6528

Form 504
Rev. April 1935

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY

DESCRIPTIVE REPORT

~~Topographic~~
Hydrographic } *Sheet No.* SPECIAL

State MASSACHUSETTS

LOCALITY

BUZZARDS BAY

Southwest of Hen and Chickens Shoal
~~Light Vessel~~

December 13-14
*193*9

CHIEF OF PARTY

H.C.Warwick

U. S. GOVERNMENT PRINTING OFFICE 102221

6528

Form 537
Ed. Dec., 1930

REG. NO.

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

HYDROGRAPHIC TITLE SHEET

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. Special H6528

REGISTER NO.

State Massachusetts

General locality Buzzards Bay

Locality Southwest of Hen and Chickens ~~Light Vessel~~ Shoal

Scale 1:5,000 Date of survey December 13-14, 1939.

Vessel M.V. GILBERT

Chief of Party H.C.Warwick

Surveyed by Party of GILBERT

Protracted by M.C.Enstine

Soundings penciled by M.C.Enstine

Soundings in ~~fathoms~~ feet

Plane of reference M.L.W.

Subdivision of wire dragged areas by

Inked by } J.A.McCormick.

Verified by

Instructions dated December 7, 1939.

Remarks: Investigation of shoal.

U. S. GOVERNMENT PRINTING OFFICE, 1931

INVESTIGATION OF SHOAL SOUTHWEST OF HEN AND CHICKENS LIGHT VESSEL

STATE OF MASSACHUSETTS

AUTHORITY

This survey was accomplished in accordance with Director's Instructions, 22/MEK, 1995 GI 1 dated December 7, 1939.

SCOPE:

A square of approximately one half mile on a side, with the critical area in the approximate center.

SURVEY METHODS:

Two projections were constructed preparatory to undertaking this survey. One, on a scale of 1:20,000, has triangulation stations sufficient for obtaining a strong three point fix from shore plotted on it. The other, on a scale of 1:5,000 covered the immediate area to be covered by hydrography.

On December 13, 1939 the "GILBERT" left her base at Woods Hole, Massachusetts and proceeded to the working grounds. It was planned to locate the 17 foot spot, drop a buoy on it, spot sound for the shoalest depth, lay off a system of closely spaced lines and sound the area within a 1/4 mile radius of the shoal spot. Although the critical area was "felt out" for considerably more than two hours the shoalest sounding obtained was 23 feet (tentatively reduced). The intended procedure was abandoned and it was decided to develop the area immediately surrounding the shoalest depth obtained.

No soundings recorded during this 2 hr. investigation. 20 and 23 ft. obtained on regular lines. J.A.M.

Three small buoys were then planted in positions best adapted to give strong three point fix control over the area to be sounded. These buoys were located by three point fix positions on three (checked with a fourth) triangulation stations ashore. For boat sheet purposes they were plotted on the 1:20,000 projection and transferred to the 1:5,000 projection. For smooth plotting, position of these buoys were later computed. The computations are transmitted as part of the original record of the survey. These computations consist of 5 Inverse Position Computations, 6 Three Point Problems, 12 Triangle Computations, 6 Position Computations, and 6 Reduction Computations (on the Position Computations).

A serial temperature was observed for fathometer correction, the initial draft setting made on the fathometer and hydrography started at 12:51 PM on the 13th. The work proceeded under more or less unfavorable conditions due to a choppy sea and cold wind interfering with visibility of the sextant angle observers. Fathometer trouble, which devoloped at 3:00 PM, prevented further work this day.

The vessel anchored on the working grounds for the night. During the night it blew up quite rough from the southwest veering to northwest in the early morning. Daylight brought out the sad fact that two of our three buoys planted the day before had gone adrift or sunk. This necessitated the planting and locating

of two additional buoys and the re-locating of the one remaining in position. Hydrography was begun at 10:57 AM on the 14th and continued until 2:09 PM with a half hour out for lunch.

The line spacing over the entire area covered is approximately 50 meters, and 25 meters or less over the more critical area. This would seem sufficiently close, on the scale used, to insure a definite delineation of depth curves. The close devolopment in the critical area is in addition to two or more hours of unrecordd sounding prior to beginning the hydrography.

Soundings were obtained every ten seconds and intermittent soundings recorded when they differed from those of regular spacing. It was attempted to take positions every two minutes, this varied somewhat, however, as adverse conditions demanded. One or more bottom specimens were obtained on each one of the half mile lines. Fifty of these specimens are recorded in the sounding record. Depth curves on the boat sheet were plotted for each fathom in different colored inks in order to facilitate a more complete study of the work. The key to the colors used is as follows:

4	fathoms	yellow
5	"	red
6	"	green
7	"	blue
8	"	violet
9	"	brown
10	"	yellow

Respectfully submitted,

H. C. Warwick.

H. C. Warwick,
Lieutenant, C&GS.,
Comd'g. Motor Vessel GILBERT.

STATISTICS

Day	Stat. Miles	Positions	Soundings
A	10.3	54	517
B	12.5	73	610
Total	22.8	127	1127

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. April, 1931

INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^*$$

in which $\log \Delta\lambda_1 = \log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1 = \log(\phi'-\phi)$ − correction for arc to sin*; and $\log s = \log s_1 +$ correction for arc to sin*.

NAME OF STATION

1. ϕ	41	24	51.31	Cuttyhunk L.H	λ	70	57	00.90
2. ϕ'	41	27	44.28	Old Cork Beacon	λ'	71	02	03.63
$\Delta\phi\ (=\phi'-\phi)$	+	02	52.97		$\Delta\lambda\ (=\lambda'-\lambda)$	+	05	02.73
$\frac{\Delta\phi}{2}$	+	01	26.48		$\frac{\Delta\lambda}{2}$		2	31.36
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	41	26	17.79					
$\Delta\phi$ (secs.)		+ 172.97			$\Delta\lambda$ (secs.)		+ 302.73	

log $\Delta\phi$	2.237971		**log** $\Delta\lambda$	2.481056	
cor. arc−sin	−		cor. arc−sin	−	
log $\Delta\phi_1$			log $\Delta\lambda_1$		
log cos $\frac{\Delta\lambda}{2}$			**log cos** ϕ_m	9.874870	
colog B_m	1.489258		**colog** A_m	1.490918	
log $\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	3.727229	(−) (opposite in sign to $\Delta\phi$)	**log** $\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	3.846844	
			log $\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	3.727229	(−)
			log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.119615	(−)
log $\Delta\lambda$	2.481056	3 log $\Delta\lambda$	$\alpha+\frac{\Delta\alpha}{2}$	127 12 27.4	
log sin ϕ_m	9.820735	log F	**log sin** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.901158	−
log sec $\frac{\Delta\phi}{2}$		log b	**log cos** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.781544	+
log a	2.301791		**log** s_1	3.945684 6	
a			cor. arc−sin	+ 5	6
b			log s		
$-\Delta\alpha$ (secs.)	+ 200.4				
$-\frac{\Delta\alpha}{2}$	+ 100.2				
	+ 1 40.2				
$\alpha+\frac{\Delta\alpha}{2}$	127 12 27.4				
α (1 to 2)	127 14 07.6				
$\Delta\alpha$	− 3 20.4				
	180				
α' (2 to 1)	307 10 47.2				

*Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.52 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 10′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 6 decimal places. 11—9810

U. S. GOVERNMENT PRINTING OFFICE: 1931

comp. mcf.

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 462
Rev. April, 1931

INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^*$$

in which $\log \Delta\lambda_1=\log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1=\log(\phi'-\phi)$ − correction for arc to sin*; and $\log s=\log s_1+$ correction for arc to sin*.

	NAME OF STATION			NAME OF STATION	
1. ϕ	41 ° 24 ′ 51.31 ″	Cuttyhunk L.H.	λ	70 ° 57 ′ 00.90 ″	
2. ϕ'	41 27 10.86	Sakonnet L.H.	λ'	71 12 10.62	
$\Delta\phi\ (=\phi'-\phi)$	+ 2 19.55		$\Delta\lambda\ (=\lambda'-\lambda)$	+ 15 09.72	
$\frac{\Delta\phi}{2}$	+ 1 09.78		$\frac{\Delta\lambda}{2}$	7 34.86	
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	41 26 01.09				
$\Delta\phi$ (secs.)	+ 139.56		$\Delta\lambda$ (secs.)	+ 909.72	
$\log \Delta\phi$	2.144730		$\log \Delta\lambda$	2.958908	
cor. arc−sin			cor. arc−sin		
$\log \Delta\phi_1$			$\log \Delta\lambda_1$		
$\log \cos\frac{\Delta\lambda}{2}$			$\log \cos\phi_m$	9.874901	
$\operatorname{colog} B_m$	1.489258		$\operatorname{colog} A_m$	1.490918	
$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.633988 (−) (opposite in sign to $\Delta\phi$)		$\log\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.324727 +	
			$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.633988 (−)	
			$\log \tan\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.690739 (−)	
$\log \Delta\lambda$	2.958908 (3 log $\Delta\lambda$)		$\alpha+\frac{\Delta\alpha}{2}$	101 31 14.0	
$\log \sin\phi_m$	9.820695 (log F)		$\log \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.991161 (−)	
$\log \sec\frac{\Delta\phi}{2}$	(log b)		$\log \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.300420 (+)	
$\log a$	2.779603		$\log s_1$	4.333566	7
a			cor. arc−sin	+	8
b			$\log s$		
$-\Delta\alpha$ (secs.)	+ 602.0				
$-\frac{\Delta\alpha}{2}$	+ 301.0				
	+ 5 01.0				
$\alpha+\frac{\Delta\alpha}{2}$	101 31 14.0				
α (1 to 2)	101 36 15.0				
$\Delta\alpha$	− 10 02.0				
	180				
α' (2 to 1)	281 26 13.0				

* Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.52 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 10′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 6 decimal places.

11—9810

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Comp. hm C.E.

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
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5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
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5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
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5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

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INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which log $\Delta\lambda_1$=log $(\lambda'-\lambda)$—correction for arc to sin*; log $\Delta\phi_1$=log $(\phi'-\phi)$—correction for arc to sin*; and log s=log s_1+ correction for arc to sin*.

NAME OF STATION

	° ′ ″	Name of station		° ′ ″
1. ϕ	41 27 44.28	Old Cock Bc.	λ	71 02 03.63
2. ϕ'	41 30 28.54	Westport Hbr W.T.	λ'	71 05 44.62
$\Delta\phi\ (=\phi'-\phi)$	+ 2 44.26		$\Delta\lambda\ (=\lambda'-\lambda)$	+ 03 40.99
$\frac{\Delta\phi}{2}$	1 22.13		$\frac{\Delta\lambda}{2}$	
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	41 29 06.41			
$\Delta\phi$ (secs.)	+ 164.26		$\Delta\lambda$ (secs.)	+ 220.99″

log $\Delta\phi$	2.215532	**log $\Delta\lambda$**	2.344373
cor. arc—sin	−	cor. arc—sin	−
log $\Delta\phi_1$		log $\Delta\lambda_1$	
log cos $\frac{\Delta\lambda}{2}$		**log cos ϕ_m**	9.874556
colog B_m	1.489262	**colog A_m**	1.490919
log$\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.704794 (−) (opposite in sign to $\Delta\phi$)	**log$\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$**	3.709848 +
		log$\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.704794 (−)
log $\Delta\lambda$	2.344373 (3 log $\Delta\lambda$)	**log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	0.005054 (−)
log sin ϕ_m	9.821137 (log F)	$\alpha+\frac{\Delta\alpha}{2}$	134 39 59.6″
log sec $\frac{\Delta\phi}{2}$	(log b)	**log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	9.851998
log a	2.165510	**log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	9.846943
a		**log s_1**	3.857850 (1)
b		cor. arc—sin	+
$-\Delta\alpha$ (**secs.**)	+ 146.4″	log s	
$-\frac{\Delta\alpha}{2}$	+ 73.2		
	+ 1 13.2		
$\alpha+\frac{\Delta\alpha}{2}$	134 39 59.6		
α (**1 to 2**)	134 41 12.8		
$\Delta\alpha$	− 2 26.4		
	180		
α' (**2 to 1**)	314 38 46.4		

* Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.52 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 10′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 6 decimal places.

11—9810

U. S. GOVERNMENT PRINTING OFFICE: 1931

Comp. McCE
Cor. [illegible]

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. April, 1931

INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1=\log(\lambda'-\lambda)$ − correction for arc to sin*; $\log\Delta\phi_1=\log(\phi'-\phi)$ − correction for arc to sin*; and $\log s=\log s_1$ + correction for arc to sin*.

NAME OF STATION

	° ′ ″	Name of station		° ′ ″
1. ϕ	41 24 51.31	Cuttyhunk L.H.	λ	70 57 00.90
2. ϕ'	41 30 28.54	Westport Hbr W.T.	λ'	71 05 44.62
$\Delta\phi\ (=\phi'-\phi)$	+ 5 37.23		$\Delta\lambda\ (=\lambda'-\lambda)$	+ 8 43.72
$\frac{\Delta\phi}{2}$	+ 2 48.62		$\frac{\Delta\lambda}{2}$	4 21.86
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	41 27 39.93			
$\Delta\phi$ (secs.)	+ 337.23		$\Delta\lambda$ (secs.)	+ 523.72″

log $\Delta\phi$	2.527926	**log $\Delta\lambda$**	2.719099
cor. arc−sin	−	cor. arc−sin	−
log $\Delta\phi_1$	2.527926	log $\Delta\lambda_1$	2.719099
log cos $\frac{\Delta\lambda}{2}$		**log cos ϕ_m**	9.874717
colog B_m	1.489260	**colog A_m**	1.490919
log$\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.017186 (−) (opposite in sign to $\Delta\phi$)	**log$\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$**	4.084735
		log$\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.017186 (−)
log $\Delta\lambda$	+ 2.719099 (3 log $\Delta\lambda$)	**log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	0.067549 (−)
log sin ϕ_m	+ 9.820931 (log F)	$\alpha+\frac{\Delta\alpha}{2}$	130 33 43.4″
log sec $\frac{\Delta\phi}{2}$	(log b)	**log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	9.880643
log a	+ 2.540030	**log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$**	9.813094
a		**log s_1**	4.204092
b		cor. arc−sin	+
−Δα (secs.)	+ 346.8″	log s	
$-\frac{\Delta\alpha}{2}$	+ 173.4		
	+ 2° 53.4″		
$\alpha+\frac{\Delta\alpha}{2}$	130 33 43.4		
α (1 to 2)	130 36 36.8		
Δα	− 5 46.8		
	180		
α′ (2 to 1)	310 30 50.0		

* Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.52 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 10′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 6 decimal places.

U. S. GOVERNMENT PRINTING OFFICE: 1931 11—9810

Corrected HOW
Comp M.C.E.
Chk M.C.E.

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. April, 1931

INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1 = \log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1 = \log(\phi'-\phi)$ − correction for arc to sin*; and $\log s = \log s_1$ + correction for arc to sin*.

NAME OF STATION

1. ϕ	41	27	44.28	Old Cock Bc	λ	71	02	03.63
2. ϕ'	41	27	10.86	Sakonnet Lt.	λ'	71	12	10.62
$\Delta\phi$ $(=\phi'-\phi)$	−	0	33.42		$\Delta\lambda$ $(=\lambda'-\lambda)$	+	10	06.99
$\frac{\Delta\phi}{2}$	−	0	16.71		$\frac{\Delta\lambda}{2}$			
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	41	27	27.57					
$\Delta\phi$ (secs.)	−		33.42		$\Delta\lambda$ (secs.)			606.99

log $\Delta\phi$	1.524006		**log** $\Delta\lambda$	2.783182	
cor. arc−sin	−		cor. arc−sin	−	
log $\Delta\phi_1$			log $\Delta\lambda_1$		
log cos $\frac{\Delta\lambda}{2}$			**log cos** ϕ_m	9.874740	
colog B_m	1.489250		**colog** A_m	1.490919	
log $\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	3.013256	(+) (opposite in sign to $\Delta\phi$)	**log** $\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	4.148841	(+)
			log $\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\}$	3.013256	(+)
log $\Delta\lambda$	2.783182	3 log $\Delta\lambda$	**log tan** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	1.135585	
log sin ϕ_m	9.820902	log F	$\alpha+\frac{\Delta\alpha}{2}$	85 45	31.5
log sec $\frac{\Delta\phi}{2}$		log b	**log sin** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.998840	
log a	2.602284		**log cos** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	8.863255	
a			**log** s_1	4.150001	
b			cor. arc−sin	+	
$-\Delta\alpha$ **(secs.)**	+ 400.2		log s		
$-\frac{\Delta\alpha}{2}$	+ 200.1				
$\alpha+\frac{\Delta\alpha}{2}$	+ 3	20.1			
α (1 to 2)	85 48	51.6			
$\Delta\alpha$	85 52	11.7			
	− 6	40.2			
	180				
α′ (2 to 1)	265 45	31.5			

*Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.52 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 10′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 6 decimal places.

11—9810

U. S. GOVERNMENT PRINTING OFFICE: 3621

comp. hcf. Corrected

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
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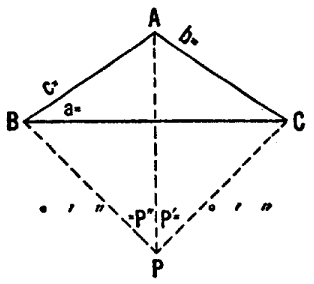
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

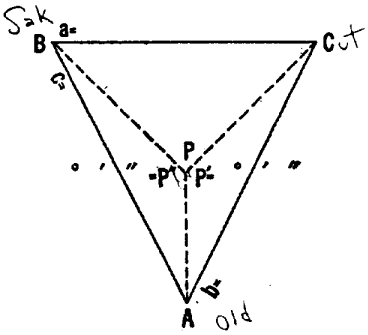
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 665
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

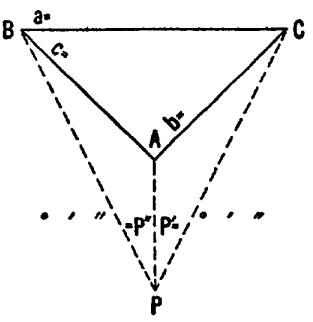
Case 1



Case 2



Case 3



P = Buoy Bug

Cases 1 and 2

P′	85	09	22.5
P″	103	23	51.5
A	138	41	24.5
Sum	327	14	24.5
½ Sum	163	37	12.2

S = 180° − ½ sum = 16 22 48

Case 3

P′
P″
Sum
A
A − sum
S = ½ (A − sum) =

Log c =	4.150001
Log sin P′ =	9.998446
Colog b =	6.054314
Colog sin P″ =	0.011976
Sum = log tan Z =	0.214737
Z =	58 37 15
Z + 45° =	103 37 15
Log cot (Z + 45°) =	9.384372
Log tan S =	9.468254
Sum = log tan ϵ =	8.852626 (sign −)
ϵ	04 04 26
S	16 22 48

(Tan ϵ+)			
S + ϵ = angle ABP	12	18	22
S − ϵ = angle ACP	20	27	14

(Tan ϵ−)
S − ϵ = angle ABP
S + ϵ = angle ACP

BPA	103	23	38	APC	85	09	22	PCB	05	10	39
ABP	12	18	22	PCA	20	27	14	CBP	3	22	20
PAB	(64	18	00)	CAP	(74	23	24)	BPC	171	27	00

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

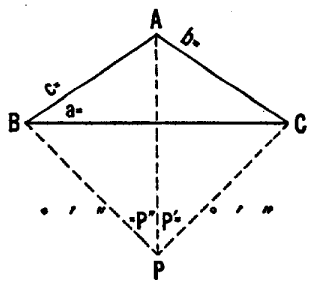
U. S. GOVERNMENT PRINTING OFFICE: 1929
11—0912

Computed by mCE

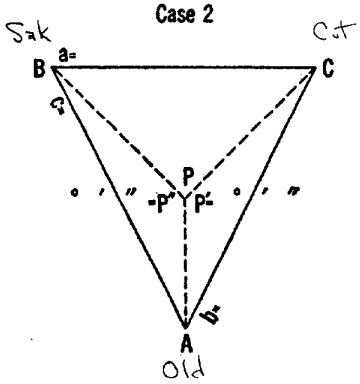
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 955
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

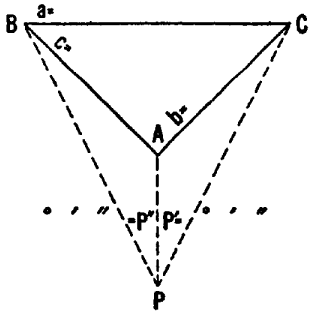
Case 1



Case 2



Case 3



P = . Buoy Cor

Old

Cases 1 and 2				Case 3			
P′	103	34	07.5	P′			
P″	93	21	37.5	P″			
A	138	41	24.5	Sum			
Sum	335	37	09.5	A			
½ Sum	167	48	34.8				
S = 180° − ½ sum =	12	11	25	S = ½ (A − sum) =			

A − sum

Log c =	4.	150001	
Log sin P′ =	9.	987706	
Colog b =	6.	054314	
Colog sin P″ =	0.	000747	
Sum = log tan Z =	0.	192768	
Z =	57	19	04
Z + 45° =	102	19	04
Log cot (Z + 45°) =	9.	339174	−
Log tan S =	9.	334514	
Sum = log tan ε =	8.	673688	(sign −)
ε	02	42	03
S	12	11	25

(Tan ε+)			
S + ε = angle ABP	09	29	22
S − ε = angle ACP	14	53	28

(Tan ε−)
S − ε = angle ABP
S + ε = angle ACP

BPA	93	21	38	APC	103	34	08	PCB	10	44	25
ABP	09	29	22	PCA	14	53	28	CBP	6	11	20
PAB	(77	09	00)	CAP	(61	32	24)	BPC	163	04	15

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

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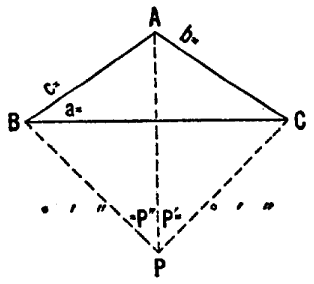
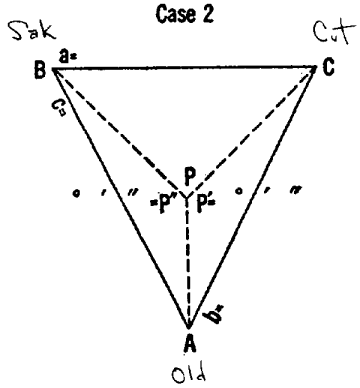
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 455
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

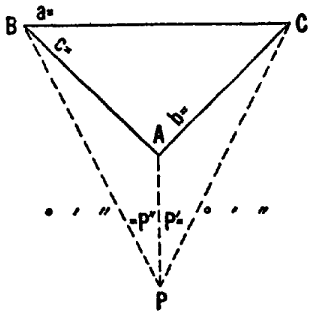
Case 1



Case 2



Case 3



Cases 1 and 2

P′	74	38	42.5
P″	107	12	30.0
A	138	41	24.5
Sum	320	32	37.0
½ Sum	160	16	18.5
S=180°−½ sum=	19	43	42

Case 3

P′			
P″			
Sum			
A			
A−sum			
S=½ (A−sum)=			

Log c =	4.	150001	
Log sin P′ =	9.	984214	
Colog b =	6.	054314	
Colog sin P″ =	0.	019890	
Sum=log tan Z=	0.	208419	
Z=	58	14	56.5
Z+45°=	103	14	56.5
Log cot (Z+45°) =	9.	371900	(−)
Log tan S=	9.	554622	
Sum=log tan ϵ=	8.	926522	(sign −)
ϵ	04	49	35
S	19	43	42

(Tan ϵ+)			
S+ϵ=angle ABP	14	54	07
S−ϵ=angle ACP	24	33	17

(Tan ϵ−)
S−ϵ=angle ABP
S+ϵ=angle ACP

BPA	107	12	30	APC	74	38	42	PCB	1	04	36
ABP	14	54	07	PCA	24	33	17	CBP	0	46	35
PAB	(57	53	23)	CAP	(80	48	01)	BPC	178	08	48

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

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11—0912

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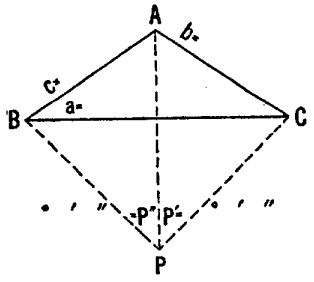
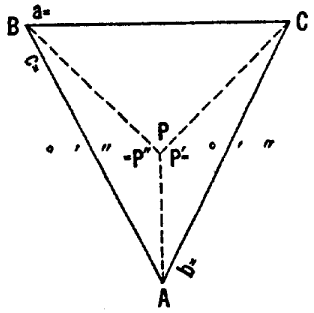
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

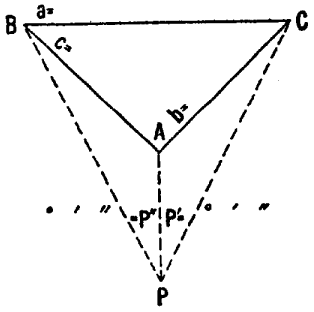
Case 1



Case 2



Case 3



Buoy Elk

Cases 1 and 2

P′
P″
A

Sum
½ Sum

S = 180° − ½ sum =

Case 3

P′	105	41	15
P″	40	05	30
Sum	145	46	45
A	172	29	34.4
A − sum	26	42	49.4
S = ½ (A − sum) =	13	21	24.7

Log c =	3.857850
Log sin P′ =	9.983514
Colog b =	6.054314
Colog sin P″ =	0.191106
Sum = log tan Z =	0.086784
Z =	50 41 13
Z + 45° =	95 41 13
Log cot (Z + 45°) =	8.998186
Log tan S =	9.375553
Sum = log tan ϵ =	8.373739 (sign −)
ϵ	1 21 16
S	13 21 25

(Tan ϵ+)
S + ϵ = angle ABP
S − ϵ = angle ACP

12 00 09
14 42 41

(Tan ϵ−)
S − ϵ = angle ABP
S + ϵ = angle ACP

BPA	40	05	30
ABP	12	00	09
PAB	127	54	21

APC	105	41	15
PCA	14	42	41
CAP	59	36	04

PCB	18	05	10
CBP	16	08	05
BPC	145	46	45

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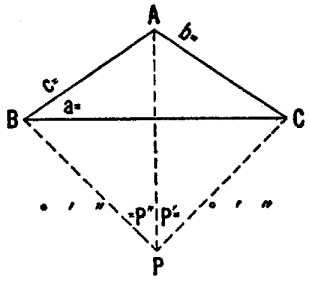
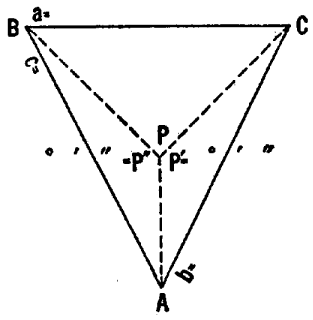
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

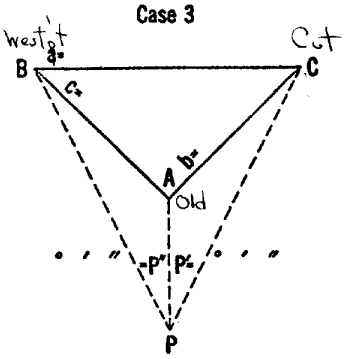
Case 1



Case 2



Case 3



P = Buoy fat

Cases 1 and 2

P′	
P″	
A	
Sum	
½ Sum	
S = 180° − ½ sum =	

Case 3

P′	87	20	15
P″	46	21	30
Sum	133	41	45
A	172	29	34.4
A − sum	38	47	49.4
S = ½ (A − sum) =	19	23	54.7

Log c =	3.857850
Log sin P′ =	9.999531
Colog b =	6.054314
Colog sin P″ =	0.140459
Sum = log tan Z =	0.052154
Z =	48 25 55
Z + 45° =	93 25 55
Log cot (Z + 45°) =	8.777937
Log tan S =	9.546701
Sum = log tan ϵ =	8.324638 (sign −)
ϵ	01 12 35
S	19 23 55

(Tan ϵ+)				(Tan ϵ−)
S + ϵ = angle ABP		18	11	20	S − ϵ = angle ABP
S − ϵ = angle ACP		20	36	30	S + ϵ = angle ACP

BPA	46	21	30	APC	87	20	15	PCB	23	58	59
ABP	18	11	20	PCA	20	36	30	CBP	23	19	16
PAB	115	27	10	CAP	72	03	15	BPC	133	41	45

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

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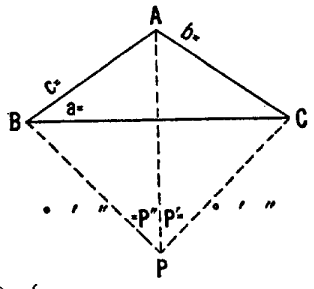
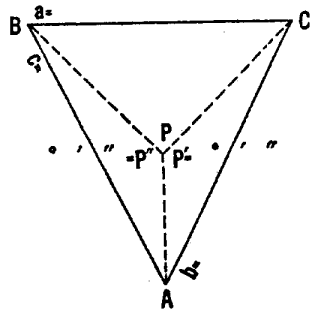
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

COMPUTATION OF THREE-POINT PROBLEM

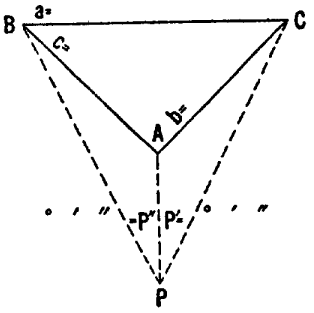
Case 1



Case 2



Case 3



Buoy Cat

Cases 1 and 2

P′
P″
A

Sum
½ Sum

S = 180° − ½ sum =

Case 3

P′	77	30	15
P″	47	50	30
Sum	125	20	45
A	172	29	34.4
A − sum	47	08	49.4
S = ½ (A − sum) =	23	34	24.7

Log c =	3.857850
Log sin P′ =	9.989589
Colog b =	6.054314
Colog sin P″ =	0.130010
Sum = log tan Z =	0.031763
Z =	47 05 36
Z + 45° =	92 05 36
Log cot (Z + 45°) =	8.562909
Log tan S =	9.639826
Sum = log tan ϵ =	8.202735 (sign −)
ϵ	0 54 49
S	23 34 25

(Tan ϵ+)		(Tan ϵ−)
S + ϵ = angle ABP	22 39 36	S − ϵ = angle ABP
S − ϵ = angle ACP	24 29 14	S + ϵ = angle ACP

BPA	47	50	30	APC	77	30	15	PCB	27	51	43
ABP	22	39	36	PCA	24	29	14	CBP	26	47	32
PAB	109	29	54	CAP	78	00	31	BPC	125	20	45

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

U. S. GOVERNMENT PRINTING OFFICE: 1929
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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Jan., 1929

COMPUTATION OF TRIANGLES

11—9121

State: _____

Do not write in this margin

	NO.	STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
		2-3						3.945686 ✓
	*	1 Bug	85 09 22 ✓					0.001554 ✓
		2 old	(74 23 24) ✓					9.983678 ✓
		3 Cut	20 27 14 ✓					9.543389 ✓
		1-3						3.930918 ✓
		1-2						3.490629 ✓
		2-3						4.150001 ✓
		1 Bug	103 23 38 ✓					0.011976 ✓
		2 Sak	12 18 22 ✓					9.328654 ✓
		3 old	(64 18 00) ✓					9.954762 ✓
		1-3						3.490631 ✓
		1-2						4.116739 ✓
	*	2-3						3.945686 ✓
		1 Cur	103 34 08 ✓					0.012294 ✓
		2 OLD	(61 32 24) ✓					9.944063 ✓
		3 CUT	14 53 28 ✓					9.409904 ✓
		1-3						3.902043 ✓
		1-2						3.367884 ✓
		2-3						4.150001 ✓
		1 Cur	93 21 38 ✓					0.000747 ✓
		2 Sak	09 29 22 ✓					9.217131 ✓
		3 Old	(77 09 00) ✓					9.988985 ✓
		1-3						3.367879 ✓
		1-2						4.139733 ✓

✓ new comp. in C&E.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Jan., 1929

COMPUTATION OF TRIANGLES

11—9121

State: _____

	NO.	STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	*	2-3						3.945686 ✓
		1 Doe	74 38 42 ✓					0.015786 ✓
		2 Old	(80 48 01) ✓					9.994377 ✓
		3 Cut	24 33 17					9.618636 ✓
		1-3						3.955849 ✓
		1-2						3.580108 ✓
		2-3						4.150001 ✓
		1 Doe	107 12 30 ✓					0.019890 ✓
		2 Oak	14 54 07 ✓					9.410213 ✓
		3 Old	(57 53 53) ✓					9.927937 ✓
		1-3						3.580104 ✓
		1-2						4.097828 ✓
	*	2-3						3.945686 ✓
		1 Elk	105 41 15 ✓					0.016486 ✓
		2 Old	(59 36 09) ✓					9.935771 ✓
		3 Cut	14 42 41 ✓					9.404749 ✓
		1-3						3.897943 ✓
		1-2						3.366921 ✓
		2-3						3.857850 ✓
		1 Elk	40 05 30 ✓					0.191106 ✓
		2 West Port	12 00 09 ✓					9.317968 ✓
		3 Old	(127 54 21) ✓					9.897089 ✓
		1-3						3.366924 ✓
		1-2						3.946045 ✓

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✓ row computed by mcg.

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U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Jan., 1929

11—9121

COMPUTATION OF TRIANGLES

State: ____________________

Do not write in this margin

NO.	STATION		OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
*	2-3							3.945686
	1	Fat	87 20 15					0.000469
	2	Old	(72 03 15)					9.978340
	3	Cut	20 36 30					9.546515
	1-3							3.924495
	1-2							3.492670
	2-3							3.857850
	1	Fat	46 21 30					0.140459
	2	Westport	18 11 20					9.494364
	3	OlD	(115 27 10)					9.955659
	1-3							3.492673
	1-2							3.953968
*	2-3							3.945686
	1	Gat	77 30 15					0.010412
	2	Old	(78 00 31)					9.990418
	3	Cut	24 29 14					9.617514
	1-3							3.946516
	1-2							3.573612
	2-3							3.857850
	1	Gat	47 50 30					0.130010
	2	Westport	22 39 36					9.585756
	3	Old	(109 29 54)					9.974351
	1-3							3.573616
	1-2							3.962211

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47
2d ∠	&	+ 61	32	24
α	2 to 1	08	43	11
Δα		−		10
		180	00	00.0
α′	1 to 2	188	43	01

		°	′	″
α	3 Cuttyhunk to 2 Old Cock	127	14	08
3d ∠	&	− 14	53	28
α	3 to 1	112	20	40
Δα		−	3	30
		180	00	00.0
α′	1 to 3	292	17	10

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	44.28	2 Old Cock	λ	71	02	03.63
Δφ	−	1	14.74	ship at	Δλ			15.23
φ′	41	26	29.54	1 Buoy Cur	λ′	71	02	18.86

	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ	+	1	38.23	ship at	Δλ	+	5	17.96
φ′	41	26	29.54	1 Buoy Cur	λ′	71	02	18.86

	Logarithms	Values in seconds
s	3.367884	26′ + 911.33
Cos α	9.994951	30″ − 14.19
B	8.510740	
h	1.873575	1st term + 74.744
s²	67357	
Sin² α	8.3614	
C	1.3506	
	6.4477	2d term + 0.000
h²	3747	
D	2.389	
	6.136	3d term + 0.000
		−Δφ 74.744

	°	′	″
½(φ+φ′)	41	27	06.9

	Logarithms	Values in seconds
s	3.367884	+ 437.83
Sin α	9.180702	30″ [258.62]
A′	8.509082	
Sec φ′	0.125153	
Δλ	1.182821	+ 15.234
Sin ½(φ+φ′)	9.820952	
−Δα	1.003673	10.08

	Logarithms	Values in seconds
s	3.902043	
Cos α	9.579982	
B	8.510745	
h	1.992770	1st term 98.349
s²	7.8041	
Sin² α	9.9322	
C	1.3498	
	9.0861	2d term + 0.122
h²	3985	
D	2.389	
	6.374	3d term + 0.000
		−Δφ 98.227

	°	′	″
½(φ+φ′)	41	25	40.4

	Logarithms	Values in seconds
s	3.902043	
Sin α	9.966102	
A′	8.509082	
Sec φ′	0.125153	
Δλ	2.502380	317.964
Sin ½(φ+φ′)	9.820645	
−Δα	2.323025	210.39

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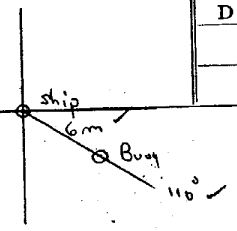
Latitude
911.33
− 2.05
909.28
5,000
Scale = 1818.56

Departure
437.83
− 5.64
432.19
864.38



check lat. Dep.
− 14.19 − 258.62
− 2.05 − 5.64
− 1.624 − 264.26
− 32.48 − 528.52

computed by M.C.F.

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Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47
2d ∠	&	+ 59	36	04
α	2 to 1	06	46	51
Δα				
		180	00	00.0
α′	1 to 2	105	41	15

		°	′	″
α	3 Cuttyhunk to 2 Old Cock	127	14	08
3d ∠	&	- 14	42	41
α	3 to 1	112	31	27
Δα				
		180	00	00.0
α′	1 to 3			

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	44.28	2 Old Cock	λ	71	02	03.63
Δφ	-	1	14.92	ship at	Δλ		1	11.84
φ′	41	26	29.36	1 Buoy Elk	λ′	71	02	15.47

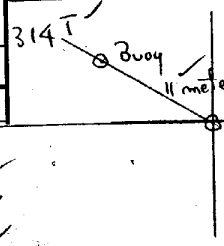
	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ		1	38.05	ship at	Δλ		5	14.57
φ′	41	26	29.36	1 Buoy Elk	λ′	71	02	15.47

	Logarithms
s	3.366921
Cos α	9.996952
B	8.510740
h	1.874613
s²	67338
Sin²α	8.1443
C	1.3506
	6.2287
h²	3749
D	2.389
	6.138

Values in seconds	
41-26	905.78 ✓
41-26-30″	-[19.74] ✓
1st term	74.922
2d term	+0.000
3d term	+0.000
-Δφ	74.922

	°	′	″
½(φ+φ′)	41	27	06.8

	Logarithms	Values in seconds
s	3.366921	71-02 +359.14 ✓
Sin α	9.072146	+
A′	8.509082	71-02-30″ -[337.32]
Sec φ′	0.125152	
Δλ	1.073301	11.8″.39
Sin ½(φ+φ′)		
-Δα		



	Logarithms
s	3.897943
Cos α	9.583282
B	8.510745
h	1.991970
s²	7.7959
Sin²α	9.9311
C	1.3498
	9.0768
h²	3.983.
D	2.368
	6.351

Values in seconds	
1st term	-98.″168
2d term	+0.119
3d term	+0.000
-Δφ	98.049

	°	′	″
½(φ+φ′)	41	25	40.3

	Logarithms	Values in seconds
s	3.897943	
Sin α	9.965539	+
A′	8.509082	
Sec φ′	0.125152	
Δλ	2.497716	314.57″
Sin ½(φ+φ′)		
-Δα		

11—9362 U. S. GOVERNMENT PRINTING OFFICE, 1929

computed by MCE

Latitude	Departure
905.78 ✓	359.14 ✓
+ 7.64 ✓	+ 7.91 ✓
913.42 ✓	367.05 ✓
5000 Scale = 1826.84	734.10 ✓

check

Lat	Dep
- 19.74 ✓	- 337.32 ✓
+ 7.64 ✓	+ 7.91 ✓
- 12.10 ✓	- 329.41 ✓
- 24.20 ✓	- 658.82 ✓

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47
2d∠	&	+ 78	00	31
α	2 to 1	25	11	18
Δα				
		180	00	00.0
α′	1 to 2	77	30	15

		°	′	″
α	3 Cuttyhunk to 2 Old Cock	127	14	08
3d∠	&	− 24	29	14
α	3 to 1	102	44	54
Δα				
		180	00	00.0
α′	1 to 3			

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	44.28	2 Old Cock	λ	71	02	03.63
Δφ	−	1	49.90	ship at	Δλ		1	08.67
φ′	41	25	54.38	1 Buoy Cat	λ′	71	03	12.30

	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ	+	1	03.08	ship at	Δλ		6	11.40
φ′	41	25	54.39	1 Buoy Cat	λ′	71	03	12.30

	Logarithms	Values in seconds
s	3.573612	25 + 752.13
Cos α	9.956607	26′ − [73.38]
B	8.510740	
h	2.040959	1st term + 109.890
s²	7.1472	
Sin²α	9.2579	
C	1.3506	
	7.7557	2d term + 0.006
h²	4 081	
D	2.389	
	6.470	3d term + 0.000
		−Δφ 109.896

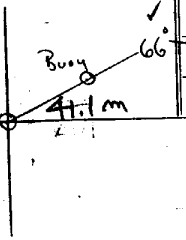
	°	′	″
½(φ+φ′)	41	26	49.3

	Logarithms	Values in seconds
s	3.573612	71 − 03 + 285.58
Sin α	9.628997	+
A′	8.509082	71 − 03 − 30 − [410.95]
Sec φ′	0.125087	
Δλ	1.836778	68.672
Sin ½(φ+φ′)		
−Δα		

	Logarithms	Values in seconds
s	3946516	
Cos α	9.343742	−
B	8.510745	
h	1.801003	1st term − 63.242
s²	7.8930	
Sin²α	9.9783	
C	1.3498	
	9.2211	2d term + 0.166
h²	3.602	
D	2.368	
	5.970	3d term + 0.000
		−Δφ 63.076

	°	′	″
½(φ+φ′)	41	25	22.8

	Logarithms	Values in seconds
s	3946516	
Sin α	9989160	+
A′	8.509082	
Sec φ′	0.125087	
Δλ	2.569845	371.40
Sin ½(φ+φ′)		
−Δα		



latitude
752.13
+ 16.72
768.85
Scale 1537.70

Departure
285.58
− 37.55
248.03
+ 496.06

Check Lat
− 173.38
+ 16.72
− 156.66
− 313.32

Dep
− 410.95
− 37.55
− 448.50
− 897.00

11—0362 U. S. GOVERNMENT PRINTING OFFICE

computed by MCE

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″			°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47	α	3 Cuttyhunk to 2 Old Cock	127	14	08
2d ∠	&	+ 72	03	15	3d ∠	&	− 20	36	30
α	2 to 1	19	14	02	α	3 to 1	106	37	38
Δα					Δα				
		180	00	00.0			180	00	00.0
α′	1 to 2	87	28	15	α′	1 to 3			

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	44.28	2 Old Cock	λ	71	02	03.63
Δφ	−	1	35.16	ship at	Δλ	+		44.12
φ′	41	26	09.12	1 Buoy fet	λ′	71	02	47.75

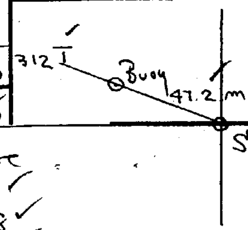
	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ	+	1	17.81	ship at	Δλ	+	5	46.85
φ′	41	26	09.12	1 Buoy fet	λ′	71	02	47.75

	Logarithms		Values in seconds
s	3.492670		41 26 + 281.35
Cos α	9.975056		41° 26′
B	8.510740		41-26-30″ [644.16]
h	1.978466	1st term	+95.163
s^2	6.9853		
$Sin^2α$	9.0355		
C	1.3506		
	7.3814	2d term	+0.002
h^2	3.947		
D	2.389		
	6.336	3d term	+0.000
		−Δφ	95.165

	Logarithms	Values in seconds
½(φ+φ′)		
s	3.492670	02 38 + 412.11
Sin α	9.517757 +	
A′	8.509082	
Sec φ′	0.125114	71-03 [284.52]
Δλ	1.644623	44.119
Sin ½(φ+φ′)		
−Δα		

	Logarithms		Values in seconds
s	3.924495		
Cos α	9.456564 −		
B	8.510745		
h	1.891824	1st term	−77.951
s^2	7.8489		
$Sin^2α$	9.9628		
C	1.3498		
	9.1615	2d term	+0.145
h^2	3.783		
D	2.368		
	6.151	3d term	+0.000
		−Δφ	77.806

	Logarithms	Values in seconds
½(φ+φ′)		
s	3.924495	
Sin α	9.981450 +	
A′	8.509082	
Sec φ′	0.125114	
Δλ	2.540141	346.850
Sin ½(φ+φ′)		
−Δα		



11—0362 U. S. GOVERNMENT PRINTING OFFICE: 1929

Latitude	Departure
281.35	412.11
+ 31.58	+ 35.08
312.93	447.19
5000 Scale 625.86	+ 894.38

check

Lat	Dep
− 644.16	− 284.52
+ 31.58	+ 35.08
612.58	249.44
− 1225.16	− 498.88

Computed by M.C.E.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47
2d ∠	&	+ 80	48	01
α	2 to 1	27	58	48
Δα		−		51
		180	00	00.0
α′	1 to 2	207	57	57
		74	38	42

		°	′	″
α	3 Cuttyhunk to 2 Old Cock	127	14	08
3d ∠	&	− 24	33	17
α	3 to 1	102	40	51
Δα		−	4	11
		180	00	00.0
α′	1 to 3	282	36	40

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	44.28	2 Old Cock	λ	71	02	03.63
Δφ	−	1	48.87	ship at	Δλ	+	1	16.84
φ′	41	25	55.41	1 Buoy Doe	λ′	71	03	20.47

	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ	+	1	04.10	ship at	Δλ	+	6	19.57
φ′	41	25	55.41	1 Buoy Doe	λ′	71	03	20.47

	Logarithms	Values in seconds
s	3.580108	30″ + 783.91
Cos α	9.946016	26′ − [141.60]
B	8.510740	
h	2.036864	1st term +108.859
s²	7.1602	
Sin²α	9.3426	
C	1.3506	
	7.8534	2d term +0.007
h²	4073	
D	2.389	
	6.462	3d term +0.000
		−Δφ 108.866

	°	′	″
½(φ+φ′)	41	26	49.8

	Logarithms	Values in seconds
s	3.580108	03′ + 475.31
Sin α	9.671324	
A′	8.509082	30″ − 221.27
Sec φ′	0.125088	
Δλ	1.885602	+76.842
Sin ½(φ+φ′)	9.820812	
−Δα	1.706414	50.86

	Logarithms	Values in seconds
s	3.955849	
Cos α	9.341474	
B	8.510745	
h	1.808068	1st term −64.279
s²	7.9117	
Sin²α	9.9785	
C	1.3498	
	9.2400	2d term +0.174
h²	3.616	
D	2.368	
	5.984	3d term +0.000
		−Δφ 64.105

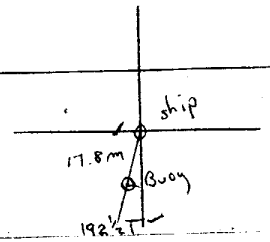
	°	′	″
½(φ+φ′)	41	25	23.4

	Logarithms	Values in seconds
s	3.955849	
Sin α	9.989275	
A′	8.509082	
Sec φ′	0.125088	
Δλ	2.579294	379.572
Sin ½(φ+φ′)	9.820609	
−Δα	2.399898	251.13

11—9362 U. S. GOVERNMENT PRINTING OFFICE: 1929

Buoy Doe
Latitude
783.91
− 17.37
766.54
Scale 1533.08

Departure
475.31
+ 3.85
479.16
958.32



Check latitude
26′ − 141.60
− 17.37
− 158.97
−317.94

Departure
30″ −221.27
+ 3.85
− 217.42
−434.89

computed by
mcc.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 37
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Old Cock to 3 Cuttyhunk	307	10	47
2d∠	&	+ 74	23	24
α	2 to 1	21	34	11
Δα		−		32
		180	00	00.0
α′	1 to 2	201	33	39
		85	09	22

		°	′	″
α	3 Cuttyhunk to 2 Old Cock	127	14	08
3d∠	&	− 20	27	14
α	3 to 1	106	46	54
Δα		−	3	53
		180	00	00.0
α′	1 to 3	286	43	01

First Angle of Triangle

	°	′	″			°	′	″
φ	41	27	49.28	2 Old Cock	λ	71	02	03.63
Δφ	−	1	33.29	ship at	Δλ	+		49.00
φ′	41	26	10.99	1 Buoy Bug	λ′	71	02	52.63

	°	′	″			°	′	″
φ	41	24	51.31	3 Cuttyhunk	λ	70	57	00.90
Δφ	+	1	19.68	ship at	Δλ	+	5	51.73
φ′	41	26	10.99	1 Buoy Bug	λ′	71	02	52.63

	Logarithms	Values in seconds
s	3.490629	26′ + 339.05
Cos α	9.968469	+
B	8.510740	30″ − 586.47
h	1.969838	1st term + 93.291
s²	6.9812	
Sin²α	9.1308	
C	1.3506	
	7.4626	2d term + 0.003
h²	3.939	
D	2.389	
	6.328	3d term + 0.000
		−Δφ 93294

	°	′	″	Logarithms	Values in seconds
½(φ+φ′)	41	26	57.6		
s				3.490629	30″ + 525.47
Sin α				9.565415	
A′				8.509082	
Sec φ′				0.125118	23 − 171.10
Δλ				1.690244	49.005
Sin½(φ+φ′)				9.820831	
−Δα				1.510075	32.3

	Logarithms	Values in seconds
s	3.930918	
Cos α	9.460485	−
B	8.510745	
h	1.902148	1st term − 79.827
s²	7.8618	
Sin²α	9.9621	
C	1.3498	
	9.1737	2d term + 0.149
h²	3.804	
D	2.389	
	6.193	3d term + 0.000
		−Δφ 79.678

	°	′	″	Logarithms	Values in seconds
½(φ+φ′)	41	25	31.2		
s				3.930918	
Sin α				9.981099	+
A′				8.509082	
Sec φ′				0.125118	
Δλ				2.546217	+ 351.73
Sin½(φ+φ′)				9.820624	
−Δα				2.366841	232.7

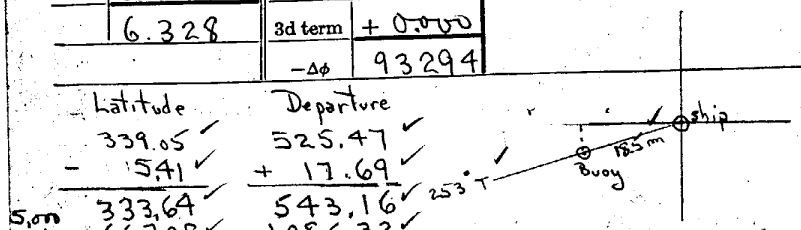
11—9363 U. S. GOVERNMENT PRINTING OFFICE: 1929

Latitude
339.05
− 541
333.64

Departure
525.47
+ 17.69
543.16

5,000 Scale = 66728

1085.32



Check Lat.
− 586.47
− 5.41
591.88
−1183.76

Dep.
−171.10
+ 17.69
153.41
−306.82

computed by M. C. E.

30

TIDAL DATA H6528

Reduction of Soundings

Hourly Heights Furnished - Director's Letter 30-FLM January 10, 1940.

A-Day

Reduction in Feet	Equivalent Reduction	Time
2	2.25 - 1.75	12:00 -- 12:14
1½	1.75 - 1.25	12:14 -- 12:46
1	1.25 - 0.75	12:46 -- 13:46
½	0.75 - 0.25	13:46 -- 15:00
0	0.25 - 0.00	----------

B-Day

Reduction in Feet	Equivalent Reduction	Time
4	4.00 - 3.75	10:00 -- 10:38
3½	3.75 - 3.25	10:38 -- 11:17
3	3.25 - 2.75	11:17 -- 11:47
2½	2.75 - 2.25	11:47 -- 12:12
2	2.25 - 1.75	12:12 -- 12:38
1½	1.75 - 1.25	12:38 -- 13:03
1	1.25 - 0.75	13:03 -- 13:36
½	0.75 - 0.25	13:36 -- 15:00
0	0.25 - 0.00	----------

Table 1

Fathometer Corrections--Special Sheet

0-60 Feet

The Dorsey Fathometer Calibrated for 820 Fathoms (1499.6 meters) per second

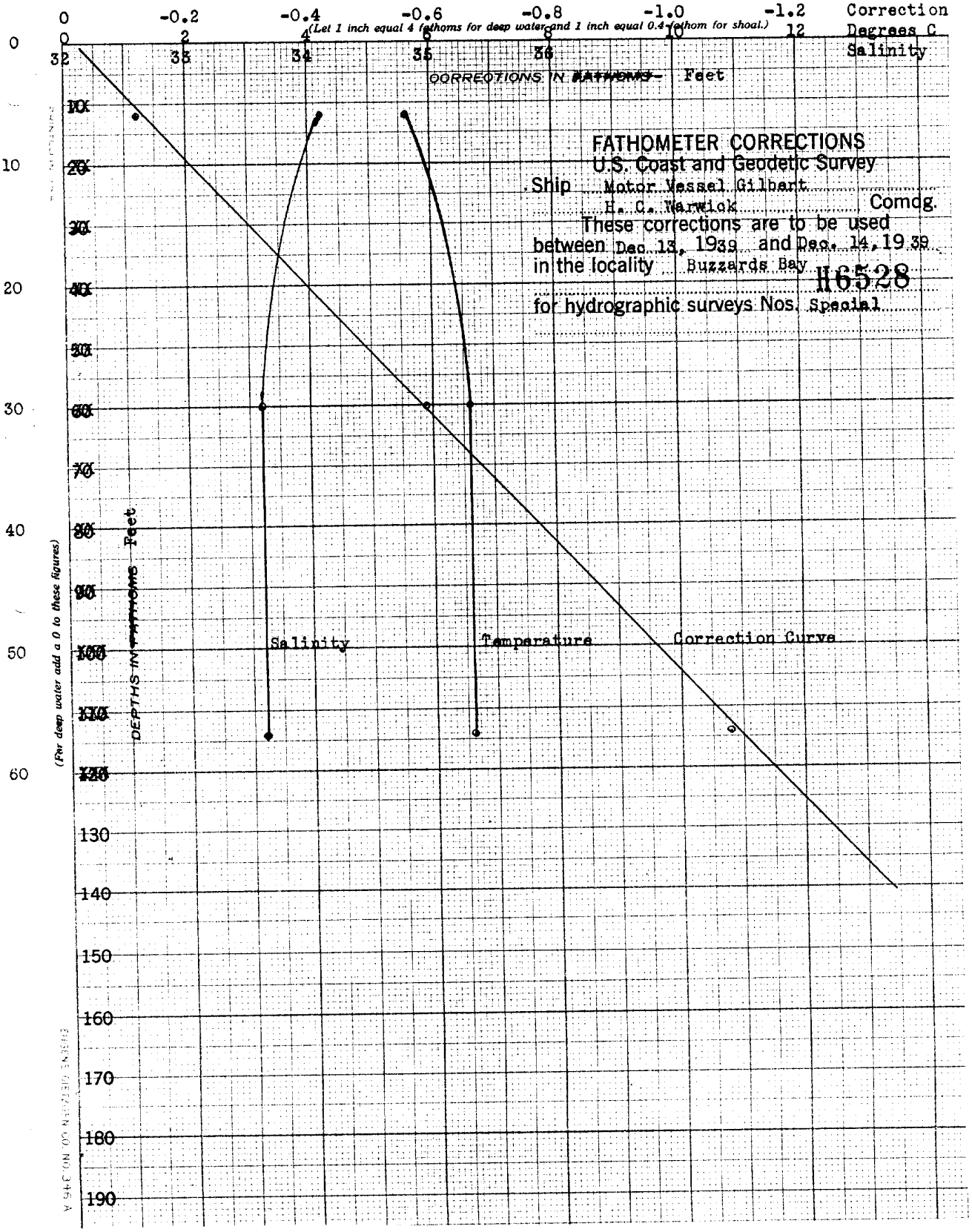
1	2	3	4	5	6	7
Depths in Feet	Temperature °C	Mean Temperature	Salinity pp/1000	Mean Salinity	Factor	Correction in feet
6	5.6		34.1		-0.0207	-0.12
30	6.6	6.1	33.6	33.8	-0.0196	-0.59
57	6.6	6.3	33.6	33.8	-0.0191	-1.08

Table 2

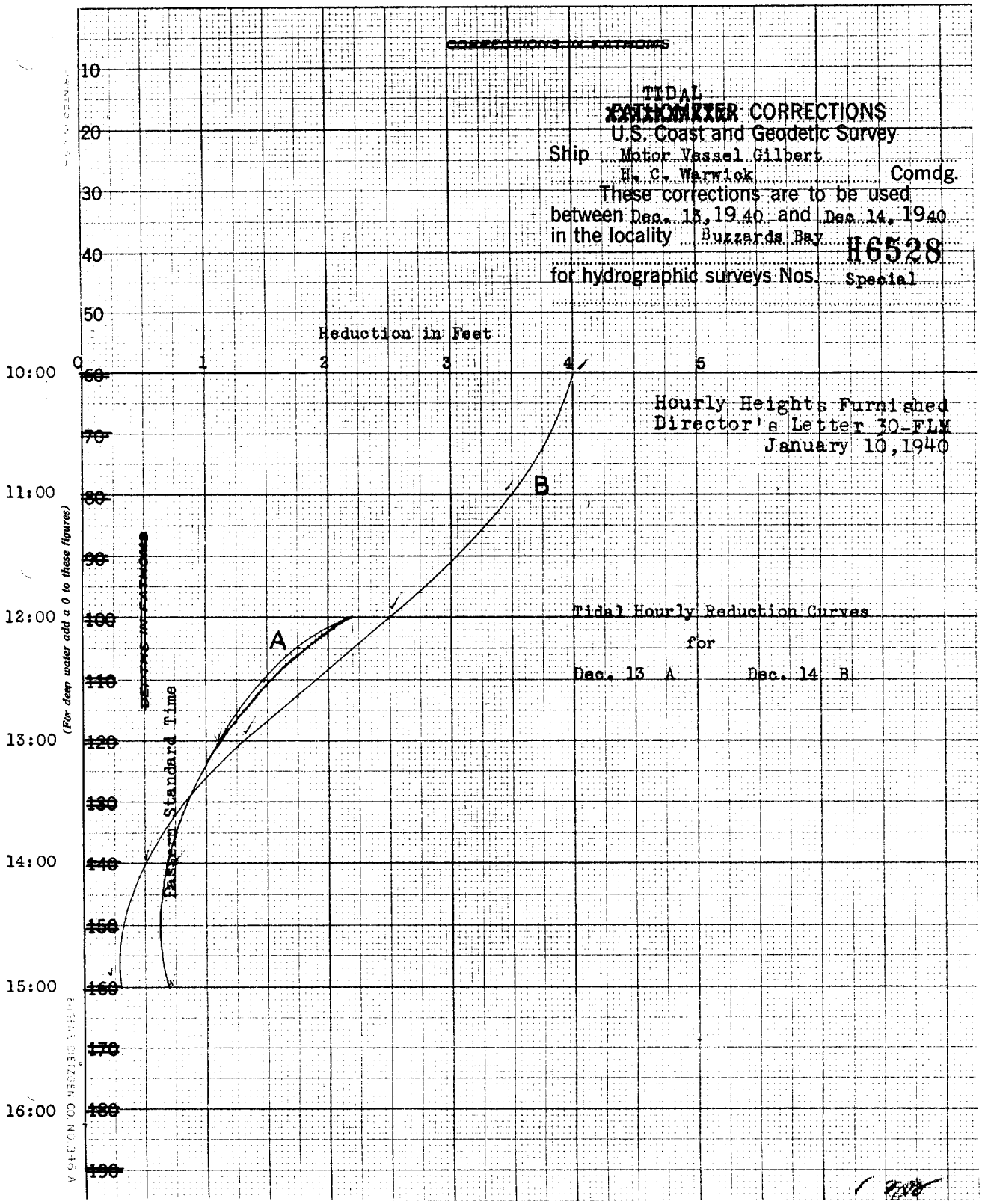
Fathometer Corrections

0-60 Feet

Depth Range in feet	Corrections (in Feet) (Temperature & Salinity)
0--10	0.0
10--36	-0.5
36--63	-1.0


0 -0.2 -0.4 -0.6 -0.8 -1.0 -1.2 Correction
(Let 1 inch equal 4 fathoms for deep water and 1 inch equal 0.4 fathom for shoal.)
0 2 4 6 8 10 12 Degrees C
32 33 34 35 36 Salinity
CORRECTIONS IN FATHOMS — Feet
FATHOMETER CORRECTIONS
U.S. Coast and Geodetic Survey
Ship Motor Vessel Gilbert
H. C. Warwick Comdg.
These corrections are to be used
between Dec. 13, 1939 and Dec. 14, 1939
in the locality Buzzards Bay
H6528
for hydrographic surveys Nos. Special
DEPTHS IN FATHOMS Feet
(For deep water add a 0 to these figures)
Salinity
Temperature
Correction Curve
0 10 20 30 40 50 60
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190

(Let 1 inch equal 4 fathoms for deep water and 1 inch equal 0.4 fathom for shoal.)



TIDAL ~~FATHOMETER~~ CORRECTIONS

U.S. Coast and Geodetic Survey

Ship Motor Vessel Gilbert

H. C. Warwick Comdg.

These corrections are to be used

between Dec. 13, 1940 and Dec. 14, 1940

in the locality Buzzards Bay H6528

for hydrographic surveys Nos. Special

Hourly Heights Furnished
Director's Letter 30-FLM
January 10, 1940

Tidal Hourly Reduction Curves
for
Dec. 13 A Dec. 14 B

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form No. 717
Rev. Dec. 1938

SHEET No. Special 16528

RECORD OF TEMPERATURES, SALINITIES, AND THEORETICAL VELOCITIES

Ship or party Motor Vessel Gilbert, H. C. Warwick, Chief of party. Dec. 13, 19 39
Locality Entrance to Buzzards Bay Project Survey No.

Date 1939	Time 75th mer. h.	m.	Latitude and longitude	* Depth	Temp. at Depth Obs. °C	Temp. at Depth Cor. °C	Specific Gravity Obs.	Specific Gravity Cor.	At Temp. Obs. °C	At Temp. Cor. °C	† Salinity	Velocity at temp. M./Sec.	Corrections Sal. M./Sec.	Corrections Pres. M./Sec.	Velocity (theoretical) M./Sec.	Therm. No. 29	Hydro. No.	Remarks (weather, bottom, etc.)
	12	16	41 26 00	1	5.6		1.0266		5.9		34.1	1469.5	-0.9	0.0	1468.6	nbs 60631	T578	Deep Sea Therm. # 360430
			71 02 30	5	6.6		1.0262		6.4		33.6	1473.5	-1.5	0.2	1472.2	"	"	"
	12	21		9 3	6.6		1.0262		6.4		33.6	1473.5	-1.5	0.3	1472.3	"	"	Bottom

* If depth recorded is bottom indicate thus: 965 B
† Express in parts /1000. If by titration indicate thus: 34.15 T

U. S. GOVERNMENT PRINTING OFFICE 11—11506

Form 712
DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
Rev. June 1937

TIDE NOTE FOR HYDROGRAPHIC SHEET

January 25, 1940

Division of Hydrography and Topography:

✓ Division of Charts: Attention: Mr. H. R.Edmonston

Plane of reference approved in
1 volumes of sounding records for

HYDROGRAPHIC SHEET 6528

Locality Entrance to Buzzards Bay

Chief of Party: H. C. Warwick in 1939
Plane of reference is mean low water reading
1.3 ft. on tide staff at Newport (Naval Training Station), R. I.
36.0 ft. below B. M. 1

Height of mean high water above plane of reference is 3.5 feet.

Condition of records satisfactory except as noted below:

Chief, Division of Tides and Currents.

U. S. GOVERNMENT PRINTING OFFICE 154327

GEOGRAPHIC NAMES

Survey No. 6528

Name on Survey	On Chart No. 1210 A,	On previous survey No. B,	On U. S. quadrangle Maps C,	From local information D	On local Maps E	P. O. Guide or Map F	Rand McNally Atlas G	U. S. Light List H	K	
Buzzards Bay	✓									1
Hen and Chickens Shoal	✓									2
										3
										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25
										26
										27

Names underlined in red approved

by RHE on 3/26/40

M 234

	Remarks.	Decisions
1		
2		
3		
4		
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9		
10		
11		
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19		
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22		
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26		
27		
M 234		

Field Records Section (Charts)

HYDROGRAPHIC SHEET NO. H6528

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

Number of positions on sheet	127
Number of positions checked	5
Number of positions revised	0
Number of soundings recorded	1127
Number of soundings revised	13
Number of soundings erroneously spaced	0
Number of signals erroneously plotted or transferred	0

Date: Jan. 27, 1940.

Verification by } J.A. McCormick Time: 6 hr.

Review by } J.A. McCormick Time: 6 hr.

2629

HYDROGRAPHIC SURVEY NO. 6528

Smooth Sheet Yes

Boat Sheet Yes

Records; Sounding 1 Vols., Wire Drag ___ Vols., Bomb ___ Vols.

Descriptive Report Yes

Title Sheet Yes

List of Signals No

Landmarks for Charts (Form 567) No

Statistics Yes

Approved by Chief of Party Yes

Recoverable Station Cards (Form 524) No

Special Chart for Lighthouse Service Yes
(Circular Nov.30, 1933)

Hydrography: Total Days 2 ; Last Date Dec. 14, 1939

Remarks

2776

FORM M-238

MEMORANDUM

IMMEDIATE ATTENTION

SURVEY
DESCRIPTIVE REPORT
PHOTOSTAT OF

No. H 6528

~~No.~~

received
registered
verified
reviewed
approved

This is forwarded in order that your attention may be directed to the matters as indicated below. Please initial in column 3 as an acknowledgement that your attention has been thus directed. The complete original records are available if desired. If you cannot give this your immediate attention, please initial, note, and forward to the next section marked, calling for the records at your convenience.

ROUTE		Initial	Attention called to
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H 6528

DEPARTMENT OF COMMERCE

OFFICE OF THE DIRECTOR

U. S. COAST AND GEODETIC SURVEY

WASHINGTON

January 31, 1940.

Memorandum for Chief, Division of Charts:

In order to provide a more complete record concerning the 17-foot shoal found with the wire drag in the entrance to Buzzards Bay in 1914, in which the Coast Guard is now interested, and for consideration with respect to the need for additional drag work in this area, the following statement is furnished:

In 1914 I was in charge of a wire drag party operating in the entrance to Buzzards Bay. Some time before the work reached the area where the 17-foot shoal was found, I was informed by this office that a steamer had struck in this vicinity. The draft of this vessel, the stage of tide and and damage sustained indicated that the depth on the obstruction was less than 19 feet.

When the drag grounded on this shoal, careful sounding for probably a half-hour or more showed a least depth of about 22 feet. Normally the procedure would have been to drag over the shoal again with a drag set at a little less than the depth found, probably about 20 feet. Our previous information, however, indicated that we had not found the least depth and accordingly the dragmaster in charge of the sounding tender, an experienced man who had noted shore ranges when first sounding on the shoal, took advantage of several opportunities when we were working near-by to place the tender on the site of the shoal and to obtain additional soundings. Several days later he recorded the sounding which reduced to 17 feet. I had no doubt as to the accuracy of this sounding, both because of the reliability and experience of the dragmaster and the evidence furnished by the accident.

Although the location of this shoal was known within narrow limits, careful sounding for periods which probably totaled two or three hours was necessary before the least depth was found, indicating that this depth is on an obstruction of very small extent, probably a pinnacle or sharp boulder. General depths on the shoal of course would be greater as shown by the recent survey.

J.H.Hawley

DIVISION OF CHARTS

Section of Field Records

REVIEW OF HYDROGRAPHIC SURVEY NO. 6528 (1939) FIELD NO.

Massachusetts, Buzzards Bay, South of Hen and Chicken Shoal.
Surveyed in Dec., 1939, Scale 1:5,000.
Instructions dated Dec. 7, 1939 (GILBERT)

Soundings: Dorsey Fathometer.

Control: 3 Point fixes on buoys.

Chief of Party - H. C. Warwick
Surveyed by - H. C. Warwick
Protracted by - M. C. Enstine
Soundings plotted by - M. C. Enstine
Verified and inked by - J. A. McCormick
Reviewed by - J. A. McCormick, January 27, 1940.
Inspected by - H. R. Edmonston

1. Shoreline and Signals.

Shoreline is outside the limits of the smooth sheet. Buoy signals were located by three-point fixes on shore signals. Position computations are attached to the descriptive report.

2. Depth Curves.

Satisfactory.

3. Sounding Line Crossings.

Crossings are much better than ordinarily would be expected from buoy control on a scale of 1:5,000.

4. Junctions with Contemporary Surveys.

The present survey is a detached investigation of a shoal area. There are no contemporary surveys adjoining nor are any contemplated.

5. Comparison with Prior Surveys.

a. H-154 (1844), 1:20,000; H-1788 (1887), 1:40,000.

Depths on the old surveys are in fair to poor agreement with those on the present survey. Neither of the old surveys shows less than 31 feet in the immediate vicinity of the shoal spot developed on the present survey.

b. H-3668 (1914) W.D., 1:20,000.

Specific instructions for the present survey called for recovery if possible of the position of the 17 foot rock (charted) in lat. 41°25.97', long. 71°02.39' on the above survey in order to furnish the U. S. Coast Guard with accurate hydrographic information for use in considering the feasibility of constructing a lighthouse on this spot. Least depth found on the present survey near the position of the 17 was 23 feet but a small, rocky shoal with least depth of 20 feet was found 150 meters to the south.

17 ft. found on 20 ft. spot by F.E. #4 of 1944.

Investigation of the records for H-3668 shows that on July 29, 1914 the drag grounded with an effective depth of 26-1/2 feet and a sounding of 22 feet (reduced) was obtained on a boulder. Several days later, when weather prevented dragging, the tender obtained a sounding of 17 feet (reduced). No fix was recorded, the 17 simply being noted as on the same rock as the 22. This then leaves the position of the charted 17 slightly open to question but it and two other drag soundings of 27 and 29 feet have been carried forward to the present survey as shown on H-3668 in the absence of more definite information. The 17 was cleared on H-3668 with an effective depth of 16 feet.

Position of 17 cleared with 21 ft. on F.E. #4. Disregard 17 on H-3868. Chart 17 obtained on FE #4.

There are no conflicts between effective drag depths on H-3668 and soundings on the present survey.

6. Comparison with Chart 237 (New Print of July 13, 1938). Chart 1210(New Print of Dec. 14, 1939).

a. Hydrography.

Hydrography charted in the area covered by the present survey is from surveys discussed in the foregoing paragraphs.

b. Aids to Navigation.

The whistle buoy marking the investigated shoal is charted about 100 meters northwest of the position obtained on the survey.

7. Condition of Survey.

Satisfactory.

8. Compliance with Instructions for the Project.

See par. 5b and note that all soundings on the present survey result from regular development with Dorsey Fathometer.

9. Additional Field Work Recommended.

Should more definite information be desired concerning this shoal than that now available the area should be re-examined with a wire drag.

Examined & Approved:

Thos B Reed
T. B. Reed,
Chief, Section of Field Records.

K. T. Adams
Chief, Division of Charts.

Fred. L. Peacock
Chief, Section of Field Work.

G Rude
Chief, Division of H. & T.

Applied to Chart 237 4/24/40 Chas R Burch Jr

Applied to Chart 70 7/2/40 F Amesbury

Appld to Chart 1210 Records 9/29/61 M. Rogers