Task 19 FY 90
Final Work Product

VIRGINIA MARINE RESOURCES COMMISSION

AUTOMATED MAPPING AND LEASING SYSTEM

GRANT

FINAL REPORT

JANUARY 31,1992

This **Automated Mapping and Leasing System** Grant was funded, in part, by the Virginia Council on the Environment's Coastal Resources Management Program through grant # NA90AA-H-CZ796 of the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972 as amended.

Grant Managment & Report by Gerald W. Showalter, VMRC

ARC/INFO run by R. B. STAGG

This Final Report describes the existing system, lists the products purchased with the grant, summarizes the methodology used in the production procedure and lists the final products being submitted.

EXISTING SYSTEM

A Sun Sparcstation 1+ with a 105MB internal hard disk and one 327MB external hard disk with a 1/4 inch tape drive was in place prior to the Grant, running ARC/INFO.

GRANT PURCHASED EQUIPMENT

Two Artecon 669MB hard disk drives in a dual bay were purchased and installed for the extensive data storage and an optical CD-ROM obtained and installed to read in programs and other prewritten data. A Hewlett Packard PaintJetXL Printer with HPGL2 language cartridge and a Hewlett Packard Draftmaster RX Pen Plotter with HPGL2 were purchased to print and plot documents and maps at various sizes and scales.

An Ethernet card with miscellaneous cabeling and hardware to link the Sparcstation 1+ to a 386 PC were purchased and installed.

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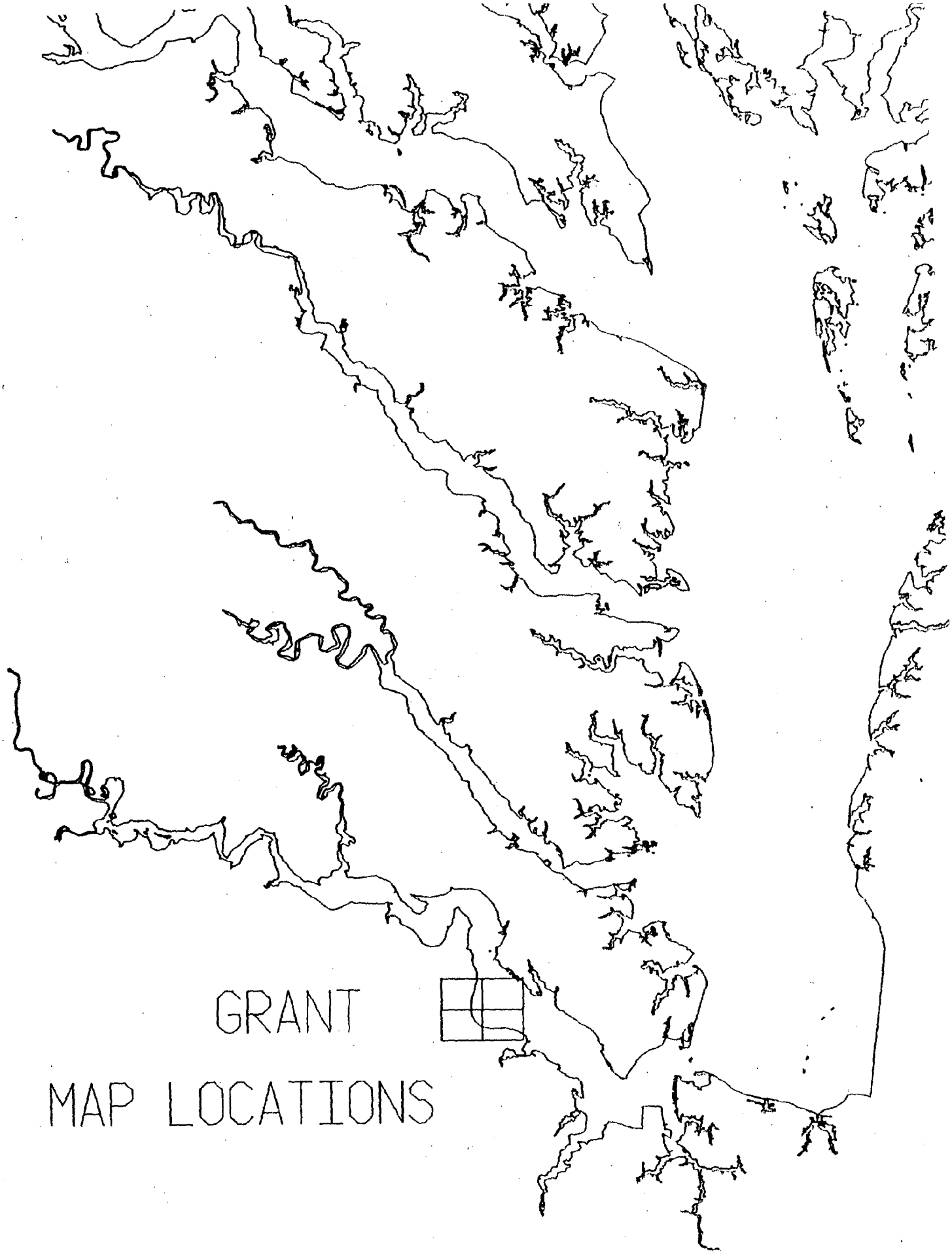
PRODUCTION METHODOLOGY

- Directories were made and coverage types defined.
- Line and shadetypes were defined.
- Additional attributes were defined.
- Coverages were made beginning with entering location data in State Plane Coordinates (NAD27), absolute values.
- Shorelines were digitized in inches, from our hardcopy maps, by the Virginia Institute of Marine Science (VIMS) in a cooperative effort.
- The digitized shoreline was transformed into State Plane Coordinates.
- Coverages were built and data attribute fields were created.
- Lease records were added to the appropriate attribute tables.
- Screen and hardcopy maps were created from initial coverages.
- Some adjustments in symbol types and attribute fields were made after viewing map compositions.
- Various Arc Macro Language (AML) programs were written throughout to simplify the coverage creation and manipulation process.

GRANT PRODUCTS

Four maps with up to six coverage layers were created.

- Two illustrations of these 4 maps were plotted on 24 inch by 36 inch paper at 1:10000 scale, and attached as Appendix A (8 sheets).
- The two illustrations of each of the 4 maps were also plotted on 8½ by 11 inch paper on the PaintJet XL printer at 1:24000 scale. Text and symbols were adjusted to fit the smaller map. 4 copies of each are attached as Appendix B (32 sheets).
- A document entitled "Procedure Used to Create Map Coverages - VMRC Oyster Leasing Maps - in ARC/INFO" was produced to show step by step procedures used to create coverages and attribute table definitions. This is attached as Appendix C. (4 copies)
- All coverages were "exported" in ARC/INFO to 1/4 inch tape. One tape is being handed to Adam Frisch, COE.


GRANT
MAP LOCATIONS

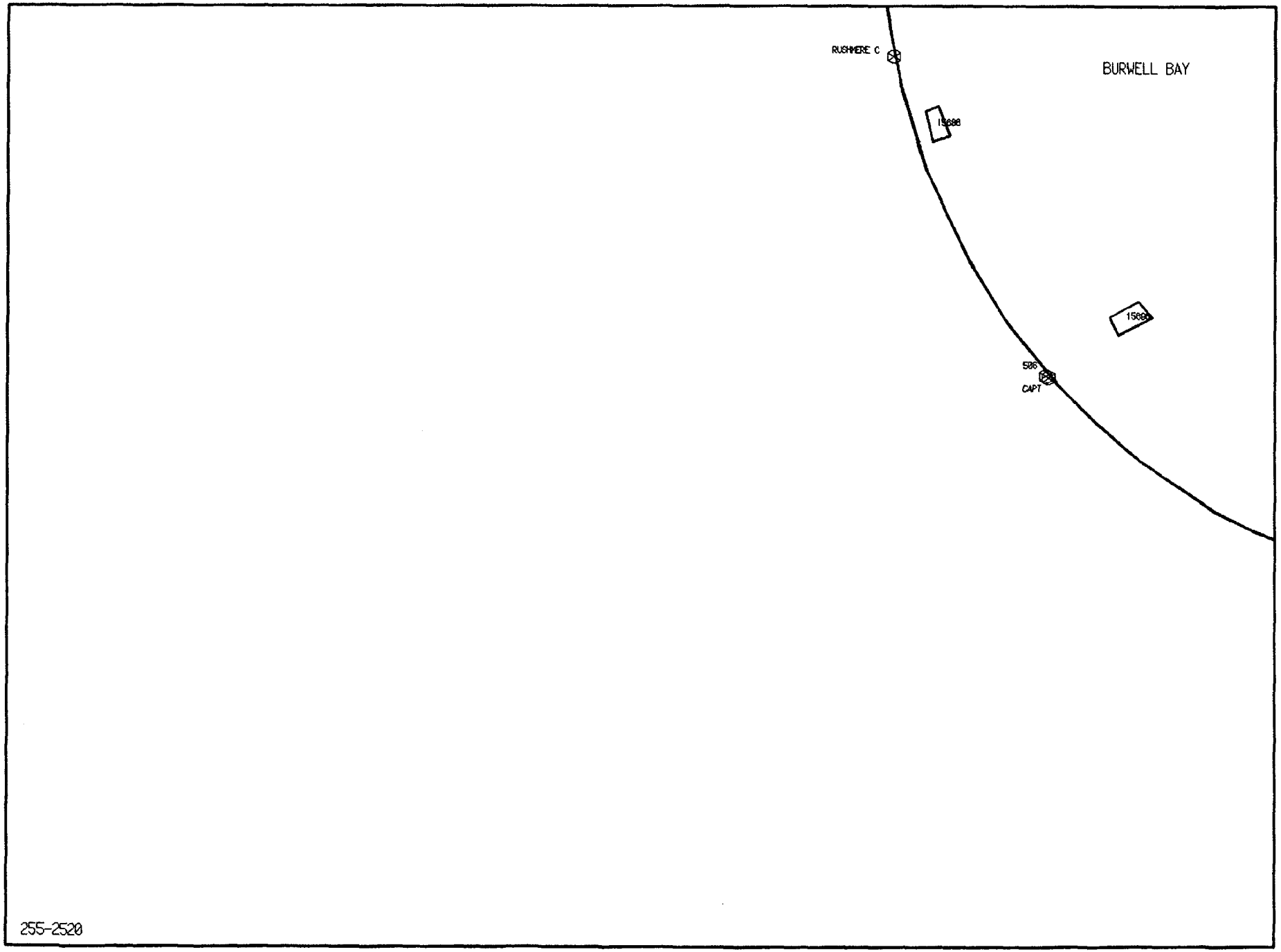
APPENDIX A

TWO ILLUSTRATIONS OF 4 MAPS AT 1:10000 SCALE

THESE ORIGINAL MAPS HANDED TO ADAM FRISCH (COE)

APPENDIX B

TWO ILLUSTRATIONS OF 4 MAPS AT 1:24000 SCALE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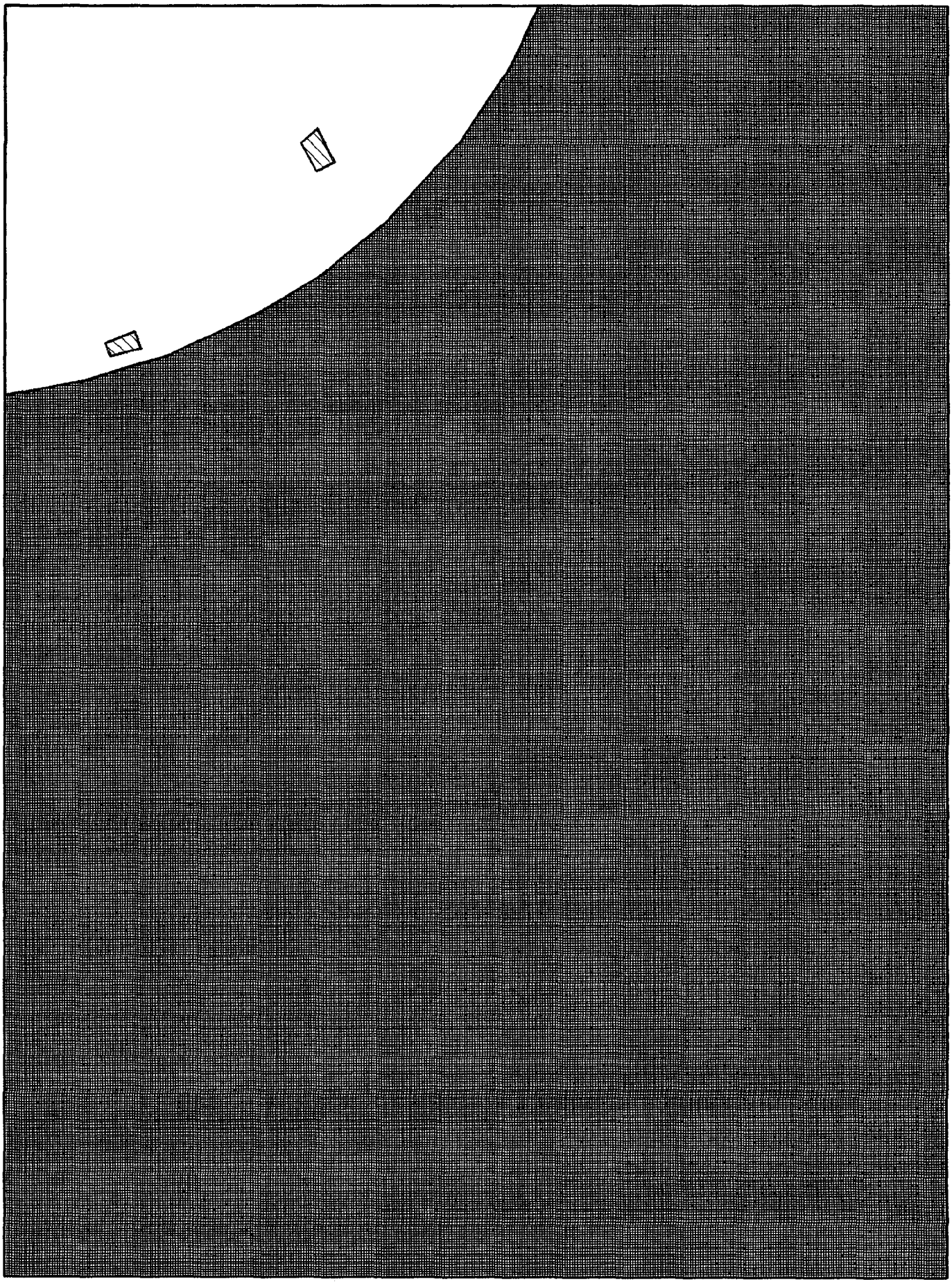

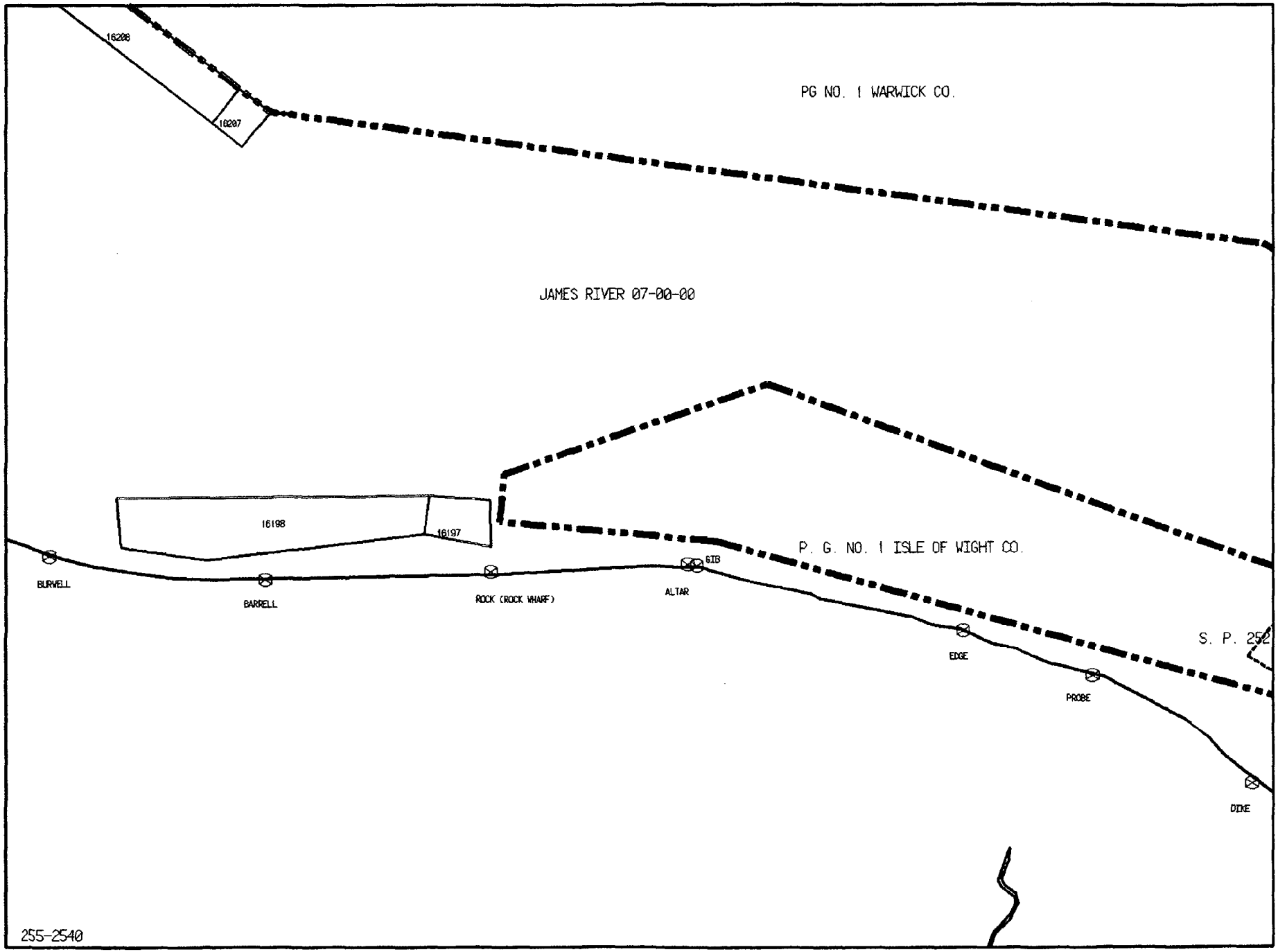
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ALTAR
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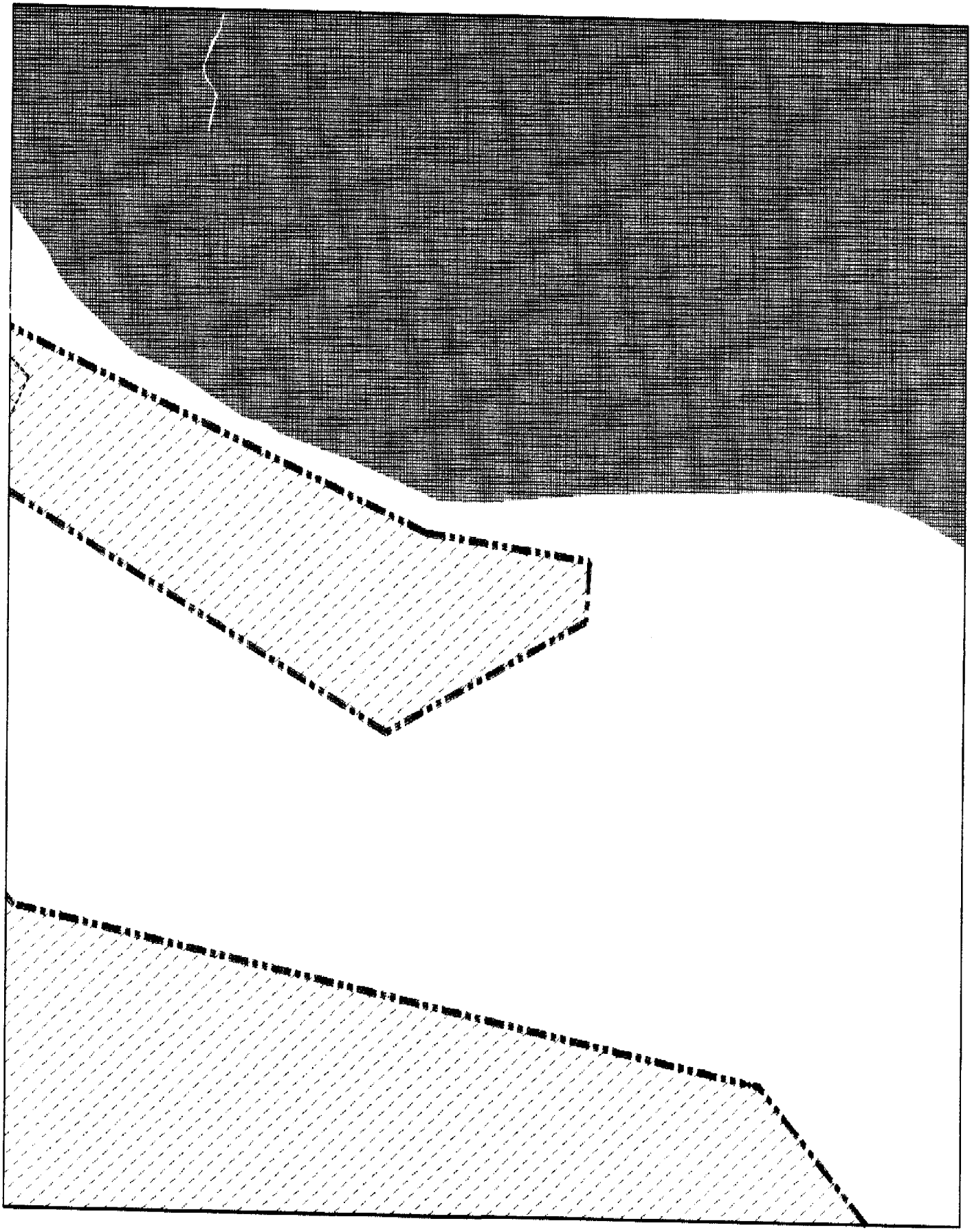

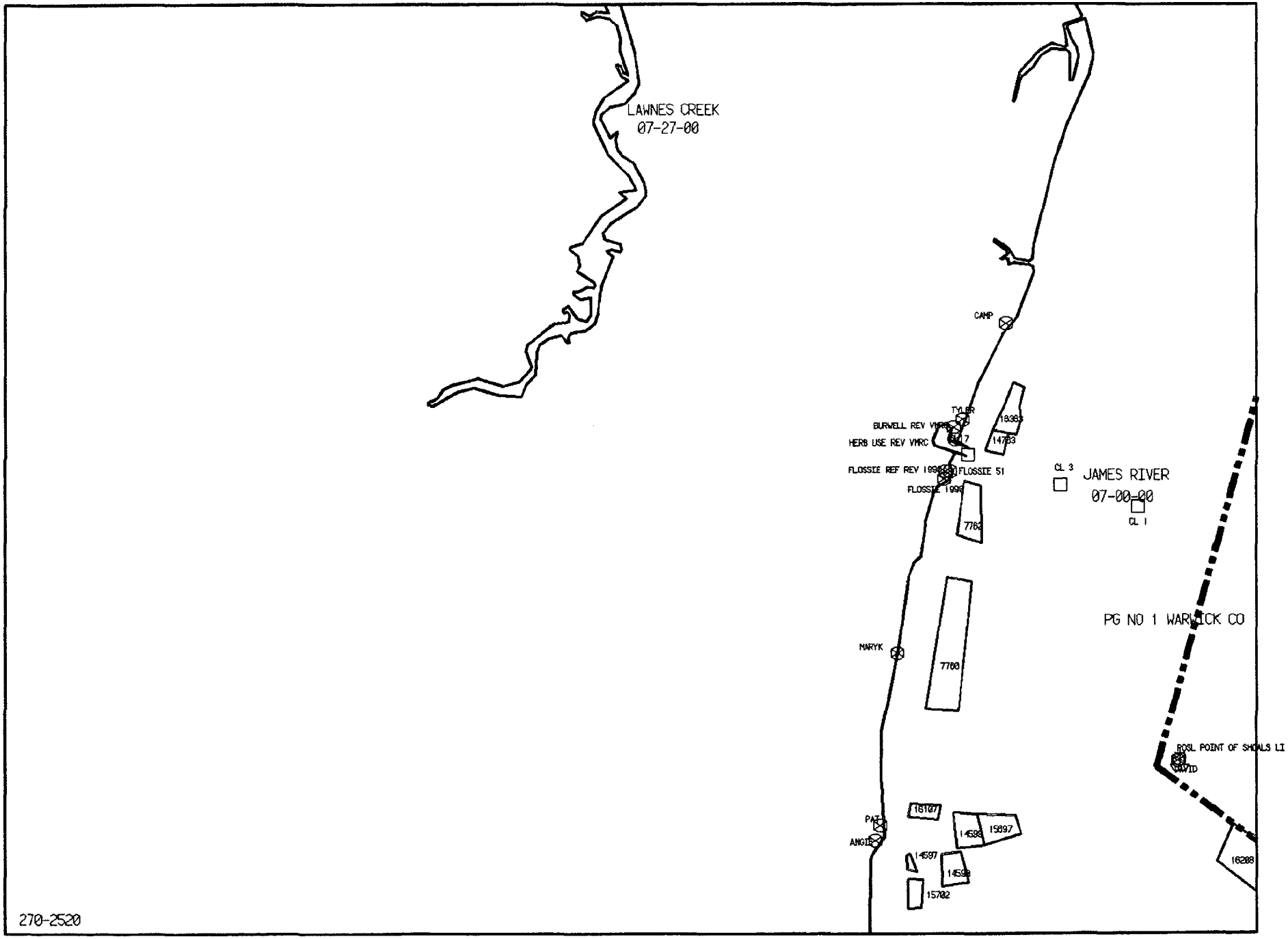
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14783
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CL 3
JAMES RIVER
07-00-00
CL 1
PG NO 1 WARWICK CO
MARYK
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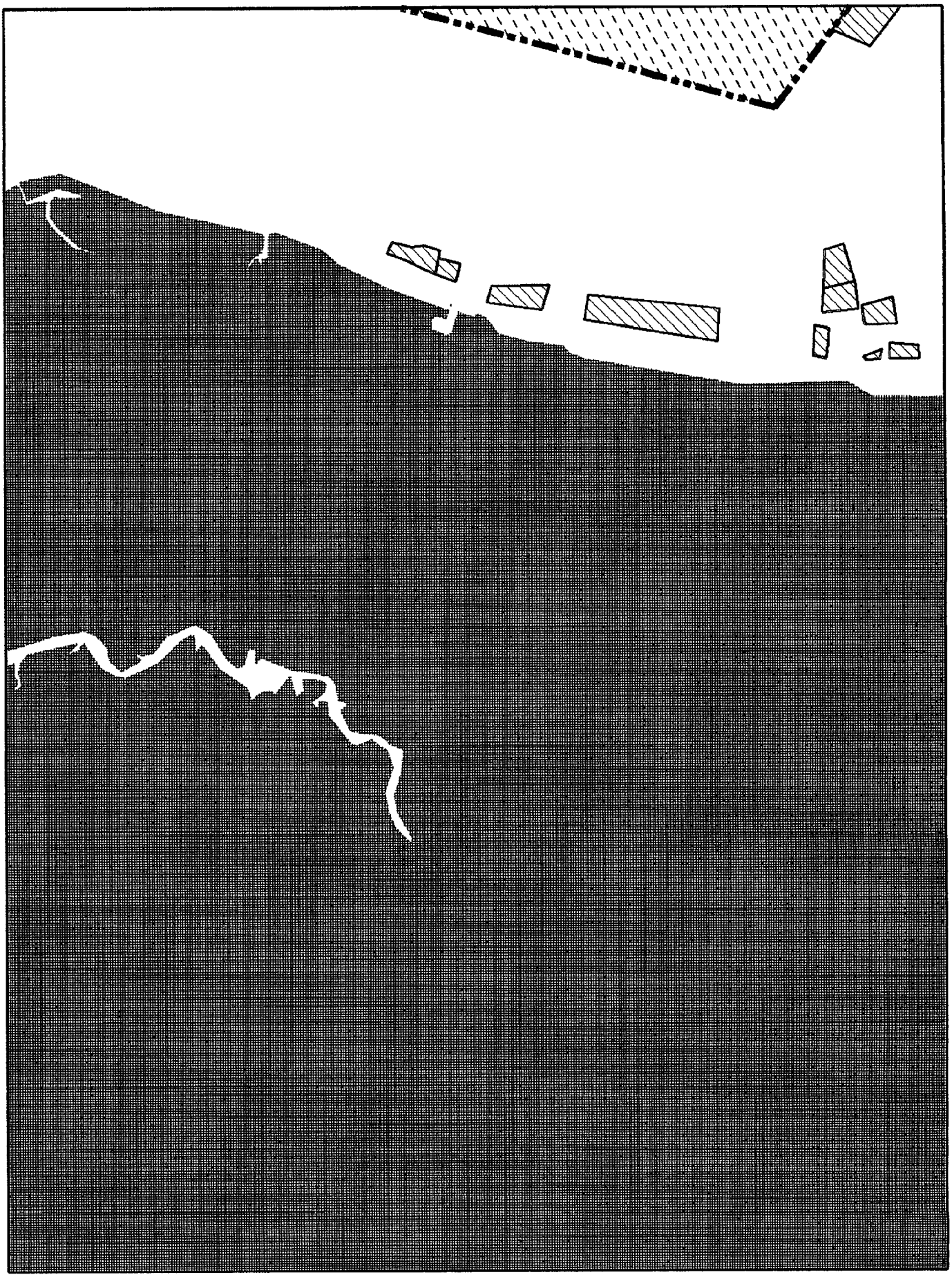

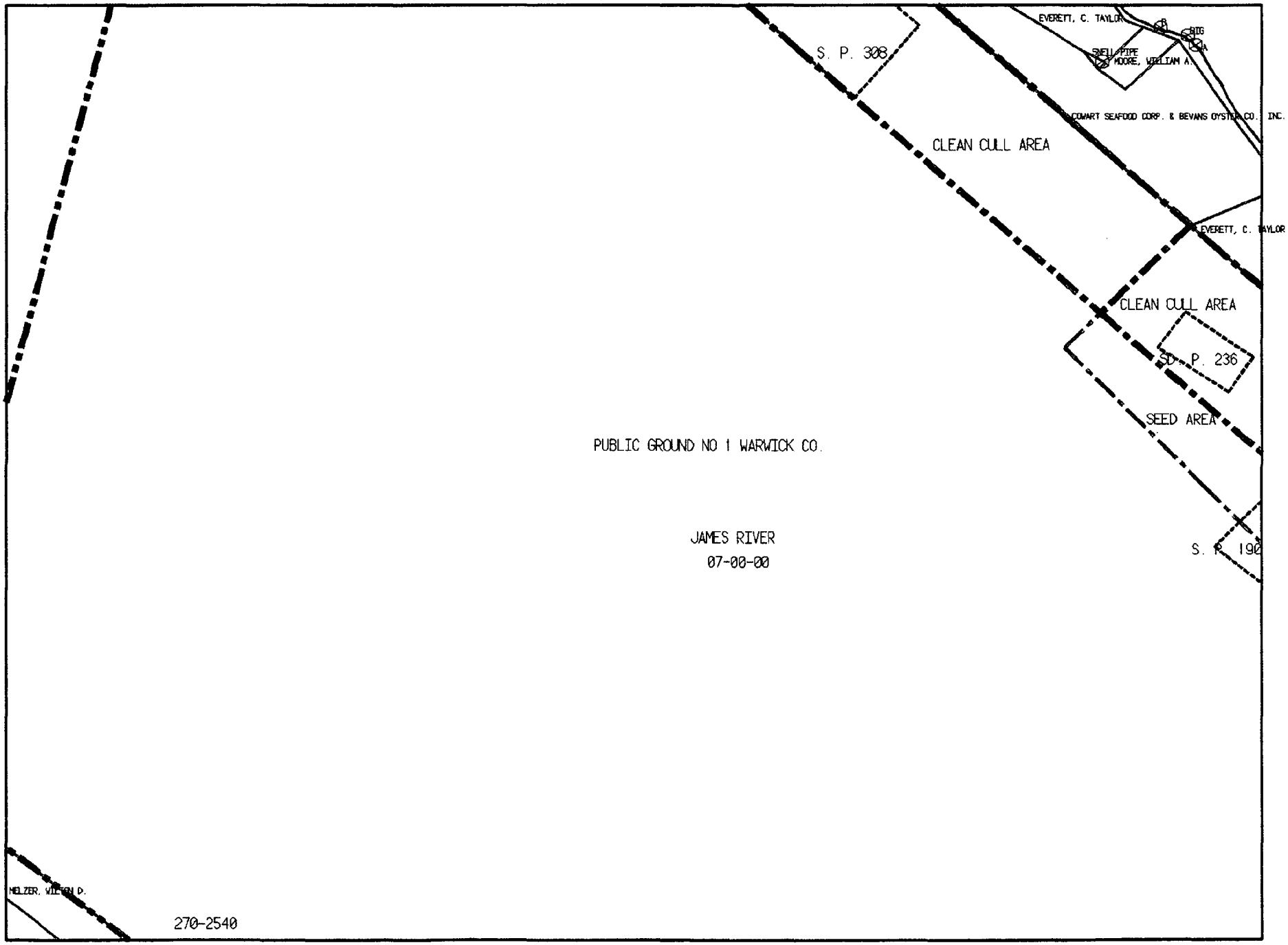
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EVERETT, C. TAYLOR
CLEAN CULL AREA
S. P. 236
SEED AREA
PUBLIC GROUND NO 1 WARWICK CO.
JAMES RIVER
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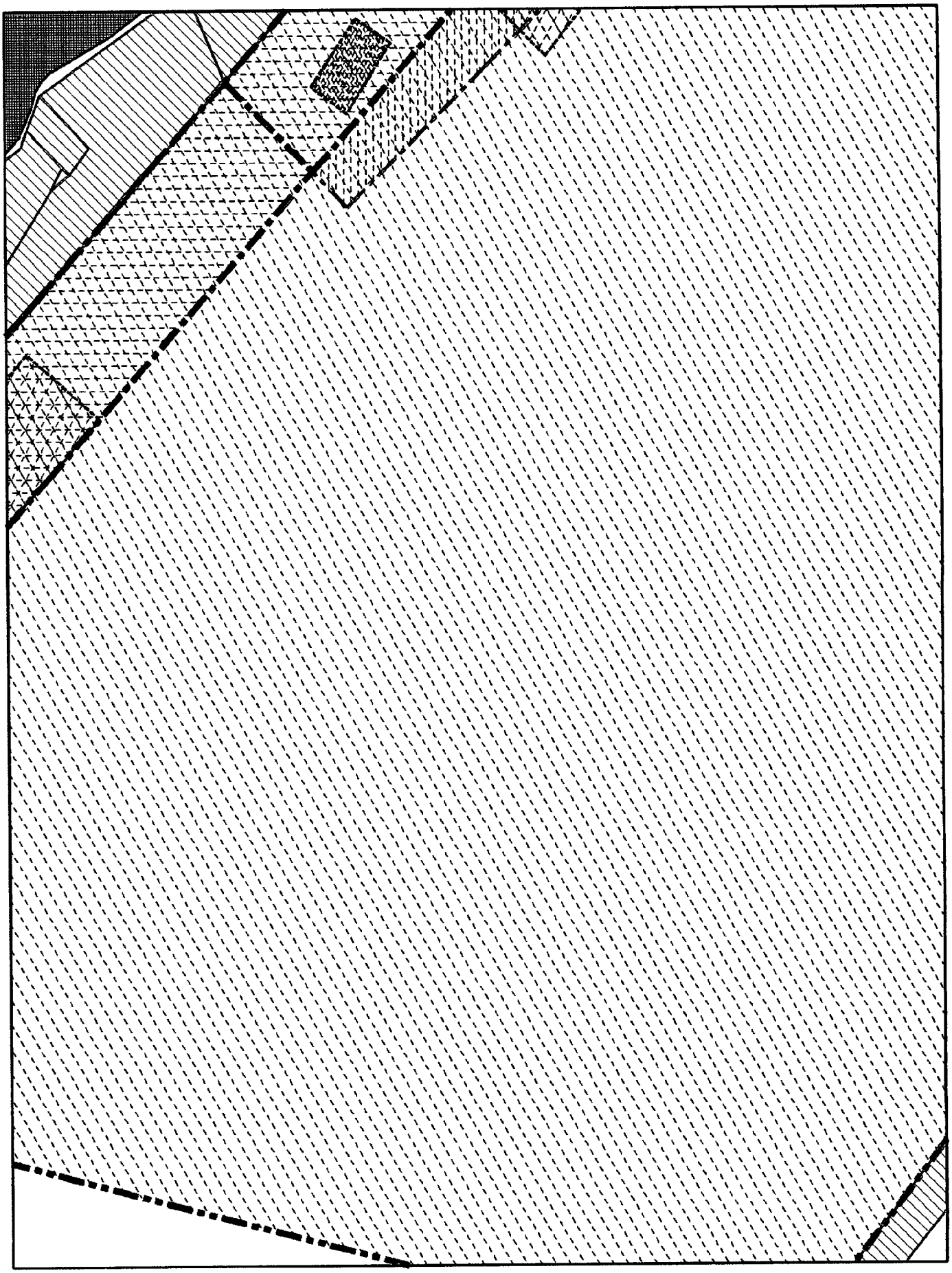
S. P. 190
HELZER, WILSON D.
270-2540



PROCEDURES USED TO CREATE MAP COVERAGES VMRC OYSTER LEASING MAPS IN ARC/INFO

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&
R. Ben Stagg

COMMONWEALTH OF VIRGINIA
VIRGINIA MARINE RESOURCES COMMISSION
FISHERIES MANAGEMENT DIVISION
ENGINEERING DEPARTMENT

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A. Attribute Table Definitions

B. Symbol Sets used for Map Coverages

C. FIPS codes

INTRODUCTION

This document covers the steps taken to create ARC/INFO coverages of 4 maps used in the VMRC, FMD, Engineering/ Surveying's Oyster Leasing program.

Shoreline coverages were obtained from VMRC mylar base maps (1:5000 scale), digitized by Virginia Institute of Marine Science in inches. These digitized coverages were converted to State Plane Coordinates by VMRC with ARC/INFO. All other coverages were entered by VMRC as State Plane Coordinate (NAD 1927) absolute values using ARC/INFO/COGO. These coverages include oyster leases, legal boundaries, Baylor (public) ground legal boundaries, management areas (shell and seed plant delineation), survey control monumentation, navigation aids, and a map border.

Attribute data was added for display and plotting purposes to show lease types, management types, Baylor grounds, land, and water. Also, linetypes were encoded for the above types. In addition symbol types were encoded for survey monumentation and navigation aids. Name, platfile numbers and lease numbers as well as record areas and actual calculated areas of leases were added.

This report and associated data is the result of a pilot grant project.

STEP BY STEP PROCEDURES

The following are detailed procedures explaining how each coverage was produced for each map. Coverages produced include leases, baylor, mng, navaids, shore27, stations, border, and cleancull. The following pages show the steps taken to create the coverages. All current hardcopy 1: 5000 scale maps are identified by the lower left corner State Plane Coordinate value (NAD 1927) with the last three whole digits dropped (ex. map corner value 270,000 2540,000 would equal map 270-2540). A directory for each map number using this same numbering system was created. Coverages are placed under each map number. Before creating map coverages line type symbols and shade symbols were defined. For a list of attributes and symbols used for these coverages see the appendices of this document.

PROCEDURE 1 - CREATION OF BORDER COVERAGE

Step 1. Set precision to double highest. Create mapcoverage border. Identify TICS- Use State Plane coordinate values starting with the lower left corner and working clockwise around the map corners.

Step 2. Add Cogo attributes.

Step 3. Build border line.

Step 4. Additem border.aat border.aat linetype 3 3 I

Step 5. calculate linetype = 102

PROCEDURE 2 - CREATION OF LEASES COVERAGE

Step 1. Set precision to double highest. Createcoverage leases using tic coverage from border coverage.

Step 2. Enter oyster lease corners by State Plane coordinate values as labels. Enter edit feature arcs. Enter snapcoverage leases. Enter snap features arc label. Enter intersectarcs add. Enter snapping closest 75. Enter coordinate mouse. Add nodes at each label point. Enter snap when done entering nodes. Check to see that all nodes snapped to labels. Enter editfeature labels. Enter select all. Enter delete.

Step 3. Leave Arcedit. Enter createlabels leases 0

Step 4. Build leases poly. Build leases line.

Step 5. Additem leases.pat leases.pat areacalc 8 8 F 3
Additem leases.pat leases.pat arearecord 8 8 F 3
Additem leases.pat leases.pat pf# 5 5 C
Additem leases.pat leases.pat name 50 50 C
Additem leases.pat leases.pat leasetype 3 3 I
Additem leases.pat leases.pat leasenumber 3 3 I

Step 6. Enter Arcedit and editfeature label. Select all. Use forms to update attribute fields added in step 5 except areacalc (use calc areacalc = area / 43560). (See list of attribute types in Appendix A).

PROCEDURE 3 - CREATION OF BAYLOR COVERAGE

Step 1. Set precision to double highest. Createcoverage baylor using tic coverage from the border coverage.

Step 2. Enter Baylor corners as label points. Enter editfeature arc. Enter snapfeatures arc label. Enter snapping closest 75. Enter coordinate mouse. Enter intersectarcs add. Add nodes at label points. Enter snap. Check to see that nodes snapped to correct label points. Enter editfeature labels and select all. Delete. Leave Arcedit.

Step 3. Createlabels baylor 0

Step 4 Build baylor poly. Build baylor line.

Step 5. Additem baylor.pat baylor.pat areacalc 8 8 F 3
Additem baylor.pat baylor.pat name 30 30 C
Additem baylor.pat baylor.pat leasetype 3 3 I
Additem baylor.aat baylor.aat linetype 3 3 I

Step 6. Enter Arcedit. Editfeature label. Select all. Unselect all labels outside of baylor. Calculate leasetype = 207. Calculate areacalc = area / 43560. Enter forms and add name. editfeature arc and select all. Unselect the mapborder arcs. Calculate linetype = 240 (For attribute type listings see Appendix A).

PROCEDURE 4 - CREATION OF SHORE27 COVERAGE

Step 1. Import shoreline from VIMS raw coverage data file.

Step 2. Transform VIMS shoreline coverage to shore27 (State Plane feet).

Step 3. Additem shore27.pat shore27.pat areacalc 8 8 F 3
Additem shore27.pat shore27.pat areatype 3 3 I
Additem shore27.aat shore27.aat linetype 3 3 I

Step 4. Enter Arcedit. Editfeature label. Select all land labels. Calculate areatype = 334.
Calculate areacalc = area / 43560.
editfeature arc. Select all shoreline arcs.
calculate linetype = 302
(See Appendix A for attribute types).

PROCEDURE 5 - CREATION OF STATIONS COVERAGE

Step 1. Set precision to double highest. Createcoverage stations using tic coverage border coverage.

Step 2. Enter station coordinates as label points.

Step 3. Exit Arcedit. Build stations points. Add xy (adds coordinate location in attribute table).

Step 4. Additem stations.pat stations.pat name 25 25 C
Additem stations.pat stations.pat desc 30 30 C
Additem stations.pat stations.pat status 30 30 C
Additem stations.pat stations.pat symbol 3 3 I

Step 5. Enter Arcedit. Editfeature label. Select all. Enter forms. Add attribute data to the name, desc, and status fields. Calculate symbol = 33. (See appendix A for attribute types).

PROCEDURE 6 - CREATION OF MNG (MANAGEMENT) COVERAGE

Step 1. Set precision at double highest.
Createcoverage mng using tic coverage from border coverage.

Step 2. Editfeature label. Enter seed and shell plant and turns coordinate corner locations as label points. Editfeature arc. Intersectarcs add. Snapcoverage mng. Snapfeature arc label. Snapping closest 75. Coordinate mouse. Add nodes at label points. Snap.
Check to see that nodes snapped to all label points. Editfeature label. Select all. Delete. Leave Arcedit.

Step 3. Createlabels mng 0

Step 4. Build mng poly
Build mng line

Step 5. Additem mng.pat mng.pat areacalc 8 8 F 3
Additem mng.pat mng.pat name 30 30 C
Additem mng.pat mng.pat leasetype 3 3 I
Additem mng.aat mng.aat linetype 3 3 I

Step 6. Enter Arcedit. Editfeature label. Select all mng area labels. Calculate areacalc = area / 43560. Enter forms and add name data and leasetype data. Editfeature arc. Enter forms. Add linetype data.
(See appendix A for attribute types).

PROCEDURE 7 - CREATION OF NAVAIDS COVERAGE

Step 1. Set precision at double highest
Createcoverage navaids using tic coverage from border coverage.

Step 2. Enter navigation aids locations as label points.

Step 3. Exit Arcedit. Build navaids point. Add xy.

Step 4. Additem navaid.pat navaid.pat name 25 25 C
Additem navaid.pat navaid.pat symbol 3 3 I

Step 5. Enter Arcedit. Editfeature label. Select all. Enter forms. Add attribute information for name and symbol type. (See appendix A for attribute types).

PROCEDURE 8 - CREATION OF CLEANCULL COVERAGE

Step 1. Set precision at double highest. Createcoverage cleancull using tic coverage from border coverage.

Step 2. Enter Arcedit. Add coordinate corners of cleancull areas as label points. Editfeature arcs. Intersectarcs add. Snapcoverage cleancull. Editfeature arc label. Snapping closest 75. Coordinate mouse. Add nodes at label points. Enter snap when done. Check to see that nodes snapped to correct label points. Editfeature label. Select all. Delete.

Step 3. Leave Arcedit. Enter createlabels cleancull 0

Step 4. Build cleancull poly
Build cleancull line

Step 5. Additem cleancull.pat cleancull.pat leasetype 3 3 I
Additem cleancull.pat cleancull.pat name 30 30 C
Additem cleancull.pat cleancull.pat areacalc 8 8 F 3
Additem cleancull.aat cleancull.aat linetype 3 3 I

Step 6. Enter Arcedit. Editfeature label. Select all. Enter forms. Edit attributes for leasetype and name. Calculate areacalc = area / 43560. Editfeature arc. Select all cleancull arcs. Calculate linetype = 228. (See appendix A for attribute types).

Appendix A: Attribute Table Description

ATTRIBUTE TABLE DESCRIPTION

COVERAGE BAYLOR

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE
linetype	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	240	baylor line

NOTE: For arcplot use carto.lin

ATTRIBUTE TABLE DESCRIPTION

COVERAGE BAYLOR

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
areacalc	8	8	F	3
name	30	30	C	
leasetype	3	3	I	

CODE DESCRIPTIONS

ITEMS	VALUES	DESCRIPTION
areacalc		calculated area in acres
name		baylor name
leasetype	207	baylor shade symbol

NOTE: For arcplot use carto.shd

ATTRIBUTE TABLE DESCRIPTION

COVERAGE BORDER

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE
linetype	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	102	mapborder

NOTE: For arcplot use carto.lin

ATTRIBUTE TABLE DESCRIPTION

COVERAGE CLEANCULL

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE
linetype	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	228	cleancull area linetype

NOTE: For arcplot use carto.lin

ATTRIBUTE TABLE DESCRIPTION

COVERAGE CLEANCULL

FEATURE ATTRIBUTE TABLE .PAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
leasetype	3	3	I	
areacalc	8	8	F	3
name	30	30	C	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
leasetype	204	cleancull shade symbol
areacalc		calculated area on acres
name		cleancull area name

NOTE: For arcplot use carto.shd

ATTRIBUTE TABLE DESCRIPTION

COVERAGE LEASES

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE
linetype	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	402	leaselines
	302	riparian
	202	riparian pays

NOTE: For arcplot use carto.lin on pen plotters.
For plotting on the Hewlett Packard PaintjetXL use vmrc.lin and symbol 400. Because the PaintjetXL uses a different palette setup, symbol 402 results in a yellow hardcopy output. Using vmrc.lin and symbol 400 will result in a yellow line on the screen but a blue line on the hardcopy output.

ATTRIBUTE TABLE DESCRIPTION

COVERAGE LEASES

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
areacalc	8	8	F	3
arearecord	8	8	F	3
pf#	5	5	C	
name	50	50	C	
leasetype	3	3	I	
leasenumber	5	5	I	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
areacalc		calculated lease area in acres
arearecord		record area of lease in acres
pf#		plat file number
name		name(s) of leaseholders
leasetype	429	regular lease
	329	riparian
	229	riparian (pays rent)
leasenumber		unique identifier of lease

NOTE: For arcplot use carto.shd on pen plotters.
For plotting on the Hewlett Packard PaintjetXL a lookup (LUT) table was created (leases.lut). This was needed because the PaintjetXL has a different color palette. Leases.lut was created in Info with two items (leasetype and symbol). Both items use the same attribute types as leasetype in the leases.pat attribute table. Symbol is given a value of 400. A shadeset file of vmrc.shd was created and symbol 400 created. This symbol will plot yellow on the screen but blue on hard copy output.

ATTRIBUTE TABLE DESCRIPTION

COVERAGE MNG

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
linetype	3	3	I	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	206	linetype symbol for all seed and shell plants

NOTE: For arcplot use carto.lin

ATTRIBUTE TABLE DESCRIPTION

COVERAGE MNG

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
area-calc	8	8	F	3
name	30	30	C	
leasetype	3	3	I	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
area-calc		calculated area of management area
name		name of management area
leasetype	216	seedplant
	214	shell plant
	215	shell turn

NOTE: For arcplot use carto.shd

ATTRIBUTE TABLE DESCRIPTION

COVERAGE NAVAID

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE
name	25	25	C
symbol	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
name		navigation aid name
symbol	7	Green Day Marker or Channel Light
	14	Red Day Marker or Channel Light
	95	Lighthouse
	11	Green Buoy
	10	Red Buoy

NOTE: For arcplot use plotter.mrk

ATTRIBUTE TABLE DESCRIPTION

COVERAGE SHORELINE

FEATURE ATTRIBUTE TYPE .AAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
linetype	3	3	I	
upland	1	1	I	
FIPS	4	4	I	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
linetype	302	shoreline
	0	mapborder
upland	1	land
	0	mapborder
FIPS	VARIABLE	See Appendix C

NOTE: For arcplot use carto.lin
upland and FIPS were entered by VIMS
linetype was entered by VMRC

ATTRIBUTE TABLE DESCRIPTION

COVERAGE SHORELINE

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE	NO. DECIMALS
areacalc	8	8	F	3
areatype	3	3	I	
water	1	1	I	
FIPS	4	4	I	

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
areacalc	varies	calculated area of polygon in acres
areatype	0	water
	334	land
water	2	water
	1	land
FIPS	VARIABLE	See Appendix C

Note: For arcplot use carto.shd *Caution* coverages with large amounts of land polygons will require considerable plotting time on pen plotters as this symbol number (334) is nearly a solid shade.
water and FIPS items were entered by VIMS
areatype and areacalc were entered by VMRC

ATTRIBUTE TABLE DESCRIPTION

COVERAGE STATIONS

FEATURE ATTRIBUTE TYPE .PAT

NAME	WIDTH	OUTPUT	TYPE
name	25	25	C
desc	30	30	C
status	30	30	C
symbol	3	3	I

CODE DESCRIPTIONS

ITEM	VALUES	DESCRIPTION
name		Survey station name
desc		Station type-Agency ,etc..
status		Recovery data
symbol	33	station symbol

NOTE: For arcplot use plotter.mrk

Appendix B. Symbol Sets

For both screen and hard copy plotting purposes (arcplot) a number of symbol, shade and marker files were used. For line and poly coverages carto.lin should be used. For shading poly coverages carto.shd should be used. For point coverages plotter.mrk should be used. Due to a different palette setup on the Hewlett Packard Paintjetxl a lookup table was made for the leases coverage. See Appendix A for more details. For a complete list of symbol types see the ARC/INFO Symbols User Guide. ***** Use caution when plotting shaded coverages on a pen plotter since some of the shaded areas will take considerable plotting time.

Appendix C: FIPS CODES

FIPS	COUNTY
001	Accomack
003	Albemarle
005	Alleghany
007	Amelia
009	Amherst
011	Appomattox
013	Arlington
015	Augusta
017	Bath
019	Bedford
021	Bland
023	Botetourt
025	Brunswick
027	Buchanan
029	Buckingham
031	Campbell
033	Caroline
035	Carroll
036	Charles City
037	Charlotte
041	Chesterfield
043	Clarke
045	Craig
047	Culpeper
049	Cumberland
051	Dickenson
053	Dinwiddie
057	Essex
059	Fairfax
061	Fauquier
063	Floyd
065	Fluvanna
067	Franklin
069	Frederick
071	Giles
073	Gloucester
075	Goochland
077	Grayson
079	Greene
081	Greensville
083	Halifax
085	Hanover
087	Henrico
089	Henry
091	Highland
093	Isle of Wight
095	James City
097	King and Queen

FIPS	COUNTY
099	King George
101	King William
103	Lancaster
105	Lee
107	Loudoun
109	Louisa
111	Lunenburg
113	Madison
115	Mathews
117	Mecklenburg
119	Middlesex
121	Montgomery
125	Nelson
127	New Kent
131	Northampton
133	Northumberlund
135	Nottoway
137	Orange
139	Page
141	Patrick
143	Pittsylvania
145	Powhatan
147	Prince Edward
149	Prince George
153	Prince William
155	Pulaski
157	Rappahannock
159	Richmond
161	Roanoke
163	Rockbridge
165	Rockingham
167	Russell
169	Scott
171	Shenandoah
173	Smyth
175	Southampton
177	Spotsylvania
179	Stafford
181	Surry
183	Sussex
185	Tazewell
187	Warren
191	Washington
193	Westmoreland
195	Wise
197	Wythe
199	York

FIPS	CITY
510	Alexandria
515	Bedford
520	Bristol
530	Buena Vista
540	Charlottesville
550	Chesapeake
560	Clifton Forge
570	Colonial Heights
580	Covington
590	Danville
595	Emporia
600	Fairfax
610	Falls Church
620	Franklin
630	Fredericksburg
640	Galax
650	Hampton
660	Harrisonburg
670	Hopewell
678	Lexington
680	Lynchburg
683	Manassas
685	Manassas Park
690	Martinsville
700	Newport News
710	Norfolk
720	Norton
730	Petersburg
735	Poquoson
740	Portsmouth
750	Radford
760	Richmond
770	Roanoke
775	Salem
780	South Boston
790	Staunton
800	Suffolk
810	Virginia Beach
820	Waynesboro
830	Williamsburg
840	Winchester

In addition, we have added codes to accommodate those birds and aquatic species found in the Chesapeake Bay and the Atlantic Ocean.

CB1	Lower Chesapeake Bay	CB3	Upper Chesapeake Bay
CB2	Middle Chesapeake Bay	AO1	Atlantic Ocean

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