

FE 234

WIRE DRAG

Diagram No. 1222-4

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

DESCRIPTIVE REPORT

Type of Survey Wire-Drage
Field No. R/H-20-1-77
Office No. FE-234 WD

LOCALITY

State Virginia
General Locality Chesapeake Bay
Locality East of Thimble Shoal and
Chesapeake Channel

1977

CHIEF OF PARTY
CDR R.A. Ganse

LIBRARY & ARCHIVES

DATE October 12, 1983

☆U.S. GOV. PRINTING OFFICE: 1980-766-230

Area 2
CHT: 12254-20
12222-20
12256-20
12220-20
12221-80
12200NL

ref: L-433(B2)

FE 234
WIRE DRAG

HYDROGRAPHIC TITLE SHEET

FE-234 W.D.

INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD NO.

R/H-20-1-77

State Virginia

General locality Chesapeake Bay

Locality East of Thimble Shoal and Chesapeake Channel

Scale 1:20,000

Date of survey 18 Feb - 14 May 1977

Instructions dated 29 November 1976

Project No. OPR-515-RU/HE

Vessel RUDE & HECK

Chief of party R.A. Ganse, CDR., NOAA

Surveyed by LCDR R.V. Smart, LT T. Ruzala, LTJG K.G. Vadnais, ENS S.P. DeBow

Soundings taken by echo sounder, hand lead, pole Wire Drag, Pneumatic Depth Gauge

Graphic record scaled by _____

Graphic record checked by _____

Protracted by _____

Automated plot by XYNETICS 1201 (rough strips) ^{only}

Verification by M.B. Hickson

Soundings in fathoms feet at MLW MLLW _____

REMARKS:

STANDARDS CK'D 10-27-83

C. Long

AWOIS - 11/9/83 mjt

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Removed from the Descriptive Report and filed with the survey records.

Nonfloating Aids or Land marks for Charts (Form 76-40)
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DESCRIPTIVE REPORT
TO ACCOMPANY
WIRE DRAG FIELD NO. 20-1-77
PROJECT OPR-515-RU/HE
VIRGINIA
ENTRANCE TO CHESAPEAKE BAY
1977
CDR. R. A. GANSE
NOAA SHIPS RUDE & HECK

- A. AUTHORITY - This project was authorized under project instructions OPR-515 RU/HE-77, Wire Drag, East Coast Investigations, dated 29 November 1976 and amended by change No. 1 dated 29 December 1976. ~~and change No. 2 dated 25 February 1977.~~ In addition the following verbal amendments were made:
(1) Item 1E was undertaken first with the approval of CAM-1, because it appeared more suitable for the purposes of training the new personnel.
(2) The area and limits of work were redefined by the author of the project instructions, Mr. Rudie^{alph} Sanocki, while he was aboard observing survey operations on March 14, 1977. See section B for specific delineation of the work.
- B. CHARACTER AND LIMITS OF THE WORK - The purpose of the portion of the work undertaken was to investigate the area about two specific items (1A and 1E) stipulated by the project instructions and located in the Entrance to Chesapeake Bay.

The area investigated for item 1E was within a circle of one nautical mile radius about the reported position of the obstruction located at LAT. 37°00.0'N, Long. 76°10.0'W, and bounded on the southern side by Thimble Shoals North Auxilliary Channel.

The area delineation for item 1A is shown in Fig. 1, as per specification by the author of the project instructions

The area is covered by Chart 12222. The boatsheet layout is from Lat. 37°08'N to Lat. 36°54'N and Long. 76°18'W to 76°01'W. A 1:20,000 scale was used for this survey.

- C. CONTROL - Raydist Stations - Raydist DR-S Range-Range control was used, operating on a frequency of 3300.4 KHz which provided a lane width of 45.39904 meters. Two Raydist shore stations were used, one at Fort Story (designated 2-75 Raydist) and located at Lat. 36°55' 49.5852"N and Long. 76°01'01.3925"W (Red). The other station (Green) was located at Little Creek Naval Amphibious Base (designated H-1-VA-77) Lat. 36°55'31.9566"N, Long. 76°09'28.2350:W. - *Both geographic positions are field positions.*

Radar ranges between the vessels were reported each fix. Coupled with bearings to the ships this puts a limit on any lane ambiguity, if one vessel's Raydist control remains good. These radar ranges were interpolated between quarter mile rings, and their accuracy is considered accurate to within about 0.05 nautical miles.

Shore Signals and Calibration - Calibration of the Raydist was effected in the working area by obtaining sextant angles to specific signals of known co-ordinates. Calculation of red and green lane values from this information was done using an HP-65 programable calculator. Shore Signals used were as follows:

LAM - Little Creek Amphibious Base Tank, 1952

Lat. 36°55'06.19000"N ✓ X=2 675 366. 27
Long. 76°11'22.54400"W ✓ Y=221 270. 41

TOY - Thimble Shoal Lighthouse, 1919

Lat. 37°00'51.71200"N ✓ X=2 659 711. 51
Long. 76°14'25.07500"W ✓ Y=255 845. 21

CUR - Little Creek NAB Desert Cove ~~Water~~ Tank, 1955

Lat. 36°55'14.38200"N ✓ X=2 683 503. 02
Long. 76.09'42.06300"W ✓ Y=222 299. 52

WIT - Little Creek ~~NAB Tank~~ NAV AMPH BASE TK, 1952

Lat. 36°54'31.74000"N ✓ X=2 687 593. 34
Long. 76°08'53.00000"W ✓ Y=218 087. 33

RIG - Little Creek, NAB Radar Reflector, 1955

Lat. 36°55'21.63400"N ✓ X=2 689 278. 38
Long. 76°08'30.69400"W ✓ Y=223 176. 85

ORB - Ocean View ~~Tank~~ Municipal Water Tank, 1950

Lat. 36°56'51.⁶⁶³~~865~~"N ✓ X=2 654 708. 39
Long. 76°15'33.886"W ✓ Y=231 442. 23

NUX - ~~Ocean View Tank~~ Norfolk USN Air Sta Tank, 1958

Lat. 36°56'41.372"N ✓ X=2 639 941. 17
Long. 76°18'36.151"W ✓ Y=230 054. 59

NOTE: X and Y in feet

Raydist Lane Loss - Some difficulty with lane loss was encountered during the project on H day and N day.

On H day a flat spot suddenly appeared between positions 1 and 2 for the green station aboard the RUDE (GV). The HECK (EV) did not seem to have the problem.

On N day intermittent lane loss was noticed about position 2 for the green station. The drag was terminated and shortly thereafter green lock was lost completely. Aboard the HECK (EV), however, the green continued to track, only in the opposite direction it should have (i.e. moving toward the green station the lane count increased). Investigation by a shore party revealed a power loss to the station, which was later restored.

A spectrum analyzer at AMC's Electronic Engineering Branch showed considerable interference about the frequencies the Raydist net operated at. It is presumed that while the green station was on the air the interference was rejected by the HECK shipboard receiver, but that in the absence of a strong green transmission it locked onto spurious signals. This could also explain the circumstances encountered on H day.

- D. DATES OF SURVEY - This survey was run in three segments concurrent with another project near Hopewell, Virginia. The first part of the Project was run from 18 February to 24 February 1977. The Second segment was run from 8 March to 16 March 1977. The final part of the project was run from 29 March to 8 April 1977. *A Pneumatic Depth Gage least depth was taken on May 14, 1977 on the large mushroom anchor found during the item 1A investigation.*
- E. TIDE REDUCERS - Field reduction of each day's data was done using predicted tides for Hampton Roads with the following correctors applied:

TIME	HEIGHT
HW= -45 min LW= -55 min	ratio = 1.08

See the smooth (approved) tide note included in this report.

F. JUNCTIONS - None

G. SPLITS - None — *See the Evaluation Report — section 6.*

H. CURRENTS AND WINDS - Currents were tidal, and reached velocities of up to 1 1/2 knots. Drags were set out and run with the currents or at slack water.

The area investigated was relatively protected, and difficulties due to winds arose mostly from ship handling problems; at low speeds as opposed to sea states.

I. TESTING - Results of the tests were recorded in both the rough and smooth tester volumes.

After the tester crossed the wire and was recovered, the test indication observed from the pole was recorded on the rough tender tester record sheet along with the depth at which it was set and the time it crossed the wire. This information was then radioed to the guide vessel.

Aboard the Guide Vessel the depth of the tester and the test indication were reconciled against the depth setting of the drag to determine the sag of lift of the ground wire.

Definition of a sag miss: A test in which the tester rod has definitely been thrown in ahead of the ground wire, and picked up after the ground wire has passed yet has no marks on the pole. The wire is assumed to have passed underneath the tester rod and the test is considered valid, providing a maximum value for the amount of lift present.

Definition of a TOB: TOB refers to "tester on bottom". It is a test result that occurs when the tester rod shows signs of having touched the ocean floor. Lifts associated with this type of test generally are not accepted because of the uncertainty as to where the ground wire struck the rod. It is likely that if the tester rod is stuck in the ocean floor the ground wire might first ride up the rod until enough force is generated to push the rod away.

In the smooth test record an asterisk (*) next to the section indicates the test came from the HECK's launch 20.

J. GENERAL NOTES - It is important to know that the ships are moving properly at the close of the drag. Before Raydist it was difficult to see if the ships were moving without making a complete fix. The Raydist's saw tooth recorder gives a permanent record of movement of the ship at all times. The Raydist strip chart was checked at the end of each drag to ascertain proper ship movement before the drag was aborted.

By use of the saw tooth strip chart one can tell the path of the ships between fixes. This fact may be important in specific cases where it is possible that between fixes the proper overlap may not have been met.

Relative Pen Lengths - In most cases the three strip chart pens were not exactly the same length, making proper interpretation of the record impossible without the appropriate adjustments. Relative pen lengths, entered on the strip charts by means of completing a rubber stamp, were noted each day.

All buoy and tester uprights were personally verified correct by the officer in charge before the project began. Those buoy and tester uprights which were used were verified correct to 50 feet (maximum use was 49 1/2 feet) by the officer in charge after the project was complete.

When the End Vessel records were scanned for G day (one month later) it was found that a mid-day checking calibration was made which indicated a two lane loss on the red. Although the evening calibration closed out, the mid-day calibration was neither rejected nor taken into account.

Although two separate signal combinations were used in the questionable calibration, one of them (LAM-ORB-TOY) was a near perfect swinger (i.e. having all signals and the ship on a common circumference), and introduced ambiguity to the computed red value. In addition, notes in the End Vessel volume indicate that visibility at the time was extremely poor.

The possibility of a larger lane loss or gain on the End Vessel side is precluded by the Radar Range and Bearings made each fix. An analysis made on all G day drags indicated that a two lane loss on the red would have no adverse effect on overlap. For these reasons, and because we were sufficiently unimpressed by the apparent loss at the time to steam in closer and re-calibrate, the strips for G day will be plotted without regard for the mid-day calibration.

Concur that a lane loss on the red did not occur.

K. DISCREPANCIES AND COMPARISONS - An obstruction was hung in the approximate position of the dangerous wreck symbol charted at Lat. 37°00.77'N Long. 76°09.93'W. Diver investigation of the hang indicated the remains of a wrecked crane barge. Although clearing strips were not run over the object, it continued to hang at 14 1/2 feet, indicating that its hazard had not diminished. - See the Evaluation Report - section 5.

The position obtained on the object was Lat. 37°00.80'N Long. 76°09.95'W.

L. PERSONNEL AND EQUIPMENT - During this survey the RUDE & HECK acted as guide and end vessel respectively. Both vessels are equipped with Raytheon DE-723 fathometers for recon hydro. Both of the vessels Bristol launches were utilized as drag tenders. Bearings to the end buoys and opposite vessel were made on Sperry gyro repeaters. Standard wire drag equipment (see attachment for differences from wire drag manual) was used throughout this survey. The officers participating were CDR R.A. Ganse, LCDR R.V. Smart, LT T. Ruzala, LTJG K.G. Vadnais, ENS C. Gross, and ENS S.P. Debow.

M. RECOMMENDATIONS - Item 1E - The hang located at ^{temporary} 36°59.71'N Long. 76°10.61'W could go uncharted (except for the possible use to the fishing community) as it protrudes a minimal amount above the bottom and has been subsequently cleared to within 1 feet of the bottom. - Concur - apparent hang on bottom.

The hangs encountered at Lat. 37°00.96'N Long. 76°11.55'W, Lat. 37°01.05'N Long. 76°10.00'W, and Lat. 37°00.90'N Long. 76°10.35'W are more substantial and should be charted with applicable clearing depth. - Concur

The dangerous wreck symbol charted at Lat. 37°00'N, Long. 76°10'W should be removed. The recommendation for simple removal is a departure from the previous policy of downgrading items that cannot be located to non-dangerous wreck symbols. - Concur - See section 5.a. of the Evaluation Report.

Although it is still held that wire drag does not disprove the existence of an object (but merely established it as non-dangerous), this particular item, a 23 foot cabin cruiser, is so insignificant that charting it in any form is misleading to the mariner. - See the Evaluation Report - Section 5.a.

The fact that the crane barge charted at Lat. 37°00.77'N Long. 76°09.93'W has not diminished as a hazard since the previous investigation is significant in that its reinvestigation can be postponed beyond the date that would otherwise be appropriate. The note "Hazard remains as charted 1977" should be added to the Wreck File entry for the item. - See the Evaluation Report - section 5.a.

ITEM 1A - On 14 May 1977 (134) a small drag was run without Raydist control or testing to hang the object found on M-day and located at Lat. 37°03.34'N Long. 76°04.97'W. The obstruction was successfully located and positively identified by divers, who ran a ^{Pneumatic Depth} Bryson Gauge measurement on it. - Based on predicted tides the least depth of the object was determined to be 43.5 ft. MLW. - See section 6.a. of the Evaluation Report.

On April 7, 1977 (Strip R-1) a solid hang was encountered at Latitude 37°03'10.5", Longitude 76°04'15.4" which was identified by divers as a large sand wave. See section 5.a. of the Evaluation Report.

The temporary hangs at the following positions are believed to be sand waves protruding substantially above the charted depths: - *Concur - See section 5.2. of the Evaluation Report.*

LAT. 37°03.3'N 37°03'17.2"	Long. 76°04.7'W 76°04'41.6"
Lat. 37°03.5'N 37°03'31.8"	Long. 76°04.9'W 76°04'52.9"
Lat. 37°03.2'N 37°03'43.2"	Long. 76°04.3'W 76°04'53.0"
Lat. 37°03.2'N 37°03'13.3"	Long. 76°04.8'W 76°04'44.8"

It is recommended that new hydrography be run in this area. Further wire drag prior to an update hydrographic survey would be difficult and wasteful of time. If sand waves of suitable height to account for the temporary hangs are not found during the hydrographic work it would probably indicate the waves are seasonal in nature. In that eventuality it would be prudent to clear the area by wire drag (preferably during the same time of year the hydro survey was conducted), setting the wire depth in accordance with the new hydrographic data.

If the sand waves prove to be seasonal, clearance effective depths should not exceed the seasonal least depths established by the sand waves.

APPROVAL SHEET

All records of this survey prior to smooth plotting are hereby approved. The Field work was personally supervised by the undersigned. The Boatsheet and records were inspected daily. The survey is considered complete and adequate for charting.

Submitted By:

K.G. Vadnais

K.G. Vadnais
Field Operations Officer
LTJG NOAA

Approved by:

R.A. Ganse

R. A. Ganse
Commanding Officer
NOAA SHIPS RUDE & HECK

DATE	DAY LETTER	STRIP	VOL. #	POSITIONS	L.N.M.	S.N.M.	RED CORR.	GREEN CORR.	LENGTH OF DRAG	SMOOTH PLOT	REMARKS
18 Feb	A	1	1	7	0	0			6000		Hang - Junk Debris
22 Feb	B	1	1	19	1.5	1.2			6000		North Edge 1E - Not Used - Hang <i>Uninvest- igated</i>
23 Feb	C	1	1	26	2.7	2.2			6000		Item 1E
	C	2	1	23	1.7	1.4			6000		South Edge - 1E
24 Feb	D	1	1	31	1.8	1.2			4800		Item 1E - Temp. Hangs <i>(2) - Apparent hangs on bottom</i>
8 Mar	E	1	II	12	1.4	.8			4800		Clearing Strip for D1
	E	2	II	13	1.1	.7			4200		Clearing Strip for D1
	E	3	II	3	.5	.2			2400		Clearing Strip for D1
9 Mar	F	1	II	14	1.6	.8			4200		Item 1E - Hang on Known Obstr. - <i>Crane Body</i>
	F	2	II	22	1.5	.8			4800		Increase Effective Depth
10 Mar	G	1	II	18	.8	.4			3000		Item 1E - Hang - <i>Metal Plate - extends 1/2 ft off bottom.</i>
	G	2	III	11	1.0	.5			4800		Item 1E - Hang on Known Obstr. <i>Same as F-1</i>
	G	3	III	10	.8	.3			2400		Clearing Strip for G1
	G	4	III	12	1.0	.4			2400		Clearing Strip for G1 - <i>Hang - Same as F-1</i>
11 Mar	H	1	III								Lane Loss
	H	2	III								Not Used
14 Mar	J	1	III	15	.9	.27			2400		Item 1E - Temp Hang - <i>Same as A-1</i>
	J	2	III	11	.9	.36			2400		Clearing Strip - Hang - <i>Same as A-1</i>
	J	3	III	10	.9	.27			2400		Clearing Strip for A1
	J	4	III	6	.6	.24			2400		Clearing Strip for A1
	J	5	IV	8	.9	.27			2400		Clearing Strip for J1
15 Mar	K	1	IV	11	.8	.28			3000		Clearing Strip - Known Hang - <i>Same as F-1</i>
16 Mar	L	1	IV	5	.6	.21			2400		Clearing Strip - for B1
	L	2	IV	6	.9	.36			3000		Increase Effective Depth
29 Mar	M	1	IV	7	.1	.03			3000		Item 1A - Hang - <i>Large mushroom anchor - extends 4-ft. off bottom</i>
30 Mar	N	1	IV								Lane Loss - Not Used
31 Mar	P	1	IV	4	.5	1.5			2400		Sand Hang - <i>Temp hang - uninvestigated - possibly hang on a sand wave - apparent</i>
1 Apr	Q	1	V	13	.6	1.2			2400		Sand Hangs <i>(3) - Temp. hangs - uninvestigated - apparent hangs on sand waves</i>
7 Apr	R	1	V	6	0	0			3000		Sand Hangs - <i>Large sand wave - diver Verified</i>

STOCK NO. 37
(4-30-57)
OIM-DC 28424

ATTACHMENT IIIb

DATE

DAY LETTER

STRIP

VOL. #

POSITIONS

L.N.M.

S.N.M.

RED CORR.

GREEN CORR.

LENGTH OF DRAG

SMOOTH PLOT

REMARKS

8 Apr
S
S

1
2

V
V

9
6

.7
.7

.21
.21

2400
2400

Clearing Strip for
Hang from M day

POSITION NO.
DAY-LETTER

BUOY NO.

LAT.

LONG.

GROUND EFF. DEPTH

CLEARED BY DAY STRIP NO.

CLEARED EFF. DEPTH

SOUNDING

CHARTED DEPTH

ATTACHMENT IV

REMARKS

POSITION NO.	DAY-LETTER	BUOY NO.	LAT.	LONG.	GROUND EFF. DEPTH	CLEARED BY DAY STRIP NO.	CLEARED EFF. DEPTH	SOUNDING	CHARTED DEPTH	REMARKS
			00' 58.0"	11' 32.5"						Debris - extends 3ft. off bottom
A1		3-4	37°00.96'	76°11.55'		J3,4,5	15			Metal Junk Outside Area
B1		N	01' 04.3"	09' 59.0"		L1,6,3	18.5			Temp. Hang - Uninvestigated
D1		5-6	59' 41.5"	10' 38.5"		E-1,3	28			Temp Hangs (2) - Apparent hangs on bottom
		6	36°59' 46.7"	76°10' 27.9"		C-2	26			
F1		3-4	00' 49.2"	09' 58.5"		* Not Cleared			12	Previously Charted Obstr. - Cross body from FE-205 (1967)
G1		1-2	00' 59.0"	10' 20.1"		G4,6,3	18.6			Minor Metal Junk metal plate - extends 1/2 ft. off bottom
G2		5-6	37° 00' 49.2"	76° 09' 58.5"		Not Cleared				Same as F1
G4		F	37° 00' 49.2"	76° 09' 58.5"		Not Cleared				Same as F1
			00' 58.0"	11' 32.5"						
J1		1-2	37°00.97'	76°11.55'		J3,4,5	15			Temp - Same as A1
J2		1-2	00' 58.0"	11' 32.5"		J3,4,5	15			Temp - Same as A1
			00' 49.2"	09' 58.5"						
K1		2-3	37°00.80'	76°09.97'		* Not Cleared			12	Previously Charted Obstr. - Same as F-1
			03' 21.2"	04' 58.5"						
M1		4-F	37°03.34'	76°04.97'		S1,2,1	44 1/2	43 1/2		Scattered Metal Wreckage - Large mushroom anchor - extends 4 ft. off bottom.
			03' 13.3"	04' 44.8"						
P1		1-3	37°03.18'	76°04.75'		S2	42			Sand Hang (Temp)
			03' 17.2"	04' 41.6"						
Q1		1-2	37°03.3'	76°04.7'		S2	42			Sand Hang (Temp)
			03' 31.8"	04' 52.4"						
		3-F	37°03.5'	76°04.9'		Not Cleared				Sand Hang (Temp)
		3-F	37°03' 43.2"	76°04' 53.0"		Not Cleared				Sand Hang (Temp)
R		5-F	37°03.17'	76°04.29'		Not Cleared				Sand Hang
			03' 10.5"	04' 15.4"						

NOTE: Sand Hangs not Further investigated - see report

* Never adequately cleared but apparently at same depth as charted.

G.P's of ITEMS

1A	37° 02.3N,	76° 05.1 ^W
1B	37° 02'N,	76° 06'W
1C	37° 02.5'N,	76° 06.8'W
1D	37° 02'N,	76° 07'W
1E	37° 00'N,	76° 10'W

G.P's of Signals

1.	36° 55' 06.190"N ✓ 76° 11' 22.544"W ✓	Little ^C Creek Amph. Base Tank, 1952
2.	37° 00' 51.712"N ✓ 76° 14' 25.075"W ✓	Thimble Shoal Lighthouse, 1919
3.	36° 55' 14.382"N ✓ 76° 09' 42.063"W ✓	Little Creek ^{NAB} Desert Cove Tank, 1955
4.	36° 54' 31.740"N ✓ 76° 08' 53.000"W ✓	Little Creek ^{NAV AMPH BASE TK, 1952} Amph. Base Tank
5.	36° 55' 21.634"N ✓ 76° 08' 30.694"W ✓	Little Creek, NAB Radar Reflect, 1955 Radar Reflector
6.	36° 56' 51.66 ³ ₁ "N ✓ 76° 15' 33.886 ¹ W ✓	Ocean View ^{Municipal Water} Tank, 1950
7.	36° 56' 41.372"N ✓ 76° 18' 36.151"W ✓	Norfolk USN Air Sta. Tank, 1958 Ocean View Tank, NAS

RESPONSIBLE PERSONNEL		
TYPE OF ACTION	NAME	ORIGINATOR
OBJECTS INSPECTED FROM SEAWARD		<input type="checkbox"/> PHOTO FIELD PARTY <input type="checkbox"/> HYDROGRAPHIC PARTY <input type="checkbox"/> GEODETIC PARTY <input type="checkbox"/> OTHER (Specify)
POSITIONS DETERMINED AND/OR VERIFIED		FIELD ACTIVITY REPRESENTATIVE
		OFFICE ACTIVITY REPRESENTATIVE
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	<i>M. B. Hickson</i>	<input checked="" type="checkbox"/> REVIEWER <input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE

INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION'

(Consult Photogrammetric Instructions No. 64.)

OFFICE

I. OFFICE IDENTIFIED AND LOCATED OBJECTS

Enter the number and date (including month, day, and year) of the photograph used to identify and locate the object.

EXAMPLE: 75E(C)6042
8-12-75

FIELD

I. NEW POSITION DETERMINED OR VERIFIED

Enter the applicable data by symbols as follows:

F - Field	P - Photogrammetric
L - Located	Vis - Visually
V - Verified	
1 - Triangulation	5 - Field identified
2 - Traverse	6 - Theodolite
3 - Intersection	7 - Planetable
4 - Resection	8 - Sextant

A. Field positions* require entry of method of location and date of field work.

EXAMPLE: F-2-6-L
8-12-75

*FIELD POSITIONS are determined by field observations based entirely upon ground survey methods.

FIELD (Cont'd)

B. Photogrammetric field positions** require entry of method of location or verification, date of field work and number of the photograph used to locate or identify the object.

EXAMPLE: P-8-V
8-12-75
74L(C)2982

II. TRIANGULATION STATION RECOVERED

When a landmark or aid which is also a triangulation station is recovered, enter 'Triang. Rec.' with date of recovery.

EXAMPLE: Triang. Rec.
8-12-75

III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH

Enter 'V-Vis.' and date.

EXAMPLE: V-Vis.
8-12-75

**PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.

Tape # 1623

U.S. DEPARTMENT OF COMMERCE
January 12, 1978 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

TIDE NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Atlantic Marine Center:

Hourly heights are approved for:

Tide Station Used (NOAA Form 77-12): 863-8863 Chesapeake Bay Bridge
Tunnel, Va.

Period: February 18-April 8, 1977

Boat Sheet

~~HYDROGRAPHIC SHEET~~: R/H-20-1-77

OPR: 515

Locality: Chesapeake Bay Entrance

Plane of reference (mean ~~lower~~ low water): 24.70ft.

Height of Mean High Water above Plane of Reference is
2.6ft.

Remarks: Recommended zoning:

Item 1A - Zone direct.

Item 1E - Apply + 15 minute time correction.

Don Spillman 11/2/78
Chief, Tides Branch

GEOGRAPHIC NAMES

FE-234 WD

Name on Survey

A ON CHART NO. 12222
B ON PREVIOUS SURVEY NO. 12254
C ON U.S. QUADRANGLE MAPS
D FROM LOCAL INFORMATION
E ON LOCAL MAPS
F P.O. GUIDE OR MAP
G RAND McNALLY ATLAS
H U.S. LIGHT LIST
K

Name on Survey	A	B	C	D	E	F	G	H	K
CHESAPEAKE BAY	✓								1
CHESAPEAKE CHANNEL	✓								2
HORSESHOE	✓								3
THIMBLE SHOAL CHANNEL	✓								4
VIRGINIA (H. H. Block)	✓								5
									6
									7
									8
									9
									10
									11
									12
									13
									14
									15
									16
									17
									18
						Approved:			19
									20
						Charles E. Harrington			21
						Chief Geographer - N/C 2x5			22
						30 Aug. 1983			23
									24
									25

RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET(A&D)	2	SMOOTH OVERLAYS: POS., ARC	
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	

DESCRIP-TION	TENDER RECORDS	GUIDE RECORDS	END RECORDS	DEPTH/POS RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDIAN FILES				1	<i>for hydrograms</i>		
ENVELOPES							
VOLUMES							
CAHIERS							
BOXES				<i>7-Wire Drag Volumes 1-Misc records & data</i>			

NAUTICAL CHARTS(List): 12222, 17th Edition & 12254, 25th Edition

SHORELINE MAPS(List):

SPECIAL REPORTS(List):

OFFICE PROCESSING ACTIVITIES
The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	EVALUATION	TOTALS
POSITIONS (GUIDE, END, DP'S)			676
POSITIONS REVISED	18	0	18
CONTROL STATIONS REVISED	1	0	1
DEPTHS REVISED(SOUNDINGS, DRAG DEPTHS)	0	0	0
	TIME - HOURS		
	VERIFICATION	EVALUATION	TOTALS
PRE-PROCESSING EXAMINATION	0	0	0
VERIFICATION OF CONTROL	2	0	2
POSITION VERIFICATION	57	0	57
SUBDIVISION OF STRIPS	57	0	57
SMOOTH POSITION SHEET	0	25	25
SMOOTH SHEET(A&D)	0	68	68
EVALUATION OF SIDESCAN SONAR RECORDS	0	0	0
COMPARISON WITH SURVEYS AND CHARTS	0	33	33
EVALUATION REPORT	0	23	23
OTHER	18	12	30
TOTALS	134	161	295

Pre-processing Examination by	Beginning Date	Ending Date
N/A	-----	-----
Verification of Field Data by	Time(Hours)	Ending Date
M. B. Hickson	134	June 28, 1983
Verification Check by	Time(Hours)	Ending Date
R. D. Sanocki	1	Sept. 6, 1983
Evaluation and Analysis by	Time(Hours)	Ending Date
M. B. Hickson	161	Aug. 18, 1983
Inspection by	Time(Hours)	Ending Date
R. D. Sanocki	6	Sept. 7, 1983

Comparisons between the present survey and prior and subsequent hydrographic surveys common to the areas of item investigations reveals the following:

(1) H-9910 (1980) is a subsequent hydrographic survey common to approximately 60% of the item IE area of investigation. There are 57 soundings shoaler than present survey effective depths by 1-foot and 6 soundings shoaler by 2 feet. These conflicts are not considered significant and may be attributed to several factors such as currents shifting minor amounts of bottom material, rounding of digital sounding data, and inferred tides. The usage of inferred tide data is addressed in section 6. of this report. Within the prescribed search area, bottom coverage is generally within 1 to 2 feet. Present survey effective depths are not considered adequate to supersede conflicting subsequent hydrography.

(2) H-7750 (1948-50) is a prior hydrographic survey common to 100% of the present survey. In the item IE area of investigation there are 20 prior soundings shoaler than present effective depths by 1-foot and 3 prior soundings shoaler by 2 feet. These conflicts are not considered significant and may be attributed to several factors such as currents shifting minor amounts of bottom material, rounding of digital sounding data, and inferred tides. The usage of inferred tide data is addressed in section 6. of this report. Within the prescribed search area, bottom coverage is generally within 1 to 2 feet. In the item IA area of investigation there are no conflicts between prior hydrography and present effective depths. Present survey effective depths are not considered adequate to supersede conflicting prior survey hydrography.

(3) H-7090 (1946) is a prior hydrographic survey common to a very small area in the southeastern corner of the item IE area of investigation. Effective depths range from 4 to 6 feet shoaler than prior hydrography. No conflicts exist between present effective depths and prior hydrography.

b. Wire Drag

FE-205 WD (1967)

H-7028 WD (1944-45) Ad. Wk. (1950)

(1) FE-205 WD (1967) is a prior wire drag field examination common to approximately 20% of the item IE area of investigation. Within the common area, three hangs were encountered by the present survey. These present hangs are addressed in the tabulation in section 5. of this report. No conflicts exist between present and prior effective depths within the common area. The prior hang on the body of a crane at 15 feet in Latitude $37^{\circ} 00' 46.8''$, Longitude $76^{\circ} 09' 56.8''$, cleared by 12 feet, least depth of 12 feet, was hung but not cleared by the present survey. The present survey established a more accurate position on the wreck at Latitude $37^{\circ} 00' 49.2''$, Longitude $76^{\circ} 09' 58.5''$. This charted wreck is recommended to be retained as charted at the position determined by the present survey.

(12)

Ref L-433/82

Checked out 4/24/84 - (12) WK JoC

Cleared in two directions # OPR 467, PSR # 11

Revised position (see k in D.R.)

Per Steve Verry, Hydro Sec.
JoC

(2) H-7028 WD (1944-45) Ad. Wk. (1950)) is a prior wire drag survey common to the northwestern one-third of the item IE area of investigation. Within the common area, four hangs were encountered by the present survey. Three of these four hangs on the present survey are shoaler than prior effective depths. These present hangs are addressed in the tabulation in section 5. of this report. One hang on the prior survey is common to the present survey and was brought forward to the smooth sheet (A&D). The prior hang is a dangerous submerged obstruction, unknown, in Latitude $37^{\circ} 01' 06.3''$, Longitude $76^{\circ} 10' 13.7''$, hung at 15 feet and cleared by $14\frac{1}{2}$ feet. This obstruction was not found by the present survey but was cleared by an effective depth of 15 feet. Present survey clearance by 16 feet is not valid due to insufficient overlap but does indicate that the obstruction has possibly settled in the 32 years between the surveys. It is recommended that this obstruction charted from this prior survey be retained as charted with a wire drag clearance of 15 feet. The navigation buoy N"2" hung on the prior survey was not found by the present survey. Prior effective depths range from 5 feet deeper to 6 feet shoaler than effective depths on the present survey within the common area. No conflicts exist between present and prior effective depths within the common area except as previously noted.

5. COMPARISON WITH CHARTS 12222, 17th Edition, August 7, 1976
12254, 25th Edition, July 10, 1976

a. Hydrography

Charted hydrography within the common area originates with prior surveys H-7750 (1948-50) and H-7090 (1946) and soundings from sources not readily ascertainable. The disposition of the charted hydrography from identified sources common to this wire drag survey are adequately discussed in section 4. of this report. There are no charted soundings conflicting with present survey effective depths which originated from unascertained sources.

Charted wire drag data within the common area originates with prior surveys FE-205 WD (1967) and H-7028 WD (1944-45) Ad. Wk. (1950) which are adequately discussed in section 4. of this report.

Additional charting recommendations based on the results of this present survey are tabulated as follows:

<u>Item Description</u>	<u>Geographic Position</u>	<u>Minimum Hang or Grounding Depth</u>	<u>Maximum Clearance or Minimum Sounding</u>	<u>Charted or Hydro Survey Depths</u>	<u>Charting Recommendation</u>
<u>ASSIGNED ITEMS INVESTIGATED</u>					
Item IA-Sunken Dangerous Wreck, PA (21-foot boat)	Charted Latitude 37°02.3' Longitude 76°05.1'	Not Located	Not Cleared	35 ft.	Source: LNM #49 of 1970 Retain as charted. See sections 6.a. and 8. of this report. ✓
Item IE-Sunken Dangerous Wreck, PA (23-foot cabin cruiser)	Charted Latitude 37°00' Longitude 76°10'	Not Located	22 ft.	25 ft.	Source: LNM #44 of 1974. ✓ Clearance depths range from 2 ft. deeper to 4 ft. shoaler than charted hydrography within the search radius. In general, coverage is within 1 to 2 ft. of the charted bottom. The split which exists in the search area is an area in which three strips were voided due to a hang or groundings. This area was covered in two directions but not by a valid effective depth. Based upon these considerations, remove the <u>Sunken Dangerous Wreck</u> from the charts. ✓

<u>Item Description</u>	<u>Geographic Position</u>	<u>Minimum Hang or Grounding Depth</u>	<u>Maximum Clearance or Minimum Sounding</u>	<u>Charted or Hydro Survey Depths</u>	<u>Charting Recommendation</u>
<u>ITEMS LOCATED BY THE PRESENT SURVEY</u>					
Temporary Hang (Apparent hang on bottom)	Latitude 36°59'41.5" Longitude 76°10'38.5" (P.A.)	28 ft.	28 ft.	29 ft. ✓	Do not chart-apparent hang on bottom. ✓
Temporary Hang (Apparent hang on bottom)	Latitude 36°59'44.7" Longitude 76°10'27.9" (P.A.)	28 ft.- estimated	28 ft.- insufficient overlap 26 ft.-valid clearance	28 ft.	Do not chart-apparent hang on bottom. ✓
Hang (Body of a crane)	Latitude 37°00'49.2" Longitude 76°09'58.5"	15 ft.	Not cleared by FE-234 12 ft. least depth by FE-205	20 ft. ✓	see Hydrographers recommendation Chart a <u>Sunken Wreck</u> Page #2 with a least depth of 12 ft. (Cleared 2 directions) ↓ 24 (FE 205 WD 1967)
Hang (Metal plate-extends 1½ ft. off bottom)	Latitude 37°00'54.0" Longitude 76°10'20.1"	18 ft.	16 ft.	20 ft. ✓	Chart a <u>Submerged Obstruction</u> with a wire drag clearance of 16 ft.
Hang (Debris-extends 3 ft. off bottom)	Latitude 37°00'58.0" Longitude 76°11'32.5"	15 ft.	15 ft.	18 ft. ✓	Chart a <u>Submerged Obstruction</u> with a wire drag clearance of 15 ft.

<u>Item Description</u>	<u>Geographic Position</u>	<u>Minimum Hang or Grounding Depth</u>	<u>Maximum Clearance or Minimum Sounding</u>	<u>Charted or Hydro Survey Depths</u>	<u>Charting Recommendation</u>
Hang (Uninvestigated)	Latitude 37°01'04.3" Longitude 76°09'59.0"	19 ft.	15 ft.	20 ft.	Chart a <u>Submerged Obstruction</u> with a wire drag clearance of 15 ft. ✓
Hang (Large sand wave)	Latitude 37°03'10.5" Longitude 76°04'15.4"	45 ft.- estimated	Not Cleared	45-48 ft.	Do not chart-sand waves are subject to movement by currents.
Temporary Hang (Apparent sand wave)	Latitude 37°03'13.3" Longitude 76°04'44.8"	48 ft.- estimated	42 ft.-one direction only	49-52 ft.	Do not ^{chart} apparent hang on a sand wave which is subject to movement by currents.
Temporary Hang (Apparent sand wave)	Latitude 37°03'17.2" Longitude 76°04'41.6"	46 ft.- estimated	42 ft.-one direction only	48 ft.	Do not chart-apparent hang on a sand wave which is subject to movement by currents.
Hang (Large mushroom anchor-extends 4 ft. off bottom)	Latitude 37°03'21.2" Longitude 76°04'58.5"	46 ft.	43½ ft.- (Pneumatic Depth Gage)	48-50 ft.	Chart a <u>Submerged Obstruction</u> with a <u>least depth of 43 ft.</u> ✓
Temporary Hang (Apparent sand wave)	Latitude 37°03'31.8" Longitude 76°04'52.9"	46 ft.- estimated	Not Cleared	47-48 ft.	Do not chart-apparent hang on a sand wave which is subject to movement by currents.
Temporary Hang (Apparent sand wave)	Latitude 37°03'43.2" Longitude 76°04'53.0"	46 ft.- estimated	Not Cleared	47-48 ft.	Do not chart-apparent hang on a sand wave which is subject to movement by currents.

b. Aids to Navigation

No floating aids to navigation were located by the present survey. One fixed aid to navigation, Thimble Shoal Light (THIMBLE SHOAL LIGHTHOUSE, 1919), was used as a calibration station, is listed in section C. and Attachment V of the Descriptive Report, and is a published triangulation station. Thimble Shoal Light is listed in the 1977 edition of the U.S. Coast Guard Light List, Volume I. This fixed aid to navigation does not fall within the limits of the smooth sheets (A&D).

6. CONDITION OF SURVEY

The condition of the survey is satisfactory except as follows:

a. Field Work and Records

(1) The investigation of item IA is not complete. Only a very small portion of the search area was covered (less than 10%). The charted position of the item was not covered.

(2) In the area covered in the item IE area of investigation, effective depths ranged generally from 1 to 2 feet above the bottom. Bottom coverage in this area is considered very good.

(3) In the area covered in the item IA area of investigation, effective depths ranged generally from 5 to 8 feet above the charted bottom. Bottom coverage in this area is considered good in light of the numerous and large sand waves.

(4) One small split exists on this survey in the item IE area of investigation in the vicinity of Latitude $36^{\circ} 59' 52''$, Longitude $76^{\circ} 10' 39''$. This split is the result of a portion of strips D-1, E-1, and E-2 being voided due to a hang or groundings. The area of the split was covered in two directions but not by a valid effective depth.

(5) Seven out of twelve hangs encountered on this survey were not investigated.

(6) Four hangs encountered by the present survey were not cleared.

(7) Two hangs were cleared in only one direction.

(8) Inferred tides were used for March 8 and 9 and April 6 and 7, 1977. Strips in which the inferred tides are used are common to the areas where effective depths are conflicting with prior and/or subsequent hydrography.

(9) No prior surveys or charts were included with the survey records.

(10) On May 14, 1977 a Pneumatic Depth Gage reading was observed on the large mushroom anchor located on March 29, 1977 (M-Day). The reading indicates a least depth of $43\frac{1}{2}$ feet. This obstruction was cleared on March 31, 1977 by an effective depth of $44\frac{1}{2}$ feet. This discrepancy may be due to tides, the wire slipping over the obstruction without any hang indication during clearing, or some error in the Pneumatic Depth Gage reading or least depth computation. In any case the application of the 43 feet least depth to the chart is the recommended action.

b. Descriptive Report

(1) Prior surveys within the common areas were not identified nor were any comparisons made with the prior surveys.

(2) Charts affected by this survey were not identified. Comparisons made by the hydrographer between charted data and the present survey are inadequate and not in conformance with the Wire Drag Manual.

(3) Control stations listed in section C. and Attachment V. required the addition of establishment dates for all stations, correction of 5 station names, and the correction of the geographic position for one station.

(4) The list of Groundings and Hangs, Attachment IV. was inaccurate and incomplete. Refer to the tabulation in section 5.a. of this report for complete information on hangs.

(5) One hang occurred on this survey which was not addressed in section M.

(6) A Geographic Names List (Form 76-155) was compiled during verification and is included in the Descriptive Report.

(7) A Non-floating Aids for Charts List (Form 76-40) was compiled during verification and is included in the Descriptive Report.

(8) Necessary corrections made by the evaluator to the Descriptive Report are denoted in red ink.

c. Field Plotting

Field plotting consisted of pencil plots on mylar for individual strips and an A&D tracing for item IE investigation. No A&D tracing was provided for the item IA investigation. The field plots provided are considered satisfactory, although not in accordance with the Wire Drag Manual.

7. COMPLIANCE WITH PROJECT INSTRUCTIONS

This wire drag field examination adequately complies with Project Instructions OPR-515-RU/HE-77 dated November 29, 1976 and Change #1 dated December 29, 1976 except as noted in this report.

8. ADDITIONAL FIELD WORK

This is an adequate basic wire drag field examination except as noted in this report. Additional field work is recommended for item IA. Since the assigned item was not actually investigated, it is recommended that a complete investigation of item IA be accomplished at an opportune time.

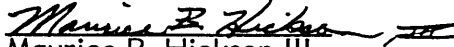
9. SPECIAL CONSIDERATIONS

a. Six temporary hangs exist on the smooth sheets (A&D) of this field examination. These temporary hangs are positioned by using all available information pertaining to the hang, however the position is not as accurate as a solid hang where numerous cuts for hang positioning are taken.

b. Numerous groundings occurred during this survey, however these groundings are not in conflict with charted and hydrographic survey depths and therefore are not smooth plotted.

c. Hangs on outset, pickup, or in void sections were smooth plotted with an estimated effective depth of hang. Five hangs on this survey have estimated effective depths.

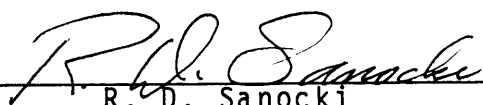
d. In strips containing a hang, the area past the initial contact of the hang was not claimed for effective depth coverage as the program of testing for lift is not considered sufficient to claim effective depths past the point of hang.


Maurice B. Hickson III
Cartographer
Evaluation and Analysis

INSPECTION REPORT
FE-234WD

The completed survey has been inspected with regard to survey coverage, investigation of hangs and clearance depths, cartographic symbolization, and verification or disproval of charted data. The survey complies with National Ocean Service requirements except as noted in the Evaluation Report. The survey records comply with NOS requirements except where noted in the Evaluation Report.

Inspected

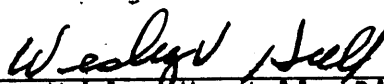


R. D. Sanocki
Chief, Verification Section
Hydrographic Surveys Branch



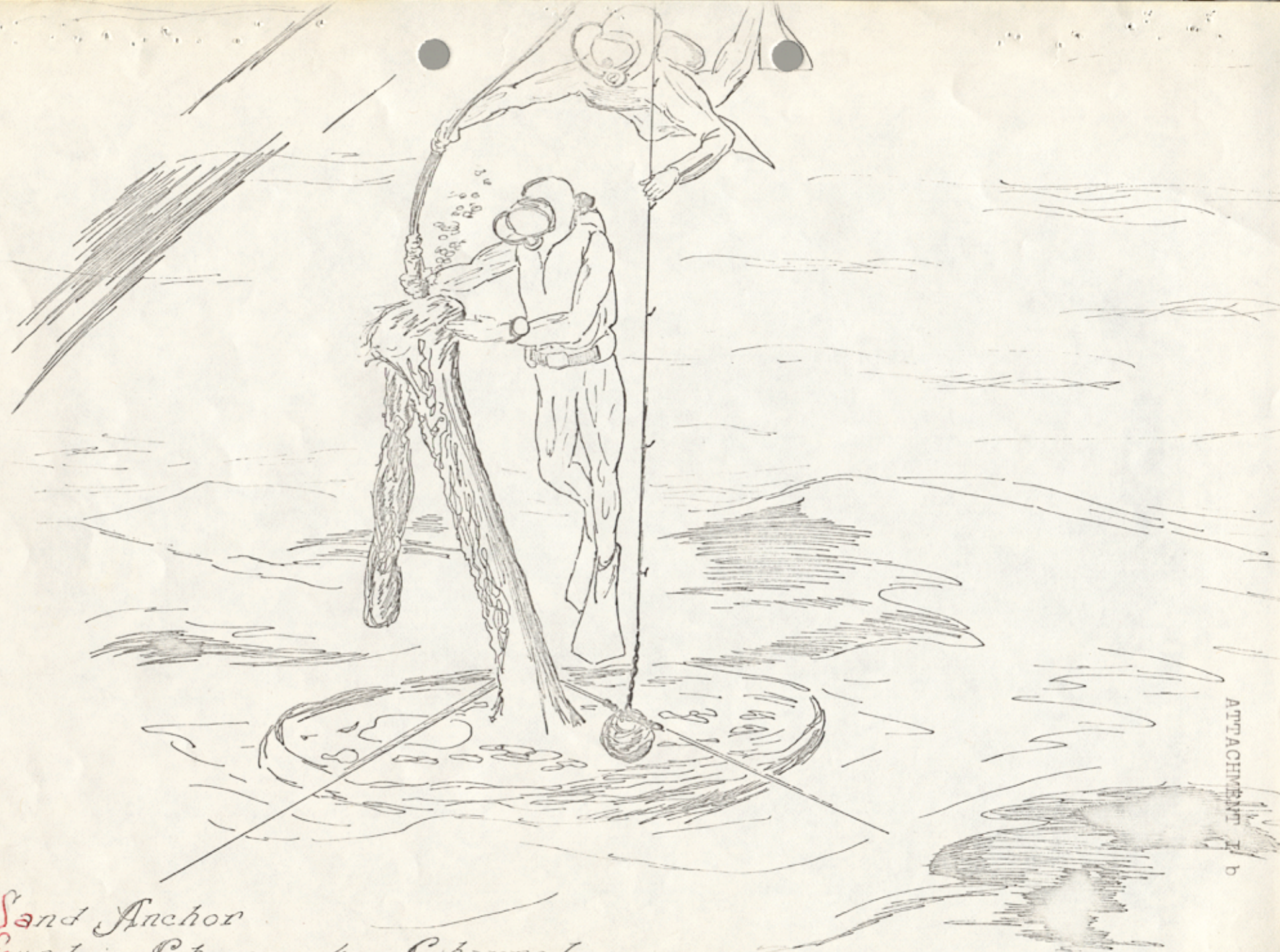
Karl Wm. Kieninger, CDR, NOAA
Chief, Hydrographic Surveys Branch

Approved 9 September 1983



Wesley V. Hull, RADM, NOAA
Director, Atlantic Marine Center





*Sand Anchor
found in Chesapeake Channel
near the Bay Bridge Tunnel, 17 May 1977*

ATTACHMENT 1 b

76° 06'

76° 05'

76° 04'

CHESAPEAKE CHANNEL

37° 04'

Temporary hangs at 46 ft. - estimated hang depths
Not cleared
Apparent hangs on sand waves

Temporary hang at 46ft - estimated hang depth
Cleared by 42 ft
Apparent hang on a sand wave

no see Page 6

Hang at 45 ft - estimated hang depth
Not cleared
Large sand wave

Hang at 46ft
Cleared by 44 ft
Shoalest sounding 43ft
Large mushroom anchor - extends 4ft off bottom

Temporary hang at 48ft - estimated hang depth - position approximate
Cleared by 42 ft
Apparent hang on a sand wave

FE-234 WD
ITEM 1A
MARCH-MAY, 1977
SCALE = 1:20,000
SOUNDINGS IN FEET AT MLW

CHESAPEAKE BAY

37° 03'

37° 02'

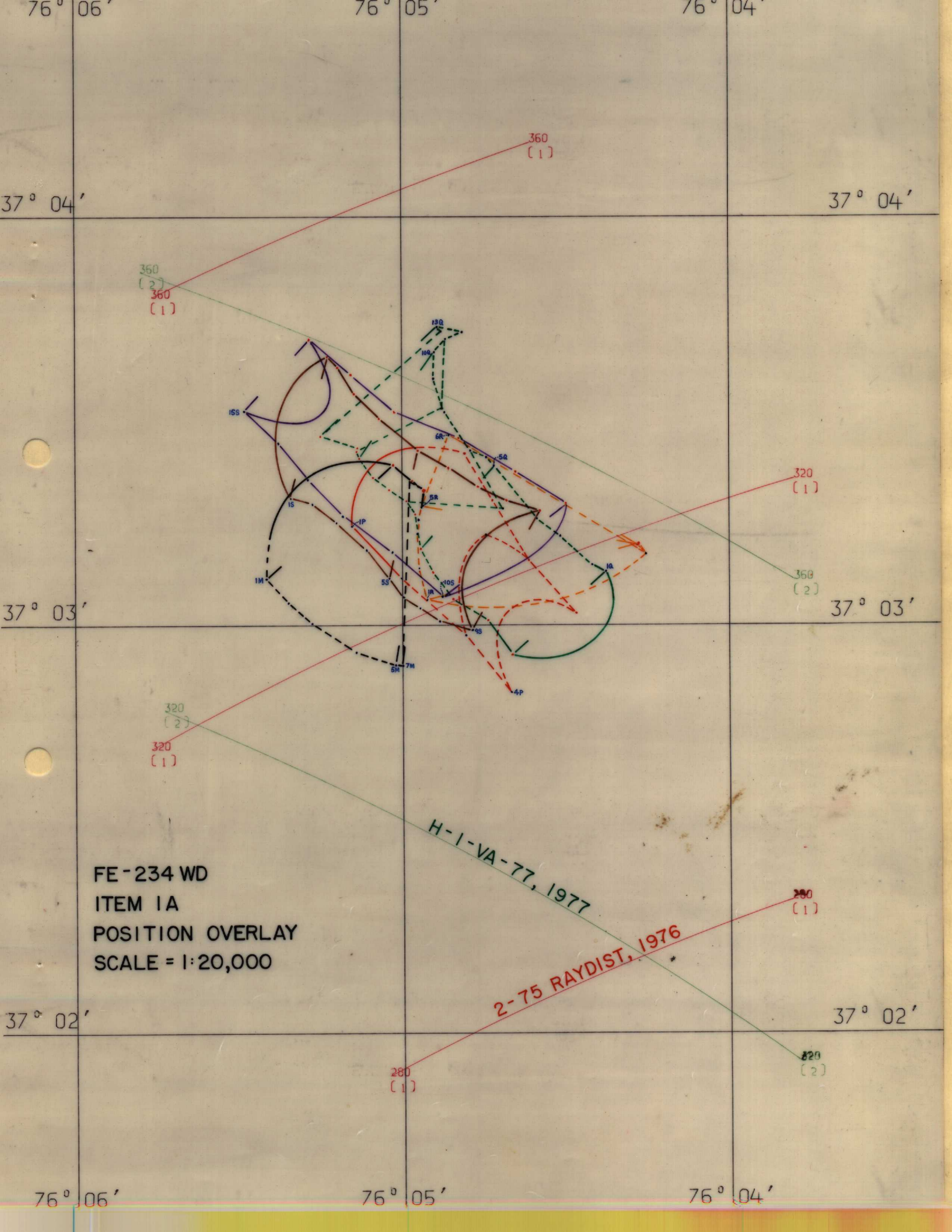
A & D SHEET

See Page 6 of this report -

76° 06'

76° 05'

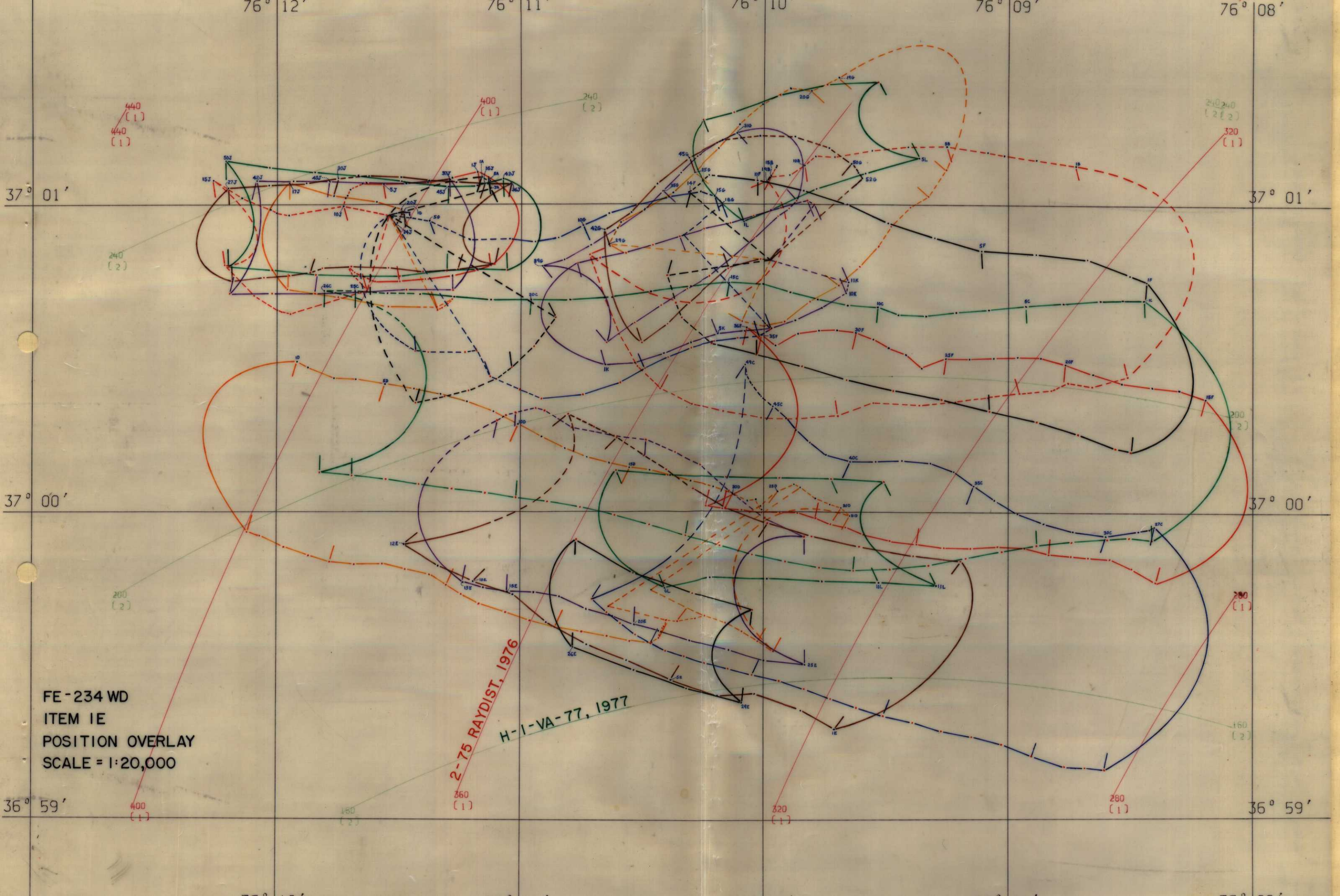
76° 04'



FE-234 WD
ITEM 1A
POSITION OVERLAY
SCALE = 1:20,000

H-1-VA-77, 1977

2-75 RAYDIST, 1976



FE-234 WD
ITEM IE
POSITION OVERLAY
SCALE = 1:20,000

2-75 RAYDIST, 1976
H-1-VA-77, 1977

HORSESHOE

Hang at 15 ft
Cleared by 15 ft
Debris - extends 3 ft off bottom

Hang at 18 ft
Cleared by 16 ft
Metal plate - extends 1 1/2 ft off bottom

Hang at 19 ft
Cleared by 15 ft
Hang not investigated

Hang at 15 ft on H-7028 WD (1945)
Cleared by 14 1/2 ft on H-7028 WD
Cleared by 15 ft on FE-234 WD
Clearance by 16 ft not valid - insufficient overlap
Uninvestigated obstruction

Hang at 15 ft
Not cleared
Cleared by 12 ft by FE-205 WD (1967)
Shoalest sounding 12 ft by FE-205 WD (1967)
Body of a crane

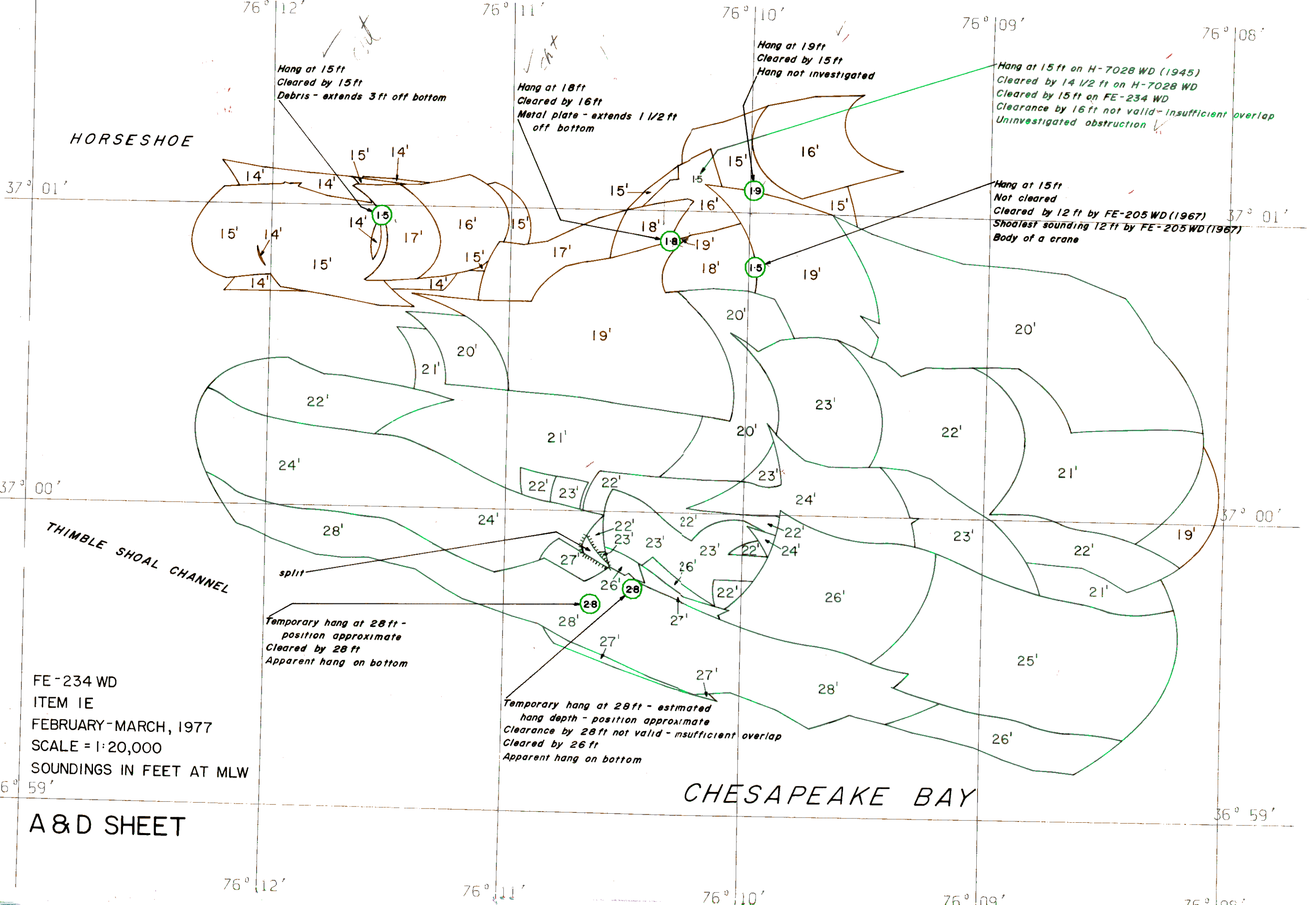
Temporary hang at 28 ft -
position approximate
Cleared by 28 ft
Apparent hang on bottom

Temporary hang at 28 ft - estimated
hang depth - position approximate
Clearance by 28 ft not valid - insufficient overlap
Cleared by 26 ft
Apparent hang on bottom

FE-234 WD
ITEM IE
FEBRUARY-MARCH, 1977
SCALE = 1:20,000
SOUNDINGS IN FEET AT MLW

A & D SHEET

CHESAPEAKE BAY





Hydrographic Survey

Name	Hydrographic	Scale	Date
1917	U.S. Navy	20,000	1916
1924	U.S. Navy, S.S. Blake	20,000	1923
1929	U.S. Navy	20,000	1928
1930	U.S. Navy	20,000	1929
1931	U.S. Navy	20,000	1930
1932	U.S. Navy	20,000	1931
1933	U.S. Navy	20,000	1932
1934	U.S. Navy	20,000	1933
1935	U.S. Navy	20,000	1934
1936	U.S. Navy	20,000	1935
1937	U.S. Navy	20,000	1936
1938	U.S. Navy	20,000	1937
1939	U.S. Navy	20,000	1938
1940	U.S. Navy	20,000	1939
1941	U.S. Navy	20,000	1940
1942	U.S. Navy	20,000	1941
1943	U.S. Navy	20,000	1942
1944	U.S. Navy	20,000	1943
1945	U.S. Navy	20,000	1944
1946	U.S. Navy	20,000	1945
1947	U.S. Navy	20,000	1946
1948	U.S. Navy	20,000	1947
1949	U.S. Navy	20,000	1948
1950	U.S. Navy	20,000	1949
1951	U.S. Navy	20,000	1950
1952	U.S. Navy	20,000	1951
1953	U.S. Navy	20,000	1952
1954	U.S. Navy	20,000	1953
1955	U.S. Navy	20,000	1954
1956	U.S. Navy	20,000	1955
1957	U.S. Navy	20,000	1956
1958	U.S. Navy	20,000	1957
1959	U.S. Navy	20,000	1958
1960	U.S. Navy	20,000	1959
1961	U.S. Navy	20,000	1960
1962	U.S. Navy	20,000	1961
1963	U.S. Navy	20,000	1962
1964	U.S. Navy	20,000	1963
1965	U.S. Navy	20,000	1964
1966	U.S. Navy	20,000	1965
1967	U.S. Navy	20,000	1966
1968	U.S. Navy	20,000	1967
1969	U.S. Navy	20,000	1968
1970	U.S. Navy	20,000	1969
1971	U.S. Navy	20,000	1970
1972	U.S. Navy	20,000	1971
1973	U.S. Navy	20,000	1972
1974	U.S. Navy	20,000	1973
1975	U.S. Navy	20,000	1974
1976	U.S. Navy	20,000	1975
1977	U.S. Navy	20,000	1976
1978	U.S. Navy	20,000	1977
1979	U.S. Navy	20,000	1978
1980	U.S. Navy	20,000	1979
1981	U.S. Navy	20,000	1980
1982	U.S. Navy	20,000	1981
1983	U.S. Navy	20,000	1982
1984	U.S. Navy	20,000	1983
1985	U.S. Navy	20,000	1984
1986	U.S. Navy	20,000	1985
1987	U.S. Navy	20,000	1986
1988	U.S. Navy	20,000	1987
1989	U.S. Navy	20,000	1988
1990	U.S. Navy	20,000	1989
1991	U.S. Navy	20,000	1990
1992	U.S. Navy	20,000	1991
1993	U.S. Navy	20,000	1992
1994	U.S. Navy	20,000	1993
1995	U.S. Navy	20,000	1994
1996	U.S. Navy	20,000	1995
1997	U.S. Navy	20,000	1996
1998	U.S. Navy	20,000	1997
1999	U.S. Navy	20,000	1998
2000	U.S. Navy	20,000	1999
2001	U.S. Navy	20,000	2000
2002	U.S. Navy	20,000	2001
2003	U.S. Navy	20,000	2002
2004	U.S. Navy	20,000	2003
2005	U.S. Navy	20,000	2004
2006	U.S. Navy	20,000	2005
2007	U.S. Navy	20,000	2006
2008	U.S. Navy	20,000	2007
2009	U.S. Navy	20,000	2008
2010	U.S. Navy	20,000	2009
2011	U.S. Navy	20,000	2010
2012	U.S. Navy	20,000	2011
2013	U.S. Navy	20,000	2012
2014	U.S. Navy	20,000	2013
2015	U.S. Navy	20,000	2014
2016	U.S. Navy	20,000	2015
2017	U.S. Navy	20,000	2016
2018	U.S. Navy	20,000	2017
2019	U.S. Navy	20,000	2018
2020	U.S. Navy	20,000	2019
2021	U.S. Navy	20,000	2020
2022	U.S. Navy	20,000	2021
2023	U.S. Navy	20,000	2022
2024	U.S. Navy	20,000	2023
2025	U.S. Navy	20,000	2024
2026	U.S. Navy	20,000	2025
2027	U.S. Navy	20,000	2026
2028	U.S. Navy	20,000	2027
2029	U.S. Navy	20,000	2028
2030	U.S. Navy	20,000	2029
2031	U.S. Navy	20,000	2030
2032	U.S. Navy	20,000	2031
2033	U.S. Navy	20,000	2032
2034	U.S. Navy	20,000	2033
2035	U.S. Navy	20,000	2034
2036	U.S. Navy	20,000	2035
2037	U.S. Navy	20,000	2036
2038	U.S. Navy	20,000	2037
2039	U.S. Navy	20,000	2038
2040	U.S. Navy	20,000	2039
2041	U.S. Navy	20,000	2040
2042	U.S. Navy	20,000	2041
2043	U.S. Navy	20,000	2042
2044	U.S. Navy	20,000	2043
2045	U.S. Navy	20,000	2044
2046	U.S. Navy	20,000	2045
2047	U.S. Navy	20,000	2046
2048	U.S. Navy	20,000	2047
2049	U.S. Navy	20,000	2048
2050	U.S. Navy	20,000	2049
2051	U.S. Navy	20,000	2050
2052	U.S. Navy	20,000	2051
2053	U.S. Navy	20,000	2052
2054	U.S. Navy	20,000	2053
2055	U.S. Navy	20,000	2054
2056	U.S. Navy	20,000	2055
2057	U.S. Navy	20,000	2056
2058	U.S. Navy	20,000	2057
2059	U.S. Navy	20,000	2058
2060	U.S. Navy	20,000	2059
2061	U.S. Navy	20,000	2060
2062	U.S. Navy	20,000	2061
2063	U.S. Navy	20,000	2062
2064	U.S. Navy	20,000	2063
2065	U.S. Navy	20,000	2064
2066	U.S. Navy	20,000	2065
2067	U.S. Navy	20,000	2066
2068	U.S. Navy	20,000	2067
2069	U.S. Navy	20,000	2068
2070	U.S. Navy	20,000	2069
2071	U.S. Navy	20,000	2070
2072	U.S. Navy	20,000	2071
2073	U.S. Navy	20,000	2072
2074	U.S. Navy	20,000	2073
2075	U.S. Navy	20,000	2074
2076	U.S. Navy	20,000	2075
2077	U.S. Navy	20,000	2076
2078	U.S. Navy	20,000	2077
2079	U.S. Navy	20,000	2078
2080	U.S. Navy	20,000	2079
2081	U.S. Navy	20,000	2080
2082	U.S. Navy	20,000	2081
2083	U.S. Navy	20,000	2082
2084	U.S. Navy	20,000	2083
2085	U.S. Navy	20,000	2084
2086	U.S. Navy	20,000	2085
2087	U.S. Navy	20,000	2086
2088	U.S. Navy	20,000	2087
2089	U.S. Navy	20,000	2088
2090	U.S. Navy	20,000	2089
2091	U.S. Navy	20,000	2090
2092	U.S. Navy	20,000	2091
2093	U.S. Navy	20,000	2092
2094	U.S. Navy	20,000	2093
2095	U.S. Navy	20,000	2094
2096	U.S. Navy	20,000	2095
2097	U.S. Navy	20,000	2096
2098	U.S. Navy	20,000	2097
2099	U.S. Navy	20,000	2098
2100	U.S. Navy	20,000	2099

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