Appendix I Costaggini Survey

(THIS PAGE INTENDED TO ACCOMPANY THE PAPER, "SURVEY OF ARTIFACTS AT NEAHKAHNIE MOUNTAIN, OREGON," BY P.A. COSTAGGINI AND R.J. SCHULTZ)

CIVIL ENGINEERING ABSTRACT:

A survey to find the interrelation of rock mounds (cairns), rocks with carvings and other artifacts was made in the vicinity of Neahkahnie Mountain (Tillamook County) Oregon, concluding in that the artifacts are remains of ancient surveys, most probably authored by the early explorers to the New World.

KEY WORDS: Ancient surveys; Archeology; Cairns; Explorers; History; Historical artifacts; Land claims; Maps; Neahkahnie Mountain; Oregon history; Rocks; Surveys; Symbolic possession; Topography; Triangulation; West coast

ABSTRACT: Acting upon a request to A.S.C.E. by the Director of the Tillamook County Pioneer Museum, a survey was performed to find the interrelation of surface rock mounds (cairns) and other surface artifacts located in the vicinity of Neahkahnie Mountain. The survey was performed to 3rd Order Survey Specifications (horizontal) of N.O.A.A. and included a tie to 2nd Order N.G.S. monuments at the top of the mountain. The mapped and adjusted data show similarities with a Sixteenth Century survey and provide insight into certain marks grooved into several large rocks. The conclusions are that the artifacts are remains of ancient surveys, or are acts of possession (or both), performed most probably by early explorers, of whom the English and Francis Drake are leading candidates for responsibility. The usefulness of the conclusions is that the data explain the artifacts better than other, locally published theories, and shed some additional light on the controversy of the location of Drake's three month landing. Additional survey work could be none north and west of the survey area.

SURVEY OF ARTIFACTS AT NEAHKAHNIE MOUNTAIN, OREGON

By Phillip A. Costaggini[1] and Robert J. Schultz,[2] A.S.C.E.

Introduction

Surface rock mounds, or cairns, and rocks with carvings, located on Neahkahnie Mountain (Tillamook County) Oregon suggest ancient surveys and/or acts of possession by European explorers. In response to the Tillamook County Pioneer Museum Director's request for A.S.C.E. assistance, the author traversed the locations in accordance with N.O.A.A. Third Order survey standards for horizontal work, adjusted and platted the data, and analyzed the results, The data show similarities with an English Sixteenth Century survey, and may explain certain marks on a stone found in the Nineteenth Century. Certain hypotheses are generated concerning orientation of key points in the traverse net.

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General Discussion

In September, 1976, M. Wayne Jensen, Jr., Director of the Tillamook County Pioneer Museum in Tillamook, Oregon, contacted the American Society of Civil Engineers in hopes of securing financial assistance to conduct a survey. His motivation was to determine the interrelation of large rock mounds and carved stones found on the slopes of Neahkahnie Mountain, a prominent Coast Range peak between Nehalem Bay and Short Sands Beach. Mr. Jensen reasoned that the monuments, not yielding information about buried treasure, Indian artifacts or U.S. Public or private land surveys, might be the remains of ancient surveys.

The request was in turn passed to the A.S.C.E.'s Oregon Section, the National Committee on the History and the Heritage, and finally to Professor Robert J. Schultz at Oregon State University. In consultation with Professor Schultz, Mr. Costaggini accepted the task of conducting the research and survey.

The Neahkahnie Mountain Survey

Figure 1 is a U.S.G.S. 15 minute quadrangle map showing the survey area. Table 1 lists the key stations with brief descriptions of each.

Survey Type and Description

The method of random traverse was selected because it

Figure 1: Nehalem Quadrangle, USGS 15 minute topographic
Scale: 1 in. = 5,208.3 ft. (0.025 m.= 1,587.519m.)

Table 1: List of Key Survey Stations, Neahkahnie

Station Name	Survey Name	Description
North Cairn	A	Cairn
Triangle	B	Stones in a pattern of an equilateral triangle, 6 ft. (1.82 m.) on a side; 2 ft. (0.61 m.) high
North Mound Two	C	Stones in a small stack
North Mound Three	D	Stones in a small stack
South Cairn	E	Cairn
Augur	F	Face of a cliff with carvings
Rock Rays	RR-2--RR-5	Small stones in a "V" alignment
Triangulation Points	H-1--H-3	Several rocks with carvings
Center Rock One	L	Large stone whose flat top is nearly horizontal; carved lines in a radial pattern
Highway 101 Rocks	37-A--37-B	Wall of stones 6 ft. (1.82 m.) wide, 3 ft. (0.91 m.) high, intersected by a 2nd row of stones.
Center Rock Two	O	Stone with carvings
North Mound Five	4B	Stones in a small stack
North Mound Six	4C	Stone with carvings
North Mound Seven	4D	Stones in a small stack
Wentz Stone	P	Large stone with carved figures, numbers and crisscrossing lines.
East Rock Mound	ER-4	Stones with carvings

afforded the opportunity of achieving relatively good accuracy as well as tying into the two local National Geodetic Survey Second Order Stations. Three closed, horizontal control loops were run (see Figure 2). Horizontal Loop One contained 40 stations and tied the two cairns (A and E) together. Horizontal Loop Two contained 7 stations and tied the point Augur (F) to the Loop One. Horizontal Loop Three contained 5 stations and tied the previous loops to the government stations. The purpose of horizontal Loop Three was to provide an independent check upon azimuth as

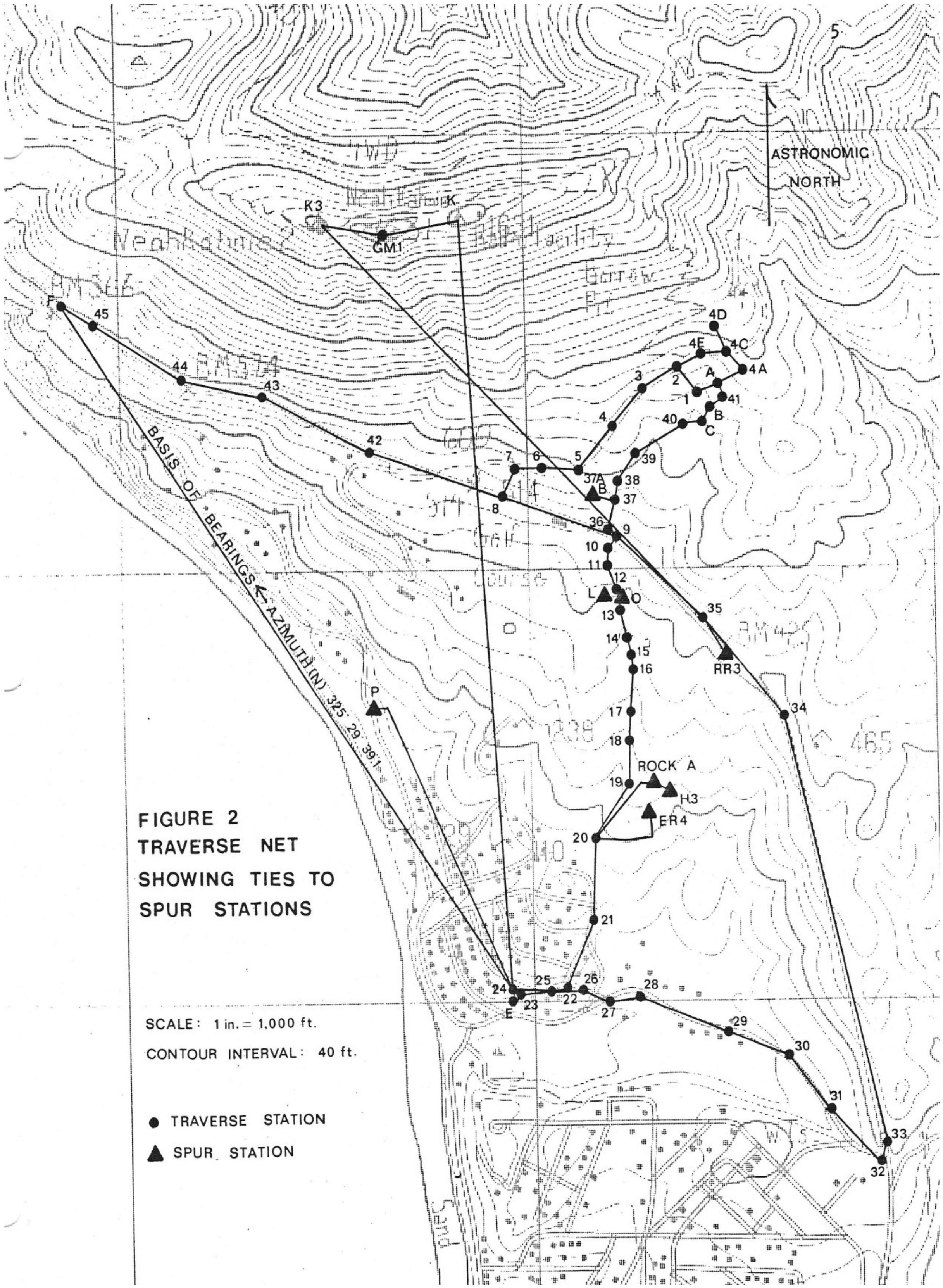


FIGURE 2
TRAVERSE NET
SHOWING TIES TO
SPUR STATIONS

well as distance. The basis of bearings was obtained for the line 24 to F by Polaris observations. A closed vertical loop of direct levels was run between two Oregon State Highway Department bench marks, establishing the elevations of 8 traverse stations. The remaining elevations were computed from zenith angles and slope distances of the traverse work. The data was reduced to mean sea level for computer adjustment by least squares.

Instrumentation for the horizontal data collection was a Wild T-2 optical theodolite and a Hewlett-Packard 3805 distance meter with two single prism glass reflectors.

Traverse Results

Table 2 lists the results of the traverse field data. Table 3 lists the leveling results.

Tie to N.G.S. Monuments

Horizontal traverse Loop Three is described in Figure 2. N.G.S. Triangulation Station Neahkahnie is located on the eastern most of the three peaks which form the mountain. Station GM-1 was a traverse station located on the center peak, at which no N.G.S. stations or marks were found (which is in agreement with the Government Recovery Notes for the center peak stations). Station GM-1 was necessary because the outside two peaks were not intervisible due to the presence of trees. On the western peak, N.G.S. Triangulation Station Neahkahnie 2 is obliterated, but its

Table 2: N.G.S. Third Order Horizontal Specifications and Traverse Results

Classification	Third Order, Class II	Neahkahnie Results and Additional Explanations
1. Recommended spacing of stations	As required for other (than metropolitan area) surveys	As required. The traverses were performed in a rural area without regard to station spacing. Dense woods precluded obtaining 328 ft. (0.1km.) minimum sight lengths.
2. Horizontal directions or angles		
a. Instrument	1".0	1".0
b. Number of observations	2	2
c. Rejection limit from mean	5".0	5".0
3. Length measurements		
a. Standard error	1:30,000	1:225,000 or greater. All lines were measured by EDM equipment, corrected for temperature and humidity at the time and place of observation. The standard error was obtained through the repeatability of the instrument.
4. Reciprocal vertical angle observations		
a. Number of and spread between observations	2 Direct, 2 Reverse 20"	2 Direct, 2 Reverse 20"
b. Number of stations between known elevations	15-20	25-30. Known elevations were obtained by leveling over 8 traverse stations on Hwy. 101.
5. Astro Azimuths		
a. Number of courses between azi. cks.	30-40	40
b. No. of observations	4	6
c. No. of nights	1	1

Table 2: Continued

Classification	Third Order, Class II	Neahkahnie Results and Additional Explanations
d. Standard error	8".0	3".2
6. Azimuth Closure	8".0 per station or 30" $(N)^{\frac{1}{2}}$	Horiz. Loop One: +20".0 total (+0".5 per station) or 189" Horiz. Loop Two: + 3".9 total (+0".6 ½er station) or 79" Horiz. Loop Three: -20".0 total (-4".0 per station) 67"
7. Position Closure after azi. closure	2.62 ft. $(0.62Mi)^{\frac{1}{2}}$ (0.8m $(K)^{\frac{1}{2}}$) or 1:5,000	Horiz. Loop One: 1:22,000 Horiz. Loop Two: 1:31,000 Horiz. Loop Three: 1:21,000

Table 3: N.G.S. Third Order Vertical Specifications and Leveling Results

Classification	Third Order, Class II	Neahkahnie Results and Additional Explanations
1. Principal uses; min. stds; higher accuracies may be used for special purposes	Misc. Local control; may not be adjusted to Natl. Net.; small engr. projects	Project as defined in Table 2.
2. Recommended spacing of stations	As needed	As required to complete level loop.
3. Spacingof marks along lines	Not more than 1.86 mi (3 km.)	All less than 1.86 mi. (3 km.)

Table 3: Continued

Classification	Third Order, Class II	Neahkahnie Results and Additional Explanations
4. Gravity requirement	Not applicable	Not applicable
5. Instrument standards	Geodetic levels and rods	Zeiss level and Philadelphia rod
6. Field procedures	Double or single run	Double run
a. Section length	0.62-1.86 mi. (1-3 km.) for dbl.	1.15 mi. (1.85 km.)
b. Maximum length of sight	295 ft. (90 m.)	104 ft. (31.7 m.)
7. Field procedures		
a. Maximum difference in lengths, forward and backwd. sights/set up	33 ft. (10 m.)	11 ft. (3.35 m.) forward run 13 ft. (3.96 m.) backward run
b. Per section (cum.)	33 ft. (10 m.)	115 ft. (35.05 m.) forward run 100 ft. (30.48 m.) backward run
c. Maximum length of line between connections	15.53 mi. (25 km.) double run	2.29 mi. (3.70 km.) double run
8. Maximum closures		
a. Section; forward and backward, loop or line	0.05 ft. $(mi.)^{\frac{1}{2}}$ (12 mm. $(km.)^{\frac{1}{2}}$) Section: 0.05 ft. (0.015m.) Loop: 0.08 ft. (0.024 m.)	Closure forward: -0.01 ft. (-0.003 m.) Closure backward: +0.15 ft. (+0.046 m.) Closure loop: +0.14 ft. (+0.043 m.)

position was computed from traverse ties made to the station's two existing Reference Marks, as shown in Figure 3. N.G.S. Station Neahkahnie 2 was not re-established because higher than Third Order methods were required. Table 4 compares the computed and published distances and azimuths of the line Neahkahnie to Neahkahnie 2.

Polaris Observations

The astronomic azimuths from traverse station 24 (instrument) to traverse station F (target) for six horizontal circle positions are listed in Table 5. Though Third Order specifications call for 4 positions, time and weather permitted the collection of two extra positions.

Analysis of Results

A survey was conducted to locate horizontal positions of historical interest for M. Wayne Jensen. Figure 4 gives the results of the survey. The several theories attempting to explain the Neahkahnie Mountain Artifacts may be examined in the light of these survey results.

In his archeological work, Mr. Jensen discovered the cairns at A and E, as well as the several collections of rocks with man-made carvings (see Table 1 and Figure 4). Mr. Jensen accumulated the following observations:

1. There were no precious metals or stones of value found

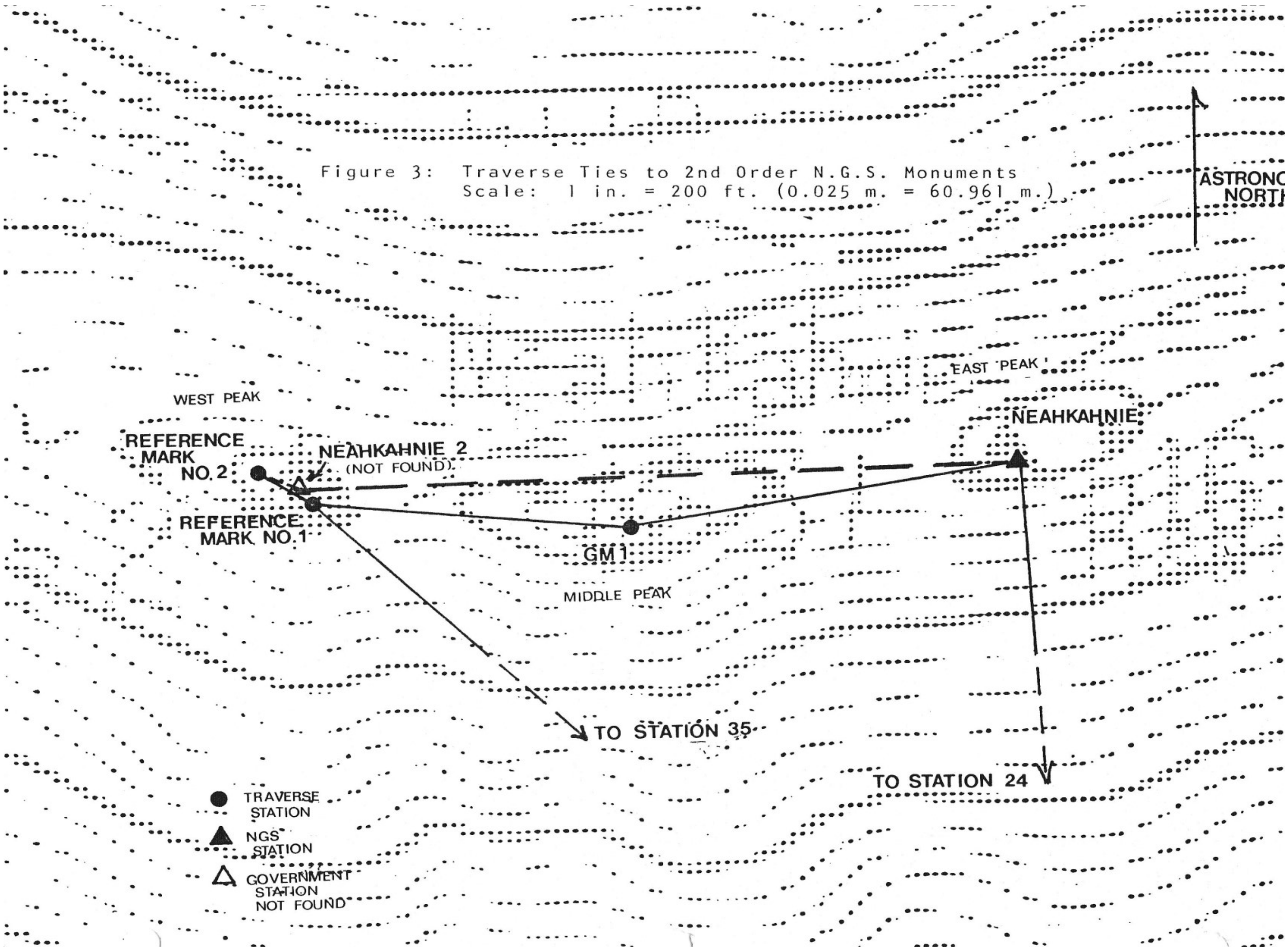


Figure 3: Traverse Ties to 2nd Order N.G.S. Monuments
Scale: 1 in. = 200 ft. (0.025 m. = 60.961 m.)

Table 4: Computed and Published Data For N.G.S. Stations

Sta.	Computed Trav. Dist. Feet (Meters)	Published Grid Dist. Feet (Meters)	Published Geodetic Distance Feet (Meters)	Computed Traverse Azimuth ° ' "	Published Grid Azi. N--OSPC North Zone ° ' "	Published Geodetic Azimuth (S) ° ' "	Published Back Azimuth (S) ° ' "
Neah. – Neah. 2	1,126.186 (343.266)	1,125.973 (343.201)	1,126.031 (343.218)	268 26 08.6	270 26 08.6	270 52 47.4	123 26 11.4

Table 5: Astronomic Azimuths, 6 Horizontal Circle Positions

Set	Position	Azimuth Polaris °	'	"	-	Horizontal Angle °	'	"	=	Astro Azimuth 24 to F °	'	"
1	1	359	14	20.6		33	44	27.0		325	29	53.6
1	2	359	11	18.6		33	41	33.5		325	29	45.1
1	3	359	08	51.0		33	39	00.5		325	29	50.5
1	4	359	06	39.2		33	37	01.1		325	29	38.2
2	1	359	06	35.3		33	34	54.5		325	29	40.8
2	2	359	02	40.3		33	33	08.0		325	29	32.3

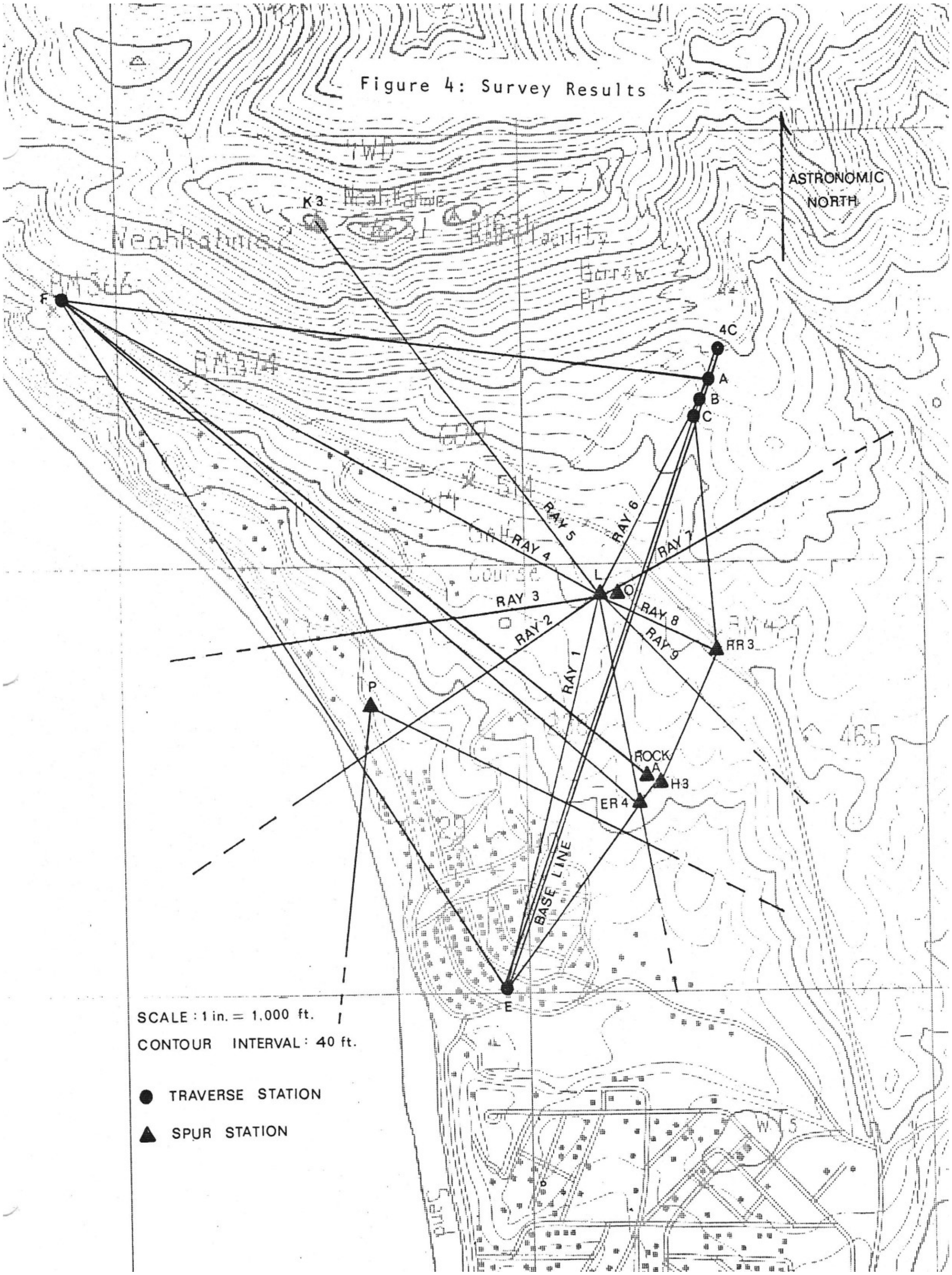


Figure 4: Survey Results

by any parties of record, nor was there any evidence suggesting any locations where treasures might have been buried or otherwise hidden.

2. The two cairns had apparently been placed deliberately, with a progressive size sorting of smaller rocks and stones at the bottom rising to the largest at the top. To reinforce the idea of deliberate placement, Mr. Jensen noted that each cairn location was several hundred feet from naturally occurring rock sites (in stream beds or draws). This suggests that the material was originally gathered and hauled to the cairn sites.

3. The rockshad been in place and undisturbed for well over one hundred years. Though this time period given is considered by Mr. Jensen as a minimum, the maximum is probably much more.

4. AT ~~Under~~ the North Cairn (A), was found a basalt stone, rectangular with square ends. The stone has a grooved line running longitudinally across the centers of two opposing rectangular faces, and a grooved line running across the center of one of the ends (so as to join the two other lines). The entire line measures 36 inches (0.91 m.) ±0.010 ft. (0.003 m.) when a cloth tape is stretched along the line. The stone as found had been chisled or cut off (from a larger rock) at the other square end. The length of 36 inches (0.91 m.)--a yard--is important in the discussion about measurements below. Under the North ~~South~~ Cairn (E) was found charcoal from burned wood. Radio carbon dating of this 1095 400 yr. 1579 charcoal indicates an age exceeding 100 years from the discovery by Mr. Jensen in 1967.

Several inferences may be drawn from these observations.

It is certain that the cairns (A and E) were not created by acts or processes of nature. They were also not locations of treasures. There are four possible explanations for the cairns: burial sites, marks made by early explorers, marks made by native inhabitants and marks made by the white settlers of the 1800's.

In the Nineteenth Century, while it is true that some surveyors buried burned wood beneath rock mounds, there are three facts discouraging the idea that this group was responsible. First, the cairns are not anywhere near any U.S. Public Land Survey corners, Donation Land Claim corners, or even property corners of record. Second, the cairns are of such size (approximately 10 feet (3.05 m.) in diameter) as to make it unlikely that Nineteenth Century surveyors would have left such large monuments. Third, no written records exist of these monuments as being survey marks or corners. The explanation of the cairns as burial sites may be eliminated because no human remains were found. Further, no Indian artifacts were found. The remaining group responsible is the early explorers.

Three countries explored the west coast of present day Canada and the United States: Russia, Spain and England. Neither of the first two countries had explorers of record in the Neahkannie area. Among the English, Francis Drake stands out as a leading candidate for responsibility, although the scarcity of original written records lends more to speculation than solid proofs. It is known that Drake searched among the coastal inlets of present day California, Oregon and perhaps Washington in a vain attempt to find a shorter route back to England. It is also known that, after reaching a northernmost point in the Pacific, he backtracked and harbored his vessel ~~for 3 months~~ at some natural inlet in California or Oregon. The exact location is unknown (and is the subject of an intense debate), ~~because~~ Drake's written records of his circumnavigation were confiscated in England and remain lost to this day. A reading of the written records extant indicates that Drake intended to claim lands in the West for England, though it is not known what specific kind of claim he made or whether a survey was performed. One tract mentions a single act--a plaque nailed to a tree--but no other records survive as to exactly how Drake claimed land. This plaque, so states the record, claimed land without any survey or formal demarcation. This type of claim falls into a category known as an "act of possession," which, though largely symbolic and ceremonial, was an important technique used by the Sixteenth Century explorers to reserve lands for the crown. Among the acts chronicled by these explorers were acts of building rock mounds or cairns. But besides being acts of possession, the Neahkahnie cairns, along with other evidence, suggest that some sort of survey was performed.

The line joining the South Cairn (E) with the North Cairn (A) lies at a bearing angle from Astronomic North of N 20° 32' 17" E, very close to the current magnetic declination of the area (N 20° 30' E). The U.S.C. & G.S. has declination data for Western Oregon from 1800 to the present, as shown in Table 6.

Table 6: Declination Data for Western Oregon, 1800-1979

Year (January 1)	Declination °	'
1800	15	56
1810	16	34
1820	17	13
1830	17	52
1840	18	29
1850	19	03
1860	19	32
1870	19	57
1880	20	15
1890	20	26
1900	20	30
1910	21	30
1935	22	30
1943	24	06
1975	20	45
1979	20	30

The trend of the declination is increasing westerly except since 1943, at which time the data indicates and easterly migration. The trend prior to 1800, then, is uncertain. Further study, perhaps employing a model to predict backwards, would be necessary before concluding that the line E to A was an intended North-South survey line. However, the assumption agrees with other research data.

A second feature of the line E to A is that is passes very close to three other survey points, C (offset distance 2.02 ft. (0.62 m.)), B (offset distance 8.34 ft. (2.54 m.))and 4C (offset distance 1.57 ft. (0.48 m.)).

Examining the distances for some possible significance begins with Wendle's Rock (see Figure 5). This rock, found on the beach in 1947 in the vicinity of the South Cairn (E), contains, among other marks, a grooved triangle, and a number, "1632" grooved along the shortest of the three legs. The triangle and

Figure 5: Wendle's Rock

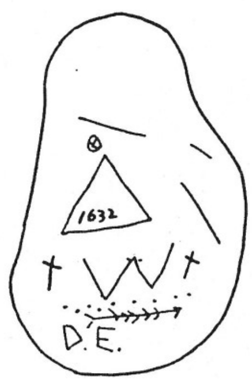
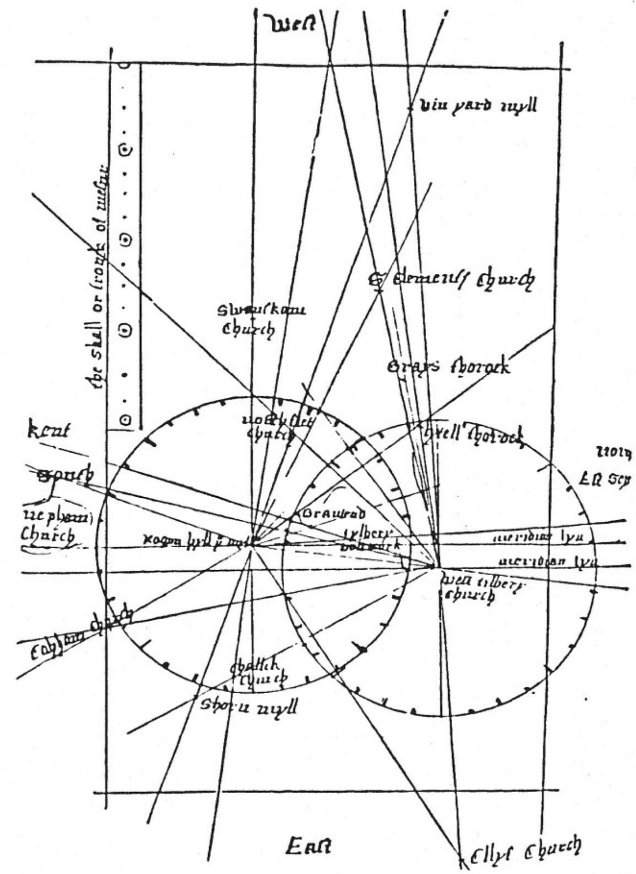


Figure 6: Bourne Survey
Scale: 1: 52,800



A triangulation problem of William Bourne. From the Sloane ms. no. 3651 in the British Museum.
(Courtesy of the Director.)

1632 have resisted credible explanations but have not been examined in the light of the survey data now available. It has been proposed that the number 1632 may refer to a year or to a measurement, or to something else. If the number refers to the year 1632, no Europeans could have been responsible since this year falls in the period between Drake and later known explorers in the area. Attempts to explain this number in terms of its relation to buried treasure have all been failures. If the number refers to a measurement, the questions remain as between what points and in what units. All distances on the plat (see figure 4) are drawn as the horizontal distances. It may be assumed that the early explorers measured along the ground surface and obtained data similar to slope measurements. This assumption is supported by the fact that, in Drake's time, stadia was unknown and the trigonometric reduction, though known, was not widely used. Utilizing this assumption, the slope distance E to A may be computed from the data and compared with the number 1632. From the survey data, the difference in elevation between E and A is:

(1) 682.686 ft. - 78.967 ft. = 603.719 ft.

(208.085 m. - 24.069 m. = 184.016 m.)

The horizontal distance E to A is 4,835.587 ft. (1,473.905 m.).

(2) Slope Distance EA = $\left((4835.587 \text{ ft.})^2 + (603.719 \text{ ft.})^2 \right)^{\frac{1}{2}}$

= 4,873.128 ft.

Metric : = $\left((1473.905 \text{ m.})^2 + (184.016 \text{ m.}) \right)^{\frac{1}{2}}$

This slope distance, expressed in yards, is 1,624.376 yds. This number is about 8 yards (24 ft. or 7.32 m.) less than the number

1632 on the stone. To delve further into the speculative, if it were assumed that an early explorer stood on the cairn at E and sighted a man on the cairn at A, his surface measurement of 1,632 yards would appear to be fairly accurate (1 part in 200). That the number 1632 refers to yards may be also suggested in two other ways. First, the basalt stone found under the North Cairn may have been used to roll out the distance between E and A or, more likely, the stone might have been a yard standard to which lengths of survey ropes or wires were compared. Second, the yard was established as a unit of length and fixed as a standard in iron in the Twelfth Century, and has survived through time as equal to the same length as the yard of today.

Another important set of marks on the Wendle Rock is the triangle, whose sides measure 6 in. (0.152 m.), 6 in. (0.152 m.), and 5 in. (0.127 m.), with the number 1632 located along the 5 in. leg. Hence the proportions of the legs among themselves are 1 to 1 or 1.2 to 1. Following the assumption that the 5 in. side represents the line E to A, then the vertice opposite is most likely point Augur (F). In triangle EAF, a very close proportional relationship with Wendle's Rock triangle exists: FA to EA 1.1 to 1; FE to EA is 1.3 to 1 so that the average of FA and FE to AE is 1.2 to 1--the same as either of the 6 in. sides to the 5 in. side on the rock. Point F is an important point, due to its position of high visibility (south to Nehalem Bay and Tillamook) and due to the presence of grooved lines in the rock face next to it.

The above discussion suggests the hypothesis that the line E to A is a baseline, oriented in the North-South magnetic direction. The hypothesis is supported by the fact that this line contains the only cairns in the entire area, indicating a possible intent to monument the line (thereby imparting to the line a greater significance than to the other lines). The hypothesized base line, when compared to a triangulation problem of William Bourne (1) in the year 1578 (see Figure 6), indicates a strong resemblance to this type of survey work. In Bourne's sketch, the line from Kogon Hill to the West Elbery Church is a baseline (the only one in the survey), from the endpoints of which emanate lines of sight to intersected stations. Though the printing on Bourne's sketch is poor, it is seen that the baseline is oriented in a North-South direction (across the page). The scale of Bourne's sketch is 1:52,800 or about 1 in. = 4,400 ft. (0.025 m. = 1,341.136 m.). The ends of the baseline measure 1.1 in. (0.028 m.) on the map, or about 4,840 ft. (1,475.250 m.), which is only 33 ft. (10.058 m.) less than the 4,873 ft. (1,485.308 m.) of the proposed Neahkahnie baseline. The Bourne baseline is shorter than most of the lines to the intersected stations. The same characteristic is exhibited in the Neahkahnie baseline, with E to A being shorter than the lines to F.

If the baseline hypothesis is accepted, it may be argued that the survey's purpose, besides being an act of possession, was to indicate topography and/or area. Area computations were among the common surveying practices in the Sixteenth Century (1):

> ...two or three measurements are taken around the side of the hill or valley; then a straight line is run from the foot of the hill to its top or from the top of the valley to its bottom....The area of each triangle is computed, and the total area of the irregular figure is found by adding the separate areas.

The above procedure roughly fits the Neahkahnie survey east of the baseline, with the topography broken into three sub-area triangles: (1) LCRR-3, (2) LRR-3ER-4 and (3) LEER-4 (see Figure 4). These three sub-areas divide the subtended surface into fairly equal topographical divisions. The northernmost triangle contains 5.75 vertical contours (an elevation change of 230 ft. (70.105 m.)) and is about 19.5 acres in area. The southernmost triangle contains 4.50 vertical contours (an elevation change of 180 ft. (54.865 m.)) and is about 25.3 acres in area. The middle triangle contains 5 contour intervals (an elevation change of 200 ft. (60.961 m.)) and is about 18.1 acres in area.

Analysis of the survey area west of the baseline reveals that the Center Rock station (L) is an important point. Station L might possibly have been a point for a radial survey. Station L is physically near the center of the survey area. The grooved lines on the rock, arranged like spokes on a wheel, emanate from the center and if each is prolonged graphically they show a fairly thorough coverage of the survey area. Further, most of these prolonged lines, or rays, intersect key survey stations. Rays 1 and 6 tie Station L to the baseline. Ray 5 intersects the top of the western peak of the mountain. Ray 4 ties to station F, Ray 8 ties to RR-3 and is presumably involved in the above discussed area computation. Ray 10 intersects ER-4. Rays 2 and 3, which point out to the ocean, may indicate ties to anchored ships near shore. This possibility is to be discussed below. The purposes of rays 7 and 9 are not readily apparent, though they may reveal more artifacts if further field work is conducted.

The graphically obtained azimuths between Station L and the survey stations in Figure 4 show close agreement with inverses computed from the traverse data, as Table 7 depicts.

Table 7: Azimuths (from North) at L (to nearest minute)

Line	Azimuths From Graphical Projections*		Azimuths From Traverse Inverses	
	°	'	°	'
L--E	194	24	196	39
L--F	298	38	296	42
L--K3	322	26	325	44
L--ER4	170	18	173	30
L--4C	25	48	27	28
L--RR3	109	26	104	03

*These azimuths were obtained in the following manner: with the theodolite set up over the Center Rock L, the circle was oriented to the correct basis of bearings by backsighting the previous station. A string line was pulled taught along each grooved line, thereby extending each line to be sighted. Each azimuth so obtained was graphically prolonged.

Similarly, grooved lines on other rocks were graphically projected and compared with traverse inverses, with these results tabulated in Table 8.

Table 8: Azimuths (from North) of Key Stations

Line	Azimuths From Graphical Projections*		Azimuths From Traverse Inverses	
	°	'	°	'
H--RR3	25	58	26	25
P--E	151	03	152	25
Rock A--F	308	36	311	37
ER4--F	311	03	313	57
D--E	201	11	201	19
D--RR3	171	16	169	19

* These azimuths were obtained as described in the note to Table 7.

Analysis of the data in Tables 7 and 8 show good conformity of graphical to mathematical, which is supportive of the hypothesis of an ancient survey.

The long lines of sight necessary in the ancient survey could be achieved only in the presence of minimal vegetation, a condition which actually occurred at least once in modern history. Photographs of the mountain in the early 1900's reveal bared slopes and high visibility. The native inhabitants, in fact, burned the area frequently to aid their hunting.

Further work needs to be done in the Neahkahnie area. The area north and west of the mountain could be investigated. Ray 5 from Station L could be prolonged over the top of Neahkahnie to see if any additional artifacts exist. Rays 7 and 9, which point in the northeast and southeast directions, respectively, could yield more information if further investigation is conducted.

Concluding Remarks

Concluding remarks concern the question of who authored the ancient survey. It was stated above that Francis Drake is a leading candidate, though there is no certainly that he performed the survey. In fact, the case for Drake is largely circumstantial; the comparisons with the Bourne Survey and the formation of cairns are convenient in that they dovetail with the evidence, but as such they provide no solid proofs. One piece of written evidence exists, however, which makes a stronger case for Drake. In the 1890's a Neahkahnie treasure hunter discovered a rock containing the word "DEOS" carved into it. This word is a pseudonym for the Spanish word for God (Dios), and is important because a crewman of Drake's, apparently unaware of the correct spelling, affixed the word "DEOS" to a map made recently after the circumnavigation (see Figures 7 and 8). This evidence certainly implies that the Spanish (who correctly spelled the word in their transcripts) did not make the carving but argues that Drake's charges were responsible. Figure 8 also provides a clue concerning Rays 2 and 3, which may have been directed to (or from) anchored ships. As Figure 8 shows, ties from ship to shore were made for orientation (or, as research has indicated, to calculate longitude).

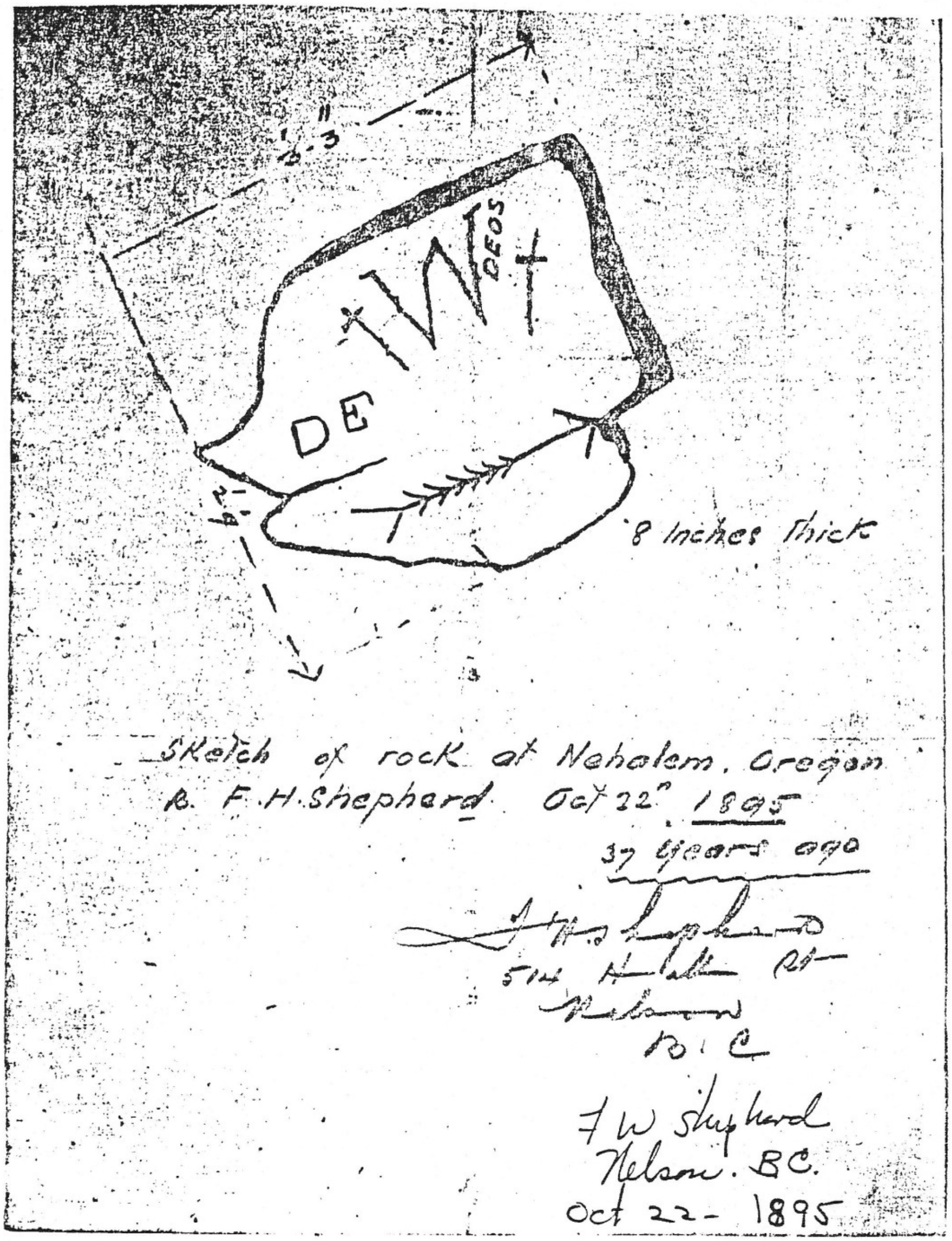
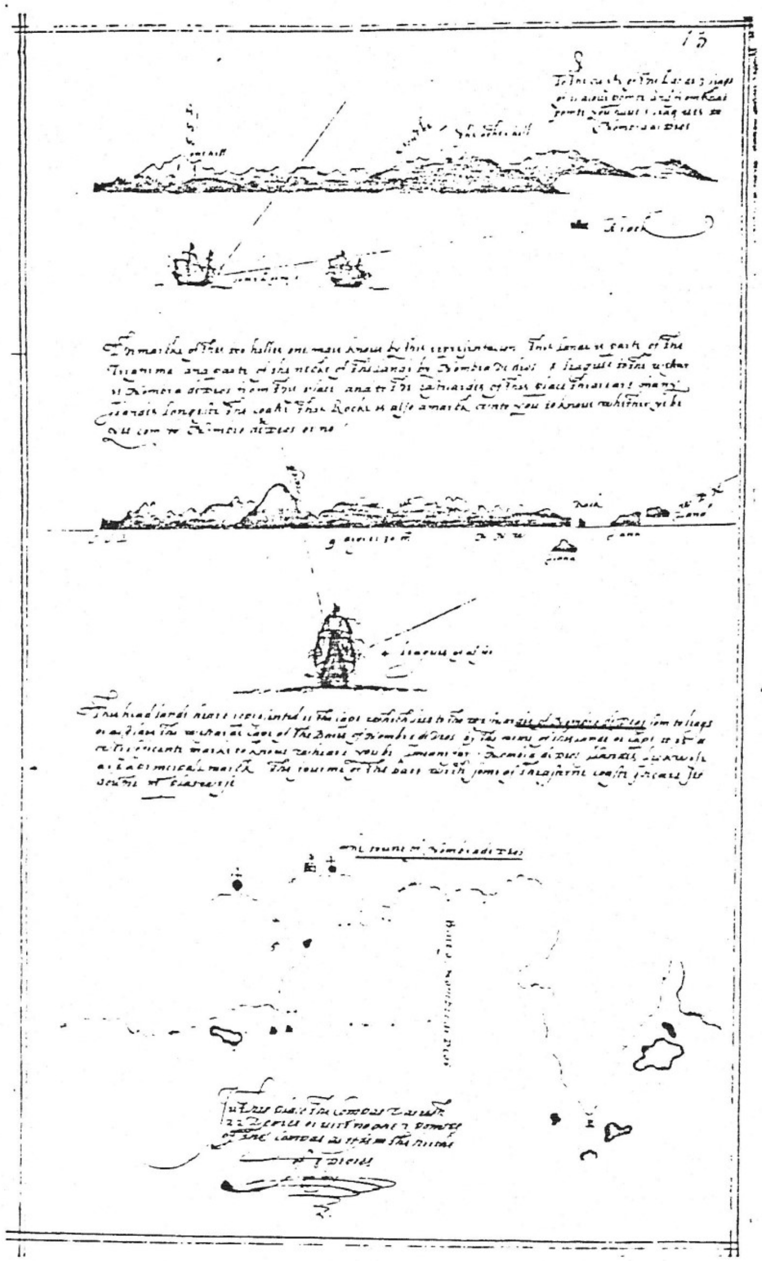


Figure 7: Sketch of Rock, Found in 1895, Containing the Word "DEOS".



VIEW OF NOMBRE DE DIOS

This watercolor sketch, made during Drake's last voyage to the Spanish Main (1595-1596), shows the care with which the sixteenth-century seaman noted details of sea and shore. Today's sailor could easily orient himself by means of these graphic notes.

Courtesy of Bibliothèque Nationale, Paris

Figure 8: Sketch Made by Drake or One of His Crewmen.

Appendix I -- References

1. Richeson, A. W. , English Land Measurng to 1800: Insturments and Land P[illegible]e, MIT Press, 1986, p 51.

2. Ibic, p 38.

Appendix II – Biography (deleated to allow for upload size of file. Available upon request or try your favorite search engine.)