

9898<sup>x</sup>

Diagram No. LS-5

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey .. Hydrographic.....  
Field No. .... WH-20-2-80.....  
Office No..... H-9898.....

LOCALITY

State ..... Michigan.....  
General Locality Lake Huron.....  
Locality ..... Port Sanilac to.....  
..... Lexington Heights.....

19 80

CHIEF OF PARTY  
CDR. F.P. Rossi.....

LIBRARY & ARCHIVES

DATE ..... November 16, 1981.....

☆U.S. GOV. PRINTING OFFICE: 1980-868-537

AREA-7  
CHARTS

14860  
14862

14800 cleared

HYDROGRAPHIC TITLE SHEET

H-9898

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.

WH-20-2-80

State MICHIGAN

General locality LAKE HURON

Locality ~~SOUTH WEST COAST~~ PORT SANILAC TO LEXINGTON HEIGHTS

Scale 1:20,000 Date of survey 23 JULY - 9 OCTOBER 1980

Instructions dated 31 MARCH 1980 Project No. OPR-X115-WH-80

Vessel NOAA SHIP WHITING Launchs 1014, 1015, and Monark 1288

Chief of party CDR Frank P. Rossi

Surveyed by J.C. Gardner, R.G. Mann, D.A. Bland, J.B. Grant

Soundings taken by echo sounder, ~~#####,###~~ ROSS Model 5000, RAYTHEON DE 719 B

Graphic record scaled by WHITING personnel

Graphic record checked by JCG, RGM, DAB, JBG, RWB

Protracted by \_\_\_\_\_ Automated plot by Synetics 1201 Plotter (Amc)  
HYDROPLOT

Soundings penciled by \_\_\_\_\_

Soundings in ~~#####~~ feet at MHW MLLW LWD (IGLD 1955:576.8 FT)

REMARKS: All times are Coordinated Universal Time

Notes in red made during verification.

STANDARDS CHECKED 11-8-82.

C. Loy

A. PROJECT

Hydrographic Survey H-9898, WH-20-2-80, was performed in accordance with Project Instructions for OPR-X115-WH-80, Lake Huron dated March 31, 1980, as amended by the following changes.

<u>Change No.</u>	<u>Date</u>
1	04/04/80
2	04/11/80
3	04/23/80
4	05/21/80
5	07/16/80
6	07/23/80
7	09/09/80

B. AREA SURVEYED

Survey H-9898 was run from July 23 to October 9, 1980, JD's

205-283. The survey extends north from  $43^{\circ}13.2'N$  to  $43^{\circ}26.1'N$ .

The survey is bounded by approximately; the ~~20-meter~~ <sup>60-foot</sup> curve in the east and the ~~5-fathom~~ <sup>10-meter</sup> ~~30-foot~~ curve in the west. The western limit of

the survey area was extended in the area of Lexington, Michigan, to junction with survey H-9899, WH-5-4-80, Lexington Harbor and in the area of Port Sanilac, Michigan, to junction with a 1:5,000 survey of the Port Sanilac Harbor, which is included with this survey.

C. SOUNDING VESSELS

The sounding vessels used in this survey was WHITING launches 1014, 1015, and MonArk 1288, EDP numbers 2932, 2931, and 2933

respectively. All hydro on the southern end of the sheet was run with Launch 1015, the north end of the survey area and Port Sanilac was run with Launch 1014. The inside of Port Sanilac was run with the MonArk.

The launches were equipped with standard hydrographic equipment. The MonArk was powered with a Johnson 85-HP outboard motor and made use of a Raytheon shallow water fathometer. No major mechanical problems were encountered with any of these vessels.

D. SOUNDING EQUIPMENT AND CORRECTIONS TO ECHO SOUNDINGS

The launches (1014 & 1015) were equipped with a Ross Model 5000 fathometer (s/n 1049 and 1087 respectively). Phase calibrations were conducted regularly in accordance with the ROSS operating manual. Analog and digital outputs compared satisfactorily. The MonArk was equipped with a Raytheon Model DE-719B fathometer (s/n 465). Calibrations were done in accordance with the Raytheon operating manual. The draft correction of the MonArk (1.0 ft) was set on the Raytheon fathometer for the day it was used (JD 260) so no TRA correction is applied on the corrector tape.

Bar checks were taken daily, weather and sea conditions permitting. TDC casts were taken with a Martek TDC unit, Model No. 167 (s/n 127).

When the correctors were determined from the bar check averages and graphed, there was a difference between the curves for launches 1014 and 1015 (average of .5 ft). The source of this error has not been completely determined, but it will be further investigated by the Electronic Engineering Division during the up-coming inport at the Atlantic Marine Center.

Velocity curves were taken off the individual bar check averages and then extrapolated to the deepest survey depths from the TDC data. *See Verification Report, section 1.b.*

It was determined that the fresh water TRA corrector of the WHITING launches was 1.7 feet instead of the 1.5 feet that was being used. All data before JD 236 (23 August 1980) used a corrector of 1.5, after that date 1.7 was used. This difference was taken into consideration when making up the TC-TI tape and the additional correctors are applied there.

Settlement and squat trials were run on launches 1014 and 1015 in Lake Huron, Michigan, in July and September 1980. Trials were run at a point of known depth, marked by a buoy. Results are the average of one run towards the buoy and one run away from the buoy with marks being taken when the buoy was abeam the transducer. The

speeds and results are listed below.

<u>SPEED IN RPM's</u>	<u>CORRECTION 1014</u>	<u>CORRECTION 1015</u>
600	+0.10	+0.00
800	+0.10	+0.10
1000	+0.30	+0.10
1200	+0.30	+0.20
1400	+0.30	+0.20
1600	+0.30	+0.30
1800	+0.30	+0.40
2000	+0.40	+0.10
2200	+0.20	+0.10
2400	-0.10	-0.20
2600	-0.40	-0.40

The settlement and squat graphs are included in the appendix.

Corrections for settlement and squat are made on the TC/TI Tape.

Periods of reduced speed during actual hydrography are noted in the sounding volumes and on the printouts.

The MonArk was run at idle speed and there is no settlement and squat correction or TC/TI Tape for this vessel.

E. HYDROGRAPHIC SHEETS

The survey area was divided into two 1:20,000 plotter sheets (skew = 90°) and one 1:5,000 plotter sheet of Port Sanilac

Harbor (skew = 0°) with the following origins.

North: 43°19'00"N  
82°25'00"W

South: 43°12'30"N  
82°25'00"W

Sanilac Harbor: 43°12'30"N  
82°32'30"W

The 1:20,000 survey has a total of 4 plotter sheets; two sheets show the crosslines and mainscheme hydrography, the two other sheets show the development hydrography and bottom samples. The Port Sanilac Harbor was surveyed at a 1:5,000 scale but the final plot consisted of one 1:2,500 scale sheet showing all hydrography and bottom samples.

#### F. CONTROL STATIONS

The following stations were used as ARGO stations, calibration signals, calibration points, Range-Azimuth set-up sites or Range-Azimuth initial points.

<u>Signal No.</u>	<u>Description</u>	<u>Light List No.</u>
100	Casey, 1980 (Sanilac Argo Site)	
102	Poth, 1980 (Bayfield Argo Site)	
104	H-2-MI-79 (Port Huron Argo Site), 1979	
132	H-32-MI-79, 1979	
113	Lexington E. Brk Light, 1979	1232
114	Lexington W. Brk Light, 1979	1232.1
133	H-33-MI-79, 1979	
115	Corps of Engineers "B", 1979	
116	Corps of Engineers "D", 1979	
117	Sanilac S. Brk Light, 1975	1234.5
118	Sanilac N. Brk Light, 1975	1234
119	Sanilac Lighthouse, 1886	1233
120	Sanilac E-Cal, 1980	
121	Sanilac W-Cal, 1980	
241	H-32-MI-80-Cal, 1980	

Stations 100-119 were either established or verified by third order traverse in 1979, run by the Hydrographic Survey Branch,

Atlantic Marine Center. Stations 120, 121, and 241 were established by WHITING personnel and were used only for daily calibration of the electronic positioning systems. They are non-recoverable stations.

A signal list is included in the appendix.

G. HYDROGRAPHIC POSITION CONTROL

Range-Range control was used on all of the 1:20,000 scale survey. Range-Azimuth was used for the 1:5,000 scale sheet.

The ARGO positioning system was used for all Range-Range work.

On the Range-Azimuth survey the Del-Norte positioning system was used to measure the ranges and the azimuths were measured with a Wild T-2 theodolite.

Baseline calibrations were conducted on the Del-Norte system in accordance with the Hydrographic Manual over a baseline of 2036 meters. All calibration records are included with the field records.

Daily correctors were computed and applied by three-point sextant fixes with a check angle or by positioning the Del-Norte Master unit or ARGO antenna on a known baseline. In general, both of the positioning systems performed satisfactorily through out the survey period. Errors were made when computing lane values for the calibration points, by using an incorrect value for converting



meters into lanes. This error was discovered, corrected and the daily partial lane correctors were changed to eliminate the discrepancy.

The following is a list of component serial numbers for the ARGO,

Del-Norte and Wild equipment:

Launch 1015 (2931)

JD's 204-212 RPU - R047851 CPU - C047824  
JD's 232-240 RPU - R0379119 CPU - C037953

Launch 1014 (2932)

JD's 209-254 RPU - R047843 CPU - C047822  
JD's 255-256 DMU - 162 Master - 169 Remote (code 74) 218,T-2 -35052  
JD 283 DMU - 192 Master - 1160 Remote (code 76) 216,T-2 -35052

Monark 1288 (2933)

JD 260 DMU - 162 Master - 169 Remote (code 74) 218,T-2 -35052

H. SHORELINE See Verification Report, section 2.b.

No shoreline manuscripts were available for this survey. The shoreline for the 1:5,000 survey of the Port Sanilac Harbor will come off an insert of NOS Chart 14862, (1:<sup>125,000</sup>~~20,000~~) 23rd Edition, 1978.

I. CROSSLINES

The percentage of crosslines on the 1: 20,000 scale survey was 11.0% and the total miles of crosslines was 48.7.

On the 1:5,000 scale section there was 3.4 miles of crosslines which was 36.0% of the hydrography done on this sheet.

Agreement with the main scheme was good (0-2 feet).

J. JUNCTIONS See also Verification Report, Section 5

This survey junctions with H-9895<sup>(1980)</sup> (1:20,000) in the south, with H-9899<sup>(1980)</sup> (1:5,000 Lexington Harbor) on the western shoreline of the southern sheet and with H-9906<sup>(1980)</sup> (1:20,000) in the north. These surveys were also conducted by WHITING personnel this year and have not been verified. There is good junction between these surveys and H-9898<sup>(1980)</sup> (0-2 feet).

This survey was also compared with a Canadian Hydrographic Survey, number 3831, (1:100,000), 1974. Survey H-9898<sup>(1980)</sup> (south sheet) showed depths of 3 to 15 feet deeper than the CHS survey with an average of 6 feet deeper. The North sheet of H-9898<sup>(1980)</sup> showed depths of 4 to 16 feet deeper with an average of 8 feet deeper than the CHS survey. See letter attached. See also Verification Report, Section 6

Corps of Engineers Lake Survey, File numbers <sup>LS</sup> X-1970<sup>(1956)</sup>, sheet 3 of 7, <sup>LS</sup> X-1971<sup>(1956)</sup>, sheet 4 of 7, <sup>LS</sup> X-1972 sheet 5 of 7 and <sup>LS</sup> X-1973 sheet 6 of 7, was also compared to survey H-9898<sup>(1980)</sup>. The South sheet of H-9898<sup>(1980)</sup> showed depths of 0-7 feet deeper with an average of 3 feet deeper than the Corp of Engineer surveys. The North sheet of H-9898<sup>(1980)</sup> showed depths of 0-5 feet deeper with an average of 4 feet deeper than the Corp of Engineer surveys.

The lake level was between 2 and 3 feet above the International Great Lakes Datum of 1955 during the survey period, but this was not taken into consideration during the comparisons with <sup>a/</sup>junctioning surveys.

L. COMPARISON WITH THE CHART (Also see Section P)

Survey H-9898 was compared with NOS Chart 1486<sup>2</sup>, (1:120,000), 23rd Edition, July 2<sup>9</sup>, 1978. The survey soundings differ from the chart by 3 to 15 feet deeper with an average of 7 feet deeper.

The survey of Port Sanilac Harbor was compared to the 1:5,000 inset of the Sanilac Harbor on the same chart as listed above. The survey surrounding Sanilac shows depths of 0-7 feet deeper with an average of 4 feet deeper than the chart.

The lake level was not considered in these comparisons, *Chart Smooth sheet depths.*

Development 2N  
Spike Investigation

JD 246  
Positions 5619-5625

This spike was discovered on the main scheme on JD 237, (between 3rd and 4th out of Position #5317). A star pattern development was run over the spike. A detached position was also taken on the spike, (Lat 43/22/43N and Long 82/30/47W), but the fathometer least depth observed (34.6 ft) occurred between 2nd and 3rd out of Position #5624. The fathometer trace appears to show that the area surrounding the spike is rocky and the spike appears to be a large rock

extending 4 feet off the bottom.

It is recommended that this spike be charted as "RK <sup>31</sup>~~34~~ ft". *Chart smooth sheet depths*

The lake level above the IGLD was not considered in reducing the least depth.

Development 3N  
Spike Investigation

JD 246  
Positions 5626-5632

This spike<sub>A</sub> <sup>(25.0')</sup> was discovered on the main scheme on JD 237, (between 3rd and 4th out of Position #5241). A star pattern development was run over the spike. The feature was also observed between, (1st and 2nd out of Position #5627), (1st and 2nd out of Position #5629), and (2nd and 3rd out of Position 5631). The observed position of these spikes <sup>are in the vicinity of</sup> <sub>A</sub> Lat. 43°21'48N and Long. 82°31'0<sup>S</sup>W. As in development 2N the<sup>s</sup> spike<sub>s</sub> appears to be a rocks extending 3 feet off the bottom with a fathometer least depth of 2<sup>4.9 and 25.0</sup>~~2.5~~<sub>A</sub> feet.

~~It is recommended that this spike be charted as "Rks <sup>26</sup>~~27~~ ft".~~

The lake level above the IGLD was not considered in reducing the least depth. ~~Successive depths are smaller than the depth of the spike. Chart smooth sheet depths and the note Rks.~~ <sup>least</sup>

Development 4N  
Spike investigation

JD 246  
Positions 5633-5638

This spike<sub>A</sub> <sup>(29.5')</sup> was discovered on the main scheme on JD 237 (just before Position #5223). A star pattern development was run over the lat 43°21'29.4", long. 82°30'48.8"

spike. The spike was observed between; (2nd and 3rd out of  
Position #5633<sup>31.0'</sup>, (2nd and 3rd out of Position #5635<sup>305'</sup>) and (2nd  
and 3rd out of Position #5637<sup>283'</sup>). The observed position of these  
<sup>5</sup>  
spikes <sup>are in the vicinity of</sup> Lat. 43/21/<sup>27</sup>30N and Long. 82/30/<sup>9</sup>4<sup>e</sup>W. This <sup>feature</sup>  
appears to be a group of rocks extending <sup>from 2 to 4</sup> feet off the  
bottom with a fathometer least depth of <sup>28.3</sup> ~~32.7~~ feet.

~~It is recommended that this feature be charted as "Rks <sup>30</sup> 32 ft".~~

The lake level above the IGLD was not considered in reducing the  
least depth. *Chart smooth sheet depths and note Rks*

M. ADEQUACY See Verification Report also

This survey is adequate to supercede the chart in the area surveyed.

N. AIDS TO NAVIGATION See Verification Report Section 7. c.

There are no floating aids to navigation in the survey area of H-9898.

O. STATISTICS

Total number of positions per launch:

	<u>1:20,000 sheet</u>	<u>1:5,000 sheet</u>
VESNO 2931	1325	
VESNO 2932	638	216
VESNO 2933	_____	<u>63</u>
	1963	279

TOTAL: 2242

Total Miles of soundings per launch:

	<u>1:20,000</u>	<u>1:5,000 sheet</u>
VESNO 2931	322.6	
VESNO 2932	164.6	11.6
VESNO 2933	_____	<u>1.3</u>
	487.2	12.8

TOTAL: 500.0 miles

Water Level Gages established: One (1).

P. MISCELLANEOUS

On JD 254 dives were made on a charted wreck <sup>(lat. 43°15'45", long. 82°30'37")</sup> on survey H-9899<sup>^</sup> <sup>(1980)</sup>

(WH-5-4-80 Lexington Harbor), and positions were taken on ~~the~~ wreckage found.

~~wreck~~. Since the positions were taken with the ARGO position

system not accurate enough for a 1:5,000 survey the position

numbers were changed and all data was transferred to this survey,

H-9898<sup>^</sup> <sup>(1980)</sup> (1:20,000). 13Wk From Prior survey <sup>1290 (1914)</sup> ~~H-1290 (1956)~~ was also retained  
at lat 43-15.74' N, long 82-30.67' W.

Change Number 7 to the Project Instructions, concerning the survey  
of the Port Sanilac Harbor, was not received until after the survey  
was completed. The hydrography on this 1:5,000 survey extends  
beyond the limits set forth in Change Number 7.

A discussion with Lt. J. C. Gardner, who took part in the dives,  
revealed the wreck was broken up and visibility poor. A 17 foot  
<sup>echo sounder depth at Pos. 1301</sup>  
least depth was obtained over this extensive, broken up wreck. Local divers  
also indicated that two schooners sank in the vicinity in the early 1900s.

Q. RECOMMENDATIONS

It is recommended that this survey supercede the chart in the area bounded by the survey limits.

R. AUTOMATED DATA PROCESSING

<u>Program No.</u>	<u>Description</u>	<u>Version Date</u>
FA181	Range-Azimuth Hydrolog	02/23/78
RK112	Range-Range/Hyperbolic Real-Time Hydroplot	08/22/80
RK201	Grid, Signal & Lattice Plot	04/18/76
RK211	Range-Range Non-Real Time Plot	01/15/76
RK212	Visual Station Table Load	04/01/74
RK216	Range-Azimuth Non-Real Time Plot	02/05/76
RK300	Utility Computations	02/05/76
RK330	Reformat and Data Check	05/04/76
AM407	Geodetic Inverse/Direct Computations	10/25/75
AM530	Layer Correctors for Velocity	05/19/75
RK561	Hyperbolic & Range-Range Geodetic Calibration	02/19/75
AM602	Extended Line Oriented Editor	05/20/75

S. REFERENCES TO REPORTS

None.



Submitted By:

*James C. Gardner, Jr.*

James C. Gardner, Jr.  
LT(jg), NOAA

Supervision of all field and office work on this hydrographic survey was continuous on a day to day basis to ensure completeness of the survey and all work was done in accordance with the Project Instructions.

Approved/Forwarded

*Frank P. Rossi*

Frank P. Rossi  
Commander, NOAA  
Commanding Officer, NOAA Ship WHITING



**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
NOAA Ship WHITING  
439 W. York Street  
Norfolk, Virginia 23510

November 14, 1980

TO : AMC Processing, OA/CAM

FROM : *Frank P. Rossi*  
Commander Frank P. Rossi, NOAA  
Commanding Officer, NOAA Ship WHITING

SUBJECT: 1980 Lake Huron Surveys: Depth Discrepancy between  
WHITING's Surveys and Canadian Surveys.

In late October I talked with Ross Douglas, Canadian Hydrographic Service, Burlington, Ontario, about our junction problem with the Canadian Surveys. He said that they were having problems with these Canadian Surveys, and indicated they were rejecting some of the work. The surveys were primarily for limnological studies and hydrographic use of them was secondary.

The fact that our junctions get worse the further one is from Port Huron - Sarnia would indicate that the CHS may be experiencing a problem with the propagation velocity they used. They did not calibrate the Mini-Fix on the United States side of their work. A modest error in the propagation velocity will produce a considerable position error when carried to distances greater than 30 miles.

The WHITING generally did not work more than 15 miles from a calibration site; therefore, there should be little error (less than 10 meters) in the WHITING's positions.



SIGNAL TAPE

WH-20-2-80

H-9898

-001 100 6 43 26 00309 082 32 20465 250 0000 164510 Casey,1980  
002 102 6 43 34 20443 081 42 30102 250 0000 164510 Poth,1980  
003 104 6 43 00 23671 082 25 21248 250 0000 164510 H-2-MI-79  
-004 132 6 43 15 04535 082 31 26752 139 0000 000000 H-32-MI-79  
-005 133 6 43 14 28565 082 31 25148 139 0000 000000 H-33-MI-79  
-006 113 6 43 15 59799 082 31 22233 139 0000 000000 Lexington E. Brk. Light,1979  
-007 114 3 43 16 02820 082 31 24754 139 0000 000000 Lexington W. Brk. Light,1979  
-008 115 6 43 25 52149 082 32 05288 250 0000 000000 C. of E. "B",1979  
-009 116 6 43 25 58103 082 32 15226 250 0000 000000 C. of E. "D",1979  
-010 117 6 43 25 51700 082 32 08976 139 0000 000000 Sanilac S. Brk. Light,1975  
-011 118 6 43 25 48992 082 32 05302 139 0000 000000 Sanilac N. Brk. Light,1975  
-012 119 6 43 25 44430 082 32 24708 139 0000 000000 Sanilac Lighthouse,1886  
-013 241 6 43 15 04550 082 31 26101 243 0000 000000 H-32-MI-79-Cal  
014 120 4 43 25 49004 082 32 04926 243 0000 000000 Sanilac E. - Cal,1980  
015 121 3 43 25 48998 082 32 05664 243 0000 000000 Sanilac W. - Cal,1980

NOAA FORM 76-40  
(6-74)

Replaces C&GS Form 567.

TO BE CHARTED  
 TO BE REVISED  
 TO BE DELETED

REPORTING UNIT  
(Field Party, Ship or Office)  
NOAA Ship WHITTING

STATE  
Michigan

LOCALITY  
Lexington/Sanilac

DATE

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

NONFLOATING AIDS OR LANDMARKS FOR CHARTS

ORIGINATING ACTIVITY

- HYDROGRAPHIC PARTY
- GEODETIC PARTY
- PHOTO FIELD PARTY
- COMPLETION ACTIVITY
- FINAL REVIEWER
- QUALITY CONTROL & REVIEW GRP.
- COAST PILOT BRANCH

(See reverse for responsible personnel)

The following objects HAVE  HAVE NOT  been inspected from seaward to determine their value as landmarks.

DATUM  
NAD 1927

SURVEY NUMBER  
H-9898

JOB NUMBER

OPR PROJECT NO.  
X115-WH-80

CHARTING NAME	DESCRIPTION (Record reason for deletion of landmark be aid to navigation. Show triangulation station names, where applicable, in parentheses)	POSITION				METHOD AND DATE OF LOCATION (See instructions on reverse side)		CHARTS AFFECTED
		LATITUDE		LONGITUDE		OFFICE	FIELD	
		° / ' / D.M. Meters	° / ' / D.P. Meters	° / ' / D.P. Meters	//			
Tank FR	Lexington West Tank FR Croswell Tank	43/16	45.5	82/36	40.5		VIS 7/20/80	14862
Stack	Lexington West Stack Michigan Sugar Co. Stack	43/16	00.0	82/36	56.5		VIS 7/20/80	14862
Spire	Lexington S. Spire Trinity Episcopal Church Spire	43/15	56.1	82/31	53.0		VIS 7/20/80	14862
Tank	Lexington Tank	43/16	08.1	82/32	15.0		VIS 7/20/80	14862 14860
	Port Sanilac N. Breakwater Lt. 2	43/25	48.99	83/32	05.30		F-2-6-L 1979	14862
	Port Sanilac S. Breakwater Lt. 3	43/25	51.70	82/32	08.98		F-2-6-L 1979	14862
	Port Sanilac Lt.	43/25	44.43	82/32	24.71		F-2-6-L 1979	14862 14500 14860
	L-1290(82)							

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

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

NOAA FORM 76-40  
(8-74)

Replaces C&GS Form 567.

### NONFLOATING AIDS OR LANDMARKS FOR CHARTS

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

<input type="checkbox"/> TO BE CHARTED <input checked="" type="checkbox"/> TO BE REVISED <input type="checkbox"/> TO BE DELETED	REPORTING UNIT <i>(Field Party, Ship or Office)</i> NOAA Ship WHITING	STATE Michigan	LOCALITY Lexington	DATE
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The following objects HAVE  HAVE NOT  been inspected from seaward to determine their value as landmarks.

OPR PROJECT NO. X115-WH-80

JOB NUMBER

SURVEY NUMBER H-9898

DATUM NAD 1927

CHARTING NAME	DESCRIPTION <i>(Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses.)</i>	POSITION				METHOD AND DATE OF LOCATION <i>(See instructions on reverse side)</i>		CHARTS AFFECTED
		LATITUDE		LONGITUDE		OFFICE	FIELD	
		$^{\circ}$ /	//	$^{\circ}$ /	//			
	Lexington Harbor E. Brk. Lt. 2	43/15	59.80	82/31	22.23		F-2-6-L 1979	14860 14860
	Lexington Harbor W. Brk. Lt. 3	43/16	02.82	82/31	24.75		F-2-6-L 1979	14860 14862
	<u>L-1290(82)</u>							

ORIGINATING ACTIVITY

HYDROGRAPHIC PARTY  
 GEODETIC PARTY  
 PHOTO FIELD PARTY  
 COMPILATION ACTIVITY  
 FINAL REVIEWER  
 QUALITY CONTROL & REVIEW GRP.  
 COAST PILOT BRANCH

*(See reverse for responsible personnel)*

RESPONSIBLE PERSONNEL	
TYPE OF ACTION	NAME
OBJECTS INSPECTED FROM SEAWARD	ORIGINATOR <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
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	OFFICE ACTIVITY REPRESENTATIVE <input 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,	
<b>OFFICE</b> <b>I. OFFICE IDENTIFIED AND LOCATED OBJECTS</b> 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	<b>FIELD (Cont'd)</b> <b>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.</b> EXAMPLE: P-8-V 8-12-75 74L(C)2982
<b>FIELD</b> <b>I. NEW POSITION DETERMINED OR VERIFIED</b> Enter the applicable data by symbols as follows: F - Field L - Located V - Verified 1 - Triangulation 2 - Traverse 3 - Intersection 4 - Resection 5 - Field Identified 6 - Theodolite 7 - Planetable 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.	<b>II. TRIANGULATION STATION RECOVERED</b> 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 <b>III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH</b> 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.

VELOCITY TABLE I

JD's 205-211 VESNO 2931

000020 0 0000 0001 000 293100 009898  
000060 0 0002  
000200 0 0004  
000670 0 0006  
000800 0 0004  
999999 0 0000

VELOCITY TABLE II

JD's 206-212 VESNO 2932

000205 0 0000 0002 000 293200 009898  
000420 0 0002  
000635 0 0004  
000800 0 0006  
999999 0 0000

VELOCITY TABLE III

JD's 232-238 VESNO 2931

000052 0 0000 0003 000 293100 009898  
000114 0 0002  
000180 0 0004  
000265 0 0006  
000620 0 0008  
000730 0 0006  
000800 0 0004  
999999 0 0000



VELOCITY TABLE<sup>LE</sup> IV

JD's 236-246 VESNO 2932

000200	1	0002	0004	000	293200	009898
000275	0	0000				
000355	0	0002				
000567	0	0004				
000690	0	0002				
000770	0	0000				
999999	0	0000				

VELOCITY TABLE V

JD's 255-283 VESNO's 2932 & 2933

000050	1	0002	0005	000	293200	009898
000170	1	0004				
000430	1	0002				
000840	1	0004				
999999	0	0000				

Field water level reductions were not performed on hydrographic survey H-9898. WHITING personnel installed and monitored a water level gage located at Port Sanilac; Lat.  $43^{\circ}26.0'N$  and Lon.  $82^{\circ}32.2'W$ .

A primary gage at Lakeport was installed by the Army Corps of Engineers and is monitored by a paid observer. This gage is located at Lat.  $43^{\circ}08.5'N$  and Lon.  $82^{\circ}29.5'W$ . This gage was found to be in proper working order.

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

WATER LEVEL NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Atlantic Marine Center: CAM3

Hourly heights are approved for

Water Level Station Used: Port Sanilac, Michigan (907-5011)

Period: July 25, 1980 - October 11, 1980

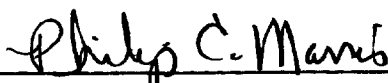
HYDROGRAPHIC SHEET: H - 9898

OPR- X115-WH/HSB - 80

Locality: Lake Huron

Plane of reference: Low Water Datum (IGLD 1955 : 576.8 Feet)

Remarks: Zoning not required. Data from other gages on Lake Huron indicates no unusual water level movement during the survey period.

  
\_\_\_\_\_  
Chief, Water Level Branch

GEOGRAPHIC NAMES ~~(FIELD)~~

Name on Survey	<div style="display: flex; justify-content: space-between;"> <span>A ON CHART NO. 14862</span> <span>B ON PREVIOUS SURVEY NO.</span> <span>C ON U.S. QUADRANGLE MAPS</span> <span>D FROM LOCAL INFORMATION</span> <span>E ON LOCAL MAPS</span> <span>F P.O. GUIDE OR MAP</span> <span>G RAND McNALLY ATLAS</span> <span>H U.S. LIGHT LIST</span> <span>K</span> </div>											
	LAKE HURON	X										
LEXINGTON	X											2
PORT SANILUC	X											3
PORT SANILUC HARBOR (TITLE)												4
MICHIGAN	<del>X</del>											4
LEXINGTON HEIGHTS	X											5
												6
												7
												8
												9
												10
												11
												12
												13
												14
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												20
												21
												22
												23
												24
												25

Approved:

*Chas. E. Harrington*  
Chief Geographer - CSRS

13 May 1982

APPROVAL SHEET  
FOR  
SURVEY H- 9898

- A. All revisions and additions made on the smooth sheet during verification have been entered in the magnetic tape records for this survey. A new final position printout has ~~not~~ been made. A new final sounding printout has ~~not~~ been made.
- B. The verified smooth sheet has been inspected, is complete, and meets the requirements of the HYDROGRAPHIC MANUAL. Exceptions are listed in the Verification Report.
- Date: Oct. 13, 1981

  
Chief, Verification Branch

HYDROGRAPHIC SURVEY STATISTICS

H-9898

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT
SMOOTH SHEET		1	BOAT SHEETS & PRELIMINARY OVERLAYS		5
DESCRIPTIVE REPORT		1	SMOOTH OVERLAYS: POS. ARC, EXCESS		3

DESCRIP-TION	DEPTH RECORDS	HORIZ. CONT. RECORDS	PRINTOUTS	TAPE ROLLS	PUNCHED CARDS	ABSTRACTS/SOURCE DOCUMENTS
ENVELOPES						
CAHIERS			2			
VOLUMES						
BOXES			1 Post Bound Plo, 4 Bound Vols. 227. Misc. 1 Orig. Vt.			

T-SHEET PRINTS (List)  
SPECIAL REPORTS (List)

OFFICE PROCESSING ACTIVITIES

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

PROCESSING ACTIVITY	AMOUNTS		
	PRE-VERIFICATION	VERIFICATION	TOTALS
POSITIONS ON SHEET			2242
POSITIONS CHECKED		2242	2242
POSITIONS REVISED		148	148
SOUNDINGS REVISED		96	96
SOUNDINGS ERRONEOUSLY SPACED		740	740
SIGNALS (CONTROL) ERRONEOUSLY PLOTTED			
	TIME - HOURS		
CRITIQUE OF FIELD DATA PACKAGE (PRE-VERIFICATION)	10	36	46
VERIFICATION OF CONTROL		8	8
VERIFICATION OF POSITIONS		42	42
VERIFICATION OF SOUNDINGS		213	213
COMPILATION OF SMOOTH SHEET		126	126
APPLICATION OF TOPOGRAPHY		3	3
APPLICATION OF PHOTOBATHYMETRY			
JUNCTIONS		2	2
COMPARISON WITH PRIOR SURVEYS & CHARTS		28	28
VERIFIER'S REPORT		14	14
OTHER			
<b>TOTALS</b>	<b>10</b>	<b>472</b>	<b>482</b>

Pre-Verification by J. Lehner, F. Saunders	Beginning Date 11/19/80	Ending Date 11/20/80
Verification by J.S. Bradford, J. Lehner, F. Saunders	Beginning Date 11/25/80	Ending Date 10/13/81
Verification Check by H. R. Smith	Time (Hours) 24	Date 9/8/81
Marine Center Inspection by H.I.T.	Time (Hours) 24	Date 10/8/81
Quality Control Inspection by S Baumgardner	Time (Hours) 82	Date 4/6/82
Requirements Evaluation by [Signature]	Time (Hours) 6.0	Date 9/21/82

Impress 10 hrs 5/6/82

REGISTRY NO. 9898

The magnetic tape containing the data for this survey has not been corrected to reflect the changes made during evaluation and review.

When the magnetic tape has been updated to reflect the final results of the survey, the following shall be completed:

MAGNETIC TAPE CORRECTED

DATE \_\_\_\_\_ TIME REQUIRED \_\_\_\_\_ INITIALS \_\_\_\_\_

REMARKS:

ATLANTIC MARINE CENTER  
VERIFICATION REPORT

Survey No.: H-9898

Field No.: WH-20-2-80

Michigan, Lake Huron, Port Sanilac to Lexington Heights

Surveyed: July 23 to October 9, 1980

Scale: 1:20,000

Project No.: OPR-X115

Soundings: Ross Digital Echo  
Sounder, Raytheon  
DE-719B Fathometer  
Lead-line

Control: Argo (Range/Range)  
Del Norte/Theodolite  
(Range/Azimuth)

Chief of Party ..... Frank P. Rossi  
Surveyed by ..... R. G. Mann  
..... J. C. Gardner, Jr.  
..... D. A. Bland  
..... J. B. Grant  
Automated Plot by ..... Xynetics 1201 Plotter (AMC)

1. Introduction

a. During verification of the survey a discrepancy of approximately two (2) feet was found between main scheme hydrography and some lines splitting main scheme hydrography. Main scheme hydrography was run between days 205 and 211. The splits were run after day 234. The fathograms were rescanned, water levels checked, and correctors checked to determine the cause with negative results. The splits were rejected and main scheme hydrography retained. The rejection of these data did not depreciate the results of this survey.

b. A discrepancy was found with the velocity correctors on this survey. The field computations could not be correlated with the graphs provided by the field. New graphs were formulated using data taken from the NOAA Forms 77-44. New velocity tables were compiled and new correctors applied to the survey. As no significant difference resulted, the original survey data provided were used for velocity corrections.

c. Notes in the Descriptive Report were made in red during verification.

2. Control and Shoreline

a. Control is adequately discussed in sections F and G of the Descriptive Report.

b. Shoreline in Port Sanilac Harbor was applied in brown from NOS Chart 14862 (23rd Edition, July 29/78). No shoreline was applied to the 1:20,000 scale survey work because there are no existing shoreline manuscripts. Charted shoreline is at a scale of 1:120,000. Transfer of this shoreline is not practical due to scale difference between the chart and the survey.



### 3. Hydrography

a. Soundings at crossings are in agreement. Depths vary from one (1) to two (2) feet.

b. The standard depth curves could be adequately delineated. The twenty-four (24) foot curve was delineated because of the charted twenty-four (24) foot curve. The thirty-six (36) foot curve was used to delineate some isolated shoal features. Brown curves were used to show additional relief in some areas.

c. The development of the bottom configuration and determination of least depths is considered adequate.

### 4. Condition of Survey

The smooth sheet and accompanying overlays, hydrographic records and reports are adequate and conform to the requirements of the Hydrographic Manual with the following exceptions:

- a. The hydrographer <sup>incorrectly identified</sup> ~~used the wrong edition of~~ the chart, <sup>used</sup> for comparison.
- b. Section N of the Descriptive Report failed to mention the fixed aids to navigation in the survey area.
- c. The error mentioned in section D of the Descriptive Report was never brought to the attention of the Electronic Engineering Division during the inport period as mentioned.
- d. The averaging of bar check data and plotting of some bar check curves was marginal at best. Direct Comparison Logs were not submitted with the survey records nor were the computations for the TDC observations.
- e. The landmarks in the vicinity of Port Sanilac were not investigated, nor is there any data to corroborate the fact that the charted landmarks and existing landmarks are one in the same. The field scaled landmarks from USCG quad maps.

### 5. Junctions

Adequate junctions were affected with the following surveys:

- H-9895 (1980) to the south ✓  
 H-9899 (1980) to the west ✓ for chart compilation use H-9899, 1:5,000  
H-9906 (1980) to the north ✓

There were no contemporary surveys inshore of this survey north and south of H-9899 (1980), Lexington Harbor and the inset of Port Sanilac Harbor shown on this survey. The Lake Survey surveys in this area were considered prior surveys and are discussed below.

### 6. Comparison With Prior Surveys

- LS-1847 (1:120,000) 1946  
 LS-1970 (1:10,000) 1956  
 LS-1971 (1:10,000) 1956

LS-1972 (1:10,000) 1956  
 LS-1972<sup>3</sup> (1:10,000) 1956  
CHS SURVEY 3831 (1:100,000) 1974

The above prior surveys are the most recent prior surveys which taken together cover the common area of the present survey.

Comparison with prior surveys done by the U. S. Lake Survey showed good agreement. In general the prior surveys were from one (1) to five (5) feet shoaler than the present survey. Some prior survey soundings were brought forward to supplement the present survey.

The Canadian Hydrographic Survey, survey 3831 of 1974, is generally three (3) to five (5) feet shoaler than the present survey. The field unit experienced difficulty in junctioning with the Canadian survey. A letter, dated November 14, 1980, outlines a conversation between CO, WHITING, and Ross Douglas, CHS. A copy of this letter is included in the Descriptive Report. The present survey should be considered as superseding the Canadian survey in the common area. *Not available during Q.C.*

The present survey is adequate to supersede the prior U. S. Lake Survey surveys in the common area except where prior survey data were brought forward to supplement the present survey.

#### 7. Comparison With Chart 14862 (23rd Edition, July 29/78)

##### a. Hydrography

The charted alongshore hydrography originates with the previously mentioned surveys and requires no further discussion.

The following charted features in Port Sanilac Harbor were neither verified or disproved by the present survey and come from unascertainable sources:

<u>Item</u>	<u>Latitude</u>	<u>Longitude</u>
Subm.		
1) Wreck	43° 25' 48.5" N	82° 32' 20.0" W
2) Shoal	43° 25' 51.0" N	82° 32' 19.0" W
3) Rock	43° 25' 51.0" N	82° 32' 24.0" W
4) Rock	43° 26' 07.0" N 25 46.5	82° 32' 26.0" W 17.5

These should remain as charted unless subsequent information indicates differently.

The charted hydrography in Port Sanilac Harbor originates with the previously mentioned surveys and unascertainable sources and requires no further discussion.

The present survey except as noted above is adequate to supersede the charted hydrography in the common area.

b. Controlling Depths

The charted controlling depth for the entrance to Port Sanilac Harbor is nine (9) feet. The present survey has an eight (8) foot depth inside of the dashed dredging limits.

c. Aids to Navigation

Although the hydrographer states there are no floating aids to navigation, five (5) fixed aids are located within the survey area. Two (2) aids are in Lexington Harbor and three (3) are in Port Sanilac. These aids are adequate to serve their intended purposes.

8. Compliance With Instructions

The survey adequately complies with Project Instructions with the following exception: Section 4.2.1 (Shoreline & Charted Detail). See Section 7a. of this report.

9. Additional Field Work

This is an adequate basic survey, and no additional field work is recommended.

Absent

J. Scott Bradford  
Cartographic Technician  
Verification of Data

Robert G. Roberson

Robert G. Roberson  
Cartographer  
Evaluation and Analysis

Harry R. Smith

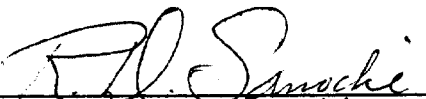
Harry R. Smith  
Senior Cartographic Technician  
Verification Check

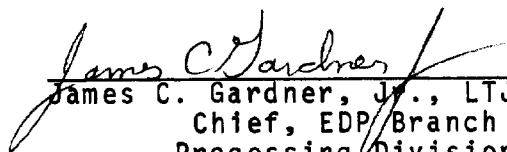
INSPECTION REPORT  
H-9898

The completed survey has been inspected by the Hydrographic Inspection Team with regard to survey coverage, delineation of depth contours, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The Verification Report has presented the facts accurately and properly, the procedures used were appropriate, and the recommendations are logical and justifiable. The survey complies with National Ocean Survey requirements except as noted in the Verification Report. The survey records comply with NOS requirements except where noted in the Verification Report. The Hydrographic Inspection Team concurs with the verifier's findings, actions, and recommendations.

Examined and Approved  
Hydrographic Inspection Team

  
Karl Wm. Kieninger, CDR, NOAA  
Chief, Processing Division

  
R. D. Sanocki  
Chief, Verification Branch  
Processing Division

  
James C. Gardner, Jr., LTJG, NOAA  
Chief, EDP Branch  
Processing Division

Approved/Forwarded  
October 13, 1981

  
Richard H. Houlder, RADM, NOAA  
Director, Atlantic Marine Center



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
Rockville, Md. 20852

C352:SRB

April 6, 1982

TO: Glen R. Schaefer *GRS*  
Chief, Hydrographic Surveys Division

THRU: Chief, Quality Control Branch *ap*

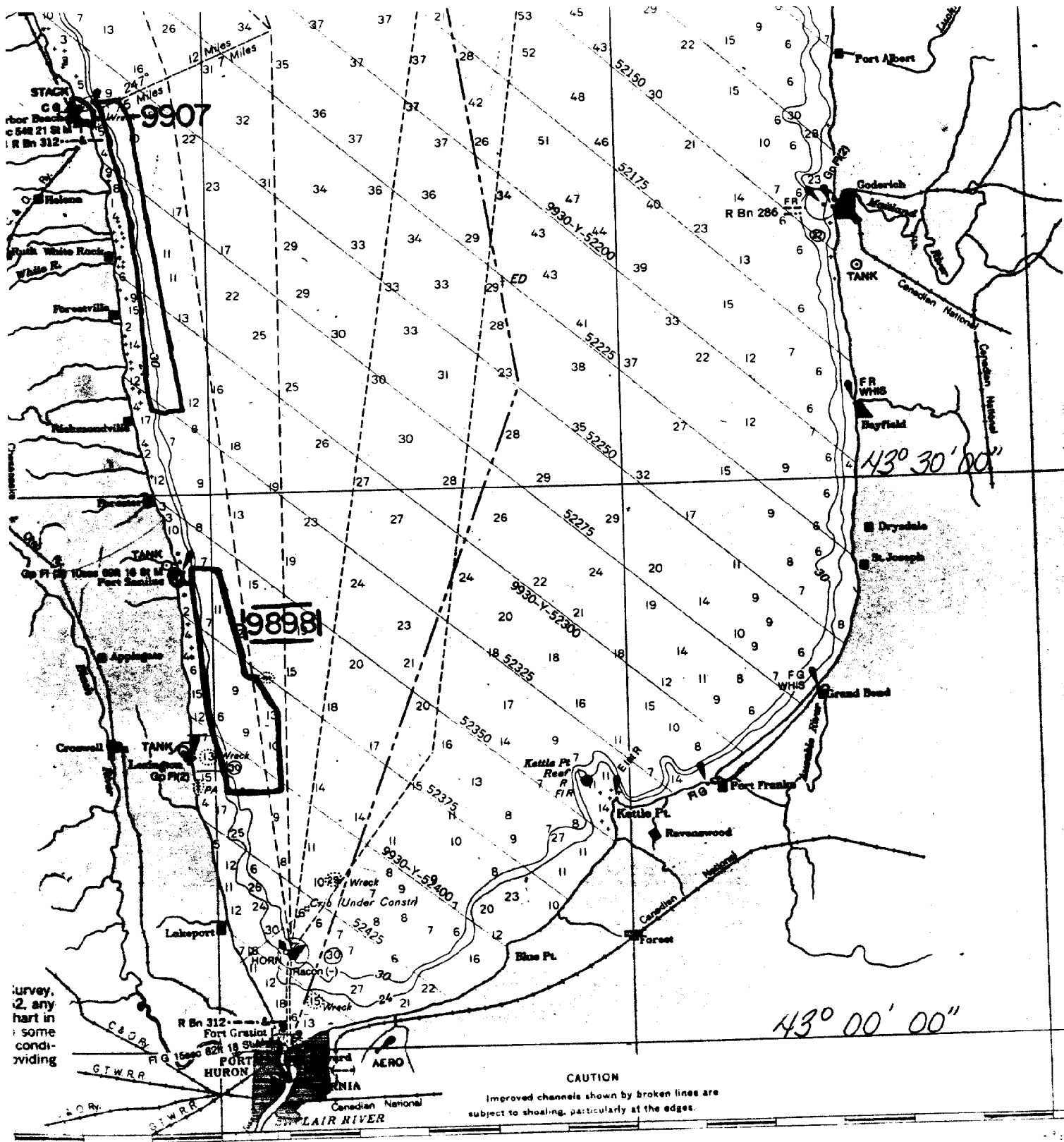
FROM: *S.R. Baumgardner*  
S. R. Baumgardner  
Quality Evaluator

SUBJECT: Quality Control Report for H-9898 (1980), Michigan, Lake Huron, Port  
Sanilac to Lexington Heights

A quality control inspection of H-9898 was accomplished to monitor the survey for adequacy with respect to data acquisition, delineation of the bottom, determination of least depths, navigational hazards, junctions, sounding line crossings, smooth plotting, shoreline transfer, decisions made and actions taken by the verifier, and the cartographic presentation of data. Revisions and additions to the smooth sheet, plus helpful comments made to the verifier, are identified on a one-half scale copy of the survey to be furnished the verifier. In general, the survey was found to conform to the National Ocean Survey's standards and requirements except as stated in the Verifier's Report.

cc:  
C351





Survey, if any part in some dividing

CAUTION  
Improved channels shown by broken lines are subject to shoaling, particularly at the edges.

82° 30' (CONTINUED ON CHART 14820) (formerly LS 3) 92° 00'

Published at Washington, D. C.  
U. S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL OCEAN SURVEY

*Diagram No. 48-5*



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
Rockville, Md. 20852

OCT 22 1982

C351:SVJ

TO: CAM - Richard H. Houlder

FROM: C3 - C. William Hayes

SUBJECT: H-9898 (1980), Michigan, Lake Huron, Port Sanilac to Lexington Heights, Report of Compliance with Project Instructions

The smooth sheet and Descriptive Report for the subject survey have been examined. In addition to the Quality Control Report, dated April 6, 1982 (copy attached), and the Hydrographic Survey Inspection Team Report, dated October 13, 1981, the following is submitted:

Section K (Comparison with Prior Surveys) was not included in the Descriptive Report. The dangerous submerged wreck covered 13 feet and charted in latitude 43°15.7'N and longitude 82°30.6'W, originating from LS-1290 (1914), was not adequately investigated. A least depth should have been obtained by diver and the hydrographer should have recommended the charting action to be taken.

Except as noted, the survey is complete and adequate for the purposes intended and is in compliance with Project Instructions OPR-X115-WH/HSB-80, dated March 31, 1980.

Attachment

cc:  
C352 w/o att.



