

3761

Diag. Cht. No. 1239-2

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC

Field No. \_\_\_\_\_ Office No. H-3761

LOCALITY

State SOUTH CAROLINA

General locality WINYAH BAY TO

Locality CHARLESTON HARBOR

1914

CHIEF OF PARTY

R. F. Luce

LIBRARY & ARCHIVES

DATE JUNE 14, 1915.

3761

REFER TO NO.

DEPARTMENT OF COMMERCE  
U. S. COAST AND GEODETIC SURVEY  
WASHINGTON

March 31st, 1914 . .

To the Inspector of Hydrography and Topography,  
Coast & Geodetic Survey,  
Washington, D. C.

Through Chief of Coast Pilot Division,

Sir,-

I have the honor to submit herewith my report  
on the plotting of the Dead Reckoning Hydrography of  
Steamer BACHE for the Season of 1914 off the South  
Carolina Coast, on Sheet "~~A.~~ 3761

I would recommend that this report be made  
a part of the Descriptive Report of Sheet "~~A.~~ 3761

Respectfully,

*Reuben Arny*  
Aid, C. & G. Survey.

-8-

H. 3761.

Off shore work. An excellent sheet.  
be drawn on this sheet to make it complete.

Shore line should

Sheet examined in Div.  
of Hyd'y & Top'y.

REPORT ON PLOTTING DEAD RECKONING LINES

FOR

SHEET ~~4~~, STEAMER BACHE, 1914.

Hyd. 3761.

There were twelve lines run and plotted by Dead Reckoning on Hydrographic Sheet "A". In general they began at the line of buoys which is about thirteen miles off-shore and ran out to about the fifteen or sixteen fathom curve which is about twenty-five miles off-shore.

GENERAL METHOD,-

The ship's true course was plotted with a protractor, then allowance was made in direction and distance for Current and then allowance was made for leeway normal to the ship's course and this point was taken for the new origin of the curve. The next ship's course was then laid off from this new origin and the line plotted as just stated until the end of the line was reached. This position I have called the final "Dead Reckoning Position". The true end of the line was determined by two sextant angles or an angle and a bearing or in some other manner and this position I have called the "True Position". Now the difference between the Dead Reckoning Position and the True Position I have called the "Residual Error" and this Residual Error was distributed in proportion to the distance run throughout the line. The heavy, full penciled line on the sheet I have called the Adjusted Line.

DETAILED METHOD

Data,-

The log number, direction and velocity of the wind, rate of leeway (in most cases) and a few other details were obtained from a book called "BRIDGE LOG"

1914

The direction and velocity of the currents were obtained from the "CURRENT RECORD".

Other data was obtained from the Sounding Records.

The corrections for the log were taken from the sheets marked "Log Tests".

In plotting this work I have made a table for each line giving the position number of the changes of course or at the Current Stations, time at those positions, time run on that course, log number, log reading, logged distance on course, distance corrected for over-run or under-run as determined from log-tests, ship's compass course, variation and deviation correction, true ship's course, direction and velocity of the current at each Current Station, direction and velocity of the wind and the rate of lee-way.

PROCEDURE.

Current Curves,-

Any convenient point in the vacant space at the top of the sheet was selected for the origin; the direction of the current was laid off on a protractor and using the meridians as north and south lines the direction was plotted through the origin and the rate in knots per hour were laid off on this line. This being done for the observations at each Current Station throughout the line.

Ship's Compass Course,-

The position of the beginning of the line was plotted using two sextant angles or an angle and a bearing as the case might be. The Ship's true course was laid off on a protractor and plotted using the meridians as a reference as in the case of the Current Curves. This gives the dotted line on the sheet or the line the ship should have passed over if there had been no current or lee-way.

Corrected Log Distance,-

Next, correct the log distance for over-run or under-run by using the corrections from the Log Tests and lay this corrected distance off on the dotted line which will give the ship's position uncorrected for current or lee-way.

Current and Lee-way Correction,-

The direction of the current at this position is laid off by interpolating on the Current Curve and the distance, by using the velocity and the time on the course.

(3)

Next, the lee-way rate is taken from the Dead Reckoning data and applied normal to the course, the distance being determined from the rate and the time on the course. The lee-way was applied normal to the course because from the appearance of Sheet "B" the lee-way was applied normal and that sheet was plotted under the direction of the Commanding Officer of the Steamer BACHE.

When the Lee-way has been applied the resulting position will give the ship's position corrected for log, current, and lee-way which I have called the "Dead Reckoning Position", or DRP.

Residual Error,-

Using this D. R. P. as a new origin a similar operation as just described is gone through and so on to the end of the line. The true end of the line is determined in a similar manner as at the beginning. This position I have called the "True Position", or T. P. As before stated the difference between the True Position and the Dead Reckoning Position is called the Residual Error. To distribute this Residual Error, measure Dead Reckoning distance of the entire line noting the distance at each point where current and lee-way corrections were applied and,

$$\frac{\text{Partial Distance}}{\text{Total Distance}} \times \text{Residual Error} = \text{Partial Error at}$$

or the correction to be applied at the respective points along the line. These points are called the True Positions and are joined by the heavy, full line, which is the final adjusted line.

The D. R. P. and the T. P. are joined by dotted lines.

Respectfully submitted,

*Reuben Aray*  
Aid, C. & G. Survey.

SUGGESTIONS FOR HYDROGRAPHIC SHEET "A" OF THE STR. BACHE.

- 1.- Keep the Bridge Log whenever the log is streamed, day or night, and to make accurate meteorological observations at least once an hour.
- 2.- Make invariably a note in the Sounding Record at the beginning of the day the number of the log~~s~~ or logs which are streamed and whenever there is a change, regardless of whether dead reckoning is to be run or not.
- 3.- To place in the Sounding Record the change of course at the ~~instant~~ instant of change, and indicate the change by the symbol "CC".
- 4.- Put the Ship's course in the proper column where it can be found without searching.
- 5.- Note the course at least once each page, where the time of one course extends from one page to the next.
- 6.- When the Current Curves are put on the Boat Sheet, indicate to which line or lines the curve is to be applied.
- 7.- Make all lee-way notes in the Sounding Record as well as in the Bridge Log clearly and distinctly and place them where they can be found without searching.
- 8.- Invariably put the Position numbers on the Boat Sheet in INK as the penciled numbers are rubbed off by use of the sheet.
- 9.- Do not allow the Recorder to record an angle in this manner, - 69.45 when he means 69° 45' but in this way 69 - 45.
- 10.- Do not allow the Recorder to use soft pencils for his records.
- 11.- See that the Recorder crosses out the scale of units in the columns for the soundings that is not to be used. That is, if the sounding are taken in fathoms and feet, cross out the words, "Feet-Tenths".
- 12.- Record lead line corrections thus,-

~~1-fathom>equals~~

	Stand.	Lead Line.
1 fathom	6 feet	6.2 feet
2 "	12 "	12.1 "
3 "	18 "	18.4 "

instead of in this manner,-

1 fathom	0.2 feet long
2 fathom	0.1 " "
3 "	0.4 " "

12.-(continued) This will do away with the possibility of forgetting to record whether the Lead line is long or short, because in one case this was done.

13,- Record the letter or number of the lead line wherever there is a change.

FORM 167.

Department of Commerce and Labor

COAST AND GEODETIC SURVEY

Washington,....., 191

Respectfully { returned } to  
                  { referred }  
                  { forwarded }

Leadline A

Used for depths of  
12 fms generally  
and from sounding  
slate -

Leadline B

used on trolley  
for depths about 12 to  
25 fms -

Leadline C

used on trolley for  
depths 25 - 40 fms  
Sigsbee Machine  
connected when taken and  
used all depths over 40 fms



POST-OFFICE ADDRESS: **Norfolk, Virginia.**

TELEGRAPH ADDRESS:

EXPRESS OFFICE:

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

Steamer "BACHE"

February 4, 1915.

To the Commanding Officer,

U. S. C. & G. Survey Str. "BACHE".

Sir:

I have the honor to submit herewith my report on the plotting of the Hydrographic Smooth Sheet No. "A" season of July to October 1914.

Respectfully,

*Rubie Argy.*

Aid, C. & G. Survey.

*Respectfully forwarded to the Superintendent, C. & G. Survey, for his information.*

*R. F. Luce  
Comdg. Str. "Bache"*

REPORT ON PLOTTING HYDROGRAPHIC SHEET NO. ~~3761~~

The work on Hydrographic Sheet No. A was performed under the direction of Captain R. F. Luce, Assistant, C. & G. Survey, commanding the U. S. S. "BACHE" between July 21st, 1914 and October 23rd, 1914. The projection was made by H. Rae Bartlett, Aid, C. & G. Survey, and the plotting by Reuben Arey, Aid, C. & G. Survey assisted by C. A. Egner, Deck Officer, C. & G. Survey.

The work lay off the South Carolina coast between Georgetown, *and Charleston* South Carolina and extended about 15 miles off the shoreline running out to the fifteen fathom curve. The plotting of the smooth sheet includes 3229 sextant angles positions, 207 positions determined by one sextant angle and a bearing, 516 positions determined by log readings and dead reckoning. A detailed table of statistics is attached hereto.

The cuts to determine the positions of buoys and signals were plotted with Steel Protractor No. 256. The positions having a right angle greater than  $12^{\circ} 21'$  were plotted with Steel Protractor No. 155.

In plotting the positions determined by one angle and a bearing the deviations to reduce the Observed to True Bearing were taken from Ships Swings made on August 22nd, 1914 and October 17th, 1914.

The first projection made by one of the officers, was found, when ready to begin plotting thereon, to be shrunken 00.45 of one per cent in one direction and 00.37 of one percent in the other and another pro-

jection was made by the undersigned and that also shrunk badly. However, upon advice from the Washington Office it was decided that the percentage of shrinking of the first projection was negligible and work was begun ~~on~~ plotting the various buoys and signals by cuts with sextant angles using the second projection.

During the progress of this work the sheet shrunk in some places while it stretched in others distorting the sheet tremendously in the vicinity of @ Char, @ Stack, @ Quarantine, and @ Tank. This threw off the cuts already made, making it necessary to replot the cuts on some of the signals as many as five times before satisfactory positions were obtained. *These locations were later transferred to the first projection on which the positions were plotted*

The buoys and signals were cut in on the sheet and the work of plotting the sextant angles commenced January 5, 1915 and completed February 2nd, 1915 with an average of 143 positions a day.

In the vicinity of @ Char for the first day or two some of the fixes were weak near the offshore ends of the lines, due to the available signals being distant and nearly on a circle.

The lines ran very smoothly with very few rejected or questioned positions and with only a very occasional, slight jump when the set was changed. The lines were evenly spaced and where the soundings indicated a shoal spot the development was sufficiently close to accurately determine the least water and extent of the shoal. In the majority of cases the development lines ran both ways of the shoal, viz, parallel and perpendicular to the backbone of the shoal. This is particularly <sup>evident</sup> widest in the vicinity of @ Dewees. To the southward from @ Jetty and Georgetown, in developing shoals, the ship was evidently set off course by strong currents making the plotting

confusing at times but the result was satisfactory.

In this vicinity the lines running offshore are nearly all spaced about one half mile apart making a much closer survey just off the entrance to Georgetown.

The positions plotted by means of one sextant angle and a bearing were very accurate and agreed very closely with the subsequent angle positions making in general very smooth lines. There were a very few of these positions that did not plot well and those which were radically out of line were rejected but those which were not badly out, were plotted because it was considered by the draftsman that there was very little choice between accepting or rejecting them after a careful investigation

*Respectfully submitted*  
*Reuben Aray*  
*Aid C. & G. Survey.*

EXTENT. The work on this sheet covers the area of inshore hydrography between Charleston and Georgetown Jetties, South Carolina, extending from a depth of between two and three fathoms inshore to a line of signal buoys placed about 14 or 15 miles off shore, a few lines and some development work being done outside of this line.

DESCRIPTION OF SURVEY. The method of sounding was the hand lead as depths were less than 10 fathoms. Lines were spaced 1 mile apart and run normal to the general trend of the coast. The vessel's speed was between four and five knots and soundings were from 50 to 150 meters apart. In an area of about 30 square miles off Charleston Jetty, lines were spaced one half mile apart and a slightly larger area off Georgetown Jetty was given the same development.

Special care was given to develop areas where shoal or uneven depths were found and approximately thirty-six such spots were closely developed by lines ~~from~~ one third to one sixth of a mile apart. The total area covered by these developments being approximately 70 square miles.

SIGNALS. As the coast has no natural elevations higher than the low sand dunes adjacent to the beach which scarcely exceed 20 feet in this locality, it was considered necessary to establish buoy signals along a line, offshore as far as possible, and to locate them by cuts from the vessel anchored at a number of positions, These being located by sextant angles between objects ashore. Six gas and whistle buoys belonging to the Lighthouse Service were used for this purpose and were anchored by the Lighthouse Tender about 4 miles apart on a line 13 to 14 miles offshore. A gas pipe

tripod was built upon these buoys and carried a black wooden target at a height of about 22 feet which was visible up to 6 miles. The buoys when no longer necessary were shifted to new positions along this line as work progressed and altogether 13 positions were made and located.

In addition to locating buoys, there were five signals established by Assistant Winston at intervals of about 5 miles along the coast whose positions had to be determined. As far as practicable cuts were taken from Triangulation Stations in the vicinity, but as there<sup>s</sup> were not sufficient, they were supplemented by cuts from the ship. This was done by anchoring the ship, allowing her to bring up to wind or current and then observing the necessary angles at least twice and by different observers for a check. Seven aids to navigation were located and used in the survey, 5 buoys, the Georgetown Jetty Light and the Charleston Light Vessel. Cuts on the buoys in all cases were in good agreement considering the fact that cut in signals were used in their location. Considerable time was spent by the vessel in this work as clear weather was necessary, and in general the sextant work was of difficult character.

Respectfully submitted,

*R. T. Luce*

Commanding Str. "BACHE"  
U.S. Coast and Geodetic Survey.

Statistics for Hydrographic Sheet No. "A".

Date	Letter	Volume	Sextant Positions	Bearings Positions	Log Positions	Soundings	Miles	Vessel
July 21, 1914	A	1	18	3	3	234	6.	"Bache"
" 24, "	C	1	100	3	10	1045	60.8	"
" 25, "	D	1 & 2	105	6	12	1224	65.7	"
" 27, "	E	2	42	6	6	485	27.5	"
" 30, "	G	2	60	9	5	564	30.1	"
" 31, "	H	3	3	27	37	473	38.8	"
Aug. 5, "	K	3	51	7	3	474	25.6	"
" 6, "	L	3	26	0	27	320	34.2	"
" 7, "	M	4	100	2	30	1047	72.0	"
" 10, "	P	4	102	13	2	639	47.0	"
" 11, "	Q	5	9	6	12	163	14.7	"
" 12, "	R	5	144	6	11	1345	66.2	"
" 13, "	S	6	63	9	18	611	45.3	"
" 14, "	T	6	25	37	26	573	35.5	"
" 15, "	U	7	88	0	0	647	31.7	"
" 24, "	V	7	118	0	0	956	41.2	"
" 29, "	W	7	46	0	0	439	16.8	"
" 31, "	W	8	106	0	0	752	25.1	"
Sept, 1, "	Y	8	117	3	8	1012	45.4	"
" 2, "	Z	9	7	3	37	298	39.3	"
" 3, "	A'	9	107	1	3	925	50.0	"
	20	9	1437	141	259	14226	818.9	
Carried forward	20	9	1437	141	207	14226	818.9	

Date	Letter	Volume	Sextant Positions	Bearings Positions	Log Positions	Soundings	Miles	Vessel
Brought forward	20	9	1437	141	250	14226	818.9	
Sept. 4, 1914	B*	10	123	14	0	1026	61.1	"Bache"
" 5, "	C*	10	71	0	0	509	29.1	"
" 11, "	D*	11	69	8	35	552	42.5	"
" 12, "	E*	11	86	0	1	564	38.0	"
" 18, "	F*	11	49	4	42	616	50.5	"
" 19, "	G*	11	64	0	0	551	32.4	"
" 21, "	H*	12	106	0	0	965	48.4	"
" 22, "	J*	12	18	0	0	115	8.5	"
" 23, "	K*	12	100	0	0	556	35.3	"
" 28, "	M*	13	107	0	3	845	43.0	"
" 29, "	N*	13	17	0	3	118	7.6	"
" 30, "	P*	13	112	0	23	1126	71.6	"
Oct. 1, "	Q*	14	103	3	13	1091	55.0	"
" 5, "	R*	14	98	0	0	874	37.4	"
" 6, "	S*	15	112	0	0	1023		"
" 7, "	T*	15	62	1	0	549	22.5	"
" 8, "	U*	16	0	16	62	451	55.2	"
" 9, "	V*	16	0	0	14	116	8.7	"
" 12, "	W*	16	84	0	0	598	24.7	"
" 13, "	X*	16	133	2	0	1026	49.6	"
" 14, "	Y*	17	67	7	9	710	35.6	"
" 15, "	Z*	17	21	0	1	116	8.5	"
" 16, "	A*	17	1	0	0	0	.0	"
	<del>43</del>	<del>17</del>	<del>3040</del>	196	456	28323	1584.1	
Carried forward	43	17	3040	196	456	28323	1584.1	



Date	Letter	Volume	Sextant Positions	Bearings Positions	Log Positions	Soundings	Miles	Vessel
Brought forward	43	17	3040	196	456	28323	1584.1	
Oct. 19, 1914	B"	18	87	0	0	0	.0	"Bache"
" 20, "	C"	18	86	8	42	1020	74.5	"
" 21, "	D"	18	0	3	18	161	12.0	"
" 23, "	E"	18	16	0	0	113	5.8	"
=====								
Totals ---	47	18	3229	207	516	29617	11676.4	

VEC  
July 13, 1915

HYDROGRAPHIC SHEET 3761.

L. P. S.

Winyah Bay to Charleston Harbor, South Carolina, by  
Asst. R. F. Luce in 1914.

TIDES.

	Cape Romain ft.
Mean low water, or plane of reference on staff	2.4
Lowest tide observed " "	1.3
Highest " " " "	8.9
Mean range of tide	4.6

*Applied to compilation of New Chart # 491  
May 10, 1935 g.H.S.*

DEPARTMENT OF COMMERCE

Hyd Sheet No 3761

Within the limits of this work the ground has been systematically covered and shoal indications carefully developed.

Practically all of the work outside of the outer line of buoys is done by dead reckoning, while that inside is controlled by three point fixes.

Most of the crossings, with few exceptions, are very good. Such portions of the lines on Hyd. 3762, as fall within the limits of this sheet, have been plotted on this sheet and the soundings plotted on them. The soundings on these lines are not identical with those on Hyd 3762, because the larger scale of this sheet permits the plotting of more soundings than it is possible to show on Hyd 3762.

The curves were drawn from the combined soundings and the 60 ft. curve, the only one common to both sheets was reduced and shown on Hyd. 3762.

The protracting was tested at intervals through out and all suspicious lines were re-protracted and corrected when necessary.

The plotting of the lines run by dead reckoning was verified, on about half of the lines, and found to be carefully and accurately done, with the exception of H day, U' day and V' day. Errors were found in these and the entire lines were replotted. This replotting was shown to Capt. Luce and approved by him.

All of the data used to plot the lines run by dead reckoning was compiled into a pamphlet, marked "Data for plotting lines run by dead reckoning." This was a great help in testing the plotting and as the practice is somewhat of an innovation, it would be a good thing if this pamphlet was used as a standard form for other parties doing work extensively by dead reckoning.

R. L. Johnston