was created for the digital geophysical logs however, some existing ReSciColl Collections of geophysical logs (legacy collections from early ScienceBase) need to be compared to, and possibly integrated with, this digital inventory and/or the paper log collection (inventory on-going). MGS is working to complete and upload item-level metadata.

Collection Webpage: MGS created a Geophysical Log Collection webpage that provides instructions regarding collection access. Note MGS's collection encompasses paper and digital logs.

PROJECT 1C: Inventory and Preservation of Chesapeake Bay Bay-bottom Geophysical Data

Goals: 1) collate CD/DVDs and other storage media (~70% are on rapidly deteriorating media) and datasets on external hard drives; 2) complete a detailed inventory of datasets and catalog relevant metadata associated with each survey; 3) create and submit the new collection-level and child-level metadata to ReSciColl; 4) transfer data on CD/DVDs to network storage and backed up with duplication on two external hard drives.

Results:

Inventory Database/Table Design: MGS project personnel designed a set of Access database tables and forms to ensure that the inventory process would effectively capture information associated with the surveys. The collection will continue to grow as ongoing and future geophysical surveys are completed so the collection database will facilitate continued inventory of the collection.

***Detailed Inventory & Data Table Entry*:** MGS staff completed an inventory of the surveys associated with the Chesapeake Bay Geophysical Data collection entering information about each survey including title, abstract/purpose, date, identifier(s), survey geographical location center, publication data, type(s) of data collected, instruments used, raw and processed data files, and total area. Each file was examined to determine if it was viable for preservation and checked for corruption. The inventory indicated 174 surveys had viable files; files per survey ranged from 1 to 760. Queries and sorting were used to check for duplicate records, errors, and omissions.

Data Storage: Digital survey data was organized and compiled into an appropriate file structure along with the inventory table. Files were transferred to network storage and transferred to two external hard drives for duplication and stored in separate locations. Depending on file sizes we plan to transfer to data shared network drive that is also backed up by the state.

Metadata Submission to ReSciColl: New collection and item-level metadata were prepared and uploaded (links in Table 1).

MGS Collection Webpage: A new collection MGS collection webpage was created which provides instructions regarding collection access. A link to the new ReSciColl collection page will be added to the MGS collection page, once available.

PROJECT 3 –Prepare and Submit Samples to USGS for Critical Mineral Geochemical Analyses

Goals: 1) select and prepare 50 samples from hand samples previous collected; 2) compile supporting documentation for samples; 3) ship samples for geochemical analysis to the USGS Analytical Chemistry Project; 4) prepare and submit collection and item-level metadata for ReSciColl; 5) create an MGS collection webpage.

Results:

Sample Selection and Preparation: 50 samples were selected and prepared for submission. Samples represent a subset of hand samples collected from ultramafic bodies and the surrounding bedrock during geologic mapping of Maryland's Piedmont.

***Supporting documentation*:** Locational and descriptive data were compiled. GPS locations with 10m accuracy, taken when the samples were collected, were used to generate latitude and longitude values for submission.

***Sample shipment*:** Shipment of samples to the USGS was coordinated and completed as planned in two sets of 25 samples each.

Metadata for the ReSciColl: Metadata was created for a new collection in the ReSciColl (see Table 1). MGS is working with the USGS lab on the item-level metadata due to the need to coordinate on the method(s)/IDs used to connect item-level metadata and laboratory results.

MGS Collection Webpage: MGS created a collection webpage that provides instructions regarding collection access and a link to the ReSciColl page.

Challenges and Impediments

Severe deterioration of some of the containers of cuttings inventoried in Project 1A required extra care to repackage, relabel and, with the poor legibility or limited original labeling, to cross-reference to boreholes. Project 1A was also affected by a staff shortage (health issues and ultimate retirement of a staff member assigned to the project required other staff to try to compensate). For Project 1B, the number and variety of logs within digital files added to the time required to inventory files. In addition some of the digital files of borehole geophysical logs did not contain detailed site information. As a result of these factors, some work to verify site location and determine coordinates for item-level metadata for these two collections (projects 1A and 1B) is still on-going.

Table 1. Deliverables proposed and delivered (goals and accomplishments) with the links to the ReSciColl collection and related MGS webpage(s)/finding aid(s), if applicable.

ProductsDelivered	TotalInventory	AsProposed	AsDelivered	Collection	Website
Drill Cuttings-Washed Subsamples (preservation + inventory)	≥232 boxes (~70-90 vials/box)	~236 boxes (~70-90 vials/box)	232 boxes, >16,000 vials	Drill Cuttings-Washed Subsamples from Garrett County	http://www.mgs.md.gov/publications/mgs_data_preservation/drill_cuttings.html
Borehole Geophysical Logs - Digital (inventory)	>4,239 files (≥1 log/file)	Not specified?	>4,239 files (≥1log/file)	Geophysical Logs - Digital	http://www.mgs.md.gov/publications/mgs_data_preservation/geophysical_logs.html
Chesapeake Bay Bay-bottom Geophysical Data Collection (inventory of rescued surveys)	> 186 surveys	~186 surveys	174 surveys (pre 2024)	Chesapeake Bay Bottom Geophysical Data	http://www.mgs.md.gov/publications/mgs_data_preservation/bay_bottom_data.html
Critical Minerals-Maryland Rock Samples for Geochemical Analyses	≥50 samples	50 rock samples (from existing collections)	50 rock samples submitted	Critical Minerals-Maryland Rock Samples Analyzed for Geochemistry	http://www.mgs.md.gov/publications/mgs_data_preservation/critical_mineral_samples.html

Success Story

In early 2024, the Maryland Geological Survey (MGS) utilized NGGDPP funds to catalog acoustic bottom mapping data from the Chesapeake Bay. The collection encompasses raw and processed side-scan, sub-bottom, and bathymetric data. Initially, project data existed as digital files stored on a network location and several hundred physical CDs kept in binders. These CDs were copied to an internal network, and backup copies made to external drives. To enhance data accessibility, an Access database was created to

track the locations and metadata of each survey and its associated files. This system facilitates more efficient searching through the collection to locate specific survey data by area of interest. Additionally, survey extents and relevant data were visualized in an ArcGIS map file and geodatabase for intuitive data retrieval. Examples of the types of data cataloged and how data may be applied and used are shown in Figure 1.

The historical data proves crucial in monitoring changes in bay floor conditions. In late March 2024, following the collapse of the Francis Scott Key Bridge, debris became lodged in the bottom of the lower Patapsco River, which connects the Port of Baltimore to the Chesapeake Bay. As various cleanup methods were evaluated, MGS received a request for relevant river- and bay-bottom data. Due to recent cataloging of the geophysical bay-bottom data, MGS was able to quickly respond. While MGS did not have historical geophysical data specifically underlying the bridge area, historical side-scan survey data were available from upstream in the Baltimore Harbor and the immediate downstream approach to the bridge crossing area, which offer valuable insight to the bay bottom structure. The cataloging process and database creation ensured timely response and access to storage locations and available datasets, supporting the cleanup effort.

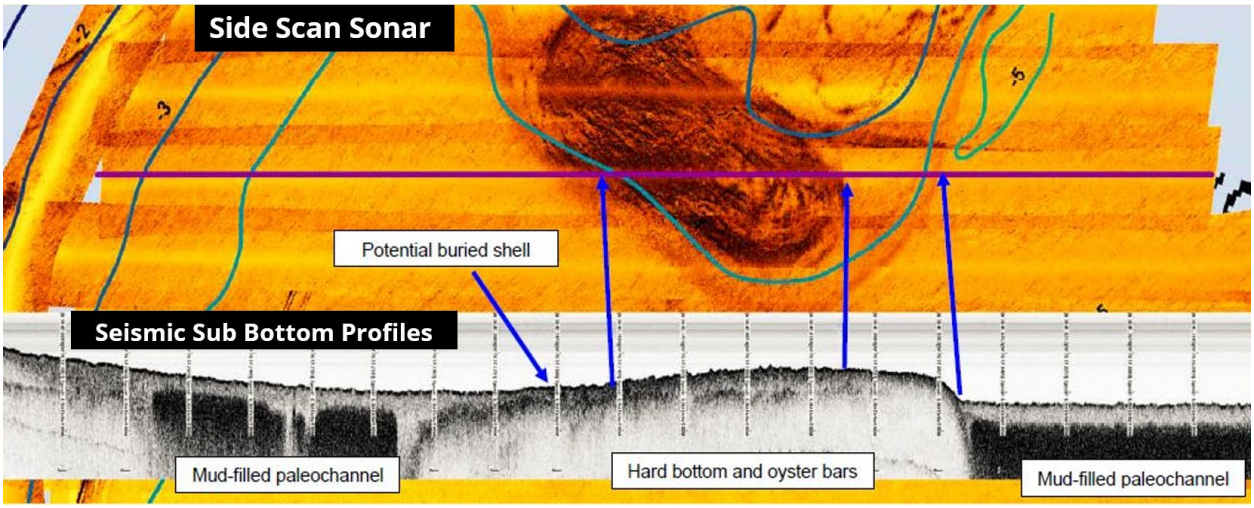

Figure 1. Examples of the types of data collected and how data may be applied and used subsequently