RESOURCE ASSESSMENT SERVICE
MARYLAND GEOLOGICAL SURVEY
Emery T. Cleaves, Director

COASTAL AND ESTUARINE GEOLOGY
FILE REPORT NO. 00-7

Acquiring a Modern Digital Shoreline for Maryland from Recent (1988-1995) Orthophotography

by

Lamere Hennessee

This study was funded by the
Maryland Coastal Zone Management Program of the
Maryland Department of Natural Resources pursuant to
National Oceanic and Atmospheric Administration
Award No. NA87OZ0236

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ACKNOWLEDGMENTS

The author would like to thank Michelle Hutchinson of EarthData International for her care in delineating the modern shoreline, her attention to detail, her patience in the face of unavoidable delays, and her diligence in meeting a seemingly impossible deadline; Bill Burgess, Chris Barnard, Ken Miller, and Jeanne Gary for facilitating contractual arrangements; Laura Callahan for shepherding the grant through channels only she understands; and Zoë Johnson for acting on her belief in the importance of the project.

This paper is funded in part by a grant from the National Oceanic and Atmospheric Administration. The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or any of its sub-agencies.

ABSTRACT

Shoreline erosion is a major problem facing the diverse coastal environments of Maryland; approximately 31 percent of the State's lengthy coastline is currently experiencing some degree of erosion. Within the State, the Maryland Geological Survey (MGS) has been the lead agency in investigating and mapping shoreline changes. Periodically over the last century, MGS has issued maps depicting changes in shoreline position over time and has tabulated acreage lost or gained along specified reaches of shoreline. These data have greatly benefitted the activities of other State organizations, such as the Shore Erosion Control Program of the Maryland Department of Natural Resources and the Shore Erosion Task Force appointed by Governor Glendening in 1999.

The most recent *Shoreline Changes* maps, compiled digitally by MGS, depict shorelines dating from 1841-1977. At the time those maps were published, MGS had acquired more recent (1988-1995) digital shorelines, interpreted from digital orthophotography, but the data set was incomplete. Funding provided by this grant enabled MGS to acquire the remaining *ca.* 1990 shorelines and to make the entire modern shoreline available on CD-ROM.

Under contract to MGS, EarthData International of Gaithersburg, Md., either extracted shorelines from an existing wetlands delineation, which was based on photointerpretation of 3.75-minute digital orthophoto quarter quads, or interpreted shorelines directly from the orthophotography. The contractor then classified the vectors as to shoreline type: beach, vegetated, structure, or water's edge. All four categories are linear features, except for "beach," which, if wide enough, can be both linear and polygonal. Upon receipt of the newly digitized shorelines, MGS packaged them with previously digitized ones and documented the data set in accordance with the Federal Geographic Data Committee's metadata standard.

Initially, MGS will use the recent shoreline to update *Shoreline Changes* maps and to determine coastal land loss, by watershed and by county, during the last half of the 20th century. Other State agencies will be able to use this data to analyze and update land loss information, analyze historical erosion trends, and assess the extent and magnitude of shore erosion on a regional geographic basis. In particular, the availability of up-to-date shoreline change data will support the design and implementation of shore protection projects and the process of developing a comprehensive shore erosion control plan for the State.

INTRODUCTION

Shoreline erosion is one of the most significant problems facing Maryland's diverse coastal environments. Approximately 31 percent of the State's 4,360-mile coastline, which borders the Chesapeake Bay, the coastal bays, and the Atlantic coast, is currently experiencing some

degree of erosion (U.S. Army Corps of Engineers, 1990). Although the extent and magnitude of erosion vary, the problem affects all of Maryland's coastal counties, posing a threat to property owners, the public, and both the terrestrial and aquatic resources of Maryland's coastal zone.

Recognizing the magnitude of shore erosion along Maryland's coastline, the State has made a concerted effort over the years to (1) gain a better understanding of the processes responsible for shore erosion and (2) respond to the problem. The Maryland Geological Survey (MGS) has been the lead agency in investigating and mapping shoreline changes in the State. Periodically over the last century, MGS has issued maps depicting changes in shoreline position over time and has tabulated acreage lost or gained along specified reaches of shoreline. These data have greatly benefitted the activities of such programs as Shore Erosion Control, administered by the Maryland Department of Natural Resources, and the efforts of the Shore Erosion Task Force appointed by Governor Glendening in August 1999.

Shore Erosion Control was established in 1968 by an act of the Maryland General Assembly to address shoreline and streambank erosion problems along the Chesapeake Bay and its tributaries. The Program provides assistance to Maryland property owners in resolving such problems. Since 1971, approximately 1,100 property owners, along 70 miles of eroding shoreline, have received project management, financial, and technical assistance through Shore Erosion Control. Coastal engineers with the Program rely heavily on the research and data assembled by MGS. Historical shoreline erosion information provides a comparative measure of the extent and magnitude of erosion. It is used, together with other site-specific information, in selecting and systematically prioritizing areas to target, given the availability of State financial assistance.

In response to citizens' concerns over the State's ability to control shoreline erosion, the Maryland General Assembly passed Resolution 13 during the 1999 Legislative Session, requesting that the Governor establish a Shore Erosion Task Force to address shore erosion issues and solutions. The Task Force concluded that, despite interest and involvement by numerous local, state, federal, and private parties, Maryland lacks the institutional, organizational, and fiscal resources to respond adequately to shore erosion. The Task Force then recommended that the State develop a comprehensive shore erosion control plan within two years to address shore erosion issues in Maryland. As a component of the planning process, the Task Force identified the need to compile, update and analyze historic shoreline change information for the purpose of establishing regional shore erosion control needs and priorities (State of Maryland Shore Erosion Task Force, 2000).

It is critical to base coastal management decisions on a sound scientific basis. And sound science depends, in part, on the availability of up-to-date information. Prior to the award of this grant, MGS had acquired recent (1988-1995) digital shorelines, interpreted from digital

orthophotography, for about one-third of the State. Funding provided by this grant enabled MGS to acquire the remaining shorelines and to make the entire modern shoreline available on CD-ROM. The details of that acquisition are the subject of this report.

PREVIOUS WORK

MGS has recently completed compiling historical shorelines, in an electronic format, for the coastal regions of Maryland (Hennessee *et al.*, 1997; Hennessee and Stott, 1999, in prep.; Maryland Geological Survey, 1999, 2000a, 2000b). The study area, comprising over 100 7.5-minute quadrangles, includes the Chesapeake Bay, the tidal reaches of Bay tributaries, the Atlantic coast, and the coastal bays. Dating from 1841 to 1977, the digital shorelines represent former positions (mean high water) of the Maryland coast at various points in time. All of the lines were derived directly or indirectly from National Ocean Service (NOS) coastal survey maps, which are generally acknowledged to be the most accurate source of historical shoreline data (Shalowitz, 1964; Anders and Byrnes, 1991). After the shorelines were digitized, they were displayed over 1988-1990 orthophoto quads, annotated, and printed as a series of 7.5-minute *Shoreline Changes* maps (Kerhin *et al.*, 1994, 1997; Stott and Hennessee, 1999, 2000).

The most recent NOS surveys of the Maryland coast date from the 1970s; most are even earlier. Consequently, MGS also began acquiring a modern (*ca.* 1990) digital shoreline. Under contract to MGS, EarthData International (EDI) of Gaithersburg, Md. extracted shorelines from an existing wetlands delineation. The wetlands coverage, in turn, was based on photo interpretation of 3.75-minute digital orthophoto quarter quads (DOQQs) flown between 1988 and 1995. In addition to extracting the shorelines, EDI classified them as to shoreline type: beach, vegetated, structure, or water's edge. MGS's acquisition of the 1990 shorelines occurred in a piecemeal fashion over a period of years, as funding permitted. Prior to the award of this grant, modern shorelines were available for about one-third of the quarter quads covering the Maryland coast. Because the data set was incomplete, it was not included in the historical shorelines data set or depicted on the first edition of the *Shoreline Changes* maps.

STUDY AREA

This grant enabled MGS to acquire recent shorelines for the remainder of the State's coastline and to package those shorelines with previously extracted ones. The study area, the coastline of Maryland, includes all of the tidal shoreline found on the 125 quadrangles listed in Appendix 1. The 211 quarter quads digitized as part of this particular project are indicated by bold print in the appendix (see the column labeled "Quadrants"). Shorelines for the quarter quads printed in normal font were digitized prior to this project.

MGS and EDI made a deliberate effort to capture all of the shoreline segments needed to draw a continuous shoreline for the Chesapeake Bay and its tributaries. As a result, the area includes several quadrangles for which historical shorelines are not available (e.g., Blackwater River, Chicamacomico River). The only exclusions were the headward reach of the Patapsco River west of the Curtis Bay quadrangle and shorelines located in out-of-state areas, such as the Virginia side of the Potomac River. Interior ponds were not digitized.

OBJECTIVES

The main objective of the project was to complete the acquisition of a recent (*ca.* 1990) shoreline for coastal Maryland. MGS again contracted the services of EDI. For the remaining 211 quarter quads, EDI either extracted shorelines from an existing wetlands delineation or, if no wetlands coverage was yet available, interpreted shorelines directly from the orthophotography. The contractor used the same classification scheme to assign attributes to the shoreline vectors: beach, vegetated, structure, or water's edge.

Upon receipt of the digital shorelines, MGS:

1. Packaged the new vectors with those previously extracted,
2. Documented the data set using the Federal Geographic Data Committee's "Content Standards for Digital Geospatial Metadata," and
3. Created a CD-ROM, "Recent (*ca.* 1990) Shorelines, Coastal Regions of Maryland" (volume label = RecentSL), containing digital shorelines in MicroImages' TNTmips .rvc format.

METHODS

SHORELINE EXTRACTION AND INTERPRETATION

EDI extracted or interpreted the modern (1988-1995) shoreline directly or indirectly from digital orthophotography. For 176 of the 211 quarter quads, EDI extracted the shoreline from existing wetlands vectors, previously delineated for the Maryland Department of Natural Resources (DNR) over 1:1,000-scale DOQQs. The DOQQs, in turn, were derived from 1:40,000-scale color infrared (CIR) film (Miller, 1995, 1997). For the remaining 35 quarter quads, the shoreline was interpreted directly from the DOQQs. (The aerial photography from which the DOQQs were produced was not tide-coordinated, so the shorelines derived from them do not necessarily coincide with a particular water level, such as mean high water.)

For shoreline vectors extracted from the existing wetlands coverage, EDI stripped wetlands vectors of their linear attributes (line classes). All shorelines and the DOQQ tile boundary were

displayed over the DOQQ (raster) from which they had been originally interpreted and, based on photo interpretation convention, reassigned the following attributes:

- Beach – any sandy, beach-like area, not including mud flats,
- Structure – any type of man-made object that serves as the land/water boundary, including, but not limited to, bulkheads, seawalls, and riprap,
- Vegetated – any portion of shoreline with vegetation, such as marsh or forest, as the dominant land cover, and
- Water's edge – a catch-all category, including mud flats, applied to any reach of shoreline not assigned to one of the three preceding categories.

All four categories are linear features, except for "beach," which, depending on width, can be both linear and polygonal. The DOQQ tile boundary was arbitrarily assigned one of the four categories so that it could be extracted with the shoreline vectors. Shoreline vectors were extracted from the original vector set by line class, using only the four shoreline categories. The extracted vectors were then displayed to detect shoreline breaks or other inconsistencies. Errors were corrected, and shoreline vectors were re-extracted. After extraction, vector sets were cleaned by deleting extraneous lines (non-shoreline vectors) that had been mistakenly assigned one of the four categories before extraction. Beach polygons were attributed at this time, and the DOQQ tile boundary was assigned to a fifth category - "unclassified." The final quality control check consisted of two steps. First, each tile (quarter quad) was displayed individually to check for unclassified shoreline vectors. Second, if the photography on which the DOQQs were based was flown in the same year, vectors from adjacent tiles were merged into a single, 7.5-minute quadrangle vector set. Otherwise, multi-year shorelines for the same quad were stored as separate objects within the TNTmips project (.rvc) file. The merged vector set was displayed to check for class consistency (proper edge matching) between adjacent tiles. Any necessary corrections were made before saving the final vector sets.

Shorelines derived directly from DOQQs were interpreted according to the procedure outlined in the wetlands inventory metadata.

The DOQQs were already georeferenced to the Maryland State Plane Coordinate System (North American Datum of 1983, meters). Georeferencing was transferred automatically to the delineated wetlands or shoreline vectors.

In digitizing historical shorelines from hard copy maps, MGS had adopted an operational definition of the headward extent of a stream – the point at which the stream was represented, not by a double line delineating opposite stream banks, but by a single line. That point, dependent as it is on the scale of the map, does not necessarily represent the head of tide. A similar criterion was used in extracting the 1990 shoreline. To the extent that the contractor could fit a double line on photography displayed at a scale of 1:24,000, the shoreline was extracted. Reaches upstream of that point were excluded. Again, the headward extent of a digitized stream does not necessarily correspond with head of tide.

Shorelines in the 1990 data set bounded several different wetlands classifications (Cowardin *et al.*, 1979), shown in Table 1.

Table 1. The translation of Cowardin classifications into shoreline vectors.

Cowardin class	Description	Classification
E 1 UB L	Estuarine – Subtidal – Unconsolidated bottom – Subtidal	water
E 2 US M	Estuarine – Intertidal – Unconsolidated shore – Irregularly exposed	water
E 2 US N	Estuarine – Intertidal – Unconsolidated shore – Regularly flooded	water
E 2 US P	Estuarine – Intertidal – Unconsolidated shore – Irregularly flooded	upland
M 2 US M	Marine – Intertidal – Unconsolidated shore – Irregularly exposed	water
M 2 US N	Marine – Intertidal – Unconsolidated shore – Regularly flooded	water
R 1 UB V	Riverine – Tidal – Unconsolidated bottom – Permanent tidal (tidally influenced, freshwater system)	water
R 2 UB 8	Riverine – Lower perennial – Unconsolidated bottom – Eusaline	water

In addition to designating UB L and UB V as water, M 2 or E 2 US (Unconsolidated shore) M (Irregularly exposed) or N (Regularly flooded) classifications were considered water, given that those areas were more likely to be under water than above. E 2 US P (Irregularly flooded) was considered upland, given that those areas were more likely to be above water than under.

The production of accurately georeferenced DOQQs depends on sufficient ground control. In open water, ground control is necessarily lacking, because land areas, if they exist at all, are small and/or inaccessible. Two quarter quads in the data set, Deal Island NW and Barren Island NE, contain so much open water that they are not properly tied to the adjoining tiles, Nanticoke SW and Honga NW, respectively. Consequently, the corresponding linework (shoreline) is not properly georeferenced. The shorelines derived from those two DOQQs are

included in the data set solely for the associated attribute information. Their positions are inaccurate.

CD-ROM PRODUCTION

Upon receipt of the newly digitized shorelines, MGS packaged them with shorelines that EDI had previously digitized and saved them all to a CD-ROM, RecentSL. On the CD, shoreline vectors are grouped by quad and, within a quad, by year. Shorelines for a particular quad are located in a TNTmips project (.rvc) file within a directory assigned the full, concatenated name of the quad. Project files are named according to the following conventions. The first four or five characters are an abbreviation of the quad name, usually the first four or five letters of the name. The next three characters "_SL" indicate that the file contains shorelines. The file extension ".rvc" denotes a file that can be read by MicroImage's TNT line of products. The TNTmips description of the project file is in the form:

QUAD NAME (NE/NW/SE/SW) - Shoreline - 19xx,
where QUAD NAME = the full name of the quad,
(NE/NW/SE/SW) = the quadrants for which a shoreline was interpreted,
19xx = the shoreline year.

For example, the shoreline for the Richland Point quad is located in a directory named RichlandPoint. The file that contains the shoreline vector itself is named RICHL_SL.rvc. The TNTmips description of the file is "RICHLAND POINT (NE) - Shoreline - 1994," indicating that a 1994 shoreline was interpreted from the NE quadrant only of the Richland Point quad.

Each .rvc file contains one or two "objects" – shoreline vectors for a particular year. The names and descriptions of objects are also standardized. The object name "_19xx" always indicates the shoreline year. The object description gives the flight date of the aerial photography from which the DOQQs were derived. For example, "1989 shoreline from DOQQs flown 4/12/1989".

Line and polygon attribute tables, both named "TYPE," are associated with each object. They contain the attributes (beach, structure, etc.) described above. A second table "TypeStyle" contains the style assignment for the TYPE Table. TypeStyle points to the project file, ShoreStyles.rvc, which contains common line and polygon styles for the entire data set.

In addition to the shoreline vector files and ShoreStyles.rvc, the CD also contains a README.txt file, in ASCII format, which describes the contents of the CD, and more detailed data documentation files (metadata) in both ASCII (METADATA.txt) and WordPerfect 6/7/8 (METADATA.wpd) format. The metadata complies with the Federal Geographic Data Committee standard, "Content Standards for Digital Geospatial Metadata," dated June 8, 1994.

CONCLUSIONS

This grant enabled MGS to complete the acquisition of a recent (*ca.* 1990) shoreline for the entire coastal region of Maryland. Initially, MGS will use the shoreline to update *Shoreline Changes* maps and to determine coastal land loss, by watershed and by county, during the last half of the 20th century. Other State agencies will be able to use these data to analyze and update land loss information, analyze historical erosion trends, and assess the extent and magnitude of shore erosion on a regional basis. In particular, the availability of up-to-date shoreline change data will support (1) the design and implementation of shore protection projects and (2) the process of developing a comprehensive shore erosion control plan for the State. Thus, acquiring a modern digital shoreline for Maryland has brought the State one step closer to understanding shore erosion trends and, ultimately, to managing the problems that erosion poses.

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APPENDIX 1

Quadrangles for which Modern Shoreline Vectors Were Extracted or Interpreted

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Aberdeen	**SE**	19940408	ABERD_SL.rvc	1,600
Alexandria	**NE, SE**	19930407	ALEXA_SL.rvc	372
Annapolis	**NE, NW, SW**	19940408	ANNAP_SL.rvc	812
Assawoman Bay	NE, NW, SE, SW	19890412	ASSAW_SL.rvc	1,632
Baltimore East	**SE**	19940408	BALTE_SL.rvc	380
	SW	19940404		
Baltimore West	**SE**	19940404	BALTW_SL.rvc	472
Barren Island[3]	**NE[4]**	19940408	BARRE_SL.rvc	248
	SW	19930408?		
Benedict	**NE, NW, SE,** SW	19930408	BENED_SL.rvc	2,596
Berlin	NE, SE, SW	19890412	BERLI_SL.rvc	1,480
Betterton	**NE, NW, SE, SW**	19950325	BETTE_SL.rvc	612
Blackwater River	**NE, NW, SE, SW**	19950325	BLACK_SL.rvc	2,728
Bloodsworth Island	NE, NW, SE, SW	19880417	BLOOD_SL.rvc	3,112
Boxiron	NE, NW, SE, SW	19890412	BOXIR_SL.rvc	892
Bristol	**NE, SE**	19940404	BRIST_SL.rvc	620

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
	NW, SW	19930408		
Broomes Island	**NE,** NW, SE, SW	19930408	BROOM_SL.rvc	1,156
Cambridge	**NE, NW, SE, SW**	19950325	CAMBR_SL.rvc	1,584
Cecilton	**NE, NW, SE, SW**	19950325	CECIL_SL.rvc	548
Centreville	**NE, NW, SE, SW**	19920406	CENTR_SL.rvc	1,976
Charlotte Hall	SW	19930408	CHARL_SL.rvc	208
Chestertown	**NE,** NW, SE, SW	19920406	CHEST_SL.rvc	848
Chicama-comico River	**NE, NW, SE, SW**	19950325	CHICA_SL.rvc	1,836
Church Creek	**NE, NW, SE, SW**	19940408	CHURK_SL.rvc	2,960
Church Hill	**NE, NW, SW**	19920406	CHURH_SL.rvc	4,096
Claiborne	NE, NW	19920406	CLAIB_SL.rvc	1,104
	SE, SW	19940408		
Colonial Beach North	**NE, NW, SE**	19930408	COLON_SL.rvc	1,284
Cove Point	NW, SE, **SW**	19930408	COVEP_SL.rvc	228
Crisfield	NE, NW, SW	19880417	CRISF_SL.rvc	1,640
Curtis Bay	**NE, SE**	19940408	CURTI_SL.rvc	5,608
	NW, SW	19940404		
Deal Island	NE, NW[4], SE, SW	19880417	DEALI_SL.rvc	2,176
Deale	NE, SE	19940408	DEALE_SL.rvc	880
	SW	19940404		
Denton	**NE, NW, SW**	19950325	DENTO_SL.rvc	368

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Dividing Creek	**SE**	19890414	DIVID_SL.rvc	228
Earleville	**NE, NW, SE, SW**	19950325	EARLE_SL.rvc	728
East New Market	**NW, SE, SW**	19950325	EASTN_SL.rvc	620
Easton	**NW, SE, SW**	19950325	EASTO_SL.rvc	780
Eden	**NE**	19890417	EDEN_SL.rvc	488
	NW, SW	19880417		
Edgewood	**NE, SE, SW**	19940408	EDGEW_SL.rvc	1,272
Elkton	**NW, SE, SW**	19950325	ELKTO_SL.rvc	584
Ewell	NE	19880417	EWELL_SL.rvc	2,204
Federalsburg	**NE, SE, SW**	19950325	FEDER_SL.rvc	356
Fowling Creek	**NE, NW, SE, SW**	19950325	FOWLI_SL.rvc	668
Galena	**NE, NW, SW**	19950325	GALEN_SL.rvc	2,312
	SE	19920406		
Gibson Island	**NE, NW, SE, SW**	19940408	GIBSO_SL.rvc	1,216
Girdletree	NW	19880330	GIRDL_SL.rvc	836
	NE, SE	19890412		
Golden Hill	**NE, NW, SE, SW**	19940408	GOLDE_SL.rvc	1,088
Great Fox Island	NE, NW, SE	19880417	GREAF_SL.rvc	1,804
Gunpowder Neck	**NE, NW, SE, SW**	19940408	GUNPO_SL.rvc	2,364
Hallwood	**NW**	19890414	HALLW_SL.rvc	628
Hanesville	**NE, NW, SE, SW**	19940408	HANES_SL.rvc	1,248

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Havre de Grace	**NE, NW, SE, SW**	19950325	HAVRE_SL.rvc	796
Hebron	NW	19890417	HEBRO_SL.rvc	216
Hobbs	**NW, SW**	19950325	HOBBS_SL.rvc	468
Hollywood	NE, **NW, SW**	19930408	HOLLY_SL.rvc	928
Honga	**NE, NW, SE, SW**	19940408	HONGA_SL.rvc	1,268
Horseshoe Point	**NW**	19940408	HORSE_SL.rvc	352
Hudson	**NE, NW, SE, SW**	19940408	HUDSO_SL.rvc	892
Indian Head	**NE, NW, SE, SW**	19930407	INDIA_SL.rvc	692
Kedges Straits	NE, SE	19880417	KEDGE_SL.rvc	3,572
	NW	19890414		
Kent Island	NE, NW, SE, SW	19920406	KENTI_SL.rvc	1,836
King George	**NE, NW**	19930407	KINGG_SL.rvc	240
Kingston	**NW, SW**	19880417	KINGS_SL.rvc	2,180
	SE	19890417		
Langford Creek	NE, NW, SE, SW	19920406	LANGF_SL.rvc	1,616
Leonardtown	**NW,** SE, SW	19930408	LEONA_SL.rvc	3,264
Love Point	SE, SW	19920406	LOVEP_SL.rvc	264
Lower Marlboro	**NE, NW, SE, SW**	19930408	LOWER_SL.rvc	3,300
Mardela Springs	**NE, NW, SE, SW**	19880417	MARDE_SL.rvc	4,972

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Marion	NE, NW, SE, SW	19880417	MARIO_SL.rvc	1,644
Mathias Point	**NE, NW, SE, SW**	19930407	MATHI_SL.rvc	1,896
Mechanicsville	NE, **NW, SE**	19930408	MECHA_SL.rvc	2,048
Middle River	**NE, NW, SE, SW**	19940408	MIDDR_SL.rvc	1,088
Millington	**NW**	19950325	MILLI_SL.rvc	312
	SW	19920406		
Monie	**NE,** NW, SE, SW	19880417	MONIE_SL.rvc	3,444
Mount Vernon	**NE, NW, SW**	19930407	MOUNT_SL.rvc	544
Nanjemoy	**NE, SE, SW**	19930407	NANJE_SL.rvc	564
Nanticoke	NE, SE	19880417	NANTI_SL.rvc	1,676
	NW, SW	19950325		
North Beach	NE, **NW,** SE, **SW**	19930408	NBEAC_SL.rvc	384
North East	NE, **NW, SE, SW**	19950325	NEAST_SL.rvc	488
Ocean City	NW, SW	19890412	OCEAN_SL.rvc	960
Oxford	**NE, NW, SE, SW**	19940408	OXFOR_SL.rvc	1,788
Perryman	**NE, NW, SE, SW**	19940408	PERRY_SL.rvc	4,404
Piney Point	NE, NW, SE	19930408	PINEY_SL.rvc	1,960
Pocomoke City	**NE, NW, SW**	19890414	POCOM_SL.rvc	760
Point Lookout	NW, SW	19930408	PTLOO_SL.rvc	1,028
Point No Point	NW, SW	19930408	PTNOP_SL.rvc	584
Popes Creek	**SE, SW**	19930408	POPES_SL.rvc	1,636
Port Tobacco	**NW, SE**	19930407	PORTT_SL.rvc	940
Preston	**NE, NW, SE, SW**	19950325	PREST_SL.rvc	836

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Prince Frederick	NE, **NW,** SE	19930408	PRFRE_SL.rvc	680
Princess Anne	**NW, SW**	19880417	PRANN_SL.rvc	488
	SE	19890417		
Public Landing	NE, NW, SE	19890412	PUBLI_SL.rvc	456
Quantico	**SE**	19930407	QUANT_SL.rvc	416
Queenstown	NE, NW, SE, SW	19920406	QUEEN_SL.rvc	1,560
Rhodesdale	**NE, NW**	19950325	RHODE_SL.rvc	392
	SE, SW	19880417		
Richland Point	**NE**	19940408	RICHL_SL.rvc	368
Ridgely	**SW**	19920406	RIDGE_SL.rvc	468
Rock Hall	**NE, NW, SE, SW**	19940408	ROCKH_SL.rvc	4,408
Rock Point	NE, NW, SE, SW	19930408	ROCKP_SL.rvc	2,240
Round Bay	**NE, SE**	19940408	ROUND_SL.rvc	1,704
	NW, SW	19940404		
Salisbury	NW	19890414	SALIS_SL.rvc	536
Saxis	**NE**	19890417	SAXIS_SL.rvc	460
	NW	19880417		
Selbyville	NE, NW, SE, SW	19890412	SELBY_SL.rvc	956
Sharptown	**SW**	19890417	SHARP_SL.rvc	560
Snow Hill	**NE, SE**	19890417	SNOWH_SL.rvc	1,140
	SW	19880330		

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Solomons Island	NE, NW, SE, SW	19930408	SOLOM_SL.rvc	1,740
South River	**NE, SE**	19940408	SOUTH_SL.rvc	1,088
	NW, SW	19940404		
Sparrows Point	**NE, NW, SE, SW**	19940408	SPARR_SL.rvc	1,252
Spesutie	**NE, NW, SE, SW**	19950325	SPESU_SL.rvc	1,120
St. Clements Island	NE, NW	19930408	STCLE_SL.rvc	812
St. George Island	NE, NW	19930408	STGEO_SL.rvc	788
St. Marys City	NE, NW, SE, SW	19930408	STMAR_SL.rvc	1,388
St. Michaels	NE, NW	19920406	STMIC_SL.rvc	1,004
	SE, SW	19940408		
Stratford Hall	NE	19930408	STRAT_SL.rvc	708
Sudlersville	**NW**	19920406	SUDLE_SL.rvc	136
Swan Point	**NE, NW, SE**	19940408	SWANP_SL.rvc	820
Taylors Island	**NE, NW, SE**	19940408	TAYLO_SL.rvc	1,684
Terrapin Sand Point	NE, SE	19880417	TERRA_SL.rvc	492
	NW, SW	19890420		
Tilghman	**NE, NW, SE, SW**	19940408	TILGH_SL.rvc	784
Tingles Island	NE, NW, SE, SW	19890412	TINGL_SL.rvc	1,552
Trappe	**NE, NW, SE, SW**	19950325	TRAPP_SL.rvc	1,180
Wetipquin	**NE, NW, SE, SW**	19880417	WETIP_SL.rvc	4,020
White Marsh	**SE**	19940408	WHITE_SL.rvc	464

Quad	Quadrants[1]	Date of photography YYYYMMDD	File name[2]	File size (Kb) (Sec. 6.4.2.1.7)
Whittington Point	NE, NW, SW	19890412	WHITT_SL.rvc	620
Widewater	**NE, SE**	19930407	WIDEW_SL.rvc	324
Wingate	**NE, NW, SE, SW**	19950325	WINGA_SL.rvc	788
Wye Mills	**NW, SE, SW**	19920406	WYEMI_SL.rvc	2,512

[1]Quadrants listed in bold font were extracted or photointerpreted as part of this project; those in normal font were completed prior to this project.

[2]Files are located in directories assigned the full name (concatenated) of the quad. The files themselves are named according to the following conventions. The first four or five characters are an abbreviation of the quad name, usually the first four or five letters of the name. The next three characters "_SL" indicate that the file contains shoreline vectors. The file extension ".rvc" denotes that the file can be read by MicroImages' TNT line of products.

[3]The date of photography for Barren Island SW is unknown. Although Barren Island NE was flown on 4/8/1994, Solomons Island SE, which adjoins Barren Island SW, was flown on 4/8/1993. The latter date was assigned to Barren Island SW.

[4]The production of accurately georeferenced DOQQs depends on sufficient ground control. In open water, ground control is necessarily lacking, because land areas, if they exist at all, are small and/or inaccessible. Two quarter quads in the data set, Deal Island NW and Barren Island NE, contain so much open water that they are not properly tied to the adjoining tiles, Nanticoke SW and Honga NW, respectively. Consequently, the corresponding linework (shoreline) is not properly georeferenced. **The shorelines derived from those two DOQQs are included in the data set solely for the associated attribute information. Their positions are inaccurate.**

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