



## **Preservation of MGS Aerial Photograph and Land-Based Core Collections (2016-2017)**

by

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**ABSTRACT:** The Maryland Geological Survey (MGS or “the Survey”) shares the concerns of other agencies and organizations engaged in geological research – that geoscience collections and data are valuable in their own right, beyond the lifetime of the projects during which they are collected or acquired, and that special efforts are required to preserve them and ensure their accessibility. In this, its ninth year as a recipient of a U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP) grant, MGS completed two separate projects aimed at furthering the preservation of its 1) aerial photograph collection; and 2) land-based (rock and/or sediment) core collection.

*During the first project*, MGS fulfilled its grant objectives by 1) creating digital infrastructure of (i.e. scanning) approximately 1,250 9-inch by 9-inch assorted aerial photographs dating from the 1940s, 1950s and 1970s; 2) updating digital infrastructure by performing a comprehensive quality assurance/quality control (QA/QC) review of approximately 5,200 internal database records corresponding to the 1950s and 1960s county-based aerial photographs; 3) updating the National Digital Catalog (NDC) with these newly reviewed and amended metadata records; 4) rescuing data at risk by re-housing approximately 5,200 of the 1950s and 1960s county-based aerial photographs into appropriate archival boxes and folders; and 5) rescuing data at risk by transferring the re-housed photographs to a Maryland State Archives (MSA) facility for permanent storage. MGS scanned approximately 500 aerial photographs less than expected (these photographs were listed as “in stock” but in fact were missing from the collection). However, MGS completed a review of approximately 200 more database records than originally proposed, and transferred approximately 200 more photographs to MSA than proposed.

*During the second project*, MGS fulfilled its grant objectives by 1) designing and creating an internal land-based core database consisting of data fields useful to collection users and required for inclusion to NDC; 2) completing a detailed inventory of 250 unique cores with identifiable locations comprising the land-based core collection (approximately 1,110 unique core boxes/containers); 3) populating the internal database with detailed metadata records for the cores; 4) submitting these metadata records to NDC; and 5) creating a land-based core collection preservation plan to update MGS’s long-range data preservation plan.

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| <b>Acronyms and Abbreviations Used in This Report</b> |                                                               |
|-------------------------------------------------------|---------------------------------------------------------------|
| <b><i>Acronym/Abbreviation</i></b>                    | <b><i>Description</i></b>                                     |
| DPAP                                                  | Data Preservation Advisory Panel                              |
| EROS                                                  | Earth Resources Observation and Science Center                |
| JHU                                                   | The Johns Hopkins University                                  |
| MD DNR                                                | Maryland Department of Natural Resources                      |
| MD SHA                                                | Maryland State Highway Administration                         |
| MGS                                                   | Maryland Geological Survey                                    |
| MSA                                                   | Maryland State Archives                                       |
| NAPP                                                  | National Aerial Photography Program                           |
| NDC                                                   | National Digital Catalog                                      |
| NGGDPP                                                | National Geological and Geophysical Data Preservation Program |
| NWIS                                                  | National Water Information System                             |
| PI                                                    | Principal Investigator                                        |
| QA/QC                                                 | Quality Assurance/Quality Control                             |
| USDA                                                  | United States Department of Agriculture                       |
| USGS                                                  | United States Geological Survey                               |

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## **INTRODUCTION**

Geographically, Maryland is a relatively small state, with a land area of 9,844 square miles and a water area of 623 square miles. But, with a population of nearly 5.8 million people, it is the fifth most densely-populated state in the United States (589 people per square mile) (MGS, 2007; U.S. Census Bureau, 2010). Maryland straddles six geologically diverse physiographic provinces, from the Appalachian Plateau to the Atlantic Continental Shelf, and contains an extensive network of tidal streams and bays, most notably the northern Chesapeake Bay. The Atlantic Ocean forms its eastern border.

The Maryland Geological Survey (MGS) has been in existence since 1896. The types of geoscience collections held by MGS reflect its mission, as it has changed over the past 121 years. Current work is focused on the geologic and groundwater resources of the State. However, MGS has retained several collections from the past, when the interests of its staff and the needs of Maryland's citizenry differed from those of today. As a consequence of its longevity and the diversity of its activities, MGS possesses a wide array of holdings in a variety of formats. A summary of MGS's permanent collections and their preservation status is provided in Appendix 1.

Nine years ago, in response to financial incentives offered by the U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP), MGS began to address the long-term preservation of its data and collections in a formalized, systematic way. Prior to MGS's participation in the NGGDPP program, there were no MGS-wide provisions to preserve data and the Survey's catalog of collections resided mainly in the minds of its staff members and their individual files. Thanks to NGGDPP funding, MGS has made great strides in preserving its geoscience collections – including creating a long-range data preservation plan, digitizing paper collections, creating detailed metadata for collection items, and collaborating with data preservation partners to post digital collections online and provide long-term archival storage of collections. A brief overview of the preservation activities completed during the FY2008 – FY2015 NGGDPP grant cycles are summarized in Appendix 2.

MGS's FY2016 NGGDPP grant activities focused on two geoscience collections: 1) aerial photographs; and 2) land-based (rock and/or sediment) cores. A brief overview of these collections and their value and justification for preservation (including user success stories) are provided below to provide context for work completed. For the aerial photograph collection, FY2016 NGGDPP grant tasks built upon previous efforts to get components of this collection properly preserved, cataloged and available digitally. For the land-based core collection, FY2016 NGGDPP grant tasks addressed the need for a detailed inventory with digital metadata and geospatial information.

### **Aerial Photograph Collection**

#### **Overview**

MGS houses a large collection of historical aerial photographs of the State, most of which were

donated by the Maryland State Highway Administration (SHA) or its predecessors. This Aerial Photograph Collection currently consists of approximately 23,800 aerial photographs and photograph-mosaic index maps. To date, MGS has identified 10 components, or sub-collections, of the Aerial Photograph Collection. Please see Appendix 3 for a detailed description of these components.

Since the FY2010 NGGDPP grant cycle, MGS has worked to preserve the Aerial Photograph Collection by creating digital infrastructure (i.e. scanning), creating detailed metadata records, reviewing/updating the MGS internal aerial photograph database, and posting metadata records to the National Digital Catalog (NDC). MGS has also re-housed photographs into archival-quality folders and boxes, transferred thousands of photographs to a Maryland State Archives (MSA) climate-controlled facility for permanent storage, and collaborated with data preservation partners to post digital images online for public access.

During the FY2016 NGGDPP grant cycle, MGS focused on these three components of the collection:

#### *Component 1: County-Based Aerial Photographs*

The first component comprises the bulk of the Aerial Photograph Collection and consists of approximately 16,000 county-based, black-and-white, 9-inch by 9-inch aerial photographs (1:20,000 scale). Component 1 photographs were taken during the following time periods: 1937-1938, 1949, 1951-1953, 1957, 1961-1964, 1968, 1970-1972, 1979-1981, and 1983-1990. These photographs were usually flown or otherwise acquired by the U.S. Department of Agriculture (USDA), the USGS, or the private firm Air Photographics. USDA and USGS photographs were donated to MGS, mainly by SHA. MGS purchased the copyrighted Air Photographics photographs.

#### *Component 7: High-Altitude Infrared Photographs*

The seventh component is a special collection consisting of approximately 50 9-inch by 9-inch, high-altitude infrared aerial photographs dating from 1970-1974. These aerial photographs cover portions of Maryland and Virginia. The counties in Maryland covered by these photographs include Anne Arundel, Baltimore, Calvert, Carroll, Charles, Frederick, Harford, Howard, Montgomery, and Prince George's counties. The scale of these photographs is not printed on the photographs; however, MGS calculates the scale to be approximately 1:120,000 for the Series 74-039 photographs; approximately 1:140,000 for the Series 144-RC8-4L/5L photographs; and approximately 1:160,000 for the Series 72-209 photographs. The source agency of these photographs is unknown.

#### *Component 9: Washington, DC and Vicinity Aerial Photographs*

The ninth component, also a special collection, consists of approximately 1,300 9-inch by 9-inch, black-and-white aerial photographs from Washington, DC and vicinity dating from 1935-1939 and circa 1950. These photographs cover portions of Washington, DC, Maryland, and Virginia.

The scale of these photographs is not printed on the photographs; however, MGS calculates the scale to be approximately 1:20,000. The source agency of these photographs is unknown.

### **Collection Value and Justification for Preservation**

Aerial photographs depict land use and land cover at particular points in time. A time-series of such photographs can reveal detectable, measurable changes and trends in those patterns. Such photography is irreplaceable – once the flight date has passed, ground conditions on that date cannot be replicated or reconstructed. The Aerial Photograph Collection will only grow in usefulness, as land use continues to change, and as researchers and managers attempt to reconstruct past usage from these snapshots in time. Aerial photographs appeal to a wide audience and have broad potential usefulness.

Several examples of the photographs' usage are illustrative. One of Maryland's most prominent physical features is the Chesapeake Bay, the largest estuary in the country. The declining health of the bay over the past half century has been a cause of concern and intensive study among a myriad of federal, state, and local government agencies. One indicator of bay health is the acreage of the bay floor covered by submerged aquatic vegetation (SAV), which acts as a nursery for a number of aquatic species and buffers the shore from wave-generated erosion. To develop a baseline against which to measure more recent distributions of SAV, the Maryland Department of Natural Resources (DNR) used the 1951-1953 aerial photographs to delineate their historical distribution.

In another Chesapeake Bay-related example, a graduate student at a local university interpreted historical shorelines from aerial photographs flown along the bay shoreline of one of Maryland's coastal counties. The resulting digital shoreline vectors were used to calculate shoreline rates of change (i.e. erosion or accretion rates for individual shore-normal transects). Coastal planners, in turn, used the rates of change to determine shoreline stabilization strategies appropriate for reaches of shoreline subject to different wave energies (and erosion rates). For instance, "living" shorelines – such as the planting of marsh grasses – are generally recommended along shorelines subject to low (less than two feet/year) rates of erosion.

Historic aerial photographs are also useful to archeologists. They provide important information on the historic built landscape – not only buildings, but other, smaller features that are not often mapped, including small roads and fence lines. These features can be extremely useful in reconstructing old plats, as many of these features are vestiges of property boundaries that can go back hundreds of years. In fact, a researcher/writer from Calvert County, Maryland contacted MGS in 2017 to request digital scans to determine the historic location of county roads at various points in time. Another patron in 2017 requested aerial photographs of the Inner Harbor area of Baltimore City in order to determine the build/renovation history of a prominent downtown building.

In some cases, very specific information about historic activities can be gleaned from aerial photographs. For example, a 1950s-era aerial photograph showed the precise location of a Native American ossuary (mass burial) that was excavated in the early 1970s. This historic photograph enabled archeologists to determine the exact location of the original gravesite – circular areas of

disturbed soil from which remains were extracted during the original archeological dig – and to identify the current owner of the property. As part of a repatriation/reburial effort, inquiries were made of the property owner to ascertain whether or not the remains might be reinterred at the original excavation site.

The Aerial Photograph Collection has also been useful to a variety of non-government and government projects. These projects have included characterization of historic watershed conditions for stream restoration efforts. One stream restoration specialist recently told MGS that the historical aerial photographs “are so valuable to documenting historic conditions (land cover, channel alignments etc.). They are a great resource for these projects” (Traband, J., personal communication, August 3, 2017). Maryland state agencies continue to utilize the Aerial Photograph Collection as well. During 2017, the Maryland Park Service requested aerial photographs to research historic tree planting sites in a state park.

In addition to the intrinsic value of the aerial photograph collection, a number of other considerations led MGS to select it for documentation. First, with the exception of certain online collections, it is one of the Survey’s most frequently used collections. The MGS Library, home to the collection, is open to the public during afternoon business hours with an appointment. Many of the Library’s patrons request access to the aerial photographs.

Second, the collection is in need of rescue. Because of their age and popularity, the photographs are at risk of further damage due to excessive handling. Compounding that problem are the poor conditions under which the photographs are stored. Temperature and relative humidity in the MGS Library fluctuate widely with the seasons. Some of the photographs have become moldy or mildewed.

Third, at its annual meeting in September 2010, MGS’s Data Preservation Advisory Panel (DPAP) discussed the collections remaining to be documented in light of the then upcoming NGGDPP request for proposals. The consensus of the Panel was that, of the MGS collections yet to be documented, the aerial photographs were undoubtedly the collection of greatest interest to the broadest range of users. In addition, making such a collection more readily available to a wider audience might encourage greater support of data preservation efforts at the Survey. One of the Panel members, the director of the Delaware Geological Survey, attested to the widespread use of that state’s web-accessible aerial photographs by “not only...the geologic community, but land use people in state, county, local government, agriculture, emergency management agencies, coastal program staff, real estate industry, engineering and geological consultants, individual home owners, schools, etc.”

Fourth, the project supports a wider state effort to create an electronic archive of historical aerial photographs. Over the past several years, a number of Maryland state agencies have periodically discussed inventorying, scanning, and preserving historical aerial photography held by state and local governments. In creating NGGDPP metadata and digital infrastructure for its collection, MGS is contributing to this statewide effort.

In summary, the creation of metadata and digital infrastructure for its historical aerial photograph collection satisfies the criteria outlined in the *Long-Range Data Preservation Plan for the*

*Maryland Geological Survey* (Hennessee, 2009), advances the permanent preservation of a valuable collection, honors the considered opinions of an advisory panel that fosters data preservation at the Survey, and contributes to statewide efforts to create an online resource available to a broad user community.

## **Land-Based Core Collection**

### **Overview**

MGS has a number of distinct core collections. During initial cataloging of collections during the FY2008 NGGDPP grant cycle, cores were broadly separated into two groups: 1) cores collected on land; and 2) cores collected by boat from the Atlantic Ocean or the State's bays, lakes and rivers. For the land-based cores, an initial distinction was made between cores from the Coastal Plain and those from other physiographic provinces. This division was based on the assumption that Coastal Plain cores would be limited to unconsolidated or semi-consolidated sediment and core from other provinces would be solely rock material.

However, during the detailed inventory conducted during the FY2016 NGGDPP grant period, it became clear that the distinction between sediment and rock cores was not so sharply defined. Some Coastal Plain cores contain rock intervals (Mesozoic or Paleozoic bedrock) and some cores drilled in fractured rock areas contain unconsolidated sediment, saprolite and/or regolith. Therefore, during the FY2016 NGGDPP period, all of the cores collected from a land-based borehole were combined into one collection. This Land-Based Core Collection replaces and combines the separate Rock Cores and Sediment Cores, Coastal Plain Cores collections. This change is reflected in the MGS permanent collections table in Appendix 1 and is also being incorporated into MGS's long-range data preservation plan.

The Land-Based Core Collection currently consists of 266 unique rock and/or sediment cores obtained from wells and boreholes drilled primarily in Maryland. To date, 16 of these cores do not have corresponding location information. The majority of the cores were collected by MGS, many in cooperation with the USGS. Other cores were donated to MGS by other researchers, state agencies or geotechnical consultants. The cores are stored primarily in wooden or cardboard boxes of varying sizes. Some cores are also stored in other containers, such as metal or plastic sampling tubes. The condition of the containers varies from poor to suitable. Many of these cores are referenced in published MGS reports.

### **Collection Value and Justification for Preservation**

Preservation and cataloging of cores is important for a number of reasons. Cores may be useful for purposes other than those for which they were originally collected. For example, rock cores once drilled for conventional oil and gas exploration are now of interest in assessing the potential for carbon sequestration and/or natural gas recovery, due to new techniques of horizontal drilling, hydrofracturing, and possibly carbon dioxide injection. As new analytical techniques become available, they can be applied to existing cores, without the added cost of collection.

Cores are expensive to collect and may be unique and/or impossible to replace. Some of the cores in the Land-Based Core Collection were drilled many decades ago. Based on conversations with a large geophysical exploration company, MGS estimates that it would cost upwards of \$125/foot to re-drill a continuous rock core and between \$75-\$125/foot to drill to sample depth (for interval coring). Using these estimates, the cost to re-drill and recover a 7,600-foot core from the Marcellus Shale (a portion of which is currently in the MGS collection) could cost nearly one million dollars in 2016. Moreover, due to Maryland's recent land development and population growth, it may be impossible to re-drill cores from the same locations. Retaining and preserving Maryland cores may allow future geologists to make judgments or interpretations in areas where drilling is no longer feasible.

Society in general, and Maryland in particular, can benefit from 1) the results of investigations using existing sediment and/or rock cores; and 2) the time and cost savings of not conducting exploratory re-drilling. For example, MGS and its Midwest Carbon Sequestration Partnership (MRCSP) partners recently conducted geochemical analyses on samples of rock core from western Maryland in order to evaluate its potential for possible carbon sequestration. Because MGS had this deep rock core in its repository, MRCSP members could avoid the prohibitive time and cost to permit, contract and drill the core. The results of analyses, such as that described above, may help Maryland assess the relative potential for physical carbon sequestration in specific rock units in the state. This, in turn, can provide insight into long-term energy resource planning, usage, and policies related to greenhouse gases.

Despite this collection's value, little preservation work was conducted prior to 2016. A very general inventory of what we now call the Land-Based Core Collection was completed during the FY2008 NGGDPP grant cycle. A more detailed inventory of a portion of the collection (based solely on data mining from project spreadsheets and not visual inspection) was completed during the FY2009 NGGDPP grant cycle. During the FY2010 – FY2015 NGGDPP grant cycles, no additional inventory work was completed on the Land-Based Core Collection, and no additional detailed metadata records were created. Part of the challenge at the time was the core storage disarray that occurred when core was hastily moved to MGS from an off-site storage facility being condemned and closed. The move was completed by non-Survey staff and cores were not relocated in a logical order or for ease of access. In fact, many of the cores were stacked with their labels facing the wall. Since that time, additional cores have been added to the collection.

As a result, the Land-Based Core Collection needed detailed metadata records including an internal database with relevant information including, but not limited to, interval descriptions, core diameter, material description, coordinates, and a long-range core preservation plan. These activities align with MGS's *Long-Range Data Preservation Plan* by supporting the creation of an internal catalog, submission of the newly created metadata records to National Digital Catalog, and the formation of a long-term preservation plan to improve collection access and usability. By fully cataloging existing cores and providing metadata online, it is possible for all potential users to determine what is available in the collection. The land-based core collection should grow in usefulness and value as drilling costs continue to rise, land use continues to change, and potential users can leverage the savings from existing materials to more fully investigate geologic issues important to society.



## GRANT OBJECTIVES

The objectives of the FY2016 NGGDPP project, as outlined in the proposal, were as follows:

### *Project 1 – Creating/Updating Digital Infrastructure and Rescuing Data for MGS’s Collection of Aerial Photographs*

- Scan the remaining approximately 1,750 9-inch by 9-inch assorted aerial photographs dating from the 1930s, 1950s and 1970s that have not yet been scanned by MGS, its data preservation partners, or USGS Earth Resources Observation and Science (EROS) Center. These photographs include high-altitude infrared photographs from the 1970s (Component 7) and photographs of Maryland near Washington, DC from the 1930s and 1950s (Component 9);
- Continue the comprehensive database QA/QC effort (begun during the FY15 NGGDPP grant cycle) and finalize an additional approximately 5,000 internal database records for MGS’s collection of county-based aerial photographs (Component 1) dating from the 1950s – 1960s;
- Update NDC with these updated metadata records if warranted;
- Re-house approximately 5,000 county-based aerial photographs from the 1950s – 1960s into appropriate archival boxes;
- Transfer these photographs to an MSA facility for permanent storage; and
- Continue working closely with MSA, as well as JHU’s Eisenhower Library, to develop plans to make these digital images web-accessible.

### *Project 2 – Creating an Internal Database and Detailed Metadata for the MGS Rock Core Collection*

- Design and create an internal MGS rock core database consisting of data fields useful to collection users and required for inclusion to NDC;
- Perform a detailed inventory of the cores comprising the rock core collection;
- Populate the internal database with detailed metadata records for the rock cores;
- Submit these detailed metadata records to NDC; and
- Assess the overall preservation needs of the rock core collection and create a draft reorganization, labeling, and long-term storage plan.

The final objective consisted of submitting a final report to the NGGDPP describing the FY2016 goals and success in achieving those goals.

# **PRESERVATION METHODOLOGY**

## **Aerial Photograph Collection**

### **Digital Infrastructure**

#### Digital File Creation

MGS scanned aerial photographs with a Plustek OpticPro A320 Flatbed Scanner at a resolution of 1200 dpi in both JPG and TIF formats. The black-and-white photographs were scanned in grayscale, and the color infrared photographs were scanned in 24-bit color.

#### Digital File QA/QC

After each photograph was scanned and the resultant JPG and TIF files were created, MGS opened each file to verify its quality and check the name of the file against the flight /project series, film negative roll, and frame printed on the photograph. In addition, the scan date, filename, and file format were documented and the scan check box updated for the corresponding record in the pertinent table within the MGS internal database.

### **Metadata Development**

#### Database Creation

The MGS aerial photograph internal database has been revised and expanded over time with the inventorying and archiving process. The current version of the aerial photograph database is named *AirPhotoDB2014\_A2013\_10May2017.mdb* (Microsoft Access 2013). Some significant changes and additions to this database have occurred since MGS began inventorying its aerial photograph collection during the FY2010 NGGDPP grant cycle. A brief history and revision summary are provided for reference in Appendix 4.

#### Database QA/QC

The aerial photograph database QA/QC process was divided into primary and secondary phases. During primary QA/QC, MGS inspected each paper photograph, opened each photograph's corresponding JPG and TIFF scan file, and opened the photograph's corresponding metadata record in the internal database. MGS verified the image's quality and checked the name of the file against the flight/project series, film negative roll, and frame printed on the photograph. MGS's internal database contains many additional metadata attributes (beyond the required National Digital Catalog metadata attributes). MGS verified that all of the following internal database metadata fields were correctly filled out: County Name, Date of Photograph, IndexMapID, Index Sheet Number, Flight Series, Frame, Photograph Type, Photograph Scale, In Stock, Missing, Not In Collection, On Index, On AltCo Index, Scanned, Scan Date, File Name, File Location, DPI, File Formats, URL, Geographic Features, Cultural Location, Cultural Features, Source/Contractor, Use Restrictions, and Notes. Queries and sorting were used to

check for duplicate records, errors, and omissions. If any of the scans were currently available online, MGS added the appropriate URLs to the metadata record.

Secondary QA/QC was conducted during the photograph boxing effort (please see the “Photograph Storage Remediation” section on page 10). For each photograph, the information recorded and reviewed in the database included box and folder number, number of photographs per folder, and number of folders per box; as well as any photograph-specific information such as presence of a stamped scale, notations on the back of the photographs, and photograph condition issues. During this process, digital scans of each photograph were again verified (MGS did indeed discover several photographs that had not been scanned during previous years and these were promptly scanned). Additional details about the database QA/QC review effort are provided for reference in Appendix 4.

### NGGDPP Metadata Creation and Submission to NDC

In some ways, the information stored in the *AirPhotoDB2014\_A2013\_10May2017.mdb* database differs in content or format from the fields that comprise NGGDPP-compliant metadata. Inventory tables in the internal MGS database includes additional information pertaining to photograph condition, the physical and cultural features depicted on the photograph, the ID of the associated air photograph index map, the location of the photograph, etc. – fields not necessarily of interest to National Digital Catalog users. Additionally, NGGDPP metadata require that dates be reported in YYYYMMDD format, instead of the MM/DD/YYYY format employed in the Access database. Several NGGDPP metadata fields (including title, abstract, and coordinates) must be constructed, largely by concatenating fields in the internal MGS inventory tables.

MGS creates metadata for the National Digital Catalog with guidance from the *NGGDPP Metadata Preparation Guide* (01/2017). This guide, coupled with MGS-specific instructions for metadata preparation, included as an appendix in a previous report (Hennessee and Shelton, 2010), make metadata preparation fairly straightforward. The NGGDPP-compliant metadata tables are initially built and compiled within a MGS data preservation Access database. In general, MGS converts Access metadata tables to .csv-formatted files for upload to the NDC.

### Verifying Accuracy and Completeness of NDC Metadata

Once the metadata files were uploaded, MGS verified the completeness and accuracy of the uploads. To check completeness, MGS verified that the total number of records in each sub-collection, determined from the appropriate internal database table, matched the number received in the National Digital Catalog. Then, for a subset of records in each component submitted, MGS checked the accuracy of the upload by verifying that the content received in the National Digital Catalog matched the information in the corresponding internal database tables.

After verifying the accuracy and completeness of the metadata upload, MGS reviewed and, as needed, revised the associated information contained in the original summary description posted on the NDC collection webpage. MGS also corrected and updated its internal collection descriptions and permanent collection table. These steps are necessary for one or more reasons. First, the exact number

of items uploaded may differ from the estimated number reported in the initial description of a collection. Second, as a collection is itemized and documented, the contents of the collection may broaden to include more kinds of items, or narrow to include fewer, necessitating a change in the collection description.

### **Photograph Storage Remediation**

Aerial photographs slated for transfer to Maryland State Archives were sorted into piles based on county, full date of photograph (MM/DD/YYYY), flight series, and frame number. Photographs were then placed in archival-quality folders, which in turn, were placed in archival-quality boxes. Typically 10 photographs were placed in each folder, and 10 folders were placed in each box (this depended, however, on the amount of curling exhibited by the photographs).

The folders and boxes utilized for storage were purchased from vendor University Products during the FY2015 NGGDPP grant cycle and included Perma/Dur reinforced file folders and Perma/Cor corrugated drop front boxes (E-flute style). The folders are sturdy, lignin-free, and acid-free with a strictly controlled pH level (8.5 +/-) buffered with 3% calcium carbonate for an alkaline reserve to provide a protected environment for the photographs. The boxes are made from 100% virgin, high alpha-cellulose pulp and are also acid- and lignin-free. The drop-front storage boxes are ideal for photograph storage as they provide easy access and retrieval of the stored photographs. These boxes also feature an adhesive-free, metal edge construction for protection and stacking strength – ideal, since these boxes are stacked on shelves within MSA’s archive facility.

MGS NGGDPP grant staff members Heather Quinn, Dale Shelton, and Katie Knippler worked jointly on the re-boxing efforts. MGS staff found that the following division of labor worked very efficiently. Mr. Shelton handled the initial sorting/grouping of photographs into folders and corresponding folder labeling. Ms. Knippler verified folder content and labels, entered information onto MSA’s required collection transfer forms, and relayed information to Ms. Quinn for a secondary review of records in the internal database (please see the “Database QA/QC” section on pages 8-9 for further details). The boxes were affixed with temporary labels, which were ultimately replaced with final sticker tables on the top and two sides of each box.

### **Photograph Transfer to MSA**

MGS coordinated with MSA staff to transfer the photographs to the MSA facility in Windsor Mill, MD. MGS staff loaded boxes into a state vehicle and drove the photographs to the Windsor Mill facility. MGS worked with MSA staff to unload the boxes, affix MSA labels, and place the boxes on the appropriate shelves in the facility.

### **Digital File Backup Protocol**

Starting in 2013, the PI, in consultation with MGS NGGDPP staff, instituted a new protocol for backing up both the data preservation databases and the digital scans of the aerial photographs. The data preservation databases are currently stored on MGS’s network in a dedicated folder. On a daily basis, copies of the data preservation databases are posted to a dedicated portable hard

drive and also to the local drive of a staffer's computer. As such, there are always three current copies of the databases in three separate locations.

As aerial photographs are scanned, the digital files are saved to a dedicated portable hard drive. Weekly back-ups are made to a second, dedicated portable hard drive. On a monthly basis, these digital files are copied to one of MGS's network servers, which backs itself up on a nightly basis. As such, every week the most up-to-date collection of digital scans is backed up on two separate portable hard drives; and scans are backed up monthly to MGS's network server.

## **Land-Based Core Collection**

### **Metadata Development**

#### Database Creation

MGS grant staff met several times late in 2016 and early 2017 to discuss the design of a land-based core database. Discussions benefitted from examples of inventory tables from other surveys and projects. MGS used Access 2013, software universally available on Survey computers, to build the internal database (*CoreCuttingsDB1\_083117\_v4\_20170913.mdb*). Tables in the database included fields to facilitate metadata creation for the NDC as well as fields to contain other information useful for MGS staff, outside geoscientists and other potential users.

One key table, *CoreInv*, was designed to record basic information about the core and core containers that would be collected during the inventory process. This information included, but was not limited to, identifications/labeling, type and condition of container(s) and core, core diameter, core intervals present, and core-specific comments. Some fields in this table were from limited (pull down) lists and/or were set up with entry masks to help reduce data entry errors. A separate linked table, called *BoreholeCoordinates*, was created to contain geographic location information. This table included fields to capture data source, original geospatial coordinates and projection, coordinate accuracy and method (as known), and coordinates converted to the required NDC decimal degree format. A key field in both the *CoreInv* and *BoreholeCoordinates* tables is the database borehole identifier (db\_bholeID field) which is used to uniquely identify each borehole in this database. During the inventory process, some of the tables were expanded to capture additional data as needed.

#### Detailed Inventory Process

During the first phase of the core inventory, MGS grant staff conducted a detailed inventory of the land-based cores located within the MGS building and entered that information into the database. In this phase, a team of two was typically needed to move/reposition core boxes due to the weight and size of the core boxes. Each box was opened and the contents were described and recorded in the *CoreInv* database table. For each core the container type, condition, and container labeling were also recorded. As a result of the box disorder and tight repository spaces, MGS staff commonly had to move the core boxes multiple times in order to extract a box, inventory it, and then stack the box back in an appropriate location and order.

Phase two of the inventory process involved tracking down borehole identification and location for each core. Core containers often provided only limited information which made identifying the source borehole or well and then locating its coordinates more challenging than anticipated. The grant team developed several strategies to resolve as many identification and location questions as possible.

One strategy involved the use of a Google Drive space which was shared with all current and retired MGS geologists. A spreadsheet was posted on this shared space that listed unidentified core and contained all of the information the grant staff had about a core along with space for feedback, comments and input. This spreadsheet was accompanied by a folder of digital imagery of the core as well as the core container for each unidentified core. A second strategy was to pursue any lead and/or potential paper or digital trail, largely through files and records of geologists who are retired or deceased.

### NGGDPP Metadata Creation and Submission to NDC

MGS created metadata for the National Digital Catalog with guidance from the *NGGDPP Metadata Preparation Guide* (01/2017). To a large extent, select data from the core inventory tables in the internal MGS database was extracted and concatenated to fill the fields (those required and some optional) for the NGGDPP-compliant metadata table. The main exception was the metadata Abstract field that involved some summarization and integration of core inventory comments in addition to information compiled via extraction and concatenation. The NGGDPP-compliant metadata table was initially built and compiled within the MGS internal database and then subsequently converted to .csv-formatted files for upload to the National Digital Catalog.

### Verifying Accuracy and Completeness of NDC Metadata

Please see similarly named section on pages 9-10 for instructions on how MGS verifies accuracy and completeness of NDC metadata uploads.

### Digital File Backup Protocol

The Land-Based Core Collection database is saved on MGS's internal network. Edits are typically made to the copy residing on the network, and subsequently updated copies are saved to a portable hard drive and an MGS staff computer. It is anticipated that some revision to the structure of this database will be needed particularly with the addition of the detailed inventory of the cuttings collection during the FY2017 NGGDPP grant cycle.

### Land-Based Core Collection Preservation Plan

MGS created a land-based core collection preservation plan with guidance from the 2003 USGS document titled *Sample Format and Elements of a Long-Range Data-Preservation Plan* and the Survey's own *Long-Range Data Preservation Plan for the Maryland Geological Survey* (Hennessee, 2009). The topics covered in the Land-Based Core Collection Preservation Plan include 1) collection overview; 2) justification for collection preservation; 3) preservation goals;

4) strategies to meet preservation goals; 5) current status of preservation goals; and 6) details about collection inventory database and metadata development.

## **RESULTS**

### **Aerial Photograph Collection**

#### **Digital Infrastructure**

##### **Digital File Creation**

Thanks to the ongoing partnership between MGS and MSA, MSA provided the services of an Archivist I/Scanner Operator staff member to assist MGS with completing its grant scanning task. Mr. Saul Gibusiwa of MSA worked approximately one day a week at MGS over the course of the grant term.

Mr. Gibusiwa scanned the entire high-altitude infrared component (Component 7; approximately 50 photographs). The collection was scanned to JPG and TIF at a resolution of 1200 dpi in grayscale resulting in approximately 100 digital images.

Mr. Gibusiwa also scanned the entire Washington, DC & Vicinity component (Component 9; approximately 1,200 photographs). The collection was scanned to JPG and TIF at a resolution of 1200 dpi in 24-bit color resulting in approximately 2,400 digital images. MGS scanned approximately 500 aerial photographs less than expected. These photographs were mistakenly listed as “in stock” in the database table but were in fact missing from the collection. MGS corrected the database table to reflect the updated status of these photographs.

To date, approximately 78 percent of the MGS Aerial Photograph Collection has been converted to digital imagery due to the scanning efforts of MGS and MGS’s data preservation partners, MSA and JHU. An additional approximately 5,350 photographs of USGS origin (approximately 22 percent of MGS’s total aerial photograph collection) have been or will be scanned by the USGS Earth Resources Observation Systems (EROS) Data Center in the following years. If these photographs are counted as scanned, approximately 100 percent of the MGS aerial photograph collection may now be considered scanned.

#### **Metadata Development**

##### **Database QA/QC**

During the FY2016 NGGDPP grant period, MGS performed a thorough QA/QC review of approximately 5,200 records associated with the 1950s and 1960s county-based aerial photographs. Errors encountered and fixed included digital scans that were not logged in the database, data entry typos, inconsistent naming/spelling, etc. These reviewed and updated records correlate to the approximately 5,200 aerial photographs that were transferred to MSA for permanent storage during the FY2016 NGGDPP grant cycle.

## NGGDPP Metadata Creation and Submission to NDC

MGS submitted updated metadata for the county-based aerial photographs (Component 1) to the NDC in July 2017. This submission replaced the existing records in NDC for the *Historical Aerial Photographs of Maryland, 1937-1990, County Collection*. This updated metadata set more thoroughly and accurately describes the items in the county-based component, due to the database QA/QC check conducted during the FY2015 – FY2016 NGGDPP grant cycles, and will facilitate search/discovery by more users. Updated information and metadata for this collection may be viewed online here:

<https://www.sciencebase.gov/catalog/item/4f4e4a94e4b07f02db658dba> .

### **Photograph Storage Remediation**

In May of 2017, MGS NGGDPP grant staff worked for approximately two weeks to sort the 1950s and 1960s county-based aerial photographs into piles based on county, full date of photograph (MM/DD/YYYY), flight series, and frame number; label the folders and boxes per MSA standards; conduct the secondary QA/QC of the database records pertaining to these photographs; and prepare the MSA records transmittal forms.

Approximately 5,200 aerial photographs (the rest of the 1950s photographs plus a portion of the 1960s photographs) were boxed up during the FY2016 NGGDPP grant cycle. This quantity is approximately 200 more photographs than proposed. Figures 1-5 illustrate the photograph boxing effort. Although these images were taken during the FY2015 boxing effort, the same workflow was utilized during the FY2016 boxing effort.

### **Photograph Transfer to MSA**

On July 10, 2017, MGS delivered 53 boxes of photographs to the MSA storage facility in Windsor Mill, MD. The boxes contained approximately 5,200 aerial photographs consisting of 1950s photographs (Montgomery County through Worcester County) and 1960s photographs (Allegany County through Frederick County).

MGS provided MSA with the necessary transfer documentation – specifically, the Pre-Transfer Record Condition Assessment Form and the Preliminary Inventory Worksheet (please see Appendix 5 and Appendix 6 for these forms, respectively). MGS also provided MSA with an Access 2013 database named *MGS2MSADatabase2017.mdb* containing two tables: 1) *MGS2MSA\_CoPhotos2017\_FINAL* – containing detailed information about each photograph that was transferred; and 2) *MGS2MSA\_Photosperfolder2017\_FINAL* – containing a list of the individual folders, and the total number of photographs per folder.





Figure 1. View of the MGS NGGDPP boxing effort. Note aerial photograph index maps in foreground, archival boxes to the right, and Mr. Shelton and Ms. Quinn in the background.



Figure 3. View of a subset of archival drop-front boxes with temporary labels.

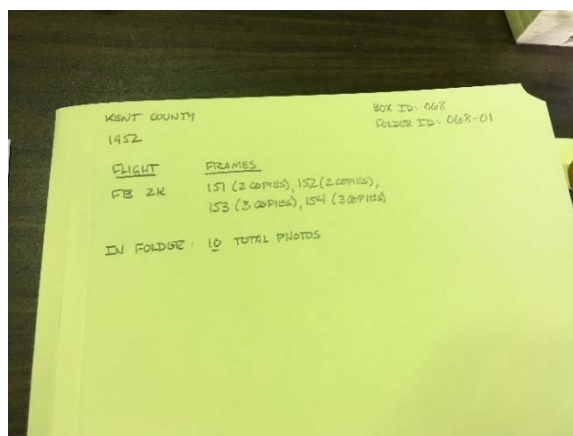


Figure 4. Example of folder label in pencil.



Figure 2. View of workstation used for secondary database QA/QC.

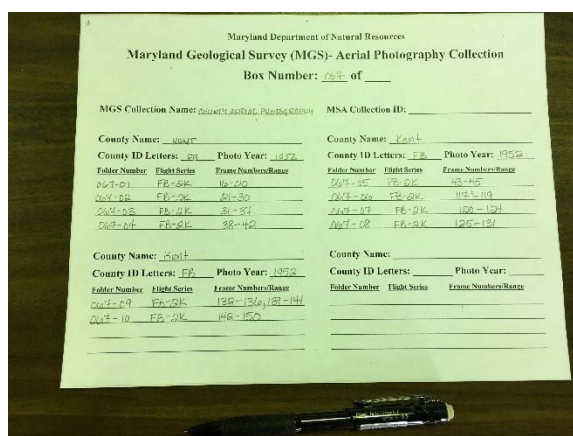


Figure 5. Example of label placed on the top of the archival boxes. These labels were later re-written in fine point permanent ink.

MGS also delivered a portable hard drive containing digital images of the transferred photographs. Of the approximately 5,200 hard copies of photographs being transferred, the digital imagery covered 4,295 unique frames. Many frames had multiple printed copies (commonly two, but sometimes up to five copies). These duplicates were included in the transfer because sometimes one print had a different print quality than another and/or one print was partially damaged or modified by superficial notation. MSA assigned the transferred aerial photographs the MSA Series identifier of T5053.

The next transfer of approximately 4,700 aerial photographs will occur during the FY17 NGGDPP grant cycle. This task will complete the transfer of all of the county-based photographs (Component 1) to Maryland State Archives.

Figures 6 and 7 illustrate the transferred boxes and the Windsor Mill facility.



Figure 6. Transferred boxes being affixed with MSA labels at the Windsor Mill facility.



Figure 7. Photograph of the inside of the Windsor Mill MSA facility.

## **Collection Accessibility**

### **Paper Holdings**

Currently, MGS holds approximately 12,500 paper aerial photographs which comprise approximately 53 percent of MGS's Aerial Photograph Collection. Library patrons are welcome to access the collection in-house with an appointment during business hours at the MGS Library (noon to 4:30pm Monday through Friday).

The balance of the paper aerial photographs comprising MGS's Aerial Photograph Collection have been transferred to the Maryland State Archives facility in Windsor Mill, MD for permanent storage. To date, all transferred photographs are part of the county-based aerial photograph component (Component 1). In August of 2016 (the end of the FY2015 NGGDPP grant cycle), MGS transferred approximately 6,100 county-based aerial photographs from the 1930s, 1940s and 1950s to the Windsor Mill MSA facility. In July of 2017 (the end of the FY2016 NGGDPP grant cycle), MGS transferred an additional approximately 5,200 county-based aerial photographs from the 1950s and 1960s to this facility.

In general, photographs are only considered for permanent transfer to MSA if the photographs have been scanned and the associated metadata records have undergone a thorough QA/QC check. Paper photographs transferred to MSA are available to patrons for viewing upon request.

## Digital Scans

MGS is continuing to work closely with MSA and JHU to explore ways of making the digital scans of the aerial photographs available to the public. Currently, MSA hosts the 1930s, 1950s, 1960s, 1970s and 1980s county aerial photograph index maps online via its *Guide to Government Records* website. The *Guide to Government Records* website is also hosting MGS's collection of aerial photographic enlargements of the Rockville-Laurel area of Montgomery County in Maryland. Utilizing the individual digital images MGS transferred, MSA is also starting the process of making the scans of the county-based aerial photographs available online via the *Guide to Government Records* website. Additionally, the Johns Hopkins University (JHU) *JScholarship* website is currently hosting the 1930s and 1950s county aerial photograph index maps, as well as assorted county-based aerial photographs of Baltimore County and City from the 1930s and 1950s.

Links to the *Guide to Government Records* and *JScholarship* websites are provided on the MGS's Aerial Photograph Collection webpage here:

[http://www.mgs.md.gov/publications/mgs\\_data\\_preservation/aerial\\_photos.html](http://www.mgs.md.gov/publications/mgs_data_preservation/aerial_photos.html).

MGS is very thankful to these data preservation partners for providing online access to many of these digital scans. The Survey struggles with network storage issues and the lack of a digital framework suitable for hosting such large numbers of digital photographs. MGS continues to explore the possibility of using the State of Maryland's *iMap* portal to host some of these photographs in the future. Additionally, MGS will explore the possibility of using the National Digital Catalog platform to host these images. Currently, customers can request digital scans from MGS who, in turn, can share these images via the cloud-based Google Drive platform.

## Land-Based Core Collection

### Metadata Development

#### Database Creation

MGS designed an Access 2013 database called *CoreCuttingsDB1\_083117\_v4\_20170913.mdb*. The primary table in the database, *CoreInv*, contains some fields of information required for National Digital Catalog metadata submission as well as fields containing additional information useful for MGS staff and outside geoscientists. As of 2017, the *CoreInv* table includes the following fields: AutoNum, Collection ID, db\_BholeID, WWell ID, Well IDsort, Well Permit, Original Well Permit ID, Other ID, Other Aliases, Core Number, Data Type, Core Diameter (inches), Box ID, Top Depth (feet), Bottom Depth (feet), Storage Location, Inventory By, Inventory Date, MeasLength (ft), Comments Summary, Box Type, Box Dimensions (inches), Core Condition, AltBoxID, Collection Notes 1, and Collection Notes 2. In the *CoreInv* table, each storage container or box was entered separately (so one core may have many entries). Where segments of multiple cores were stored together in one box or container (a situation that was revealed during the inventory process), each of these cores was entered separately and the

information on the shared container was entered into the Collection Notes columns. Linked tables within the database captured geographic location information which was stored primarily in a table titled *BoreholeCoordinates*. The *BoreholeCoordinates* table contains information pertaining to the original coordinate source, original coordinate projection, method of coordinate conversion, and notes regarding where the coordinate information was found. The *BoreholeCoordinates* table links to the *CoreInv* table via the *db\_BholeID* field in a one-to-many relationship.

### Detailed Inventory Process

Between March and August 2017, MGS staff completed a detailed inventory of the sediment and/or rock cores in the Land-Based Core Collection. Multiple challenges were encountered during the inventory process. While the majority of the cores were located in the MGS Core Library (main building basement), additional cores were located in the MGS Annex basement and a few were being temporarily stored in a laboratory. Cores were stored in a variety of container types. At the outset, NGGDPP grant staff found the cores in a very disorganized state largely resulting from a major core relocation in the 1980s using non-Survey movers. During this move, many boxes were placed with their labels facing the wall and cores from the same borehole were not stacked together.

Narrow aisles and limited space to maneuver core boxes meant that boxes typically had to be moved several times in order to inventory them, organize them, and re-stack them (labels out) with boxes from the same borehole or well. Additionally, many boxes needed reinforcements with either duct tape (cardboard boxes) or nails (wooden boxes) due to general disintegration of the containers. In some cases, metal hinges were replaced or repaired on the wooden boxes. Additionally, many boxes had limited information on them, making determining the correct borehole ID and location extremely difficult (and in some cases to date, impossible).

Despite these challenges, MGS staff inventoried 250 unique rock cores with known locations. Most cores were housed in wooden and cardboard boxes of varying sizes (approximately 945 boxes in total); some cores were stored in their original Shelby tubes, polyvinyl chloride (PVC) tubes, or clear plastic tubes of varying length and diameter (approximately 187 tubes in total). There are approximately 16 cores for which locations are still being confirmed or sought.

### NGGDPP Metadata Creation and Submission to NDC

NGGDPP-compliant metadata for the Land-Based Core Collection was submitted to the NDC in September 2017. In addition, a Geographic Information System shapefile showing core locations was also created and uploaded into the NDC. NDC metadata for the Land-Based Core Collection may be viewed online here:

<https://www.sciencebase.gov/catalog/item/4f4e49d8e4b07f02db5df127>

## **Collection Accessibility**

### **Physical Cores**

Scientists from other government agencies, universities/research institutes, and private firms – working independently or collaboratively with MGS – may access the cores by appointment. In many cases, users perform a visual review of the core (e.g., a physical comparison with other cores or samples). They may also request subsamples for further geochemical, paleontological, and mineralogical analyses.

### **Core Database**

Ultimately, MGS plans to publish components of the land-based core database online via the MGS “Land-Based Core Collection” webpage located here: [http://www.mgs.md.gov/publications/mgs\\_data\\_preservation/land-based\\_cores.html](http://www.mgs.md.gov/publications/mgs_data_preservation/land-based_cores.html) . Until that time, users may contact MGS with database inquiries.

### **Land-Based Core Collection Preservation Plan**

Please see Appendix 7 for the Land-Based Core Collection Preservation Plan. Although currently presented as a stand-alone document, MGS plans to incorporate information from this plan into its *Long-Range Data Preservation Plan for the Maryland Geological Survey* (Hennessee, 2009). Although the MGS long-range plan has been informally updated in-house throughout the years, a formal, published revision of this plan is currently underway and expected to be released in 2018.

## **NON GRANT-RELATED ACTIVITIES**

Although the activities described in this section were not directly funded by the NGGDPP, MGS is including this section for two reasons. First, undertaking the activities was inspired by the Survey’s involvement with the NGGDPP. Second, documenting all of the Survey’s data preservation activities in one place allows this report to serve double duty – not only as a final report to the NGGDPP, but also as an annual report to MGS’s data preservation stakeholders (e.g., MGS staff and members of the MGS Data Preservation Advisory Panel).

### **MGS-MSA-JHU Cooperative**

The following activities were conducted during September 2016 – August 2017 as a continuation of the cooperative agreement forged between MGS, MSA and JHU in July of 2011. Tim Baker and James Watson of MSA and Jim Gillispie of JHU have graciously provided their services and guidance, and steadfastly supported MGS’s data preservation efforts over the years. Cooperative efforts included:

- Tim Baker of MSA agreed to help MGS meet its FY2016 NGGDPP grant Match objective by offering the services of an MSA Archivist I/Scanner Operator to assist MGS with its



FY2016 scanning tasks. Mr. Saul Gibusiwa of MSA scanned approximately 1,250 assorted aerial photographs dating from the 1940s, 1950s and 1970s.

- JHU provided MGS with a list of maps needed to complete its collection of Maryland USGS topographic maps. MGS is currently compiling what needed maps it has in-house, and will provide paper copies to JHU for scanning. If MGS has more than one copy, MGS will give one copy to JHU for its permanent collection.
- In August 2017, MSA temporarily transferred five boxes of historical Mason-Dixon Line documents and photographs to MGS. MGS will scan the items and then share the digital images with MSA and JHU.
- MSA is starting the process of posting digital scans of the county-based photographs (Component 1) online via their *Guide to Government Records* website.

### **MGS Internal Activities**

In addition to tasks completed as part of the MGS-MSA-JHU Cooperative, MGS also conducted several data preservation-related tasks in-house. A summary of activities completed during the FY2016 NGGDPP grant year is included below.

MGS NGGDPP staff has continued to maintain designated areas for “Recycle”, “Shred”, “Possible Archive”, and “Definite Archive” materials. Items placed in the Possible Archive and Definite Archive areas are assessed by MGS NGGDPP staff and, as time allows, properly inventoried and archived. This is an ongoing and slow process, as MGS staff work on this task during their infrequent breaks between funded projects.

MGS has also continued its participation in Baltimore City’s curbside single stream recycling program. MGS has placed large rolling recycling bins at several locations throughout the building to facilitate proper recycling.

During the summer of 2016, MGS prepared 1) an inventory of the Survey’s paper and digital records; and 2) a records retention schedule for each identified series. This work was requested by MD DNR’s Resource Assessment Service (RAS), which is the group under which MGS resides within MD DNR. MD DNR’s most recent inventory and records retention schedule dates back to the early 1990s – so an update was desperately needed. MGS submitted its forms to RAS in September 2016. MGS’s forms were compiled with the forms from other RAS groups and submitted to the MD DNR Records Retention Working Group in October 2016. The forms were reviewed by MSA and returned with comments in June 2017. MGS, along with other RAS divisions, re-submitted its inventory and records retention schedule in July 2017. MGS is awaiting final review of its documents by MSA.

As of the conclusion of the FY2016 NGGDPP grant period, MGS had a contract in place for the installation of a new halon system in the original Archives Room at MGS (Room 316 off of the MGS Library). This new system will replace the old, non-functioning fire suppression equipment. Ultimately, archived paper items (reports, books, maps, etc.) will be relocated back to Room 316. Work on the halon system started in late October 2017.

MGS is also investigating the purchase of collapsible shelving to install in the MGS Library and the Archives Room. Although the cost may be prohibitive, MGS is in desperate need of space-saving solutions to store our numerous archival materials.

MGS also continued its compilation of a still-incomplete digital finding aid – essentially metadata – for its many publications, both reports and maps. The finding aid is being utilized in the Survey's website redesign, to facilitate searching and serving digital versions of MGS publications. The MGS curator is working closely with the website design team to ensure data preservation database and website compatibility. This compatibility will facilitate the delivery of the Survey's digital publications and information about other MGS collections to the public.

### **Data Preservation Advisory Panel**

At its annual meeting in early January of 2017, the Survey's Data Preservation Advisory Panel (DPAP) encouraged MGS to apply for FY2017 NGGDPP funding to accomplish two objectives – (1) continue preserving its vast collection of historical aerial photographs, and (2) start preserving its rock cuttings collection.

Following the panel's recommendations, MGS prepared a two-project proposal to meet these objectives. The first project addressed needs for data preservation of historical aerial photographs and focused on continued efforts to create/update digital infrastructure and rescue photographs at risk of loss/deterioration for the next logical segments of the collection. Specifically, MGS proposed to: (1) finish its comprehensive QA/QC effort (begun during the FY2015 NGGDPP grant cycle) and finalize the remaining approximately 4,700 internal database records for MGS's collection of county-based aerial photographs dating from the 1960s – 1990s; (2) update the NDC with these newly updated metadata records; (3) re-house the remaining approximately 4,700 county-based aerial photographs from the 1960s – 1990s into appropriate archival boxes; (4) transfer these photographs to an MSA facility for permanent storage; and (5) purchase archival folders and boxes for the remaining approximately 7,800 photographs comprising the other components of the MGS aerial photograph collection.

The second project focused on initiating data preservation of the Rock Cuttings Collection with an emphasis on metadata creation and rescue of cuttings housed in deteriorating containers. Specifically, MGS proposed to: (1) purchase boxes and envelopes to re-house a portion of this collection; (2) create an internal MGS rock cuttings database consisting of data fields useful to collection users and required for inclusion to NDC; (3) perform a *detailed* inventory of approximately 450 boxes of rock cuttings (approximately 13 percent of the collection) and populate the internal database with detailed metadata records; (4) submit NGGDPP-compliant metadata records to NDC; and (5) while performing the inventory, re-inforce boxes/envelopes or re-house the cuttings as appropriate.

The DPAP wrote a letter of endorsement, which MGS included with its grant application materials. MGS submitted its proposal to the NGGDPP via [www.grants.gov](http://www.grants.gov) on January 26, 2017.

## **FY2017 NGGDPP GRANT STATUS**

In a letter dated May 22, 2017, the USGS NGGDPP alerted MGS that full funding had been awarded for the FY2017 grant cycle. Grant activities will be completed during the September 2017 – August 2018 timeframe.

## **CONCLUSIONS**

During the past year, MGS has initiated and/or successfully completed a number of activities in building what it hopes will become a first-rate repository of collections useful to the larger geoscience community. MGS fulfilled its FY2016 NGGDPP grant objectives by completing two separate projects focused on furthering the preservation of its 1) aerial photograph collection; and 2) land-based core collection.

*During the first project*, MGS satisfied its grant objectives by 1) creating digital infrastructure of (i.e., scanning) approximately 1,250 9-inch by 9-inch assorted aerial photographs dating from the 1940s, 1950s and 1970s; 2) updating digital infrastructure by performing a comprehensive QA/QC review of approximately 5,200 internal database records corresponding to the 1950s and 1960s county-based aerial photographs; 3) updating the NDC with these newly reviewed and revised metadata records; 4) rescuing data at risk by re-housing approximately 5,200 of the 1950s and 1960s county-based aerial photographs into appropriate archival boxes and folders; and 5) rescuing data at risk by transferring the re-housed photographs to an MSA facility for permanent storage. MGS scanned approximately 500 aerial photographs less than expected (these photographs were listed as “in stock” but in fact were missing). However, MGS reviewed approximately 200 more database records than originally proposed, and transferred approximately 200 more photographs to MSA than proposed. The MGS Aerial Photograph Collection continues to be in demand by a variety of users including archeologists, historical researchers/writers, stream restoration specialists, Maryland state agencies, and the citizens of Maryland. The digital infrastructure, inventory and metadata developed under the NGGDPP grant program have been key to meeting user requests for paper and digital photographs efficiently and effectively.

*During the second project*, MGS fulfilled its grant objectives by 1) designing and creating an internal land-based core database consisting of data fields useful to collection users and required for inclusion to the NDC; 2) performing a detailed inventory of approximately 250 cores comprising the land-based core collection (approximately 1,110 core containers); 3) populating the internal database with detailed metadata records for the cores; 4) submitting these metadata records to NDC; and 5) creating a land-based core collection preservation plan (presented in Appendix 7). The information presented in Appendix 7 will be incorporated into MGS’s long-range data preservation plan which is slated for update in 2018. The value of preserving the Land-Based Core Collection has been underscored recently by the successful use of existing core in performing geochemical analyses on a project where re-drilling would be prohibitively expensive to the State and its project partners. The detailed inventory and metadata created during the FY2016 NGGDPP grant period are essential to realizing this collection's potential for both time/cost savings and greater understanding of natural resources of Maryland.



Independent of the grant, MSA and JHU generously donated their services to further MGS's data preservation efforts. Currently, the 1930s, 1950s, 1960s, 1970s and 1980s county aerial photograph index maps (Component 4) and the Montgomery County photographic enlargements (Component 3) are available to the public online via MSA's *Guide to Government Records* website. MSA also provided the services of an Archivist I/Scanner Operator to assist MGS with its FY2016 NGGDPP scanning task. Additionally, MSA is starting the process of posting the individual scans of the county-based aerial photographs (Component 1) to its *Guide to Government Records* website. JHU's *JScholarship* website is currently hosting the 1930s and 1950s county aerial photograph index maps (Component 4), as well as assorted county-based aerial photographs of Baltimore County and City from the 1930s and 1950s (Component 1).

Other non-grant highlights include the preparation of an inventory of the Survey's paper and digital records and a records retention schedule for each identified series during the summer of 2016. This work was submitted to MD DNR's Records Retention Working Group in October 2016 to update the obsolete MD DNR records retention policy created back in the early 1990s. The forms were reviewed by MSA and returned with comments in June 2017. MGS re-submitted its inventory and records retention schedule in July 2017.

Since preliminary metadata creation and digital infrastructure for MGS's aerial photograph collection is complete, MGS is currently focusing on finalizing metadata records via a comprehensive QA/QC review process; making the digital scans of this collection accessible to the public; and transferring the paper aerial photographs and index maps to MSA, a state facility better suited for their long-term preservation. As preservation of the aerial photograph collection draws closer to completion, MGS is also focusing on continuing the preservation of the land-based core collection (future work is outlined in Appendix 7) and starting the preservation of its rock cuttings collection. Looking forward, MGS will continue to document its remaining collections, seek funding for data preservation, prepare collections for long-term preservation, and explore possible mechanisms to enhance public access to collections.

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## **APPENDICES**

## Appendix 1. MGS Permanent Collections and Their Preservation Status

| Status of MGS permanent collections, by NGGDPP collection category, as of September 2017 (shaded cells indicate that the activity is complete).                                                                                                 |                           |                                   |                      |                                      |                        |                        |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------|----------------------|--------------------------------------|------------------------|------------------------|---------------------|
| Collection category                                                                                                                                                                                                                             | Permanent collections (N) | Items in collection               | Collection inventory | Metadata creation                    | Digital infrastructure | Internet accessibility | Education/ outreach |
| <b>PHYSICAL COLLECTIONS</b>                                                                                                                                                                                                                     |                           |                                   |                      |                                      |                        |                        |                     |
| 1. Auger samples                                                                                                                                                                                                                                |                           |                                   |                      |                                      |                        |                        |                     |
| 2. Fluid samples                                                                                                                                                                                                                                |                           |                                   |                      |                                      |                        |                        |                     |
| 3. Geochemical samples                                                                                                                                                                                                                          |                           |                                   |                      |                                      |                        |                        |                     |
| <b>4. Hand samples</b>                                                                                                                                                                                                                          | 2                         |                                   |                      |                                      |                        |                        |                     |
| Maryland Rocks and Minerals (P1510)                                                                                                                                                                                                             |                           | 99 (203)                          | NGGDPP 2008          | NGGDPP 2010                          |                        |                        |                     |
| Exhibition Flasks: Mineral Commodities of Maryland (P1692)                                                                                                                                                                                      |                           | 38                                | NGGDPP 2010          | NGGDPP 2010                          |                        |                        |                     |
| 5. Ice cores                                                                                                                                                                                                                                    |                           |                                   |                      |                                      |                        |                        |                     |
| <b>6. Paleontological samples</b>                                                                                                                                                                                                               | 1                         |                                   |                      |                                      |                        |                        |                     |
| Maryland Macrofossils (P1518)                                                                                                                                                                                                                   |                           | 156 (200) species; 1500 specimens | NGGDPP 2008          | NGGDPP 2010                          |                        |                        |                     |
| <b>7. Land-based cores</b>                                                                                                                                                                                                                      | 1                         |                                   |                      |                                      |                        |                        |                     |
| Land-Based Cores (P1531)<br><br><i>NEW category: Land-Based Core collection combines and replaces these 2 permanent collections: 1) Rock Cores (P1531); and 2) Coastal Plain Cores (P1507). Revision made during FY2016 NGGDPP grant cycle.</i> |                           | 250                               | NGGDPP 2008          | NGGDPP 2009 (partial)<br>NGGDPP 2016 |                        |                        |                     |

| Collection category                                        | Permanent collections (N) | Items in collection | Collection inventory  | Metadata creation | Digital infrastructure | Internet accessibility | Education/ outreach |
|------------------------------------------------------------|---------------------------|---------------------|-----------------------|-------------------|------------------------|------------------------|---------------------|
| <b>8. Rock cuttings</b>                                    | 1                         |                     |                       |                   |                        |                        |                     |
| Rock Cuttings (P1532)                                      |                           | 200,000             | NGGDPP 2008 (partial) | NGGDPP 2017       |                        |                        |                     |
| <b>9. Water-based cores</b>                                | 3                         |                     |                       |                   |                        |                        |                     |
| Atlantic Continental Shelf Cores (P993)                    |                           | 282                 | NGGDPP 2008           | NGGDPP 2009       |                        |                        |                     |
| Chesapeake Bay Cores (P1648)                               |                           | 4,255               | NGGDPP 2009           | NGGDPP 2009       |                        |                        |                     |
| Heavy Minerals, Atlantic Coastal Shelf (P1519)             |                           | 250                 |                       |                   |                        |                        |                     |
| 10. Sidewall cores                                         |                           |                     |                       |                   |                        |                        |                     |
| 11. Thin sections and polished sections                    |                           |                     |                       |                   |                        |                        |                     |
| 12. Type stratigraphic sections                            |                           |                     |                       |                   |                        |                        |                     |
| <b>Subtotal</b>                                            | <b>8</b>                  |                     |                       |                   |                        |                        |                     |
| <b>DERIVED/INDIRECT DATA</b>                               |                           |                     |                       |                   |                        |                        |                     |
| <b>13. Drilling/completion reports</b>                     | 1                         |                     |                       |                   |                        |                        |                     |
| Well Permits and Well Completion Reports, Maryland (P1526) |                           | 500,000             | NGGDPP 2008           |                   |                        |                        |                     |
| <b>14. Drill stem and other tests</b>                      | 1                         |                     |                       |                   |                        |                        |                     |
| Aquifer (Pump) Tests, Maryland Coastal Plain (P1521)       |                           | 262                 | NGGDPP 2008           |                   |                        |                        |                     |
| <b>15. Field notes</b>                                     | 1                         |                     |                       |                   |                        |                        |                     |
| Geology Field Notebooks, Maryland (P1522)                  |                           | 70                  | NGGDPP 2008           |                   |                        |                        |                     |
| <b>16. Geochemical data</b>                                | 1                         |                     |                       |                   |                        |                        |                     |
| Maryland Groundwater Quality Data (P1530)                  |                           | ?                   | NGGDPP 2008           |                   |                        |                        |                     |
| 17. Geophysical data                                       |                           |                     |                       |                   |                        |                        |                     |

| Collection category                                                                                                                                       | Permanent Collections (N) | Items in collection           | Collection inventory | Metadata creation                 | Digital infrastructure  | Internet accessibility | Education/outreach |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------|-----------------------------------|-------------------------|------------------------|--------------------|
| <b>18. Lithology logs</b>                                                                                                                                 | 1                         |                               |                      |                                   |                         |                        |                    |
| Geological (Lithological) Descriptions of Coastal Plain Cores and Well Cuttings, MD and VA (P1527)                                                        |                           | 52                            | NGGDPP 2008          |                                   |                         |                        |                    |
| <b>19. Maps</b>                                                                                                                                           | 1                         |                               |                      |                                   |                         |                        |                    |
| MGS Maps, including Oversized Inserts in MGS Publications (no USGS ID)                                                                                    |                           | 1500                          | In progress (9/2017) | In progress (9/2017)              |                         |                        |                    |
| 20. Paleomagnetic resistivity                                                                                                                             |                           |                               |                      |                                   |                         |                        |                    |
| <b>21. Paper reports</b>                                                                                                                                  | 3                         |                               |                      |                                   |                         |                        |                    |
| Published MGS Reports                                                                                                                                     |                           | ~500                          | In progress (9/2017) | In progress (9/2017)              |                         |                        |                    |
| Unpublished MGS Reports (P1553)                                                                                                                           |                           | 300                           | NGGDPP 2008          | In progress (9/2017)              |                         |                        |                    |
| Doctoral Dissertations on Maryland Geology (P1523)                                                                                                        |                           | 28                            | NGGDPP 2008          |                                   |                         |                        |                    |
| 22. Petrophysical data                                                                                                                                    |                           |                               |                      |                                   |                         |                        |                    |
| <b>23. Photographs</b>                                                                                                                                    | 12                        |                               |                      |                                   |                         |                        |                    |
| Historical (1948-1977) Photographs of Tidal Shorelines, Maryland (P1565) (components: (1) envelopes of photographs and assoc. film negatives, (2) slides) |                           | (1) ~ 1,300<br><br>(2) 12,000 | NGGDPP 2008          | (1) 11/2013<br><br>(2) to be done |                         |                        |                    |
| X-rays and Xeroradiographs of Marine and Estuarine Sediment                                                                                               |                           | 300                           | NGGDPP 2008          |                                   |                         |                        |                    |
| Historical Air Photograph Index Maps of Maryland, 1936-1980                                                                                               |                           | 395                           | NGGDPP 2011          | NGGDPP 2011                       | 2012-2015 (JHU and MSA) | Yes                    |                    |
| Historical Aerial Photographs of Maryland, 1937-1990, County Collection (P1603)                                                                           |                           | 16,026                        | NGGDPP 2008          | NGGDPP 2011-2012                  | NGGDPP 2012-2015        |                        |                    |

| Collection category                                                                                      | Permanent Collections (N) | Items in collection | Collection inventory | Metadata creation | Digital infrastructure | Internet accessibility | Education/ outreach |
|----------------------------------------------------------------------------------------------------------|---------------------------|---------------------|----------------------|-------------------|------------------------|------------------------|---------------------|
| Historical Aerial Photographs of Maryland, 1936-1991, Quad Collection                                    |                           | 4,867               | NGGDPP 2012          | NGGDPP 2013       | 2015 –USGS EROS        |                        |                     |
| Historical Aerial Photographs of Fenwick and Assateague Islands, Maryland, 1952-1964 (P1691)             |                           | 505                 | NGGDPP 2010          | NGGDPP 2010-2011  | 2011 (JHU)             | Yes                    |                     |
| Historical (1966-1974) Aerial Photographs of the Rockville-Laurel Area, Montgomery County, Maryland      |                           | 176                 | NGGDPP 2012          | NGGDPP 2012       | 2015 (MSA)             | Yes                    |                     |
| Historical Aerial Photographs of MD, PA, VA, and WV, 1977-1983, Black-and-White High Altitude Collection |                           | 211                 | NGGDPP 2014          | NGGDPP 2014       | 2015 – USGS EROS       |                        |                     |
| Historical Aerial Photographs of Maryland, 1970-1974, High-Altitude Infrared Collection                  |                           | 48                  | NGGDPP 2014          | NGGDPP 2014       | NGGDPP 2016            |                        |                     |
| Historical Aerial Photographs of Maryland, 1988-1989, Quad-Based Infrared Collection                     |                           | 196                 | NGGDPP 2014          | NGGDPP 2014       | 2015 – USGS EROS       |                        |                     |
| Historical Aerial Photographs of Washington, DC, MD, and VA, 1935-1939 and circa 1950                    |                           | 1,706               | NGGDPP 2014          | NGGDPP 2014       | NGGDPP 2016            |                        |                     |
| Historical Aerial Photographs of Maryland, 1987-1989, USGS NWIS Well-Related Collection                  |                           | 45                  | NGGDPP 2014          | NGGDPP 2014       | 2015 – USGS EROS       |                        |                     |
| 24. Potential fields                                                                                     |                           |                     |                      |                   |                        |                        |                     |
| 25. Production history                                                                                   |                           |                     |                      |                   |                        |                        |                     |
| <b>26. Routine analysis data</b>                                                                         | 2                         |                     |                      |                   |                        |                        |                     |
| Marine and Estuarine Beach and Bottom Sediment Data (P1612)                                              |                           | ~50 studies         | NGGDPP 2008          | (NGGDP 2010)      |                        |                        |                     |



| Collection category                                                                                     | Permanent Collections (N) | Items in collection | Collection inventory | Metadata creation | Digital infrastructure | Internet accessibility | Education/ outreach |
|---------------------------------------------------------------------------------------------------------|---------------------------|---------------------|----------------------|-------------------|------------------------|------------------------|---------------------|
| Paleontological and Palynological Data Derived from MD Water Wells (P1524)                              |                           | ?                   | NGGDPP 2008          |                   |                        |                        |                     |
| 27. Scout tickets                                                                                       |                           |                     |                      |                   |                        |                        |                     |
| <b>28. Seismic data</b>                                                                                 | 1                         |                     |                      |                   |                        |                        |                     |
| Marine and Estuarine Seismic Profile Prints (P1554)                                                     |                           | 240                 | NGGDPP 2008          |                   |                        |                        |                     |
| 29. Source rock maturity analysis                                                                       |                           |                     |                      |                   |                        |                        |                     |
| 30. Special analysis data                                                                               |                           |                     |                      |                   |                        |                        |                     |
| 31. Stratigraphic horizons                                                                              |                           |                     |                      |                   |                        |                        |                     |
| <b>32. Surface and airborne data</b>                                                                    | 3                         |                     |                      |                   |                        |                        |                     |
| Bathymetric Surveys, MD Water Bodies (P1547)                                                            |                           | 8                   | NGGDPP 2008          | NGGDPP 2010       |                        |                        |                     |
| Elevation Surveys of Arnold, Broad Creek, and Crofton Meadows Well Fields, Anne Arundel Co., MD (P1529) |                           | 15                  | NGGDPP 2008          |                   |                        |                        |                     |
| Beach Profiles, Coastal Maryland (P1613)                                                                |                           | ?                   | NGGDPP 2008          |                   |                        |                        |                     |
| <b>33. 2-D and 3-D seismic reflection</b>                                                               | 1                         |                     |                      |                   |                        |                        |                     |
| 2-D Seismic Reflection Profiles, Maryland Coastal Plain (P1520)                                         |                           | 2                   | NGGDPP 2008          |                   |                        |                        |                     |
| 34. Vertical seismic profiles                                                                           |                           |                     |                      |                   |                        |                        |                     |
| <b>35. Well logs</b>                                                                                    | 2                         |                     |                      |                   |                        |                        |                     |
| Geophysical Logs, Western Maryland Deep Wells (P1528)                                                   |                           | 337                 | NGGDPP 2008          | NGGDPP 2010       |                        |                        |                     |
| Well Logs, Maryland and Neighboring States (P1525)                                                      |                           | 2,000               | NGGDPP 2008          |                   |                        |                        |                     |
| <b>Subtotal</b>                                                                                         | <b>30</b>                 |                     |                      |                   |                        |                        |                     |
| <b>TOTAL</b>                                                                                            | <b>38</b>                 |                     |                      |                   |                        |                        |                     |

## **Appendix 2. MGS NGGDPP Grants (FY2008 – FY2015)**

Nine years ago, in response to financial incentives offered by the U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP), Maryland Geological Survey (MGS) began to address the long-term preservation of its data and collections in a formalized, systematic way. Prior to MGS's participation in the NGGDPP program, there were no MGS-wide provisions to preserve data and the Survey's catalog of collections resided mainly in the minds of its staff members and their individual files.

Thanks to NGGDPP funding, MGS has made great strides in preserving its geoscience collections – including creating a long-range data preservation plan, digitizing paper collections, creating detailed metadata for collection items, and collaborating with data preservation partners to post digital collections online and provide long-term archival storage of collections. Below is a brief overview of the preservation activities completed during the FY2008 – FY2015 NGGDPP grant cycles.

### **FY2008 NGGDPP Grant (2008-2009)**

In 2008, NGGDPP awarded MGS a one-year grant (FY2008) to identify and broadly describe the geoscience collections and data in its possession. In addition, MGS entered information about the nature, size, condition, and accessibility of those collections and data deemed “permanent” into the Collections Inventory of the National Digital Catalog (Hennessee and Shelton, 2009). Since then, MGS has identified 38 permanent collections: 8 physical collections and 30 derived or indirect data collections. A detailed list of those collections and their data preservation status (as of September 2017) is located in Appendix 1.

### **FY2009 NGGDPP Grant (2009-2010)**

In 2009, NGGDPP awarded MGS a second grant (FY2009), which enabled the Survey to familiarize itself with metadata creation through the preliminary documentation of three of its sediment core collections. Additionally, MGS developed a *Long-Range Data Preservation Plan* for its non-digital holdings (Hennessee, 2009) and appointed a curator from among its scientific staff. Inspired by the Data Preservation Workshop at Indiana University, MGS established a Data Preservation Advisory Panel (DPAP) composed of outside geologists, archivists, librarians, and archeologists. From its inception, the DPAP has fostered data preservation at MGS, helping to resolve thorny questions, endorsing proposals, and forming partnerships in applying for preservation-related grants.

### **FY2010 NGGDPP Grant (2010-2011)**

The third NGGDPP grant (FY2010) allowed MGS to continue metadata creation for several more of its collections and led to a revision in the format of the Survey's final report submitted to the NGGDPP. As part of its third-year effort, MGS documented approximately 20 percent of the Fenwick and Assateague Island aerial photographs (Component 2 of the MGS Aerial Photograph Collection), a pilot project of sorts for its fourth year effort. Please see Appendix 3 for an overview of the components comprising the Aerial Photograph Collection.

### **FY2011 NGGDPP Grant (2011-2012)**

In 2011, its fourth year as a recipient of a NGGDPP grant (FY2011), MGS created metadata for three components of its aerial photograph collection. These components included county-based aerial photographs from two of the earliest “eras” in its holdings, 1936-1938 and 1951-1953 (Component 1); the second and final subset of enlarged (2-feet by 2-feet) aerial photographs flown in the 1950s and 1960s over the State’s barrier islands (Component 2); and the entire collection of index maps (Component 4).

### **FY2012 NGGDPP Grant (2012-2013)**

During the fifth NGGDPP grant cycle (FY2012), MGS created metadata for approximately 9,000 county-based aerial photographs flown post-1953 (Component 1) and the entire collection of Montgomery County aerial photographs flown in the 1960s and 1970s (Component 3). MGS also scanned approximately 4,000 1950s county-based aerial photographs (Component 1).

### **FY2013 NGGDPP Grant (2013-2014)**

In 2013, NGGDPP awarded MGS a sixth grant (FY2013). This grant enabled MGS to create metadata for all of Component 5 (approximately 900 quadrangle-based aerial photographs flown in the 1930s-1990s) and scan an additional approximately 2,800 county-based aerial photographs flown in the 1930s and 1950s (Component 1). Additionally, MGS started a preliminary Quality Control/Quality Assurance (QA/QC) check of the records in its internal data preservation databases.

### **FY2014 NGGDPP Grant (2014-2015)**

During the seventh NGGDPP grant cycle (FY2014), MGS scanned approximately 7,200 county-based aerial photographs from the 1960s and 1970s (Component 1); created metadata for approximately 2,200 previously unidentified photographs (Components 6-10); and continued its preliminary QA/QC check of the records in its internal data preservation databases.

### **FY2015 NGGDPP Grant (2015-2016)**

In 2015, NGGDPP awarded MGS an eighth grant (FY2015). This grant enabled MGS to scan approximately 1,580 county-based photographs from the 1980s and 1990s (Component 1) and perform a comprehensive QA/QC of approximately 6,100 internal database records for the 1930s – 1950s county-based aerial photographs. Additionally, MGS purchased archival-quality drop-front storage boxes and folders for the entire county-based aerial photograph collection (approximately 16,000 9-inch by 9-inch photographs). Approximately 6,100 county-based aerial photographs from the 1930s – 1950s were re-housed into these archival folders/boxes and transferred to an MSA facility for permanent storage.

### **Appendix 3. Aerial Photograph Collection – Description**

Maryland Geological Survey (MGS) houses a large collection of historical aerial photographs of the State, most of which were donated by the Maryland State Highway Administration (SHA) or its predecessors. This Aerial Photograph Collection currently consists of approximately 23,800 aerial photographs and photograph-mosaic index maps. To date, the Survey has identified 10 components, or sub-collections, of its Aerial Photograph Collection. Below is a summary of these 10 components, including each component’s metadata, digital infrastructure and online availability status.

#### **Component 1. County-Based Aerial Photographs**

The first component, the bulk of the collection, consists of approximately 16,000 county-based black-and-white 9-inch by 9-inch aerial photographs (1:20,000-scale) from several time periods – 1937-1938, 1949, 1951-1953, 1957, 1961-1964, 1968, 1970-1972, 1979-1981, and 1983-1990.

These photographs were usually flown or otherwise acquired by the USDA, USGS, or Air Photographics. USDA and USGS photographs were donated to MGS, mainly by SHA. MGS purchased the copyrighted Air Photographics photographs.

As of August 2016, all photographs in this component have been digitized (1200 dpi; all in TIF format; most also in JPG format).

Select photographs of Baltimore County and Baltimore City from 1937-1938 and 1952-1953 are available online via JHU’s *JScholarship* website here: <https://jscholarship.library.jhu.edu/handle/1774.2/32749> .

Metadata for this component (updated during this FY2016 NGGDPP grant cycle) is available via the *Historical Aerial Photographs of Maryland, 1937-1990, County Collection* on USGS’ *National Digital Catalog* website here: [https://www.National Digital Catalog.gov/catalog/item/4f4e4a94e4b07f02db658dba](https://www.NationalDigitalCatalog.gov/catalog/item/4f4e4a94e4b07f02db658dba) . The *National Digital Catalog* ID for this component is 4f4e4a94e4b07f02db658dba.

In August 2016, approximately 6,100 aerial photographs (comprising the 1930s, 1940s, and a portion of the 1950s) were transferred to the MSA facility in Windsor Mill, MD for permanent storage. In July 2017, MGS transferred an additional approximately 5,200 aerial photographs (comprising the remaining 1950s photographs and a portion of the 1960s photographs) to the Windsor Mill facility. The MSA Series ID is T5053.

#### **Component 2: Fenwick and Assateague Island Aerial Photographs**

The second component, considered a “special collection,” consists of approximately 500 unrectified, black-and-white, 2-feet by 2-feet photographic enlargements, flown over one or both of the State’s two Atlantic coast barrier islands, Fenwick and Assateague Islands, during 13 different time periods between 1952 and 1964.

These aerial photographs were scanned by JHU and are available on JHU's *JScholarship* website here: <https://jscholarship.library.jhu.edu/handle/1774.2/36062> .

The metadata for this component is available via the *Historical Aerial Photographs of Fenwick and Assateague Islands, Maryland, 1952-1964* collection on USGS' *National Digital Catalog* website here: [https://www.National Digital Catalog.gov/catalog/item/4f4e4aafe4b07f02db66cf18](https://www.NationalDigitalCatalog.gov/catalog/item/4f4e4aafe4b07f02db66cf18) . The *National Digital Catalog* ID for this component is 4f4e4aafe4b07f02db66cf18.

### **Component 3: Montgomery County Aerial Photographs**

The third component, another special collection, consists of approximately 200 unrectified, black-and-white, 19-inch by 19-inch photographic enlargements, flown over the Rockville-Laurel area of Montgomery County, Maryland, annually or biannually, on 12 different dates between 1966 and 1974.

These photographs were scanned for MGS by MSA staff during the summer of 2015 and are available on MSA's *Guide to Government Records* website here: <http://guide.mdsa.net/pages/series.aspx?id=SE145> .

The metadata for this component is available via the *Historical (1966-1974) Aerial Photographs of the Rockville-Laurel Area, Montgomery County, Maryland* collection on USGS' *National Digital Catalog* here: [https://www.National Digital Catalog.gov/catalog/item/5069f121e4b046e0dfdbbc73](https://www.NationalDigitalCatalog.gov/catalog/item/5069f121e4b046e0dfdbbc73) . The *National Digital Catalog* ID for this component is 5069f121e4b046e0dfdbbc73.

### **Component 4: County Aerial Photograph Index Maps**

The fourth component consists of approximately 400 22-inch by 34-inch photograph-mosaic index maps, dating from 1936-1990, depicting flight lines and frame numbers for both the aerial photographs flown for a particular county or section of a county, as well as the 2-feet by 2-feet photographic enlargements for the barrier islands. These index maps are the reference companion maps to the first component, the county-based aerial photographs.

All of the index maps have been scanned. The 1930s, 1950s, 1960s, 1970s, and 1980s index maps are available on MSA's *Guide to Government Records* website here: <http://guide.mdsa.net/pages/index.aspx> (click on "View by Agency", enter "Maryland Geological Survey" under "Agency", and scroll down to the county listings). The 1930s and 1950s index maps are available on JHU's *JScholarship* website here: [https://jscholarship.library.jhu.edu/handle/1774.2/36422/browse?rpp=20andetal=-1andtype=titleandsort\\_by=1andorder=ASCandoffset=0](https://jscholarship.library.jhu.edu/handle/1774.2/36422/browse?rpp=20andetal=-1andtype=titleandsort_by=1andorder=ASCandoffset=0) . Digital copies of the 1990s index maps are not currently posted online; however, MGS visitors can view the digital images in-house or request copies of the digital images.

The metadata for this component is available via the *Historical Air Photograph Index Maps of Maryland, 1936-1990* collection on USGS' *National Digital Catalog* here:

<https://www.National Digital Catalog.gov/catalog/item/4f70c4dee4b08a0b754221e1> . The *National Digital Catalog* ID for this component is 4f70c4dee4b08a0b754221e1.

### **Component 5: Quadrangle-Based Aerial Photographs**

The fifth component consists of approximately 4,900 aerial photographs (mostly 9-inch by 9-inch), mainly black-and-white, some color) that were primarily flown or acquired by the USGS and organized on a 7.5-minute quadrangle basis. These photographs date from 1936 – 1991. The scale of the photography varies but primarily ranges from approximately 1:12,000 to 1:35,400. These photographs were donated to MGS.

This component comprises a previously unidentified set of photographs that were inventoried during the FY2012 NGGDPP grant cycle. Originally these photographs were included in with Component 1, the county-based series. However, once it was recognized that these photographs were flown on a quadrangle-by-quadrangle basis, instead of a county-by-county basis, MGS decided to designate these photographs as a distinct component.

MGS does not plan to scan the Component 5 aerial photographs because the USGS EROS Center is in the process of scanning the majority of photographs flown or otherwise acquired by the USGS. In fact, as of February 2015, approximately 65 percent of the photographs in Component 5 have already been scanned by the EROS group. MGS anticipates that the remainder of the Component 5 photographs will be made available in digital form by EROS in the next several years.

The metadata for this component was completed during the FY2013 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of Maryland, 1936-1991, Quad Collection* on USGS' *National Digital Catalog* website here: <https://www.National Digital Catalog.gov/catalog/item/53fcdfe8e4b0413fd75eab5b> . The *National Digital Catalog* ID for this component is 53fcdfe8e4b0413fd75eab5b.

### **Component 6: High-Altitude Black-and-White Aerial Photographs**

The sixth component is a special collection which consists of approximately 200 9-inch by 9-inch, black-and-white high-altitude aerial photographs dating from 1977-1983. These aerial photographs were primarily flown or acquired by the USGS and cover portions of Maryland, Pennsylvania, Virginia, and West Virginia. The scale of these photographs is 1:80,000.

MGS does not plan to scan the photographs in this component since the photographs originated with the USGS. According to the NGGDPP, the USGS EROS group is scanning the majority of USGS aerial photographs over the next several years. As such, it is likely that digital images of these photographs will soon be available via EROS. MGS will continue to monitor the USGS EROS *EarthExplorer* online service for these images.

The metadata for this component was completed during the FY2014 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of MD, PA, VA, and WV, 1977-1983, Black-and-White High-Altitude Collection* on USGS' *National Digital Catalog* website here:

<https://www.National Digital Catalog.gov/catalog/item/55c50826e4b033ef5212bd4b> . The *National Digital Catalog* ID for this component is 55c50826e4b033ef5212bd4b.

### **Component 7: High-Altitude Infrared Aerial Photographs**

The seventh component, also a special collection, consists of approximately 50 9-inch by 9-inch high-altitude infrared aerial photographs dating from 1970-1974. These aerial photographs cover portions of Maryland and Virginia. The counties in Maryland covered by these photographs include Anne Arundel, Baltimore, Calvert, Carroll, Charles, Frederick, Harford, Howard, Montgomery, and Prince George's Counties. The scale of these photographs is not printed on the photographs; however, MGS calculates the scale to be approximately 1:120,000 for the Series 74-039 photographs; approximately 1:140,000 for the Series 144-RC8-4L/5L photographs; and approximately 1:160,000 for the Series 72-209 photographs. The source agency of these photographs is unknown.

These photographs were digitized (1200 dpi; all in TIF and JPG format) for MGS by MSA staff as part of MGS's FY2016 NGGDPP grant tasks.

The metadata for this component was completed during the FY2014 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of Maryland, 1970-1974, High-Altitude Infrared Collection* on USGS' *National Digital Catalog* website here: <https://www.National Digital Catalog.gov/catalog/item/55e0756ce4b0f42e3d040f03> . The *National Digital Catalog* ID for this component is 55e0756ce4b0f42e3d040f03.

### **Component 8: Quadrangle-Based Infrared Aerial Photographs**

The eighth component is a special collection which consists of approximately 200 9-inch by 9-inch USGS 7.5-minute quadrangle-based infrared aerial photographs dating from 1988-1989. These photographs were primarily flown or acquired by the USGS NAPP. The Maryland counties covered by these photographs include Anne Arundel, Allegany, Calvert, Cecil, Charles, Dorchester, Kent, Prince George's, Queen Anne's, St. Mary's, Somerset, Talbot, and Washington Counties. The scale of these photographs is 1:40,000.

MGS does not plan to scan the photographs in this component since the photographs originated with the USGS. The USGS EROS group is scanning the majority of USGS aerial photographs over the next several years. As such, it is likely that digital images of these photographs will soon be available via EROS. MGS will continue to monitor the USGS EROS *EarthExplorer* online service for these images.

The metadata for this component was completed during the FY2014 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of Maryland, 1988-1989, Quad-Based Infrared Collection* on USGS' *National Digital Catalog* website here: <https://www.National Digital Catalog.gov/catalog/item/55df7430e4b0518e354e0b67> . The *National Digital Catalog* ID for this component is 55df7430e4b0518e354e0b67.

### **Component 9: Washington, DC and Vicinity Aerial Photographs**

The ninth component, also a special collection, consists of approximately 1,300 9-inch by 9-inch, black-and-white aerial photographs from Washington, DC and vicinity dating from 1935-1939 and circa 1950. These photographs cover portions of Washington, DC, Maryland, and Virginia. The scale of these photographs is not printed on the photographs; however, MGS calculates the scale to be approximately 1:20,000. The source agency of these photographs is unknown.

These photographs were digitized (1200 dpi; all in TIF and JPG format) for MGS by MSA staff as part of MGS's FY2016 NGGDPP grant tasks.

The metadata for this component was completed during the FY2014 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of Washington, DC, MD, and VA, 1935-1939 and circa 1950* on USGS' *National Digital Catalog* website here: [https://www.National Digital Catalog.gov/catalog/item/55e35a3fe4b05561fa2081f9](https://www.NationalDigitalCatalog.gov/catalog/item/55e35a3fe4b05561fa2081f9) . The *National Digital Catalog* ID for this component is 55e35a3fe4b05561fa2081f9.

### **Component 10: USGS Well-Related Aerial Photographs**

The tenth component is a special collection which consists of approximately 50 9-inch by 9-inch, black-and-white county-based aerial photographs dating from 1987-1989. The Maryland counties covered by these photographs include Anne Arundel, Baltimore, Calvert, Carroll, Cecil, Charles, Frederick, Harford, Howard, Montgomery, and St. Mary's Counties. These photographs were primarily flown or acquired by the USGS. The scale of these photographs is not printed on the photographs; however, MGS calculates the scale to be approximately 1:40,000.

These photographs have notations on them which designate well codes assigned by either MGS or USGS. These well codes correspond to the "Site Name" designation information on the USGS NWIS web interface. Users can go to <http://nwis.waterdata.usgs.gov/md/nwis/inventory> and check "Site Name". Click "Submit" and then enter the desired well code into the search box to retrieve additional information about the well (use spaces instead of dashes, e.g. AA-Ad-104 should be entered as AA Ad 10). Well information available via this interface typically includes latitude and longitude, county, hydrologic unit, well depth, hole depth, land surface altitude, national aquifers, local aquifers, field groundwater-level measurements, and field/lab water-quality sample data.

MGS does not plan to scan the photographs in this component since the photographs originated with the USGS. According to the NGGDPP, the USGS EROS Center is scanning the majority of USGS aerial photographs over the next several years. As such, it is likely that digital images of these photographs will soon be available via EROS. MGS will continue to monitor the USGS EROS *EarthExplorer* online service for these images.

The metadata for this component was completed during the FY2014 NGGDPP grant cycle and is available via the *Historical Aerial Photographs of Maryland, 1987-1989, USGS NWIS Well-Related Collection* on USGS' *National Digital Catalog* website here: <https://www.National>



[Digital Catalog.gov/catalog/item/55e4935fe4b05561fa208470](https://digitalcatalog.gov/catalog/item/55e4935fe4b05561fa208470) . The *National Digital Catalog* ID for this component is 55e4935fe4b05561fa208470.

## Appendix 4. Aerial Photograph Collection – Database & Metadata History

### MGS Internal Database

Metadata for the photographs in the Maryland Geological Survey (MGS) Aerial Photograph Collection are derived from information stored in an internal MGS database. This database has been revised and expanded over time with the inventorying and archiving process. The current version of the aerial photograph database is named *AirPhotoDB2014\_A2013\_10May2017.mdb* (Microsoft Access 2013). Some significant changes and additions to this database have occurred since MGS began inventorying its aerial photograph collection. A brief history and revision summary are provided here for reference. Appendix 3 provides an overview of the 10 components comprising the Aerial Photograph Collection.

At the start of the inventory process, MGS created a Microsoft Access 2003 database, *AirPhotoIndex.mdb*, and began entering information about the aerial photographs and photograph-mosaic index maps in its collection. This initial database included two primary tables – *tblAirPhoto* and *tblIndexMap* – which contained information about the county-based aerial photographs and index maps, respectively (Components 1 and 4). The index maps correspond to the county-based aerial photographs and the Fenwick and Assateague Island aerial photographs (Components 1 and 2). The “titles” of all photographs depicted on the index maps were entered into the air photograph table, regardless of whether MGS actually held the photographs in its collection. Thus, a subsequent phase of the project entailed entering information about the actual photographs that comprise these MGS components.

QA/QC work conducted in 2013-2014 resulted in an updated, more accurate, and user-friendly database which MGS re-named *AirPhotoDatabase2014.mdb*. This Access 2003 database was later converted to Microsoft Access 2013 and renamed *AirPhotoDatabase2014\_Access2013.mdb* to identify as such. Some original tables within this database were renamed to better identify content.

During the FY2014 U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP) grant period (2014-2015), MGS added five new tables which comprise metadata for Components 6-10 of MGS’s Aerial Photograph Collection. Additional QA/QC work conducted during the FY2015 and FY2016 grant cycles resulted in an updated database, renamed *AirPhotoDB2014\_A2013\_10May2017.mdb* in 2017 to reflect the changes made during the FY2016 NGGDPP grant cycle. Please see the “Database QA/QC” section on pages A-16 and A-17 for more details on the QA/QC process.

The MGS Aerial Photograph Collection currently consists of 10 distinct sets of aerial photographs, also known as components. With the exception of Components 1 and 2, these components do not have associated photograph-mosaic index maps. In general, new database tables were developed to house information about these distinct components. These tables often include one or more fields that are used to capture parameter(s) that are specific to the component.

The current tables in the *AirPhotoDB2014\_A2013\_10May2017.mdb* database associated with

the 10 aerial photograph collection components include:

- *tbl\_CountyAirPhotoInv\_inclMSA2017* – an updated detailed inventory of the county-based flights of aerial photography (Component 1). This table includes corrections made as a result of the ongoing records QA/QC process;
- *tblAerialPhotos\_OC\_1964\_v2* – a detailed inventory of the Fenwick and Assateague Island aerial photographs (2’x2’) (Component 2);
- *tbl\_AerialPhotos\_MontCo\_1966-1974* – a detailed inventory of the Montgomery County aerial photography enlargements (Component 3);
- *tbl\_CountyAPIndexMapInv\_Updated081516* – an updated detailed inventory of the aerial photography index maps (Component 4);
- *tbl\_QuadAirPhotoInv* – a detailed inventory of the quadrangle-based aerial photographs (Component 5);
- *tbl\_SpclColl 1- HAPPhot* – a detailed inventory of the high altitude, black-and-white aerial photographs (Component 6);
- *tbl\_SpclColl 2- HAPInfrPhot* – a detailed inventory of the high-altitude, infrared aerial photographs (Component 7);
- *tbl\_SpclColl 3- QuadInfrPhot* – a detailed inventory of the quadrangle-based, infrared aerial photographs (Component 8);
- *tbl\_SpclColl 4- Wshngtn DC-Vcnty* – a detailed inventory of the Washington, DC and vicinity aerial photographs (Component 9); and
- *tbl\_SpclColl 5- USGSWellPhot* – a detailed inventory of the USGS NWIS well-related aerial photographs (Component 10).

### **Database QA/QC**

In 2013-2014, independent of NGGDPP funding, MGS began an initial QA/QC review of the original *AirPhotoIndex.mdb* database records. The majority of this internal QA/QC occurred during the scanning of the aerial photographs, and involved comparing photograph scans (digital infrastructure) with associated photograph inventory records and updating tables as needed.

Specifically, while each photograph was being scanned, MGS staff systematically navigated to that photograph’s metadata record in the *AirPhotoIndex.mdb* database and performed a QA/QC of all of the information previously entered in the database for the photograph. MGS staff checked for accurate information and correct spelling/format. Examples of fields that were reviewed include: County Name, Date of Photograph, Flight Series, Frame, Photograph Scale, File Name, and File Location. In addition, queries and sorting were used to check for duplicate records, errors, and omissions. This QA/QC approach was valuable because 1) it was an efficient use of “down time” while the photograph was scanning, and 2) it resulted in more accurate metadata records.

The QA/QC effort outlined above primarily affected the information related to the county-based photography (Component 1) because this component has been the primary focus of scanning to

date. This initial source data QA/QC was very valuable in two key ways: (1) the process forced a familiarity with the collection, which was extremely useful to the PI and other MGS NGGDPP staff; and (2) the process revealed some errors with regards to flight series, date, scale, and naming conventions which otherwise may not have been noticed.

The initial QA/QC work in 2013-2014 resulted in an updated, more accurate and user-friendly database which MGS re-named *AirPhotoDatabase2014.mdb*. This 2003 database was later converted to Microsoft Access 2013 and renamed *AirPhotoDatabase2014\_Access2013.mdb* to identify as such. Some original tables within this database were renamed to better identify content. During the FY2014 NGGDPP grant period (2014-2015), MGS added five new tables which comprise metadata for Components 6-10 of MGS's aerial photograph collection.

During the FY2015 NGGDPP grant period, MGS performed a more thorough QA/QC of approximately 6,100 records associated with the 1930s, 1940s, and 1950s county-based aerial photographs. During the FY2016 NGGDPP grant period, MGS performed a thorough QA/QC of an additional approximately 5,200 records associated with the 1950s and 1960s county-based aerial photographs. The *AirPhotoDatabase2014\_Access2013.mdb* database was renamed *AirPhotoDB2014\_A2013\_10May2017.mdb* in 2017 to reflect the changes made during the FY2016 NGGDPP grant cycle. The goal of this QA/QC work was to finalize a sub-set of internal database records, and use these updated database records to 1) organize, cross-reference, and re-house the corresponding photographs into appropriate archival folders and boxes; and 2 transfer the photographs to an MSA facility better suited for their long term storage and preservation.

As MSA requires complete and correct metadata to accompany transferred items, MGS adhered to the following QA/QC process which consisted of two phases. During the first phase, MGS inspected each paper photograph, opened each photograph's corresponding JPG and TIFF scan file, and opened the photograph's corresponding metadata record in the internal database. MGS verified the image's quality and checked the name of the file against the flight/project series, film negative roll, and frame printed on the photograph. Note that MGS's internal database contains many additional metadata attributes (beyond the required National Digital Catalog metadata attributes). MGS verified that all of the following internal database metadata fields were correctly filled out: County Name, Date of Photograph, IndexMapID, Index Sheet Number, Flight Series, Frame, Photograph Type, Photograph Scale, In Stock, Missing, Not In Collection, On Index, On AltCo Index, Scanned, Scan Date, File Name, File Location, DPI, File Formats, URL, Geographic Features, Cultural Location, Cultural Features, Source/Contractor, Use Restrictions, and Notes. Queries and sorting were used to check for duplicate records, errors, and omissions. If any of the scans were currently available online, MGS added the appropriate URLs to the metadata record.

Secondary QA/QC was conducted during the photograph boxing effort. For each photograph, the information recorded and reviewed in the database included box and folder number, number of photographs per folder, and number of folders per box; as well as any photograph-specific information such as presence of a stamped scale, notations on the back of the photographs, and photograph condition issues. During this process, digital scans of each photograph were again verified.

## Appendix 5. MSA Pre-Transfer Record Condition Assessment Form

### Maryland State Archives

#### Pre-Transfer Record Condition Assessment Form

Agency Name: Maryland Geological Survey (MD Department of Natural Resources)  
Agency Address: 2300 Saint Paul Street, Baltimore, MD 21218  
Agency Phone Number: 410-554-5500

Current Storage Conditions: (e.g. in boxes on floor, on shelves; offsite storage, ect.)  
The 9"x9" photographs comprising our county-based aerial photograph collection are currently stored vertically in manila folders in metal file cabinets in the MGS Library. We are in the process of re-housing these photographs into acid-free, lignin-free archival folders and drop-front boxes. Photos that are in poor condition will be placed in individual acid-free, lignin-free folders within the boxes.

Has Storage area ever had problems with any of the following?

- ☐ Flooding
- ☐ Leaks
- ☐ Fire
- ☐ Mildew
- ☐ Insects
- ☐ Rodents
- ☒ Other (please list): Lack of environmental control (temperature/humidity vary greatly with the seasons in the MGS Library).

If so, please explain the problem and how it was resolved:

We have not had funding to address the lack of environmental control in the MGS building. As such, the photographs have remained stored under these conditions.

Were the records damaged as a result? If so, please explain:

A small percentage of the photographs may have become moldy, due to excessive humidity and lack of ventilation. However, we have not encountered any moldy photographs during the boxing effort thus far.

General Conditions of the Records (check all that apply):

- ☐ Surface dirt
- ☒ Tears
- ☒ Folds/creases
- ☐ Stains/discoloration
- ☐ Residues/accretions
- ☐ Insect damage/remains
- ☐ Water damage/mildew
- ☐ Separated pages
- ☐ Brittle paper
- ☐ Lacy paper
- ☐ Tunnels in pages
- ☐ Sawdust accumulation
- ☐ Broken/detached cover
- ☐ Odor

Additional Comments:

Some photographs have writing on them (front and/or back) in marker or pen. Usually these annotations are scientists' notes or the delineation of study areas.

## **Appendix 6. MSA Preliminary Inventory Worksheet**

*NOTE: Boxes 71 (highlighted in yellow) through Box 123 were delivered during the FY16 NGGDPP grant cycle*

**Maryland State Archives**  
**Preliminary Inventory Worksheet**

|                              |                                                                                                        |                                                                     |
|------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Date:</b>                 | Finalized 6/5/2017                                                                                     | (e.g. date form is filled out)                                      |
| <b>Agency:</b>               | Maryland Geological Survey (MD DNR)                                                                    | (e.g. Baltimore City Circuit Court)                                 |
| <b>Series Name:</b>          | County-Based Aerial Photograph Collection                                                              | (e.g. civil papers)                                                 |
| <b>Series T Number:</b>      | T5053 - Aerial Photographs                                                                             | (e.g. T2691 - may be left blank if unknown)                         |
| <b>Retention Schedule:</b>   | Permanent. MD DNR Records Retention Schedule is currently being created; item number citation unknown. | (Provide schedule & item number citation for these records)         |
| <b>Restriction Citation:</b> | N/A                                                                                                    | (If this series needs to be restricted, provide the legal citation) |

**NOTE:**

Please use as many lines below as needed. Different series will need a separate spreadsheet or tab.

| Box ID | Folder ID (comprised of Box ID-Folder #) | Title as found on volume or brief description of contents of box | Dates Covered by Contents |
|--------|------------------------------------------|------------------------------------------------------------------|---------------------------|
| 001    | 001-01                                   | Allegany County - Flight Series AMN-3                            | 04/19/1938                |
|        | 001-01                                   | Allegany County - Flight Series AMN-4                            | 04/23/1938                |
|        | 001-01                                   | Allegany County - Flight Series AMN-8                            | 05/02/1938                |
|        | 001-02                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-02                                   | Anne Arundel County - Flight Series AHR-2                        | 05/01/1938                |
|        | 001-03                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-04                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-05                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-06                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-07                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-08                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-09                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 001-10                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
| 002    | 002-01                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 002-02                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 002-03                                   | Anne Arundel County - Flight Series AHR-4                        | 04/12/1938                |
|        | 002-03                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-04                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-05                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-06                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-07                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-08                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-09                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-10                                   | Anne Arundel County - Flight Series AHR-5                        | 04/14/1938                |
|        | 002-10                                   | Anne Arundel County - Flight Series AHR-6                        | 04/15/1938                |
| 003    | 003-01                                   | Anne Arundel County - Flight Series AHR-6                        | 04/15/1938                |
|        | 003-02                                   | Anne Arundel County - Flight Series AHR-6                        | 04/15/1938                |
|        | 003-02                                   | Anne Arundel County - Flight Series AHR-6                        | 04/16/1938                |
|        | 003-03                                   | Anne Arundel County - Flight Series AHR-6                        | 04/16/1938                |
|        | 003-04                                   | Anne Arundel County - Flight Series AHR-6                        | 04/16/1938                |
|        | 003-05                                   | Anne Arundel County - Flight Series AHR-6                        | 04/16/1938                |



|     |        |                                           |            |
|-----|--------|-------------------------------------------|------------|
| 003 | 003-06 | Anne Arundel County - Flight Series AHR-6 | 04/16/1938 |
|     | 003-07 | Anne Arundel County - Flight Series AHR-6 | 04/16/1938 |
|     | 003-08 | Anne Arundel County - Flight Series AHR-6 | 04/16/1938 |
|     | 003-09 | Anne Arundel County - Flight Series AHR-6 | 04/16/1938 |
|     | 003-09 | Anne Arundel County - Flight Series AHR-8 | 04/23/1938 |
|     | 003-10 | Baltimore County - Flight Series AJO-66   | 11/24/1937 |
| 004 | 004-01 | Baltimore County - Flight Series AJO-66   | 11/24/1937 |
|     | 004-01 | Baltimore County - Flight Series AJO-70   | 12/03/1937 |
|     | 004-01 | Baltimore County - Flight Series AJO-1    | 04/05/1938 |
|     | 004-02 | Baltimore County - Flight Series AJO-1    | 04/05/1938 |
|     | 004-03 | Baltimore County - Flight Series AJO-1    | 04/05/1938 |
|     | 004-04 | Baltimore County - Flight Series AJO-1    | 04/05/1938 |
|     | 004-04 | Baltimore County - Flight Series AJO-2    | 04/11/1938 |
|     | 004-05 | Baltimore County - Flight Series AJO-2    | 04/11/1938 |
|     | 004-05 | Baltimore County - Flight Series AJO-3    | 04/11/1938 |
|     | 004-06 | Baltimore County - Flight Series AJO-3    | 04/11/1938 |
|     | 004-06 | Baltimore County - Flight Series AJO-8    | 04/23/1938 |
|     | 004-07 | Baltimore County - Flight Series AJO-8    | 04/23/1938 |
|     | 004-08 | Baltimore County - Flight Series AJO-8    | 04/23/1938 |
|     | 004-09 | Baltimore County - Flight Series AJO-8    | 04/23/1938 |
|     | 004-09 | Baltimore County - Flight Series AJO-9    | 04/23/1938 |
|     | 004-09 | Baltimore County - Flight Series AJO-15   | 05/02/1938 |
| 005 | 005-01 | Calvert County - Flight Series AHS-4      | 04/12/1938 |
|     | 005-01 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-02 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-03 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-04 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-05 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-06 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-07 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-08 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-09 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 005-10 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
| 006 | 006-01 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 006-02 | Calvert County - Flight Series AHS-7      | 04/20/1938 |
|     | 006-02 | Calvert County - Flight Series AHS-10     | 04/24/1938 |
|     | 006-03 | Calvert County - Flight Series AHS-10     | 04/24/1938 |
|     | 006-04 | Calvert County - Flight Series AHS-10     | 04/24/1938 |
|     | 006-05 | Calvert County - Flight Series AHS-10     | 04/24/1938 |
|     | 006-06 | Calvert County - Flight Series AHS-10     | 04/24/1938 |
|     | 006-07 | Carroll County - Flight Series AGZ-19     | 09/24/1937 |
|     | 006-07 | Carroll County - Flight Series AGZ-20     | 09/24/1937 |
|     | 006-08 | Carroll County - Flight Series AGZ-49     | 12/03/1937 |
|     | 006-08 | Carroll County - Flight Series AGZ-53     | 12/03/1937 |
|     | 006-09 | Carroll County - Flight Series AGZ-53     | 12/03/1937 |
|     | 006-10 | Carroll County - Flight Series AGZ-66     | 11/24/1937 |
|     | 006-10 | Carroll County - Flight Series AGZ-53     | 12/03/1937 |



|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 007 | 007-01 | Carroll County - Flight Series AGZ-66    | 11/24/1937 |
|     | 007-02 | Carroll County - Flight Series AGZ-66    | 11/24/1937 |
|     | 007-02 | Carroll County - Flight Series AGZ-71    | 12/03/1937 |
|     | 007-03 | Carroll County - Flight Series AGZ-71    | 12/03/1937 |
|     | 007-04 | Carroll County - Flight Series AGZ-71    | 12/03/1937 |
|     | 007-04 | Carroll County - Flight Series AGZ-78    | 02/08/1938 |
|     | 007-05 | Carroll County - Flight Series AGZ-78    | 02/08/1938 |
|     | 007-06 | Carroll County - Flight Series AGZ-78    | 02/08/1938 |
|     | 007-06 | Carroll County - Flight Series AGZ-79    | 02/08/1938 |
|     | 007-06 | Carroll County - Flight Series AGZ-81    | 03/21/1938 |
|     | 007-07 | Carroll County - Flight Series AGZ-81    | 03/21/1938 |
|     | 007-08 | Carroll County - Flight Series AGZ-81    | 03/21/1938 |
|     | 007-09 | Carroll County - Flight Series AGZ-81    | 03/21/1938 |
|     | 007-10 | Carroll County - Flight Series AGZ-81    | 03/21/1938 |
|     | 007-10 | Carroll County - Flight Series AGZ-83    | 03/22/1938 |
| 008 | 008-01 | Cecil County - Flight Series ANI-12      | 04/25/1938 |
|     | 008-01 | Cecil County - Flight Series ANI-15      | 05/02/1938 |
|     | 008-02 | Cecil County - Flight Series ANI-15      | 05/02/1938 |
|     | 008-03 | Charles County - Flight Series AHU-1     | 06/22/1937 |
|     | 008-04 | Charles County - Flight Series AHU-1     | 06/22/1937 |
|     | 008-05 | Charles County - Flight Series AHU-1     | 06/22/1937 |
|     | 008-06 | Charles County - Flight Series AHU-1     | 06/22/1937 |
|     | 008-06 | Charles County - Flight Series AHU-2     | 06/22/1937 |
|     | 008-07 | Charles County - Flight Series AHU-2     | 06/22/1937 |
|     | 008-07 | Charles County - Flight Series AHU-4     | 06/23/1937 |
|     | 008-07 | Charles County - Flight Series AHU-21    | 07/28/1937 |
|     | 008-08 | Charles County - Flight Series AHU-21    | 07/28/1937 |
|     | 008-08 | Charles County - Flight Series AHU-30    | 08/28/1937 |
|     | 008-08 | Charles County - Flight Series AHU-32    | 09/08/1937 |
|     | 008-09 | Dorchester County - Flight Series ANJ-13 | 05/01/1938 |
|     | 008-09 | Dorchester County - Flight Series ANJ-19 | 05/07/1938 |
|     | 008-10 | Frederick County - Flight Series AHA-19  | 09/24/1937 |
| 009 | 009-01 | Frederick County - Flight Series AHA-19  | 09/24/1937 |
|     | 009-01 | Frederick County - Flight Series AHA-20  | 09/24/1937 |
|     | 009-02 | Frederick County - Flight Series AHA-20  | 09/24/1937 |
|     | 009-02 | Frederick County - Flight Series AHA-49  | 12/03/1937 |
|     | 009-03 | Frederick County - Flight Series AHA-49  | 12/03/1937 |
|     | 009-03 | Frederick County - Flight Series AHA-53  | 12/03/1937 |
|     | 009-04 | Frederick County - Flight Series AHA-53  | 12/03/1937 |
|     | 009-04 | Frederick County - Flight Series AHA-70  | 03/21/1938 |
|     | 009-04 | Frederick County - Flight Series AHA-86  | 04/12/1938 |
|     | 009-05 | Frederick County - Flight Series AHA-86  | 04/12/1938 |
|     | 009-06 | Garrett County - Flight Series AMO-8     | 05/02/1938 |
|     | 009-06 | Garrett County - Flight Series AMO-9     | 05/31/1938 |
|     | 009-07 | Garrett County - Flight Series AMO-9     | 05/31/1938 |
|     | 009-08 | Garrett County - Flight Series AMO-9     | 05/31/1938 |
|     | 009-08 | Garrett County - Flight Series AMO-10    | 05/31/1938 |

|     |        |                                               |            |
|-----|--------|-----------------------------------------------|------------|
| 009 | 009-09 | Garrett County - Flight Series AMO-10         | 05/31/1938 |
|     | 009-09 | Garrett County - Flight Series AMO-10         | 08/13/1938 |
|     | 009-10 | Garrett County - Flight Series AMO-10         | 08/13/1938 |
| 010 | 010-01 | Garrett County - Flight Series AMO-11         | 08/14/1938 |
|     | 010-02 | Garrett County - Flight Series AMO-11         | 08/14/1938 |
|     | 010-02 | Garrett County - Flight Series AMO-12         | 08/20/1938 |
|     | 010-03 | Garrett County - Flight Series AMO-12         | 08/20/1938 |
|     | 010-04 | Garrett County - Flight Series AMO-12         | 08/20/1938 |
|     | 010-05 | Garrett County - Flight Series AMO-12         | 08/20/1938 |
|     | 010-05 | Garrett County - Flight Series AMO-12         | 08/29/1938 |
|     | 010-06 | Garrett County - Flight Series AMO-12         | 08/29/1938 |
|     | 010-06 | Garrett County - Flight Series AMO-12         | 08/30/1938 |
|     | 010-07 | Garrett County - Flight Series AMO-12         | 08/30/1938 |
|     | 010-08 | Garrett County - Flight Series AMO-12         | 08/30/1938 |
|     | 010-09 | Garrett County - Flight Series AMO-15         | 10/02/1938 |
|     | 010-10 | Garrett County - Flight Series AMO-15         | 10/02/1938 |
| 011 | 010-10 | Garrett County - Flight Series AMO-16         | 10/16/1938 |
|     | 011-01 | Garrett County - Flight Series AMO-16         | 10/16/1938 |
|     | 011-01 | Garrett County - Flight Series AMO-18         | 10/25/1938 |
|     | 011-02 | Garrett County - Flight Series AMO-18         | 10/25/1938 |
|     | 011-03 | Harford County - Flight Series ANK-1          | 04/05/1938 |
|     | 011-03 | Harford County - Flight Series ANK-9          | 04/23/1938 |
|     | 011-04 | Howard County - Flight Series NP-72           | 12/03/1937 |
|     | 011-05 | Montgomery County - Flight Series NV-74       | 12/11/1937 |
|     | 011-05 | Montgomery County - Flight Series NV-79       | 02/08/1938 |
|     | 011-06 | Montgomery County - Flight Series NV-1        | 04/11/1938 |
|     | 011-07 | Montgomery County - Flight Series NV-1        | 04/11/1938 |
| 012 | 011-08 | Montgomery County - Flight Series NV-1        | 04/11/1938 |
|     | 011-09 | Montgomery County - Flight Series NV-1        | 04/11/1938 |
|     | 012-01 | Prince George's County - Flight Series FG-113 | 04/19/1937 |
|     | 012-02 | Prince George's County - Flight Series FG-113 | 04/19/1937 |
|     | 012-03 | Prince George's County - Flight Series FG-113 | 04/19/1937 |
|     | 012-03 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-04 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-05 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-06 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-07 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
| 013 | 012-08 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-09 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 012-10 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-01 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-02 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-03 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-04 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-05 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-06 | Prince George's County - Flight Series FG-118 | 04/30/1937 |
|     | 013-06 | Prince George's County - Flight Series FG-119 | 04/30/1937 |



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| 013 | 013-07 | Prince George's County - Flight Series FG-119 | 04/30/1937 |
|     | 013-08 | Prince George's County - Flight Series FG-119 | 04/30/1937 |
|     | 013-09 | Prince George's County - Flight Series FG-119 | 04/30/1937 |
|     | 013-09 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 013-10 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
| 014 | 014-01 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 014-02 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 014-03 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 014-04 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 014-05 | Prince George's County - Flight Series FG-132 | 05/31/1937 |
|     | 014-06 | Prince George's County - Flight Series FG-135 | 05/31/1937 |
|     | 014-07 | Prince George's County - Flight Series FG-135 | 05/31/1937 |
|     | 014-08 | Prince George's County - Flight Series FG-135 | 05/31/1937 |
|     | 014-09 | Prince George's County - Flight Series FG-135 | 05/31/1937 |
|     | 014-10 | Prince George's County - Flight Series FG-135 | 05/31/1937 |
| 015 | 015-01 | Prince George's County - Flight Series FG-133 | 06/09/1937 |
|     | 015-02 | Prince George's County - Flight Series FG-133 | 06/09/1937 |
|     | 015-02 | Prince George's County - Flight Series AHV-4  | 06/23/1937 |
|     | 015-02 | Prince George's County - Flight Series AHV-30 | 08/28/1937 |
|     | 015-03 | Prince George's County - Flight Series AHV-32 | 09/08/1937 |
|     | 015-03 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 015-04 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 015-05 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 015-06 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 015-07 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 015-08 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
| 016 | 016-01 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 016-02 | Prince George's County - Flight Series AHV-1  | 04/11/1938 |
|     | 016-02 | Prince George's County - Flight Series AHV-4  | 04/12/1938 |
|     | 016-03 | Prince George's County - Flight Series AHV-4  | 04/12/1938 |
|     | 016-04 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
|     | 016-05 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
|     | 016-06 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
|     | 016-07 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
| 017 | 017-01 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
|     | 017-02 | Prince George's County - Flight Series AHV-2  | 05/01/1938 |
|     | 017-03 | Prince George's County - Flight Series AHV-3  | 05/01/1938 |
|     | 017-04 | Prince George's County - Flight Series AHV-3  | 05/01/1938 |
|     | 017-05 | Prince George's County - Flight Series AHV-3  | 05/01/1938 |
|     | 017-06 | Prince George's County - Flight Series AHV-3  | 05/01/1938 |
|     | 017-07 | Prince George's County - Flight Series AHV-3  | 05/01/1938 |
| 018 | 018-01 | Queen Anne's County - Flight Series AHW-5     | 06/24/1937 |
|     | 018-01 | Queen Anne's County - Flight Series AHW-6     | 6/24/1937  |
|     | 018-01 | Queen Anne's County - Flight Series AHW-7     | 6/24/1937  |
|     | 018-01 | Queen Anne's County - Flight Series AHW-28    | 08/20/1937 |
|     | 018-01 | Queen Anne's County - Flight Series AHW-37    | 09/10/1937 |
|     | 018-02 | Somerset County - Flight Series ANL-16        | 05/03/1938 |

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|-----|--------|--------------------------------------------|------------|
| 018 | 018-02 | Somerset County - Flight Series ANL-18     | 05/06/1938 |
|     | 018-02 | Somerset County - Flight Series ANL-20     | 05/07/1938 |
|     | 018-02 | Somerset County - Flight Series MD-21      | 07/24/1949 |
|     | 018-03 | St. Mary's County - Flight Series AHX-7    | 04/20/1938 |
|     | 018-03 | St. Mary's County - Flight Series AHX-10   | 04/24/1938 |
|     | 018-04 | Talbot County - Flight Series AHY-5        | 06/24/1937 |
|     | 018-05 | Talbot County - Flight Series AHY-6        | 06/24/1937 |
|     | 018-06 | Talbot County - Flight Series AHY-27       | 08/16/1937 |
|     | 018-07 | Talbot County - Flight Series AHY-28       | 08/20/1937 |
|     | 018-08 | Talbot County - Flight Series AHY-36       | 09/10/1937 |
|     | 018-08 | Talbot County - Flight Series AHY-63       | 11/14/1937 |
| 019 | 019-01 | Wicomico County - Flight Series ANM-16     | 05/03/1938 |
|     | 019-01 | Wicomico County - Flight Series ANM-18     | 05/06/1938 |
|     | 019-02 | Wicomico County - Flight Series ANM-19     | 05/07/1938 |
|     | 019-02 | Wicomico County - Flight Series ANM-20     | 05/07/1938 |
|     | 019-03 | Wicomico County - Flight Series ANM-20     | 05/07/1938 |
|     | 019-03 | Wicomico County - Flight Series ANM-26     | 06/07/1938 |
|     | 019-04 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 019-05 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 019-06 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 019-07 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
| 020 | 019-08 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 019-09 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 019-10 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-01 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-02 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-03 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-04 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-05 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-06 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
|     | 020-07 | Anne Arundel County - Flight Series AHR-1K | 06/20/1952 |
| 021 | 020-08 | Anne Arundel County - Flight Series AHR-2K | 06/20/1952 |
|     | 020-09 | Anne Arundel County - Flight Series AHR-4K | 07/02/1952 |
|     | 020-10 | Anne Arundel County - Flight Series AHR-4K | 07/02/1952 |
|     | 021-01 | Anne Arundel County - Flight Series AHR-4K | 07/02/1952 |
|     | 021-02 | Anne Arundel County - Flight Series AHR-4K | 07/02/1952 |
|     | 021-03 | Anne Arundel County - Flight Series AHR-4K | 07/02/1952 |
|     | 021-03 | Anne Arundel County - Flight Series AHR-6K | 10/04/1952 |
|     | 021-04 | Anne Arundel County - Flight Series AHR-6K | 10/04/1952 |
|     | 021-05 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
|     | 021-06 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
| 022 | 021-07 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
|     | 021-08 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
|     | 021-09 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
|     | 021-10 | Anne Arundel County - Flight Series AHR-7K | 10/17/1952 |
| 022 | 022-01 | Baltimore County - Flight Series AJO-3K    | 07/12/1952 |
|     | 022-02 | Baltimore County - Flight Series AJO-4K    | 07/25/1952 |



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| 027 | 027-03 | Baltimore County - Flight Series AJO-7K | 11/29/1952 |
|     | 027-04 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
|     | 027-05 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
|     | 027-06 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
|     | 027-07 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
|     | 027-08 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
|     | 027-09 | Baltimore County - Flight Series AJO-8K | 02/14/1953 |
| 028 | 028-01 | Baltimore County - Flight Series 431-7  | 04/24/1953 |
|     | 028-02 | Baltimore County - Flight Series 431-7  | 04/24/1953 |
|     | 028-03 | Baltimore County - Flight Series 431-7  | 04/24/1953 |
|     | 028-03 | Baltimore County - Flight Series 431-9  | 04/24/1953 |
|     | 028-04 | Baltimore County - Flight Series 431-9  | 04/24/1953 |
|     | 028-05 | Baltimore County - Flight Series 431-9  | 04/24/1953 |
|     | 028-05 | Baltimore County - Flight Series 431-11 | 04/24/1953 |
|     | 028-06 | Baltimore County - Flight Series 431-11 | 04/24/1953 |
|     | 028-07 | Baltimore County - Flight Series 431-13 | 04/24/1953 |
| 029 | 028-08 | Baltimore County - Flight Series 431-15 | 04/24/1953 |
|     | 029-01 | Baltimore County - Flight Series 431-15 | 04/24/1953 |
|     | 029-01 | Baltimore County - Flight Series 431-16 | 04/24/1953 |
|     | 029-02 | Baltimore County - Flight Series 431-16 | 04/24/1953 |
|     | 029-03 | Baltimore County - Flight Series 431-16 | 04/24/1953 |
|     | 029-03 | Baltimore County - Flight Series 431-17 | 04/24/1953 |
|     | 029-04 | Baltimore County - Flight Series 431-17 | 04/24/1953 |
|     | 029-05 | Baltimore County - Flight Series 431-17 | 04/24/1953 |
|     | 029-05 | Baltimore County - Flight Series 431-18 | 04/24/1953 |
|     | 029-06 | Baltimore County - Flight Series 431-18 | 04/24/1953 |
|     | 029-07 | Baltimore County - Flight Series 431-18 | 04/24/1953 |
|     | 029-07 | Baltimore County - Flight Series 431-19 | 04/24/1953 |
|     | 029-08 | Baltimore County - Flight Series 431-19 | 04/24/1953 |
|     | 029-08 | Baltimore County - Flight Series 431-20 | 04/24/1953 |
| 030 | 030-01 | Baltimore County - Flight Series 431-20 | 04/24/1953 |
|     | 030-02 | Baltimore County - Flight Series 431-21 | 04/24/1953 |
|     | 030-03 | Baltimore County - Flight Series 431-22 | 04/24/1953 |
|     | 030-03 | Baltimore County - Flight Series 431-19 | 05/09/1953 |
|     | 030-04 | Baltimore County - Flight Series 431-19 | 05/09/1953 |
|     | 030-04 | Baltimore County - Flight Series 431-2  | 05/10/1953 |
|     | 030-05 | Baltimore County - Flight Series 431-2  | 05/10/1953 |
|     | 030-06 | Baltimore County - Flight Series 431-3  | 05/10/1953 |
|     | 030-07 | Baltimore County - Flight Series 431-3  | 05/10/1953 |
|     | 030-07 | Baltimore County - Flight Series 431-4  | 05/10/1953 |
| 031 | 030-08 | Baltimore County - Flight Series 431-4  | 05/10/1953 |
|     | 031-01 | Baltimore County - Flight Series 431-4  | 05/10/1953 |
|     | 031-01 | Baltimore County - Flight Series 431-5  | 05/10/1953 |
|     | 031-02 | Baltimore County - Flight Series 431-5  | 05/10/1953 |
|     | 031-03 | Baltimore County - Flight Series 431-5  | 05/10/1953 |
|     | 031-04 | Baltimore County - Flight Series 431-6  | 05/10/1953 |
|     | 031-05 | Baltimore County - Flight Series 431-6  | 05/10/1953 |



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|-----|--------|-----------------------------------------|------------|
| 031 | 031-06 | Baltimore County - Flight Series 431-8N | 05/10/1953 |
|     | 031-07 | Baltimore County - Flight Series 431-8S | 05/10/1953 |
| 032 | 032-01 | Baltimore County - Flight Series 431-10 | 05/10/1953 |
|     | 032-02 | Baltimore County - Flight Series 431-10 | 05/10/1953 |
|     | 032-02 | Baltimore County - Flight Series 431-12 | 05/10/1953 |
|     | 032-03 | Baltimore County - Flight Series 431-12 | 05/10/1953 |
|     | 032-03 | Baltimore County - Flight Series 431-14 | 05/10/1953 |
|     | 032-04 | Baltimore County - Flight Series 431-14 | 05/10/1953 |
|     | 032-05 | Baltimore County - Flight Series AJO-5T | 09/25/1957 |
|     | 032-06 | Baltimore County - Flight Series AJO-5T | 09/25/1957 |
|     | 032-07 | Baltimore County - Flight Series AJO-5T | 09/25/1957 |
|     | 032-07 | Baltimore County - Flight Series AJO-6T | 09/27/1957 |
|     | 032-07 | Baltimore County - Flight Series AJO-7T | 10/03/1957 |
| 033 | 033-01 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-02 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-03 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-04 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-05 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-06 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-07 | Calvert County - Flight Series AHS-3K   | 06/26/1952 |
|     | 033-08 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 033-09 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
| 034 | 034-01 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-02 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-03 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-04 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-05 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-06 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-07 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-08 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 034-09 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
| 035 | 035-01 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 035-02 | Calvert County - Flight Series AHS-4K   | 06/26/1952 |
|     | 035-02 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-03 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-04 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-05 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-06 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-07 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-08 | Calvert County - Flight Series AHS-5K   | 07/02/1952 |
|     | 035-09 | Calvert County - Flight Series AHS-6K   | 10/22/1952 |
|     | 035-10 | Calvert County - Flight Series AHS-5T   | 10/13/1957 |
|     | 035-10 | Calvert County - Flight Series AHS-6T   | 10/22/1957 |
| 036 | 036-01 | Caroline County - Flight Series AHT-1K  | 06/06/1952 |
|     | 036-01 | Caroline County - Flight Series AHT-1K  | 06/08/1952 |
|     | 036-02 | Caroline County - Flight Series AHT-2K  | 06/13/1952 |
|     | 036-03 | Caroline County - Flight Series AHT-2K  | 06/13/1952 |

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| 036 | 036-04 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-05 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-06 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-07 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-08 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-09 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
|     | 036-10 | Caroline County - Flight Series AHT-2K | 06/13/1952 |
| 037 | 036-10 | Caroline County - Flight Series AHT-3K | 06/13/1952 |
|     | 037-01 | Caroline County - Flight Series AHT-3K | 06/13/1952 |
|     | 037-02 | Caroline County - Flight Series AHT-3K | 06/13/1952 |
|     | 037-03 | Caroline County - Flight Series AHT-3K | 06/13/1952 |
|     | 037-04 | Caroline County - Flight Series AHT-3K | 06/13/1952 |
|     | 037-05 | Caroline County - Flight Series AHT-4K | 06/13/1952 |
|     | 037-06 | Caroline County - Flight Series AHT-4K | 06/13/1952 |
|     | 037-06 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 037-07 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 037-08 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
| 038 | 037-09 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 037-10 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 038-01 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 038-02 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 038-03 | Caroline County - Flight Series AHT-7K | 10/04/1952 |
|     | 038-04 | Carroll County - Flight Series AGZ-9K  | 10/24/1951 |
|     | 038-05 | Carroll County - Flight Series AGZ-9K  | 10/24/1951 |
| 039 | 038-06 | Carroll County - Flight Series AGZ-1K  | 09/04/1952 |
|     | 038-07 | Carroll County - Flight Series AGZ-1K  | 09/04/1952 |
|     | 039-01 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-02 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-03 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-04 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-05 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-06 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
| 040 | 039-07 | Carroll County - Flight Series AGZ-5K  | 09/12/1952 |
|     | 039-07 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-01 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-02 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-03 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-04 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-05 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
| 041 | 040-06 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 040-07 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 041-01 | Carroll County - Flight Series AGZ-6K  | 09/14/1952 |
|     | 041-02 | Carroll County - Flight Series AGZ-7K  | 09/14/1952 |
|     | 041-03 | Carroll County - Flight Series AGZ-7K  | 09/14/1952 |
|     | 041-04 | Carroll County - Flight Series AGZ-7K  | 09/14/1952 |
|     | 041-05 | Carroll County - Flight Series AGZ-7K  | 09/14/1952 |
|     | 041-06 | Carroll County - Flight Series AGZ-7K  | 09/14/1952 |



|     |        |                                       |            |
|-----|--------|---------------------------------------|------------|
| 041 | 041-07 | Carroll County - Flight Series AGZ-7K | 09/14/1952 |
| 042 | 042-01 | Carroll County - Flight Series AGZ-7K | 09/14/1952 |
|     | 042-02 | Carroll County - Flight Series AGZ-7K | 09/14/1952 |
|     | 042-03 | Cecil County - Flight Series ANI-1K   | 07/02/1952 |
|     | 042-04 | Cecil County - Flight Series ANI-1K   | 07/02/1952 |
|     | 042-05 | Cecil County - Flight Series ANI-1K   | 07/02/1952 |
|     | 042-06 | Cecil County - Flight Series ANI-1K   | 07/02/1952 |
|     | 042-07 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
| 043 | 043-01 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-02 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-03 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-04 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-05 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-06 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 043-07 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
| 044 | 043-08 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-01 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-02 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-03 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-04 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-05 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-06 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
| 045 | 044-07 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 044-08 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 045-01 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 045-02 | Cecil County - Flight Series ANI-2K   | 07/02/1952 |
|     | 045-02 | Cecil County - Flight Series ANI-3K   | 07/12/1952 |
|     | 045-03 | Cecil County - Flight Series ANI-3K   | 07/12/1952 |
|     | 045-04 | Cecil County - Flight Series ANI-3K   | 07/12/1952 |
|     | 045-05 | Cecil County - Flight Series ANI-1T   | 08/13/1957 |
|     | 045-06 | Cecil County - Flight Series ANI-1T   | 08/13/1957 |
|     | 045-07 | Cecil County - Flight Series ANI-1T   | 08/13/1957 |
|     | 045-08 | Cecil County - Flight Series ANI-1T   | 08/13/1957 |
| 046 | 045-08 | Cecil County - Flight Series ANI-2T   | 08/16/1957 |
|     | 045-09 | Cecil County - Flight Series ANI-2T   | 08/16/1957 |
|     | 045-10 | Cecil County - Flight Series ANI-2T   | 08/16/1957 |
|     | 046-01 | Cecil County - Flight Series ANI-2T   | 08/16/1957 |
|     | 046-02 | Cecil County - Flight Series ANI-2T   | 08/16/1957 |
|     | 046-02 | Cecil County - Flight Series ANI-2T   | 08/21/1957 |
|     | 046-03 | Cecil County - Flight Series ANI-2T   | 08/21/1957 |
|     | 046-04 | Cecil County - Flight Series ANI-2T   | 08/21/1957 |
|     | 046-04 | Cecil County - Flight Series ANI-2T   | 08/28/1957 |
|     | 046-04 | Cecil County - Flight Series ANI-3T   | 08/28/1957 |
|     | 046-05 | Cecil County - Flight Series ANI-3T   | 08/28/1957 |
|     | 046-05 | Cecil County - Flight Series ANI-7T   | 10/03/1957 |
|     | 046-06 | Cecil County - Flight Series ANI-7T   | 10/03/1957 |
|     | 046-07 | Charles County - Flight Series AHU-1K | 06/19/1952 |

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| 055 | 055-07 | Dorchester County - Flight Series ANJ-5K | 07/02/1952 |
|     | 055-08 | Dorchester County - Flight Series ANJ-5K | 07/02/1952 |
|     | 055-09 | Dorchester County - Flight Series ANJ-5K | 07/02/1952 |
|     | 055-10 | Dorchester County - Flight Series ANJ-6K | 07/25/1952 |
|     | 055-10 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
| 056 | 056-01 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-02 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-03 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-04 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-05 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-06 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-07 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-08 | Dorchester County - Flight Series ANJ-7K | 10/04/1952 |
|     | 056-09 | Frederick County - Flight Series AHA-3K  | 09/11/1952 |
| 057 | 057-01 | Frederick County - Flight Series AHA-3K  | 09/11/1952 |
|     | 057-02 | Frederick County - Flight Series AHA-3K  | 09/11/1952 |
|     | 057-02 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 057-03 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 057-04 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 057-05 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 057-06 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
| 058 | 058-01 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 058-02 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 058-03 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 058-04 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 058-05 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
| 059 | 059-01 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 059-02 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 059-03 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 059-04 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 059-05 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
| 060 | 060-01 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 060-02 | Frederick County - Flight Series AHA-4K  | 09/12/1952 |
|     | 060-02 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 060-03 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 060-04 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 060-05 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
| 061 | 061-01 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 061-02 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 061-03 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 061-04 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 061-05 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 061-06 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
| 062 | 062-01 | Frederick County - Flight Series AHA-5K  | 09/12/1952 |
|     | 062-01 | Frederick County - Flight Series AHA-8K  | 10/24/1952 |
|     | 062-02 | Frederick County - Flight Series AHA-8K  | 10/24/1952 |



|     |        |                                         |            |
|-----|--------|-----------------------------------------|------------|
| 062 | 062-03 | Frederick County - Flight Series AHA-8K | 10/24/1952 |
|     | 062-04 | Frederick County - Flight Series AHA-8K | 10/24/1952 |
|     | 062-05 | Frederick County - Flight Series AHA-8K | 10/24/1952 |
|     | 062-06 | Frederick County - Flight Series AHA-8K | 10/24/1952 |
|     | 062-07 | Frederick County - Flight Series AHA-8K | 10/24/1952 |
| 063 | 063-01 | Harford County - Flight Series ANK-2K   | 07/02/1952 |
|     | 063-01 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-02 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-03 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-04 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-05 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-06 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-07 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-08 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-09 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 063-10 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
| 064 | 064-01 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-02 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-03 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-04 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-05 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-06 | Harford County - Flight Series ANK-3K   | 07/12/1952 |
|     | 064-06 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
|     | 064-07 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
|     | 064-08 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
|     | 064-09 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
|     | 064-10 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
| 065 | 065-01 | Harford County - Flight Series ANK-4K   | 07/25/1952 |
|     | 065-01 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-02 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-03 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-04 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-05 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-06 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-07 | Harford County - Flight Series ANK-5K   | 08/23/1952 |
|     | 065-07 | Harford County - Flight Series ANK-7K   | 10/22/1952 |
|     | 065-08 | Harford County - Flight Series ANK-7K   | 10/22/1952 |
|     | 065-09 | Harford County - Flight Series ANK-3T   | 08/28/1957 |
|     | 065-10 | Howard County - Flight Series NP-9K     | 10/24/1951 |
|     | 065-10 | Howard County - Flight Series NP-6K     | 09/14/1952 |
| 066 | 066-01 | Howard County - Flight Series NP-6K     | 09/14/1952 |
|     | 066-02 | Howard County - Flight Series NP-7K     | 09/14/1952 |
|     | 066-03 | Howard County - Flight Series NP-7K     | 09/14/1952 |
|     | 066-04 | Kent County - Flight Series FB-1K       | 06/03/1952 |
|     | 066-05 | Kent County - Flight Series FB-1K       | 06/03/1952 |
|     | 066-06 | Kent County - Flight Series FB-1K       | 06/03/1952 |
|     | 066-07 | Kent County - Flight Series FB-1K       | 06/03/1952 |

|     |        |                                         |            |
|-----|--------|-----------------------------------------|------------|
| 066 | 066-07 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 066-08 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 066-09 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 066-10 | Kent County - Flight Series FB-2K       | 06/03/1952 |
| 067 | 067-01 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-02 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-03 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-04 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-05 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-06 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-07 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-08 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-09 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 067-10 | Kent County - Flight Series FB-2K       | 06/03/1952 |
| 068 | 068-01 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 068-02 | Kent County - Flight Series FB-2K       | 06/03/1952 |
|     | 068-02 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-03 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-04 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-05 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-06 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-07 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-08 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-09 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 068-10 | Kent County - Flight Series FB-3K       | 06/03/1952 |
| 069 | 069-01 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 069-02 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 069-03 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 069-04 | Kent County - Flight Series FB-3K       | 06/03/1952 |
|     | 069-04 | Kent County - Flight Series FB-4K       | 06/06/1952 |
|     | 069-05 | Kent County - Flight Series FB-4K       | 06/06/1952 |
|     | 069-06 | Kent County - Flight Series FB-4K       | 06/06/1952 |
|     | 069-07 | Kent County - Flight Series FB-4K       | 06/06/1952 |
|     | 069-08 | Kent County - Flight Series FB-4K       | 06/06/1952 |
|     | 069-08 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 069-09 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 069-10 | Kent County - Flight Series FB-5K       | 06/06/1952 |
| 070 | 070-01 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 070-02 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 070-03 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 070-04 | Kent County - Flight Series FB-5K       | 06/06/1952 |
|     | 070-05 | Kent County - Flight Series FB-1T       | 08/06/1957 |
|     | 070-05 | Kent County - Flight Series FB-4T       | 08/13/1957 |
|     | 070-05 | Kent County - Flight Series FB-5T       | 10/22/1957 |
| 071 | 070-05 | Kent County - Flight Series FB-5T       | 11/06/1957 |
|     | 071-01 | Montgomery County - Flight Series NV-1G | 09/20/1951 |
|     | 071-02 | Montgomery County - Flight Series NV-1G | 09/20/1951 |



|     |        |                                               |            |
|-----|--------|-----------------------------------------------|------------|
| 071 | 071-03 | Montgomery County - Flight Series NV-1G       | 09/20/1951 |
|     | 071-04 | Montgomery County - Flight Series NV-1G       | 09/20/1951 |
|     | 071-05 | Montgomery County - Flight Series NV-1G       | 09/20/1951 |
|     | 071-06 | Montgomery County - Flight Series NV-1G       | 09/20/1951 |
|     | 071-07 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
|     | 071-08 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
|     | 071-09 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
|     | 071-10 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
| 072 | 072-01 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
|     | 072-02 | Montgomery County - Flight Series NV-2G       | 09/28/1951 |
|     | 072-03 | Prince George's County - Flight Series AHV-1K | 06/20/1952 |
|     | 072-04 | Prince George's County - Flight Series AHV-1K | 06/20/1952 |
|     | 072-05 | Prince George's County - Flight Series AHV-1K | 06/20/1952 |
|     | 072-06 | Prince George's County - Flight Series AHV-2K | 06/20/1952 |
|     | 072-06 | Prince George's County - Flight Series AHV-3K | 06/20/1952 |
|     | 072-07 | Prince George's County - Flight Series AHV-3K | 06/20/1952 |
|     | 072-08 | Prince George's County - Flight Series AHV-5K | 07/25/1952 |
|     | 072-08 | Prince George's County - Flight Series AHV-7K | 10/17/1952 |
|     | 072-09 | Queen Anne's County - Flight Series AHW-1K    | 06/03/1952 |
| 073 | 072-10 | Queen Anne's County - Flight Series AHW-1K    | 06/03/1952 |
|     | 073-01 | Queen Anne's County - Flight Series AHW-1K    | 06/03/1952 |
|     | 073-01 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-02 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-03 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-04 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-05 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-06 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-07 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-08 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
|     | 073-09 | Queen Anne's County - Flight Series AHW-2K    | 06/03/1952 |
| 074 | 073-09 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 073-10 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-01 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-02 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-03 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-04 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-05 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-06 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-07 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-08 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
| 075 | 074-09 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 074-10 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 075-01 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 075-02 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 075-03 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 075-04 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |
|     | 075-05 | Queen Anne's County - Flight Series AHW-3K    | 06/03/1952 |



|     |        |                                            |            |
|-----|--------|--------------------------------------------|------------|
| 075 | 075-05 | Queen Anne's County - Flight Series AHW-4K | 06/06/1952 |
|     | 075-06 | Queen Anne's County - Flight Series AHW-4K | 06/06/1952 |
|     | 075-07 | Queen Anne's County - Flight Series AHW-4K | 06/06/1952 |
|     | 075-08 | Queen Anne's County - Flight Series AHW-4K | 06/06/1952 |
|     | 075-09 | Queen Anne's County - Flight Series AHW-4K | 06/06/1952 |
|     | 075-10 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
| 076 | 076-01 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-02 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-03 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-04 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-05 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-06 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-07 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-08 | Queen Anne's County - Flight Series AHW-5K | 06/06/1952 |
|     | 076-09 | Queen Anne's County - Flight Series AHW-1T | 08/06/1957 |
|     | 076-10 | Queen Anne's County - Flight Series AHW-1T | 08/06/1957 |
| 077 | 077-01 | Queen Anne's County - Flight Series AHW-1T | 08/06/1957 |
|     | 077-01 | Queen Anne's County - Flight Series AHW-2T | 08/06/1957 |
|     | 077-01 | Queen Anne's County - Flight Series AHW-2T | 08/08/1957 |
|     | 077-02 | Queen Anne's County - Flight Series AHW-2T | 08/08/1957 |
|     | 077-03 | Queen Anne's County - Flight Series AHW-2T | 08/08/1957 |
|     | 077-03 | Queen Anne's County - Flight Series AHW-3T | 08/08/1957 |
|     | 077-04 | Queen Anne's County - Flight Series AHW-3T | 08/08/1957 |
|     | 077-05 | Queen Anne's County - Flight Series AHW-3T | 08/08/1957 |
|     | 077-06 | Queen Anne's County - Flight Series AHW-4T | 08/13/1957 |
|     | 077-07 | Queen Anne's County - Flight Series AHW-4T | 08/13/1957 |
|     | 077-08 | Queen Anne's County - Flight Series AHW-4T | 08/13/1957 |
|     | 077-08 | Queen Anne's County - Flight Series AHW-4T | 10/13/1957 |
|     | 077-09 | Queen Anne's County - Flight Series AHW-4T | 10/13/1957 |
|     | 077-09 | Queen Anne's County - Flight Series AHW-5T | 10/22/1957 |
|     | 077-10 | Queen Anne's County - Flight Series AHW-5T | 10/22/1957 |
|     | 077-10 | Queen Anne's County - Flight Series AHW-5T | 10/23/1957 |
|     | 077-11 | Queen Anne's County - Flight Series AHW-5T | 11/06/1957 |
| 078 | 078-01 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-02 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-03 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-04 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-05 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-06 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-07 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-08 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-09 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 078-10 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
| 079 | 079-01 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 079-02 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 079-03 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |
|     | 079-04 | Somerset County - Flight Series ANL-3K     | 06/08/1952 |

|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 079 | 079-05 | Somerset County - Flight Series ANL-3K   | 06/08/1952 |
|     | 079-06 | Somerset County - Flight Series ANL-3K   | 06/08/1952 |
|     | 079-07 | Somerset County - Flight Series ANL-3K   | 06/08/1952 |
|     | 079-08 | Somerset County - Flight Series ANL-3K   | 06/08/1952 |
|     | 079-09 | Somerset County - Flight Series ANL-3K   | 06/08/1952 |
|     | 079-09 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 079-10 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
| 080 | 080-01 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-02 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-03 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-04 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-05 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-06 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-07 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-08 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 080-09 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
| 081 | 081-01 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-02 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-03 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-04 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-05 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-06 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-07 | Somerset County - Flight Series ANL-4K   | 06/08/1952 |
|     | 081-07 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 081-08 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 081-09 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
| 082 | 082-01 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-02 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-03 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-04 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-05 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-06 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-07 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-08 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-09 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 082-10 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
| 083 | 083-01 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 083-02 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 083-03 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 083-04 | Somerset County - Flight Series ANL-5K   | 06/13/1952 |
|     | 083-04 | Somerset County - Flight Series ANL-6K   | 10/04/1952 |
|     | 083-05 | Somerset County - Flight Series ANL-6K   | 10/04/1952 |
|     | 083-06 | Somerset County - Flight Series ANL-6K   | 10/04/1952 |
|     | 083-07 | St. Mary's County - Flight Series AHX-2K | 06/19/1952 |
|     | 083-08 | St. Mary's County - Flight Series AHX-2K | 06/19/1952 |



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|-----|--------|------------------------------------------|------------|
| 088 | 088-08 | St. Mary's County - Flight Series AHX-5K | 07/25/1952 |
|     | 088-08 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 088-09 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 088-10 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
| 089 | 089-01 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-02 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-03 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-04 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-05 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-06 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-07 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-08 | St. Mary's County - Flight Series AHX-6K | 10/22/1952 |
|     | 089-09 | St. Mary's County - Flight Series AHX-3T | 10/13/1957 |
| 090 | 089-09 | St. Mary's County - Flight Series AHX-5T | 10/13/1957 |
|     | 090-01 | Talbot County - Flight Series AHY-1K     | 06/03/1952 |
|     | 090-02 | Talbot County - Flight Series AHY-1K     | 06/03/1952 |
|     | 090-03 | Talbot County - Flight Series AHY-1K     | 06/03/1952 |
|     | 090-04 | Talbot County - Flight Series AHY-1K     | 06/03/1952 |
|     | 090-05 | Talbot County - Flight Series AHY-1K     | 06/03/1952 |
|     | 090-06 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 090-07 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 090-08 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 090-09 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
| 091 | 090-10 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 091-01 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 091-02 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 091-03 | Talbot County - Flight Series AHY-2K     | 06/03/1952 |
|     | 091-04 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
|     | 091-05 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
|     | 091-06 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
|     | 091-07 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
|     | 091-08 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
|     | 091-09 | Talbot County - Flight Series AHY-3K     | 06/03/1952 |
| 092 | 091-10 | Talbot County - Flight Series AHY-4K     | 06/06/1952 |
|     | 092-01 | Talbot County - Flight Series AHY-4K     | 06/06/1952 |
|     | 092-01 | Talbot County - Flight Series AHY-5K     | 06/06/1952 |
|     | 092-02 | Talbot County - Flight Series AHY-5K     | 06/06/1952 |
|     | 092-03 | Talbot County - Flight Series AHY-5K     | 06/06/1952 |
|     | 092-04 | Talbot County - Flight Series AHY-5K     | 06/06/1952 |
|     | 092-05 | Talbot County - Flight Series AHY-5K     | 06/06/1952 |
|     | 092-06 | Talbot County - Flight Series AHY-1T     | 08/06/1957 |
|     | 092-07 | Talbot County - Flight Series AHY-1T     | 08/06/1957 |
|     | 092-08 | Talbot County - Flight Series AHY-1T     | 08/06/1957 |
| 093 | 092-09 | Talbot County - Flight Series AHY-2T     | 08/08/1957 |
|     | 092-10 | Talbot County - Flight Series AHY-2T     | 08/08/1957 |
|     | 093-01 | Talbot County - Flight Series AHY-2T     | 08/08/1957 |
|     | 093-02 | Talbot County - Flight Series AHY-2T     | 08/08/1957 |



|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 093 | 093-02 | Talbot County - Flight Series AHY-3T     | 08/08/1957 |
|     | 093-03 | Talbot County - Flight Series AHY-3T     | 08/08/1957 |
|     | 093-04 | Talbot County - Flight Series AHY-4T     | 10/13/1957 |
|     | 093-05 | Talbot County - Flight Series AHY-5T     | 10/22/1957 |
|     | 093-05 | Talbot County - Flight Series AHY-5T     | 10/23/1957 |
|     | 093-06 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 093-07 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 093-08 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 093-09 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 093-10 | Washington County - Flight Series AHB-2K | 09/11/1952 |
| 094 | 094-01 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 094-02 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 094-03 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 094-04 | Washington County - Flight Series AHB-2K | 09/11/1952 |
|     | 094-04 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 094-05 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 094-06 | Washington County - Flight Series AHB-3K | 09/11/1952 |
| 095 | 095-01 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 095-02 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 095-03 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 095-04 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 095-05 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 095-06 | Washington County - Flight Series AHB-3K | 09/11/1952 |
| 096 | 096-01 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 096-02 | Washington County - Flight Series AHB-3K | 09/11/1952 |
|     | 096-02 | Washington County - Flight Series AHB-4K | 09/12/1952 |
|     | 096-03 | Washington County - Flight Series AHB-4K | 09/12/1952 |
|     | 096-03 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 096-04 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 096-05 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 096-06 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 096-07 | Washington County - Flight Series AHB-8K | 10/24/1952 |
| 097 | 096-08 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 097-01 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 097-02 | Washington County - Flight Series AHB-8K | 10/24/1952 |
|     | 097-03 | Wicomico County - Flight Series ANM-2K   | 06/08/1952 |
|     | 097-04 | Wicomico County - Flight Series ANM-3K   | 06/08/1952 |
|     | 097-04 | Wicomico County - Flight Series ANM-4K   | 06/08/1952 |
|     | 097-05 | Wicomico County - Flight Series ANM-4K   | 06/08/1952 |
|     | 097-06 | Wicomico County - Flight Series ANM-4K   | 06/08/1952 |
|     | 097-07 | Wicomico County - Flight Series ANM-5K   | 06/13/1952 |
|     | 097-07 | Wicomico County - Flight Series ANM-6K   | 10/04/1952 |
|     | 097-08 | Worcester County - Flight Series ANN-1K  | 06/08/1952 |
| 098 | 097-09 | Worcester County - Flight Series ANN-1K  | 06/08/1952 |
|     | 097-10 | Worcester County - Flight Series ANN-1K  | 06/08/1952 |
|     | 098-01 | Worcester County - Flight Series ANN-1K  | 06/08/1952 |
|     | 098-02 | Worcester County - Flight Series ANN-1K  | 06/08/1952 |

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|-----|--------|---------------------------------------------|------------|
| 102 | 102-05 | Allegany County - Flight Series AMN-1AA     | 09/12/1962 |
|     | 102-06 | Allegany County - Flight Series AMN-1AA     | 09/12/1962 |
|     | 102-07 | Allegany County - Flight Series AMN-1AA     | 09/12/1962 |
|     | 102-07 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 102-08 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 102-09 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 102-10 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
| 103 | 103-01 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-02 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-03 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-04 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-05 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-06 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-07 | Allegany County - Flight Series AMN-2AA     | 09/12/1962 |
|     | 103-07 | Allegany County - Flight Series AMN-4AA     | 10/01/1962 |
|     | 103-08 | Allegany County - Flight Series AMN-4AA     | 10/01/1962 |
|     | 103-09 | Anne Arundel County - Flight Series AHR-1DD | 10/13/1963 |
|     | 103-10 | Anne Arundel County - Flight Series AHR-1DD | 10/13/1963 |
| 104 | 104-01 | Anne Arundel County - Flight Series AHR-1DD | 10/13/1963 |
|     | 104-02 | Anne Arundel County - Flight Series AHR-1DD | 10/13/1963 |
|     | 104-02 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-03 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-04 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-05 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-06 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-07 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-08 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-09 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 104-10 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
| 105 | 105-01 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-02 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-03 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-04 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-05 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-06 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-07 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-08 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-09 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
|     | 105-10 | Anne Arundel County - Flight Series AHR-2DD | 10/13/1963 |
| 106 | 106-01 | Anne Arundel County - Flight Series AHR-2DD | 10/14/1963 |
|     | 106-02 | Anne Arundel County - Flight Series AHR-2DD | 10/14/1963 |
|     | 106-03 | Anne Arundel County - Flight Series AHR-3DD | 10/14/1963 |
|     | 106-04 | Anne Arundel County - Flight Series AHR-3DD | 10/14/1963 |
|     | 106-05 | Anne Arundel County - Flight Series AHR-3DD | 10/14/1963 |
|     | 106-06 | Baltimore County - Flight Series AJO-1DD    | 05/16/1964 |
|     | 106-07 | Baltimore County - Flight Series AJO-1DD    | 05/16/1964 |

|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 106 | 106-08 | Baltimore County - Flight Series AJO-1DD | 05/16/1964 |
|     | 106-08 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 106-09 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 106-10 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
| 107 | 107-01 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-02 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-03 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-04 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-05 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-06 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-07 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-08 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-09 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 107-10 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
| 108 | 108-01 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-02 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-03 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-04 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-05 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-06 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-07 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-08 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-09 | Baltimore County - Flight Series AJO-2DD | 05/16/1964 |
|     | 108-10 | Baltimore County - Flight Series AJO-1DD | 05/18/1964 |
| 109 | 109-01 | Baltimore County - Flight Series AJO-1DD | 05/18/1964 |
|     | 109-02 | Baltimore County - Flight Series AJO-1DD | 05/18/1964 |
|     | 109-03 | Baltimore County - Flight Series AJO-1DD | 05/18/1964 |
|     | 109-04 | Baltimore County - Flight Series AJO-1DD | 05/18/1964 |
|     | 109-04 | Baltimore County - Flight Series AJO-3DD | 05/22/1964 |
|     | 109-05 | Baltimore County - Flight Series AJO-4DD | 05/22/1964 |
|     | 109-06 | Baltimore County - Flight Series AJO-4DD | 05/22/1964 |
|     | 109-07 | Baltimore County - Flight Series AJO-4DD | 05/22/1964 |
|     | 109-08 | Baltimore County - Flight Series AJO-5DD | 06/10/1964 |
|     | 109-09 | Baltimore County - Flight Series AJO-5DD | 06/10/1964 |
|     | 109-09 | Baltimore County - Flight Series AJO-5DD | 06/16/1964 |
|     | 109-10 | Baltimore County - Flight Series AJO-5DD | 06/16/1964 |
| 110 | 110-01 | Baltimore County - Flight Series AJO-5DD | 06/16/1964 |
|     | 110-02 | Baltimore County - Flight Series AJO-5DD | 06/16/1964 |
|     | 110-02 | Baltimore County - Flight Series AJO-5DD | 06/25/1964 |
|     | 110-03 | Baltimore County - Flight Series 1165-1  | 02/05/1968 |
|     | 110-03 | Baltimore County - Flight Series 1165-2  | 02/05/1968 |
|     | 110-04 | Baltimore County - Flight Series 1165-3  | 02/05/1968 |
|     | 110-04 | Baltimore County - Flight Series 1165-4  | 02/05/1968 |
|     | 110-04 | Baltimore County - Flight Series 1165-5  | 02/05/1968 |
|     | 110-05 | Baltimore County - Flight Series 1165-6  | 02/05/1968 |
|     | 110-05 | Baltimore County - Flight Series 1165-7  | 02/05/1968 |
|     | 110-06 | Baltimore County - Flight Series 1165-8  | 02/05/1968 |



|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 110 | 110-06 | Baltimore County - Flight Series 1165-9  | 02/05/1968 |
|     | 110-07 | Baltimore County - Flight Series 1165-1  | 03/25/1968 |
|     | 110-07 | Baltimore County - Flight Series 1165-1A | 03/25/1968 |
|     | 110-08 | Baltimore County - Flight Series 1165-2  | 03/25/1968 |
|     | 110-09 | Baltimore County - Flight Series 1165-3  | 03/25/1968 |
|     | 110-10 | Baltimore County - Flight Series 1165-4  | 03/25/1968 |
| 111 | 111-01 | Baltimore County - Flight Series 1165-5  | 03/25/1968 |
|     | 111-02 | Baltimore County - Flight Series 1165-6  | 03/25/1968 |
|     | 111-03 | Baltimore County - Flight Series 1165-7  | 03/25/1968 |
|     | 111-04 | Baltimore County - Flight Series 1165-8  | 03/25/1968 |
|     | 111-05 | Calvert County - Flight Series AHS-5DD   | 10/15/1963 |
|     | 111-05 | Calvert County - Flight Series AHS-3DD   | 05/04/1964 |
|     | 111-06 | Calvert County - Flight Series AHS-3DD   | 05/04/1964 |
|     | 111-07 | Calvert County - Flight Series AHS-3DD   | 05/04/1964 |
|     | 111-08 | Calvert County - Flight Series AHS-3DD   | 05/04/1964 |
|     | 111-09 | Calvert County - Flight Series AHS-3DD   | 05/04/1964 |
| 112 | 111-09 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 111-10 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 112-01 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 112-02 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 112-03 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 112-04 | Calvert County - Flight Series AHS-1DD   | 05/05/1964 |
|     | 112-04 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 112-05 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 112-06 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 112-07 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
| 113 | 112-08 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 112-09 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 112-10 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 113-01 | Calvert County - Flight Series AHS-2DD   | 05/21/1964 |
|     | 113-02 | Caroline County - Flight Series AHT-1EE  | 05/06/1964 |
|     | 113-02 | Caroline County - Flight Series AHT-2EE  | 05/08/1964 |
|     | 113-02 | Caroline County - Flight Series AHT-3EE  | 05/11/1964 |
|     | 113-02 | Caroline County - Flight Series AHT-5EE  | 05/22/1964 |
|     | 113-03 | Carroll County - Flight Series AGZ-2DD   | 09/23/1963 |
|     | 113-04 | Carroll County - Flight Series AGZ-2DD   | 09/23/1963 |
|     | 113-05 | Carroll County - Flight Series AGZ-2DD   | 09/23/1963 |
|     | 113-05 | Carroll County - Flight Series AGZ-2DD   | 09/30/1963 |
|     | 113-06 | Carroll County - Flight Series AGZ-2DD   | 09/30/1963 |
|     | 113-07 | Carroll County - Flight Series AGZ-3DD   | 10/15/1963 |
|     | 113-08 | Cecil County - Flight Series ANI-3DD     | 05/21/1964 |
| 114 | 113-09 | Cecil County - Flight Series ANI-3DD     | 05/21/1964 |
|     | 113-10 | Charles County - Flight Series AHU-3DD   | 05/04/1964 |
|     | 113-10 | Charles County - Flight Series AHU-1DD   | 05/05/1964 |
|     | 113-11 | Charles County - Flight Series AHU-1DD   | 05/05/1964 |
|     | 114-01 | Charles County - Flight Series AHU-1DD   | 05/05/1964 |
|     | 114-02 | Charles County - Flight Series AHU-1DD   | 05/05/1964 |



|     |        |                                           |            |
|-----|--------|-------------------------------------------|------------|
| 114 | 114-03 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-04 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-05 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-06 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-07 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-08 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-09 | Charles County - Flight Series AHU-1DD    | 05/05/1964 |
|     | 114-09 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 114-10 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
| 115 | 115-01 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-02 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-03 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-04 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-05 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-06 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-07 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-08 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 115-09 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
| 116 | 116-01 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 116-02 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 116-03 | Charles County - Flight Series AHU-3DD    | 05/11/1964 |
|     | 116-03 | Charles County - Flight Series AHU-2DD    | 05/18/1964 |
|     | 116-04 | Charles County - Flight Series AHU-2DD    | 05/18/1964 |
|     | 116-05 | Charles County - Flight Series AHU-2DD    | 05/18/1964 |
|     | 116-05 | Charles County - Flight Series AHU-4DD    | 05/21/1964 |
|     | 116-06 | Charles County - Flight Series AHU-4DD    | 05/21/1964 |
|     | 116-06 | Charles County - Flight Series AHU-4DD    | 05/22/1964 |
|     | 116-07 | Charles County - Flight Series AHU-4DD    | 05/22/1964 |
|     | 116-07 | Charles County - Flight Series AHU-4DD    | 06/10/1964 |
|     | 116-08 | Charles County - Flight Series AHU-4DD    | 06/10/1964 |
| 117 | 117-01 | Dorchester County - Flight Series ANJ-1EE | 05/06/1964 |
|     | 117-01 | Dorchester County - Flight Series ANJ-2EE | 05/08/1964 |
|     | 117-02 | Dorchester County - Flight Series ANJ-2EE | 05/08/1964 |
|     | 117-02 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-03 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-04 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-05 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-06 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-07 | Dorchester County - Flight Series ANJ-3EE | 05/11/1964 |
|     | 117-07 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
|     | 117-08 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
| 118 | 117-09 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
|     | 117-10 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
|     | 118-01 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
|     | 118-02 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |
|     | 118-03 | Dorchester County - Flight Series ANJ-4EE | 05/11/1964 |

[illegible]



|     |        |                                          |            |
|-----|--------|------------------------------------------|------------|
| 122 | 122-09 | Frederick County - Flight Series AHA-2EE | 06/30/1964 |
|     | 122-10 | Frederick County - Flight Series AHA-2EE | 06/30/1964 |
|     | 122-10 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
| 123 | 123-01 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-02 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-03 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-04 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-05 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-06 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-07 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-08 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-09 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-10 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-11 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-12 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-13 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |
|     | 123-14 | Frederick County - Flight Series AHA-3EE | 06/30/1964 |

## **Appendix 7. Land-Based Core Collection Preservation Plan**

### **Collection Overview**

As of September 2017, the Maryland Geological Survey (MGS) Land-Based Core Collection currently consists of 266 unique rock and/or sediment cores obtained from wells and boreholes drilled primarily in Maryland. To date, 16 of these cores do not have corresponding location information. The majority of the cores were collected by MGS, many in cooperation with the U.S. Geological Survey (USGS). Other cores were donated to MGS by other researchers, state agencies or geotechnical consultants. The cores are stored primarily in wooden or cardboard boxes of varying sizes. Some cores are also stored in other containers, such as metal or plastic sampling tubes. The condition of the containers varies from poor to suitable. The majority of these cores are located in the MGS Core Library in the basement of MGS's Kenneth M. Weaver building; several other cores are stored in the basement of the MGS Annex building. Many of these cores are referenced in published MGS reports.

The Land-Based Core Collection was inventoried in detail during the FY2016 U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP) grant cycle. The cores comprising this collection were historically described as part of two separate collections: 1) Rock Core collection; and 2) Sediment Cores, Coastal Plain Cores collection. This initial division was based on the assumption that Coastal Plain cores would be limited to unconsolidated or semi-consolidated sediment and core from other provinces would be solely rock material.

However, during the detailed inventory conducted during 2016-2017, it became clear that the distinction between sediment and rock cores was not so sharply defined. Some Coastal Plain cores contain rock intervals (Mesozoic or Paleozoic bedrock) and some cores drilled in fractured rock areas contain unconsolidated sediment, saprolite and/or regolith. Therefore, during the FY2016 NGGDPP period, all of the cores collected from a land-based borehole were combined into one collection – the Land-Based Core Collection. This change is reflected in the MGS permanent collections table in Appendix 1 and is also being incorporated into MGS's long-range data preservation plan update scheduled for 2018.

### **Justification for Collection Preservation**

Preservation and cataloging of the Land-Based Core Collection is important for a number of reasons. Cores may be useful for purposes other than those for which they were originally collected. Existing cores offer the potential for new or additional analytical techniques and testing to be applied to a pertinent core sample, without the added time and cost of new drilling.

Cores are expensive to collect and may be unique and/or impossible to replace. Some of the cores in the Land-Based Core Collection were drilled many decades ago. Based on conversations with a large geophysical exploration company, MGS estimates that it would cost upwards of \$125/foot to re-drill a continuous rock core and between \$75-\$125/foot to drill to sample depth (for interval coring). Using these estimates, the cost to re-drill and recover a



7,600-foot core from the Marcellus Shale (a portion of which is currently in the MGS collection) could cost nearly one million dollars in 2016.

Moreover, due to Maryland's recent land development and population growth, it may be impossible to re-drill cores from the same locations. In the 30-year period from 1970 to 2000, Maryland's population grew by approximately 35 percent; in the period between 2000 and 2010 Maryland's population increased by another 9 percent, <http://msa.maryland.gov/msa/mdmanual/01glance/html/pop.html#state>. Retaining and preserving Maryland cores may allow future geologists to make judgments or interpretations in areas where drilling is no longer feasible.

Society in general, and Maryland in particular, can benefit from 1) the results of investigations using existing sediment and/or rock cores; and 2) the time and cost savings of not conducting exploratory re-drilling. By fully cataloging existing cores and providing metadata online, it is possible for all potential users to determine what is available in the collection. The land-based core collection should grow in usefulness and value as drilling costs continue to rise, land use continues to change, and potential users can leverage the savings from existing materials to more fully investigate geologic issues important to society.

### **Preservation Goals, Strategies, and Current Status**

The preservation goals and strategies for the Land-Based Core Collection mirror the general preservation goals outlined in the Long-Range Data Preservation Plan for the Maryland Geological Survey (Hennessee, 2009). Goals and strategies specific to this collection are listed below along with the status of the work (as of September 2017).

- **GOAL 1:** Document the Land-Based Core Collection in detail and develop protocols to evaluate which cores are kept, acquired, assimilated or discarded.
  - **Strategy 1-1:** Complete a detailed inventory of the Land-Based Core Collection.
    - **Status:** Complete. See *CoreCuttingsDB1\_083117\_v4\_20170913.mdb* (Access 2013 internal database).
  - **Strategy 1-2:** Update/improve the metadata records in the Land-Based Core Collection internal database. Focus on adding missing geographic location information and linking MGS publications to cores.
    - **Status:** Ongoing.
  - **Strategy 1-3:** Keep, acquire, and assimilate cores collected in Maryland and/or relevant to State of Maryland research (historic, current, or anticipated). Discard or refuse cores without location identification information. Discard or refuse cores not relevant to State of Maryland research (historic, current, or anticipated).
    - **Status:** Evaluations ongoing.
- **GOAL 2:** Organize the Land-Based Core Collection.

- o **Strategy 2-1:** Rank the cores in order of preservation priority based on condition of core and/or housing material, availability of staff familiar with the cores, usefulness or perceived demand for access to the cores, and funding opportunities.
  - **Status:** Ongoing. To date, all cores in the Land-Based Core Collection have been inventoried and documented in the internal database. Core and box condition are documented in the internal database; cores in deteriorating boxes should be re-packaged first.
- o **Strategy 2-2:** Re-arrange core boxes to place boxes containing core from the same borehole/well in the same stack. Stack with labels facing outwards. Re-write faded labels.
  - **Status:** Complete.
- o **Strategy 2-3:** Develop a protocol for adding cores to this collection and adding metadata records to the internal database.
  - **Status:** Ongoing. Accession form with instructions in progress; current protocol is to contact Katherine Knippler, MGS Curator, who will document the core, identify a storage location for the core, and add detailed metadata records about the core to the internal database.
- o **Strategy 2-4:** Add/update MGS Core Library location information in the internal database once final re-organization of cores is complete.
  - **Status:** Ongoing. Some cores may be re-positioned within the MGS Core Library once publications currently stored in the space are either disposed of or moved to another location.
- **GOAL 3:** Provide and maintain an appropriate repository for the Land-Based Core Collection.
  - o **Strategy 3-1:** Ensure that the MGS Core Library has adequate lighting and climate control.
    - **Status:** Complete. Lighting and climate control are adequate.
  - o **Strategy 3-2:** Ensure that MGS staff and outside users can access the MGS Core Library.
    - **Status:** Complete. MGS staff have access to the Core Library during normal working hours (7am-7pm, Monday-Friday). Outside users may request a visit to the MGS Core Library during this time. Outside users will be accompanied by an MGS staff member during their visit.
  - o **Strategy 3-3:** Remove non-core materials (such as publications) from the MGS Core Library to provide more usable space for core and cuttings storage.
    - **Status:** Not started. Data Preservation staff will work with Publications staff to identify MGS publications that may be recycled and removed. Publications will only be considered for removal if 1) the items have been digitally scanned; and 2) at least 3 complete copies are archived.

- o **Strategy 3-4:** Re-arrange shelving units in the MGS Core Library to create wider, more accessible aisles.
    - **Status:** Not started. Adequate space is not available at this time.
  - o **Strategy 3-5:** Prepare a small room with long tables, adequate lighting, and seating for examination of pulled cores.
    - **Status:** Not started. Adequate space is not available at this time.
- **GOAL 4:** Make users aware of the Land-Based Core Collection and provide access.
  - o **Strategy 4-1:** Create a Land-Based Core Collection webpage on the MGS website. Describe the collection and provide contact information for inquiries and core access requests.
    - **Status:** Complete. See [www.mgs.md.gov/publications/mgs\\_data\\_preservation/land-based\\_cores.html](http://www.mgs.md.gov/publications/mgs_data_preservation/land-based_cores.html)
  - o **Strategy 4-2:** Post NGGDPP-compliant metadata on the National Digital Catalog.
    - **Status:** Complete. See <https://www.sciencebase.gov/catalog/item/4f4e49d8e4b07f02db5df127>
  - o **Strategy 4-3:** Develop an online geospatial display and dataset of the land-based core collection so that patrons can browse and identify cores in their area of interest.
    - **Status:** Not complete. Additional revisions to database are ongoing at this time.
- **GOAL 5:** Ensure that the Land-Based Core Collection continues to be useful and reliable.
  - o **Strategy 5-1:** Investigate possible partnerships with state universities, other state agencies, and other state geological surveys for joint data storage and access.
    - **Status:** Ongoing. MGS Curator will solicit ideas on how to improve core storage and access from the MGS Data Preservation Advisory Panel (DPAP).
  - o **Strategy 5-2:** Periodically inventory items in the Land-Based Core Collection and replace broken or damaged core boxes or containers as necessary. Update database when improvements are made.
    - **Status:** Ongoing. Boxes/containers in poor condition are noted in the internal database; awaiting funding to purchase housing materials and staff time to re-house cores in deteriorating boxes/containers.
  - o **Strategy 5-3:** Track the number of users (both MGS staff and outside users) who

inquire about and/or access the Land-Based Core Collection.

- **Status:** Not started. MGS Curator will create a Google Sheet and log these usage statistics.
- **Strategy 5-4:** As geospatial display is developed (Strategy 4-3), work to link related publications and data to core to facilitate use and relevance of collection. Consider tie in with online aquifer information system.
  - **Status:** Not started. MGS does not have the staff time or funding to complete this task at this time.
- **Strategy 5-5:** Take high-resolution photographs of the Land-Based Core Collection.
  - **Status:** Not started. MGS does not have the equipment, staff time, or funding to complete this task at this time.
- **GOAL 6:** Pursue outside funding to support preservation of the Land-Based Core Collection.
  - **Strategy 6-1:** Apply for future NGGDPP funding to complete outstanding preservation tasks.
    - **Status:** To be determined.
  - **Strategy 6-2:** Encourage MGS staff to include support for the repository (funds, staff hours) in project proposals.
    - **Status:** Ongoing.
  - **Strategy 6-3:** Continue to discuss collaborative projects and funding strategies with members of the DPAP committee.
    - **Status:** Ongoing.

### **Collection Inventory Database and Metadata Development**

#### **Internal Database Design and Creation of Detailed Metadata Records**

During the FY2016 NGGDPP grant cycle, MGS designed and populated an Access 2013 database called *CoreCuttingsDB1\_083117\_v4\_20170913.mdb*. The primary table in this database is called *CoreInv* and contains some fields of information required for National Digital Catalog metadata submission as well as fields containing additional information useful for MGS staff and outside geoscientists. As of 2017, the *CoreInv* table includes the following fields: AutoNum, Collection ID, db\_BholeID, WWell ID, Well IDsort, Well Permit, Original Well Permit ID, Other ID, Other Aliases, Core Number, Data Type, Core Diameter (inches), Box ID, Top Depth (feet), Bottom Depth (feet), Storage Location, Inventory By, Inventory Date, MeasLength (ft), Comments Summary, Box Type, Box Dimensions (inches), Core Condition, AltBoxID, Collection Notes 1, and Collection Notes 2.



In the *CoreInv* table, each storage container or box was entered separately (so one core may have many entries). Where segments of multiple cores were stored together in one box or container (a situation that was revealed during the inventory process), each of these cores was entered separately and the information on the shared container was entered into the Collection Notes columns.

Linked tables within the database captured geographic location information which was stored primarily in a table titled *BoreholeCoordinates*. The *BoreholeCoordinates* table contains information pertaining to the original coordinate source, original coordinate projection, method of coordinate conversion, and notes regarding where the coordinate information was found. The *BoreholeCoordinates* table links to the *CoreInv* table via the db\_BholeID field in a one-to-many relationship.

#### NGGDPP Metadata Submitted to the National Digital Catalog

NGGDPP-compliant metadata for the Land-Based Core Collection was submitted to the National Digital Catalog (NDC) in September 2017. In addition, a Geographic Information System shapefile showing core locations was also created and uploaded into the NDC. NDC metadata for the Land-Based Core Collection may be viewed online here:

<https://www.sciencebase.gov/catalog/item/4f4e49d8e4b07f02db5df127>