2504

Diag Cht. No. 5530-3

U. S. COAST AND GEODETIC SURVEY.

O. H. Tittmann, Superintendent.

State: Cal.

DESCRIPTIVE REPORT.

Hydrographic Sheet No. 2504

LOCALITY:

San Francisco Bar

1900.

CHIEF OF PARTY:

Ferdinand Westdahl

2504

Descriptive Report

to accompany hydrographic sheet entitled

Treasury Department

U. S. Coast and Geodetic Survey

O. H. Tittmann Superintendent

San Francisco Bar

California

Ferdinand Westdahl, Assistant, Chief of Party

Steamer W. C. Arthur

March 26 to July 12

1900

Scale 1/20,000

This is a re-survey of San Francisco Bar covering practically the same area as the one executed by Assistant Gresham Bradford in 1873, except that the inner limit of this survey is a line drawn from Franks Lagoon Point to the Seal Rocks. The area to the eastward of this line, which includes the South Channel and the Golden Gate, had been surveyed recently by a party under Lieut. Sears, U. S. N.

The changes developed in the bar from the survey of 1873 are very slight. It seems to have deepened on the Southern part, and to have moved slightly nearer the heads in the main channel. The lumps found on the Southern crest of the bar in the former survey seem to have disappeared or flattened out.

The pilots are of the opinion that these lumps form during the more unvarying winds and seas of the summer season and wash away during the stronger outflow caused by freshets in winter seasons. I am inclined to believe this is true. The former survey was made mainly in October and November, while this was done in April, May and June. It is not surprising that such changes should take place as the movement of the sand along the bottom on the bar must be tremendous. I am informed by pilots and shipmasters that vessels compelled to anchor on the bar generally loose their anchors from being imbedded in the quicksand: if the bottom happens to be hard and they recover their anchor they find both anchor and chain in a polished state from the scouring sand.

In smooth weather the bar may be crossed anywhere by vessels of ordinary draft, from twelve to twenty-four feet, except over the Four-fathom Bank at or near low water. In rough weather and moderately large swell there are three channels available for large and deep-laden ships, named respectively the Main, the North or Bonita, and the South Channels. When the bar is breaking there is but one channel available for large ships, the North Channel, and local knowledge is required to run through it, although it is now well supplied with buoys.

The Main Channel across the bar is the most direct and

the one most used. It is two miles wide, reaching from three-quarters of a mile to the Southward of the range of Alcatraz and Fort Point Lights to one and one-quarter miles to the Northward of the same range, within which limits nothing less than thirty-two feet at the plane of reference has been discovered in this survey.* The best part of this channel, carrying nothing less than thirty-~~three~~ feet at low water and shortest distance across the bar, is only seven-eighths of a mile wide from the range of Alcatraz and Fort Point Lights northward. For the best depth in this stretch, thirty-four feet at low water, bring Fort Point Light to bear N. 59° E. (NE. by E. 1/4 E. nearly) and steer for it until Point Bonita Light is abeam, distant nine-tenths of a mile, then change course to NE. 1/4 E. for the middle of the entrance between Lime Point and Fort Point.

This sailing line passes one and one-tenth miles to the Northward of the Lightship, and almost half a mile to the Northward of the so-called Nine-fathom fairway buoy; and along it the distance is three and a quarter miles from a depth of ten fathoms outside the bar to the same depth inside. It seems to me the Lightship ought to be placed on that line. *

The North Channel runs along within between one-third and one-quarter of a mile of the rocky and forbidding looking cliffs on the North side of the entrance. When the Four-fathom Bank is breaking this channel does not look very inviting because the foam from the broken seas reaches across it to

the shore breakers and, at high water especially, the seas strike the cliffs and reverberate in outgoing waves which meet the incoming ones and cause a most confusing commotion. To a stranger the attempt to run through this channel seems almost foolhardy and as the shore rocks, near which he must run, seem the most imminent danger he is apt to steer off as much as possible and thereby exposing himself to being boarded and disabled by the breakers on the bank. If the range is followed closely these dangers are more apparent than real for the least depth in the narrowest part is nine fathoms and it never breaks in the channel on account of the seas having already been broken on the bank. The real dangers are hidden and consist of the Sears and Cantissima sunken rocks near the outer one of which, the Cantissima, he must run.

Coming from the northward, from a position one-quarter of a mile southwest from the Duxbury Reef whistling buoy, steer E. 3/4 N. for seven miles to the North Channel range, which is the outermost rock off Rocky Point directly under the apparent highest point of the ridge running from Tomales Point to Duxbury Point. (See sketch). If the Black Buoy No. 3, marking the limit of safe passage past the sunken rocks, lies in its proper position it should show a little to the left of the summit of Blue Mountain on the San Francisco peninsula.

Change course and run in on this range by heading for

Blue Mountain, passing Red Buoy No. 2 a scant quarter of a mile on the starboard hand, close to Black Buoy No. 3 on port hand, and Black and Red Buoy, marking east end of the bank, one-eighth of a mile on starboard hand. When the first high bluff of Lime Point, back of the fog-whistle building, opens out to the southward of Point Diablo haul up to NE. by E. ½ E, or for Alcatraz Island which shows in the middle of the entrance between Lime Point and Fort Point and forms an excellent range with some point in the Contra Costa hills in the background.

Close steering must be made in the North Channel to avoid the sunken rocks on the port hand and the edge of the Four-fathom Bank on the starboard hand. If the weather is clear so the range can be seen reliance should be placed on it rather than the buoys. If the range is obscured as a matter of caution the ship should be swung off a little to the southward of the course to pass a ships length at least from the Black Buoy No. 3 marking the rocks.

In coming from the southward or westward and wishing to enter by the North Channel to avoid a breaking bar circle around it until the 1080 ft. hill above Sausalito, (the highest on the northern peninsula to the southward of Mount Tamalpais,) bears NE. by E. 3/4 E., then steer for it until on the range and proceed as above directed.

The South Channel runs along about three-quarters of

a mile from the beach South of the entrance and although it carries more water than the main channel, nothing less than thirty-six feet at low water, it is the least used of the three. If the bar is rough the ship following this channel would run in the trough of the seas for a distance of two and a half miles.* It is obstructed by a spit running one and one-half miles in a general South Southwest direction from the Cliff-House having from five to seven feet less water upon it than on either side of it. At a point eighty-five hundredths of a mile S. by W. ½ W. from the Cliff House this spit is partially cut through, and if a red buoy were placed at this point for the guidance of pilots this channel might become popular, especially for deep-laden, long ships leaving port and generally bound to the Southward. Besides carrying more water than the main channel there is less danger of striking the bottom here because the sea is abeam and the ship will roll rather than pitch. The pilots will not use this channel unless it is buoyed as they claim a vessel would lose its insurance if an accident should occur. As the survey of 1873 shows an almost similar condition of this spit it is probably a permanent feature. I respectfully recommend that two red buoys be placed to mark this channel, one in the position indicated above and the other sixty-five hundredths of a mile W. 3/4 S. from the Ocean Side House, both to be passed close aboard by vessels using the channel.*

The sailing direction for the South Channel is, when approaching the bar, to bring Point Bonita Light to bear N. by W. 3/4 W. and steer for it until the Kile Rocks are abeam, then haul up to NE. 1/2 N. for the middle of the entrance between Lime Point and Fort Point. In leaving port by this channel run S. by E. 3/4 E. with Point Bonita Light astern until Ocean Side House bears NE., then haul off shore on your course.

* Buoys. In addition to buoying the South Channel I respectfully recommend that Black Buoy No. 1, supposed to mark the west end of the so-called Four-fathom Bank and also known as the "Potato Patch", be changed one mile S. 1/2 E. from its present position. It would then mark the West end of the Five-fathom Bank as well as the northern limit of the Main channel. The pilots whom I have consulted about this change are much in favor of it. If this change is made it might be desirable to define the northwestern limit of the Five-fathom Bank by placing an additional red, or red and black, buoy in seven or eight fathoms of water off the bank about midway between Black Buoy No. 1 in its new position and Red Buoy No. 2. *

Bottom The bottom may be said to consist generally of fine, gray sand, varying in shade from dark to light. In the axis of the strongest current inside the bar the sand is coarse and mixed with broken shells and black, red and white specks. Near the entrance fine and coarse gravel pre-

-dominates. The Five-fathom Bank is composed almost entirely of fine gray sand, and so is the southern part of the bar. In the latter region the lead sometimes brought up small, live shells. (Pulmonata, Alexia Myosotis)

Currents The ebb current rushes through the Golden Gate in a general southwest direction spreading out fan shaped after passing the heads from W. by S. from Point Bonita to about S.S.W. from Point Lobos. When nearing the crest of the bar its direction becomes more erratic, sometimes deflecting to the southward and sometimes to the westward. I was never able to estimate before hand the influence of the ebb current upon the vessels course when running the lines across the bar in either of the two directions adopted. When near the crest of the bar there was always a change in force and direction, sometimes entirely different in character on adjacent lines, indicating the erratic nature of the current in the main channel and as far north and south of it as Black Buoy No. 1 and the South Shoal Buoy.

The spit already mentioned as stretching in a general South Southwest direction from the Cliff House seems to form the southern limit of the stronger ebb current and the southern edge of the Five-fathom Bank the northern limit. In crossing either of these when running the northwest and southeast lines of soundings a sudden and radical change in direction and speed of the vessel over the ground was always experienced

on the ebb; and as the ebb runs strong here for an hour or more after the flood current begins to force its way in along both the South and North Channels it is reasonable to suppose that the meeting of these currents has formed the Spit and the bank. Owing no doubt to the rounded configuration of Point Lobos as compared with Point Bonita there is no eddy current noticable in the South channel on the ebb, at least not reaching out as far as the ship was able to approach, but the ebb itself is weak. In the North Channel, however, there is a strong eddy; in fact it is rare to find any current at all running out through that channel so that the constant scouring in one direction doubtless accounts for the deeper channel.

The wedges of blue water coming in through both the North and South channels at the beginning of flood and impinging upon the discolored water carried out of the bay by the ebb are quite noticable features. Off Point Bonita it forms a strong rip, resembling breakers on a reef, extending about half a mile from the point and in line with it.

The flood current seems also to be deflected, to the northward, by the bar. It is not felt strongly inside the bar until about half a mile from the Nine-fathom buoy. Outside the bar there is quite a current setting to the northward on the flood so that I have frequently noticed the lightship swung to it and heading about South even when there was a moderate

northwest breeze.

Curves of equal depth are drawn for every fathom, from four to ten inclusive, smoothly through the outermost soundings representing the given depth. Many soundings of greater depth are thereby included within the curve. Owing to the constant swell, from two to four feet and more in height, the additional rough, choppy sea whenever the wind blew only a moderate breeze, and, above all, inexperienced leadsmen, the soundings do not cross as well as I could wish. A great many parts of lines have been rejected in the plotting and some run over again. Probably neither the larger nor the smaller depth at a crossing is right but the truth lies somewhere between the two. A leadsman when in doubt about a sounding is generally guided in calling out the depth by the preceding cast. This results, when running on lines almost parallel to the direction of the curves, in calling out a certain depth longer than it ought to be. Another source of discrepancy is that two men rarely have the same way of estimating the depth in a swell and ruffled surface when sounding and it was necessary to have two men to relieve one another. While I maintained a close watch on the sounding it was impracticable to scrutinize every cast; and besides the mere looking at the line is not sufficient, one must have hold of it to make quite sure there is no stray line. No shoal soundings have been rejected, only those giving larger depths

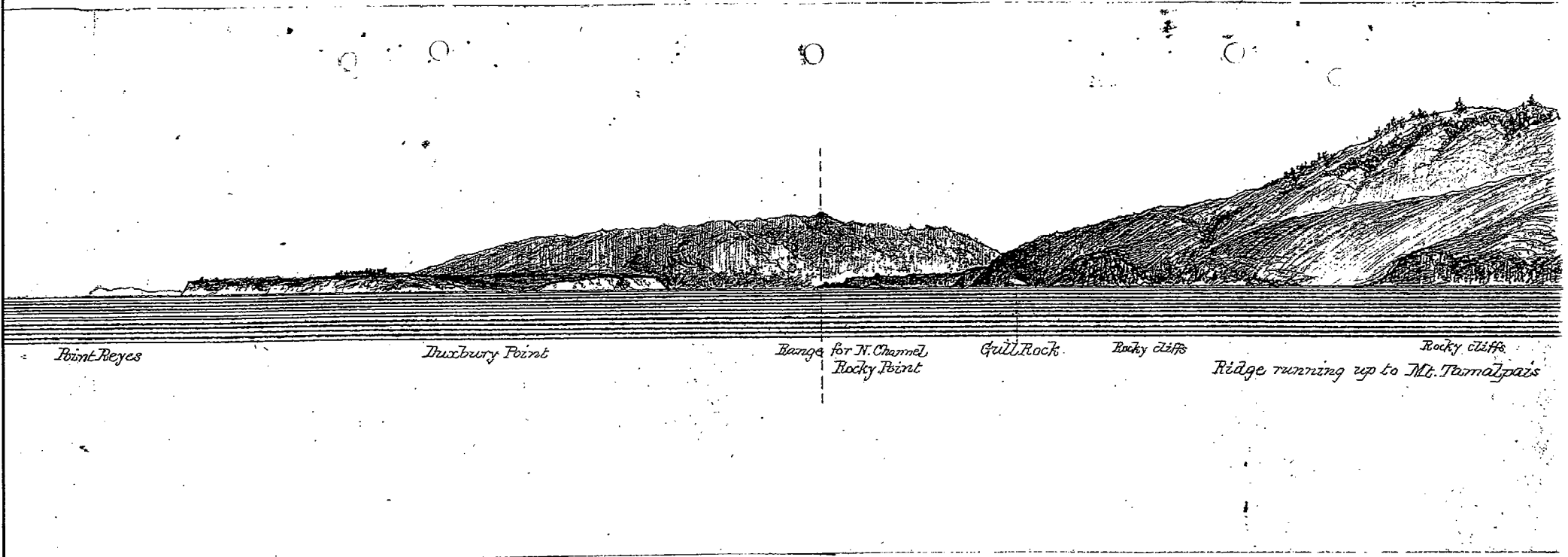
than the crossings indicated. For these reasons in drawing the curves smoothly through the outermost soundings of a given depth the error, if any, is on the right side, in favor of the ship.

I am led to remark here that good leadsmen are indispensable in a hydrographic party and that special inducements should be held out to such men to remain in the service. During this survey I had not a man who had ever used a lead to any extent before except the boatswain who had done so on the bay sheets; and from the way the soundings cross on those sheets I do not regard him as a good leadsman. The angles for position may be measured with the greatest care and skill upon the best selection of objects, the lines run in the most judicious and effective way, tide reductions applied, as in this case, in accordance with the most scientific scheme, yet the whole survey is so entirely dependent upon the accuracy and good judgment of the leadsman that one could wish for the invention of some self-recording machine dragged over the bottom to indicate correct depths.

Supplementary notes regarding the North Channel range.

In examining the photographic copy of Lieut. Sears' survey of the North Channel I discovered that he recommends as a range for this channel the extremity of Point Bonita on with Lone Mountain until the sunken rocks are passed, then to haul up to range of the Point Lobos windmill under Blue

Mountain. It is a ticklish matter to change course at a critical point in a narrow channel, especially in long, modern ships, and a straight away course is therefore more advantageous and safe. Point Bonita on with Lone Mountain is the old range for the channel recommended in the Survey of 1873 and which subsequent experience has proven to be dangerous because it leads too near the northern edge of the Four-fathom Bank. The old lighthouse tender "Shubrick" was boarded by a sea and lost her paddlebox while running in on that range. The Point Lobos windmill is not now conspicuous enough and there are other windmills near it. Blue Mountain has been changed from a smooth, grassy, and fairly well defined peak to a tree-covered hill not so well defined but still good to steer for. The opposite, or back range, Rocky Point under the apparent highest peak of the ridge running from Tomales Point to Duxbury Point would lead too close to the Cruzissima Rock, but if changed, as given in the preceding directions to the outermost rock off Rocky Point under the same highest peak it will clear the Black Buoy No. 3 by about eighty feet, and that buoy itself lies at a fairly safe distance from the rock. To verify this statement I steamed out with the ship to-day (March 27, 1901) and proceeded very slowly over this new range sounding right along and found nothing less than nine fathoms when passing the buoy. When abreast of


Point Reyes
Duxbury Point
Range for N. Channel
Rocky Point
Gull Rock
Rocky cliffs
Rocky cliffs
Ridge running up to Mt. Tamalpais

Franks Lagoon Point, about the locality where a vessel, intending to use it for running in through the channel, would pick it up according to preceding directions, I made a careful sketch of its appearance which is submitted herewith and which I recommend to be substituted in another edition of the Coast Pilot for the one between pages 226 and 227 in the present edition.

Although not strictly belonging to this descriptive report I beg to submit in this place a recommendation for a continuous sketch on one line of all the coast seen about such important harbors as San Francisco, like the sketches on file in the Sub Office from which the present Coast Pilot views are copied. Such a view could be folded in the book, or, better still, printed on the margin of the chart. In these days of scientific navigation and use of the three-point problem for correctly determining a ships track in approaching a harbor the appearance of objects to be observed upon and their relation to each other can be more readily recognized from such a view than from the ones published in the present edition of the Coast Pilot. If time and opportunity had permitted it was my purpose to make a new view of the approaches to San Francisco and to have drawn it along the margin of this sheet as a sample. There are some changes from the old views to be noted, such as the Golden Gate Park which now shows like a dark band laid across the former conspicuous

sandwaste in that vicinity. It is my hope that I may yet find an opportunity to do so before the new edition is to be published; but even if I do not, I respectfully submit that the old, long views on file in the Sub Office are more useful, even in their present state, than the mutilated copies of them in the Coast Pilot.

As the present sheet of the bar survey does not include Fort Point I have omitted drawing the ranges and sailing lines upon it, assuming that the Office has better facilities for doing so and will select for the published chart those approved by the Superintendent. For the purpose of comparison of the two surveys I have laid the tracings of both over each other, but the one of the 1873 survey is shrunk so much that I consider it inadvisable to draw exact ranges and bearings by such means.

Respectfully submitted
Ferdinand Westdahl
Assistant C. & G. Survey
Comdg "McArthur"

ADDRESS ALL COMMUNICATIONS TO
"SUPERINTENDENT, COAST AND GEODETIC SURVEY,
WASHINGTON, D. C."
VEC

2504

Department of Commerce and Labor

COAST AND GEODETIC SURVEY

Washington

January 15, 1909.

Mr. Andrew Braid,

Assistant in charge of Office.

Sir:

In reply to the verbal request of Mr. J. T. Watkins, this day, for the verification of planes of reference on Hydrographic Sheets Nos. 456, 1201, 1628, and 2504 for San Francisco Bar and vicinity, I have to report as follows:

On Hydrographic Sheet No. 456, the plane of reference used appears to have been 1 foot lower than the plane of mean lower low water which is now adopted for this region.

On Hydrographic Sheets Nos. 1201, 1628, and 2504, the plane used was approximately the same as mean lower low water, differing from it by less than half a foot.

Respectfully yours,

E. P. Shidy

Chief of Tidal Division.

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Hyd. Sheet 1628 by E.D. Zansig in 1884

Plane of reference referred to Gauge at Sausalito + ½ ft

= 5.3 ft on gauge = 3.3 below M.S.L.

Mean L.L.W. at Sausalito (tide tables) = 2.9 " "

2.9
3.3
5.3

Hyd. Sheet 1201 by J. Bradford in 1873

Plane of ref. referred to 7th St. Gauge — ½ ft

= 5.7 on gauge = 2.8 below M.S.L.

Mean L.L.W. at 7th Point (tide tables) = 2.2 " "

5.3

Hyd. Sheet 456 by Alden in 1855

TIDES: SUMMARY.

Station:

Observations — Lat. / Long.

Year	No. of- HWs	No. of- LWs	HWI h m	LWI h m	Ln. ft.	On staff used HTL ft.	On staff used H't ft.	On staff used L't ft.	Staff HTL ft.	Remarks.

c = corrected x = uncorrected

B.M.

Accepted Values.

High water interval h m

Low water interval

Mean range ft.

Staff of-	ft.	ft.	ft.
Highest tide observed			
High water			
Half tide level			
Low water			
Lowest tide observed			

Compiled by _____

Date _____

Blue 1855 — plotted profiles in red —

2504

Pt-Br SH	Shu-	½	26	52½	31
0 ¾	52	¾	32	53	35
1	58	18	32	54	37
2	33	20½	32	½	37
¾	31	22	32	55½	29
3 ¾	28	24	32	56	12
4 ¾	28	[illegible]	32	57	Shu.
5	25	27	32		
½	25	28	34		
¾	23	29	34		
6	23	½	31		
¾	23	30½	32		
7	25	31	32		
½	25	32	31		
¾	23	32½	32		
8	23	34½	32		
¼	25	36	31		
½	23	38	31		
9	23	39	32		
½	23	¾	31		
¾	25	42	32		
10	23	43	32		
11	23	½	32		
12	23	44½	32		
¼	25	43½	32		
½	25	44½	32		
¾	23	45	34		
13	23	46	35		
¼	25	47	35		
½	23	½	34		
14	23	48	32		
¼	26	½	34		
15	26	49	35		
16	26	50	35		
¾	23	51	35		
17	23	½	35		
¼	26	52	32		

Test Shift of Bar

Blk 1900

Sta At Bow L.H.	depth shoal	Sta	depth	Sta	Depth	Sta	Depth	Sta	Depth	Sta	Depth
		13+½	25	27+½	33	41+¼	34				
		14	26	28	34	½	33				
		15	26	+¼	33	42	33				
		+½	26	+½	33	¼	34				
		+¾	27	29	32	½	34				
		16	27	+¼	32	43	35				
		+½	27	½	33	¼	34				
		+¾	28	¾	32	½	34				
3	31	17	28	30	32	¾	35				
+¼	29	+½	28	+¾	32	44	35				
+¾	29	18	27	31	33	45	35				
4 +½	29	+¼	28	+½	33	¼	34				
5	28	+¾	30	+¾	32	46	34				
+½	26	19	29	32	32	¼	35				
6	26	+½	30	½	32	47	35				
+½	26	20	30	¾	31	48	35				
7	26	+½	29	33	32	49	35				
+¼	25	+¾	29	34	32	½	34				
½	26	21	30	⅛	31	50	35				
¾	26	+½	29	¼	32	½	34				
8	25	+¾	30	½	31	51	34				
¼	23	22	32	¾	31	¼	35				
½	22	+¼	30	35	32	½	34				
¾	24	+½	30	36	32	¾	35				
9	23	+¾	31	37	32	52	35				
¼	24	23	31	¼	31	¼	34				
½	23	+½	31	½	32	½	35				
10	24	24	32	¾	32	53	36				
¼	23	+¼	31	38	33	½	36				
11	23	+½	32	¾	33	54	37				
¼	25	25	33	39	34	+¾	37				
½	24	+½	33	½	34	55	36				
12	25	26	34	½	35	½	33				
¼	24	+½	33	40	35	56	30				
¾	23	+¾	34	¾	35	57	Shoal				
13	25	27	33	41	34						

1873 Green

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Sta	Depth	Sta	Depth	Sta	Depth	Sta	Depth
Pt Bow Rk	Short	13 1/2	23 24	28 + 1/2	32	42	31
0 + 3/4	48	14	23	29	33	1/4	32
1	57	1/4	24	1/2	31	1/2	29
+ 1/2	42	15	25	30	32	3/4	29
2	35	1/4	25	1/4	32	43	31
1/2	30	3/4	26	1/2	31	1/4	31
3	28	16	28	31	30	1/2	32
3/4	28	1/4	27	1/2	31	3/4	32
4	27	1/2	27	32	30	44	31
1/4	26	3/4	25	1/4	30	1/2	33
1/2	27	17	27	1/2	31	3/4	33
3/4	26	1/2	27	33	31	45	32
5	26	18	28	34	31	1/4	33
1/4	26	1/2	28	1/4	32	46	33
3/4	24	3/4	26	3/4	32	1/2	33
6	25	19	28	35	31	47	34
1/4	24	1/4	28	1/2	30	1/2	34
1/2	25	20	29	36	30	48	33
7	25	1/2	30	1/4	30	1/2	35
1/4	25	21	31	1/2	31	49	35
1/2	23	22	31	3/4	29	1/4	34
3/4	23	1/4	29	37	29	1/2	34
8	25	1/2	30	1/4	30	3/4	35
1/4	24	3/4	29	1/2	32	50	33
3/4	23	23	29	3/4	32	1/4	34
9	23	1/2	31	38	31	57	34
1/2	23	24	32	1/2	32	1/2	34
3/4	24	1/2	33	3/4	30	52	35
10	22	25	32	39	32	53	35
1/4	23	1/4	34	1/4	32	1/2	36
11	23	1/2	33	1/2	31	54	35
1/4	22	3/4	34	40	32	1/2	36
1/2	23	26	33	1/4	31	55	27
12	23	1/2	33	1/2	31	1/2	18
1/4	23	27	33	3/4	32	57	Shore
1/2	24	1/2	32	41	32		
3/4	23	28	33	1/2	32		
				3/4	30		

Rod 1884 — 32 — incomplete not used

Sta	Dept.				
Pt Bar Sh	Shore				
1	66	¼	30	42	35
		½	29	½	33
6½	26	21	29	¾	32
7	26	¼	30	43	32
¼	29	½	32	44	32
½	26	22	32	45	32
8	26	¼	30	½	33
9	26	¾	30	¾	33
¼	23	23	32	46	35
½	26	½	32	¼	33
10	23	¾	33	½	35
¼	26	24	35	¼	33
½	24	½	36	47	35
¾	26	25	38	¼	33
11	23	26	38	½	35
12	23	½	38	48	35
¼	26	¾	39	½	35
¾	26	27	38	49	38
13	24	28	38	50	38
¼	26	½	36	¼	36
½	24	29+½	36	½	38
14	24	30	35	¾	36
¼	23	31	35	51	38
½	26	32	37	¼	38
15	26	+½	33	½	36
¾	26	33	33	52	35
16	24	34	33	¼	38
¼	26	35	33	½	36
17	26	½	35	¾	38
¾	26	36	35	53	36
18	24	37	35	54	41
½	29	38	35	55	—
¾	27	39	35	56	—
19	29	40	35	57	Shore
½	29	½	35		
¾	31	41	36		
20	29	½	35		