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IV A.

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TRIANGULATION COMPUTATIONS

MARSHALL ISLANDS

ENIWETOK ATOLL

1948

Chief Geodetic Computer
April 1, 1954

BEST COPY AVAILABLE

JTF 7
No. 2

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TRIANGULATION

A scheme of first-order triangulation composed of check figures was executed along the eastern side of the atoll from a first-order base line on Runit Island. This scheme extends northward to Engebi Island and southward to Aniyaanii Island, and was executed for the the purpose of coordinating local surveys on the activated islands and to establish distances and azimuths between certain installations.

All observations were made at night, and standard procedure was followed throughout. The maximum triangle closure for the entire scheme was 02.41 seconds and the average 01.01 seconds. The maximum triangle closure in the base expansion figure was 01.10 seconds and the average 00.55 seconds.

With the exception of station REEF PHOTO TOWER, which could not be occupied because of excessive vibration, all stations were occupied. Traverse ties were made to the Zero and/or Photo towers on Engebi, Aomon, Runit, and Aniyaanii Islands.

In order to coordinate the triangulation of the U.S.S. BOWDITCH with the new survey, stations NORTH BASE USN, 1944 and SAND USN, 1944 were incorporated into the scheme.

BASE LINE

A first-order base line was measured on Runit Island between stations NORTH BASE USN, 1944 and newly established station RUNIT. The configuration of the island necessitated the adoption of a broken base consisting of four sections of varying lengths. First-order inver tapes were used, and standard procedure followed throughout.

The computed probable error of the total measurement is 1 part in 2,100,000.

This base line is shorter than the second-order base line measured on the same island by the U.S.S. BOWDITCH in 1944 due to the fact that a considerable portion of the sand spit extending off the south end of the island has washed away.

The base expansion figure was developed through station CORAL, a newly established station constructed in the same general area as station REEF USN, 1944, but not identical with that station. This is the most advantageous position at which the construction of a station suitable for observations was feasible.

The base expansion figure does not meet the specifications for first-order triangulation in that the R_1 for the figure is larger than is generally allowed on first order triangulation. This is the only respect in which the triangulation fails to meet first-order specifications, and is largely compensated by the limited extent of the scheme.

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DATUM

No astronomic observations were made. The datum adopted was that established by the survey of the U.S.S. BOWDITCH in 1944, which is considered to meet all requirements of the present survey.

The probable errors of the elements of the datum as determined by the U.S.S. BOWDITCH are as follows:

Latitude	0".1
Longitude	0".1
Azimuth	0".7

Although the original azimuth observations were made from station NORTH BASE USN, 1944 to station SOUTH BASE USN 1944, a line which no longer exists, an examination of the correction obtained for the angle in the adjustment of the BOWDITCH triangulation shows that but little accuracy is lost by using the azimuth of the line NORTH BASE USN, 1944 to SAND USN, 1944. It was therefore considered that a reobservation for the purposes of the present survey was not justified.

In the computation of the new first-order scheme, the latitude and longitude of station NORTH BASE USN, 1944 and the forward azimuth of the line NORTH BASE USN, 1944 to SAND USN, 1944 have been held, and together with the elements of the Clarke spheroid of 1866 determine the datum used.

RECOMPUTATION OF USN STATIONS.

Since the introduction of a new base line into the scheme changes the length obtained for the line NORTH BASE USN, 1944 to SAND USN, 1944, a recomputation was made for stations of the BOWDITCH survey to the southward of the first-order scheme in order to make them consistent with the new scheme and available for use on the present project. This recomputation was made from the line NORTH BASE USN, 1944 -- SAND USN, 1944. The adjusted angles of the BOWDITCH surveys were used.

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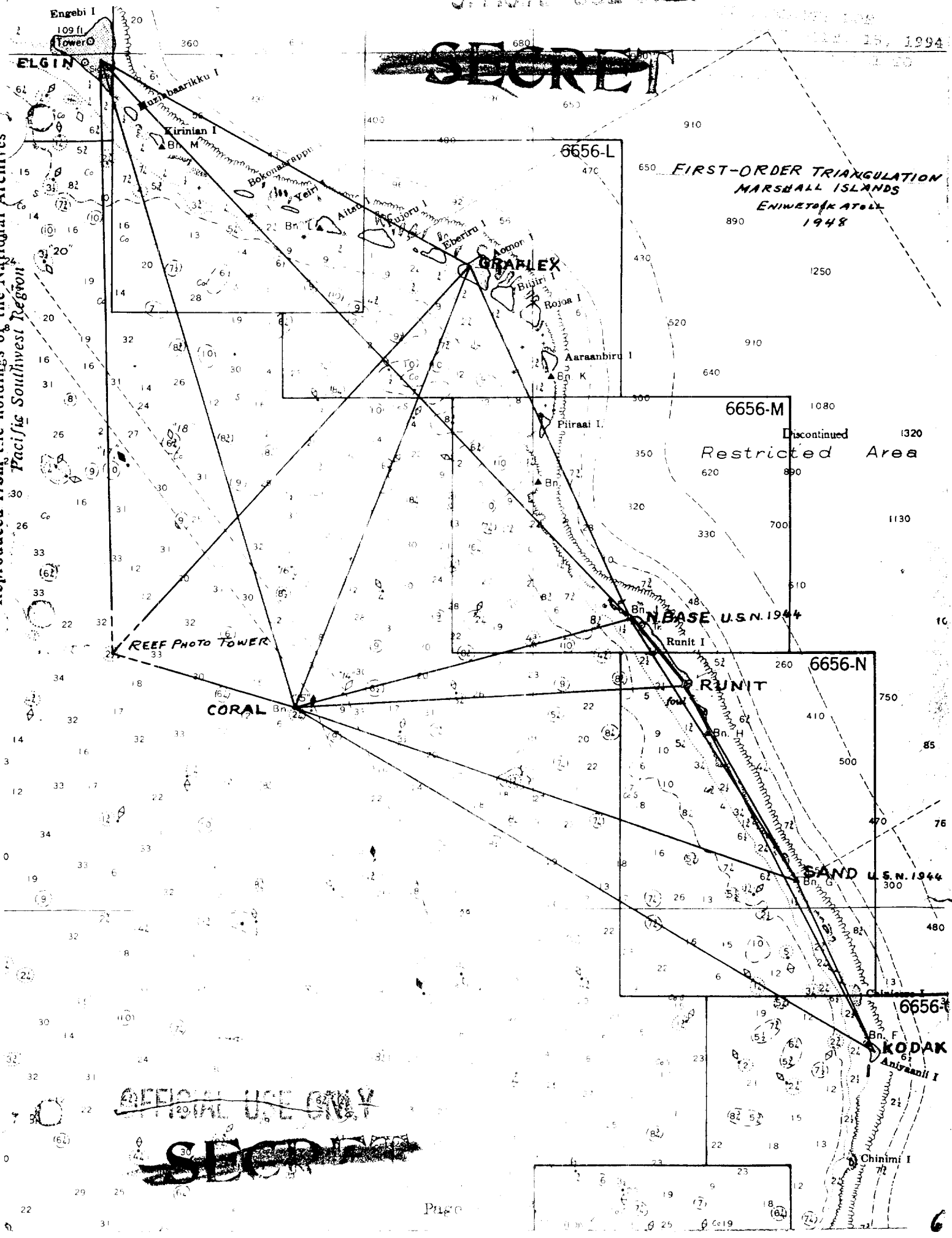

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FROM ANTON SINISGALLI TO
DIANE S. NIXON

PARTMENT OF COMMERCE
S. COAST AND GEODETIC SURVEY
Form 28 B
Ed. April 1940

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FIELD COMPUTATION

GEOGRAPHIC POSITIONS

Locality ENIWETOK ATOLL

ENIWETOK ASTRONOMIC DATUM, 1944

Accession No. of Computation:

FIRST -order Triangulation. State MARSHALL ISLANDS

16—15534-1 U. S. GOVERNMENT PRINTING OFFICE

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK AZIMUTH	TO STATION	DISTANCE LOGARITHM (METERS)	DISTANCE METERS	DISTANCE FEET
NORTH BASE, USN, 1944	° ′ ″ 11 33 23.265		° ′ ″ 327 56 52.40	° ′ ″ — — —	SAND, USN, 1944			
d.m.	162 21 09.890							
SAND, USN, 1944	11 30 18.781		47 57 15.78	327 56 52.40	NORTH BASE, USN, 1944	3.824 1990	[illegible]	[illegible]
d.m.	162 23 06.873							
CORAL	11 32 40.255		255 01 25.04	75 [illegible]	[illegible]			
			287 02 51.95	109 04 [illegible]	LANGL, USN	[illegible]	444.41 ✓	24.189
[illegible]	[illegible]							
	[illegible]		[illegible]	[illegible]	CORAL			
	[illegible]		[illegible] 46	322 [illegible]	[illegible]	[illegible] 776	3809.[illegible]	28.401.9
KUDAK	28 17.674		125 16 28.70	300 55 01.46	CORAL	[illegible] 0476	2541.9609	8,500.818
	62 42 38.135		54 00 12.79	333 59 49.43	RUNIT	3.438 2840	14407.35 ✓	47,268.1
GRAFTON						3.408 2891	8096.35 ✓	26,562.8
	37 [illegible]		[illegible]	[illegible]	NORTH BASE	[illegible]	[illegible]	[illegible]
	[illegible]			[illegible]	CORAL	[illegible]	[illegible]	[illegible]
ELGIN	[illegible]		[illegible]	[illegible]	GRAFTON	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	63 [illegible]	CORAL	[illegible]	[illegible]	[illegible]
[illegible]	32 [illegible]		180 09 04.00	00 [illegible] 04.22	ELGIN	4.013 7715	12259.99 ✓	40,215.[illegible] ✓
	162 14 54.051		285 39 19.13	105 39 47.12	CORAL	3.637 2242	4327.49 ✓	7,135.2 ✓
			266 31 08.64*	86 32 25.14*	RUNIT ZERO TOWER	3.164 2928*	1575.69	18,043.2
			223 22 17.41*	43 21 09.14*	AOMON ZERO TOWER	4.055 4317*	11361.40	32,277.9
			176 16 49.13*	356 11 43.40*	ENGEBI ZERO TOWER	4.123 5877*	13291.92	43,608.6

[1] No check on this position.

Abbreviations used: d. = described; m. = marked; n. = not; r. = recovered; l. = lost; p. = probably. (Examples: n. d. = not described; p. l = probably lost.)

* Derived by Inverse Position Computation

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U. S. COAST AND GEODETIC SURVEY
Form 28 B
Ed. April 1940

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FIELD COMPUTATION

GEOGRAPHIC POSITIONS

Accession No. of Computation:

Locality ENIWETOK ATOLL

~~North American 1927~~ ENIWETOK ASTRONOMIC 1944 Datum

FIRST-order ~~Triangulation~~ TRAVERSE. State MARSHALL ISLANDS

16—13634-1 U. S. GOVERNMENT PRINTING OFFICE

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK AZIMUTH	TO STATION	DISTANCE: LOGARITHM (METERS)	DISTANCE: METERS	DISTANCE: FEET
	° ′ ″		° ′ ″	° ′ ″				
ANIYAANII PHOTO TOWER	11 28 18.619		143 52 48.38	323 52 48.30	KODAK	1.330 9208	21,425.5	70,272
	162 [illegible] 59.52		[illegible] 58 51.18*	331 58 18.62*	RUNIT ZERO TOWER	[illegible] 9406*	10520.60'	34,516.3
RUNIT ZERO TOWER	[illegible]		[illegible] 58 10.04	290 58 48.81	NEWTON CASE	[illegible] 945	9961.56	654,906
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRAVERSE [illegible]	[illegible] 3.295		26 17 41.20	30 17 37.98	ADMO[illegible]	[illegible]	[illegible]	[illegible]
	162 [illegible] 22.518							

✓ No check on this position.

Abbreviations used: d.=described; m.=marked; n.=not; r.=recovered, l.=lost; p.=probably. (Examples: n. d.=not described; p. l.=probably lost.)

* Derived By Inverse Position Computation

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U. S. COAST AND GEODETIC SURVEY
FORM 28 B
Ed. April 1940

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FIELD COMPUTATION GEOGRAPHIC POSITIONS

Accession No. of Computation: _____

Locality ENIWETOK ATOLL

ENIWETOK ASTRONOMIC, 1994 ~~North American 1927~~ Datum

order TRAVERSE ~~Triangulation~~. State MARSHALL ISLANDS

10—18634-1 U. S. GOVERNMENT PRINTING OFFICE

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK AZIMUTH	TO STATION	DISTANCE		
						LOGARITHM (METERS)	METERS	FEET
TRAVERSE STA BILLIFI	11 [illegible] 162 [illegible]		[illegible]	306 17 41.20	TRAVERSE STA ALMON	2.380 3885	759.[illegible]	2,490.994

[1] No check on this position. Abbreviations used: d. = described; m. = marked; n. = not; r. = recovered; l. = lost; p. = probably. (Examples: n. d. = not described; p. l. = probably lost.)

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DEPARTMENT OF COMMERCE
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SECRET
[illegible] OBSERVATIONS

Station CORAL

State Marshall Islands (Eniwetok Atoll)

Chief of party R.L.Pfe[illegible]

Date 2-[illegible]-[illegible]

Computed by M.G.

Observer G.R.Stro[illegible]de

Instrument [illegible]

Checked by JRS

U. S. GOVERNMENT PRINTING OFFICE: 1933 — 11—95038

OBSERVED STATION	Observed direction	Correction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	° ′ ″
ELGIN	0 00 00.00			0 00 00.00	
GRAFLEX	[illegible] 14 [illegible]				
N.BASE U.S.N. 1944	[illegible] [illegible] [illegible]				
RUNIT	[illegible] 43 [illegible]				
SAND U.S.N. 1944	[illegible] 34 [illegible]				
KODAK	[illegible] 46 [illegible]				
REEF PHOTO TOWER	[illegible] 32 [illegible]				

No eccentricity of [illegible] station.

Observations made for [illegible]

Recorded in volumes [illegible]

NOTE: No reference [illegible]

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[illegible]

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SECRET

Station ELGIN
State Marshall [illegible] (Enewetok Atoll)
Chief of party R. L. Pfau
Date 2-14-48
Computed by G.R.S.
Observer G.R.S.
Instrument [illegible]
Checked by R.L.P.

OBSERVED STATION	[illegible]	[illegible]	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		° ′ ″	° ′ ″
GRAFLEX	[illegible]		0 00 00.00	
N. BASE U.S.N. 1944	[illegible]			
CORAL	[illegible]			
REEF PHOTO TOWER	[illegible]			
ENGEBI ZERO TOWER	[illegible]			

No eccentricity of lights or instrument at this station.
Observations made from eight foot steel tower.
Observations recorded in volume [illegible].
NOTE: No reference marks were established at this station.

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[illegible] 10A

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LIST OF DIRECTIONS

Station GRAFLEX

Chief of party R.L.Pfau

Observer G.R.Stroud

State [illegible] (Eniwetok Atoll)

Date [illegible]

Instrument [illegible]

Computed by [illegible]

Checked by [illegible]

OBSERVED STATION	Observed direction	Correction	Sea level correction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
N.BASE U.S.N. 1941	0 00 00.00			0 00 00.00	
CORAL	[illegible]				
REEF PHOTO TOWER	[illegible]			67 49 24.02	
ELGIN	[illegible]				
Aomon Zero Tower Hor. dist. [illegible]	[illegible]				
Aomon Photo Tower Esr					
Hor. Dist. [illegible]	[illegible]				

No eccentricity [illegible]

Observations made fr[illegible]

Recorded in volume 3.

NOTE: No reference m[illegible]

* Observations [illegible]

* Record of meas[illegible]

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LIST OF DIRECTIONS

Station ...ODAK — *Sale* Marshal Islands

Chief of party R.L.Pfau — *Date* 8-13-4[illegible] — *Computed by* M.G.

Observer G.R.Strode — *Instrument* G3[illegible]5 — *Checked by* [illegible]

OBSERVED STATION	Observed angle	Recorded angle	Reduction	Corrected direction with zero setting	Adjusted direction*
	° ′ ″	° ′ ″		° ′ ″	° ′ ″
CORAL	[illegible]			[illegible] 00 00.00	
RUNIT	[illegible]				
AND USN 1944	[illegible]				
R.M.No.1 NE Hor.					
Dist. 57.398ft					
17.495meters	[illegible]				
*Aniyaanii photo tower					
SE Hor. Dist. [illegible]	[illegible]				
R.M.No.2 SSE Hor.					
Dist. 110.819ft.					
33.[illegible] meters	[illegible]				

No eccentricity of [illegible]

Observations made [illegible]

Recorded in volume 1.

*Distance to the Aniyaanii photo tower [illegible] stainless steel tape G3661 with tension of [illegible]

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LIST OF DIRECTIONS

Station N. BASE U.S.N. [illegible] *State* [illegible]

Chief of party R.L. [illegible] *Date* [illegible] *Computed by* M.G.

Observer G.R.Strode *Instrument* [illegible] *Checked by* [illegible]

U. S. GOVERNMENT PRINTING OFFICE: 1933 11—9503

OBSERVED STATION	Observed direction	Weight	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	° ′ ″
RUNIT	[illegible]			0 00 00.00	
SAND U.S.N. 1944	[illegible]				
CORAL	[illegible]				
ELGIN	[illegible]				
GRAFLEX	[illegible]				
RUNIT PHOTO TOWER Hor. Dist. 40.1642 m.	[illegible]				
RUNIT ZERO TOWER Hor. Dist. 199.615 m.	[illegible]				

No eccentricity of [illegible] instrument [illegible] station.

Observations made from [illegible] wooden tower.

Recorded in volume [illegible]

NOTE: No reference made [illegible] station.

* Record of observations [illegible]

† Record of measurements [illegible]

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LIST OF DIRECTIONS

Station RUNIT

Chief of party R. L. Pfau

Observer G.R.S. & J.C.E.

Computed by G.R.S.

Checked by

OBSERVED STATION	[illegible]	[illegible]	[illegible] direction with [illegible]	Adjusted direction*
			° ′ ″	° ′ ″
SAND U.S.N. 1944	[illegible]		0 00 00.00	
KODAK	[illegible]			
CORAL	[illegible]			
N. BASE U.S.N. 1944	[illegible]			

Reference mark No. 1
41.075 feet, 12.520 meters [illegible]
Reference mark No. 2
48.062 feet, 14.650 meters [illegible]

No eccentricity of [illegible] instrument [illegible] station.
Observations made from [illegible]
Observations recorded [illegible] 1 and 2 and in
Horizontal angles volume [illegible]
NOTE: Reference mark [illegible] of instrument H-374.

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LIST OF DIRECTIONS

Station SAND U.S.N. 1944 *State* Marshall Islands (Enewetok Atoll)

Chief of party R.L.Pfe. *Date* 2-14-4 *Computed by* M.G.

Observer G.R.Strode *Instrument* [illegible] *Checked by* [illegible]

OBSERVED STATION	Observed direction	Reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
KODAK	0 00 00.00			0 00 00.00	
CORAL	[illegible]				
N BASE U.S.N. 1944	[illegible]				
RUNIT	[illegible]				

No eccentricity of line of instrument [illegible] station.

Observations made from [illegible] RCOC tower.

Recorded in volume 1.

NOTE: No reference marks at this station.

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REDUCTION TO CENTER

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Form 382
Ed. June 1929

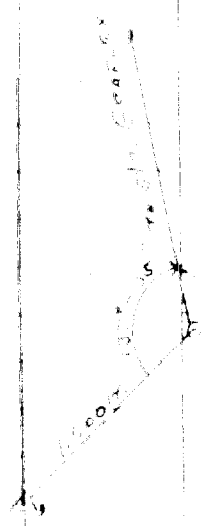
Eccentric Light at Station

REEF PHOTO TOWER

d = *1.500* *meters*

16—19440

STATION	[illegible]	[illegible]	LOGARITHM OF REDUCTION IN SECONDS	REDUCTION
Center				
Graflex	*13* [illegible]	[illegible]	*.26187*	*+18.28*



Eccentric of station REEF PHOTO TOWER as referred to from the GRAFLEX ONLY *[illegible] other stations.*

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Form 470
Ed. Oct., 19

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ABSTRACT OF DIRECTIONS

Station [illegible] Computed [illegible] Date 2-17-48

Observer [illegible] Checked by [illegible] Inst. No. 6335

POSITION NO.	TIME OBSERVED 0h 0m	STATIONS OBSERVED				KODAK	REEF PHOTO TOWER
						° ′	° ′
						137 4	302 31
1	0.00					42.2	18.4
2	0.00					40.1	18.2
3	0.00					39.7	19.9
4	0.00					46.5	18.6
5	0.00					37.6 (36.4)R	16.3 (15.3)R
6	0.00					40.1	17.6
7	0.00					40.9	17.3
8	0.00					39.9	17.2
9	0.00					43.5	20.4
10	0.00					38.5	21.6
11	0.00					42.5	20.4
12	0.00					41.5	21.[illegible]
13	0.00					[illegible]	19.9
14	0.00					42.1	22.0
15	0.00					[illegible]	22.3
16	0.00					42.9	21.2
Sum,						113	58.4
Mean,						40.7R	19.52
Cor. for ecc.,							
Direction,							

DO NOT WRITE IN THIS MARGIN

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DO NOT WRITE IN THIS MARGIN

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U. S. COAST AND GEODETIC SURVEY
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Ed. Oct., 19[illegible]

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ABSTRACT OF DIRECTIONS

Station ELGIN
Date 2-19-48
Observer G.R. Strode
Inst. No. 6335

U. S. GOVERNMENT PRINTING OFFICE: 1931 — 11—4689

POSITION NO.	GRAFLEX (INITIAL 0° 00')									
1	0.00									
2	0.00									
3	0.00									
4	0.00									
5	0.00									
6	0.00									
7	0.00									
8	0.00									
9	0.00									
10	0.00									
11	0.00									
12	0.00									
13	0.00									
14	0.00									
15	0.00									
16	0.00									
Sum,										
Mean,										
Cor. for ecc.,										
Direction,										

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ABSTRACT OF DIRECTIONS

Station GRAFTON Computed by Date 2-18-48
Observer G. R. Smith Checked by Inst. No. G 335

U. S. GOVERNMENT PRINTING OFFICE, 1941 11—4089

POSITION NO.	STATIONS OBSERVED					
	N BASE S.N. 1944 (INITIAL) 0° 00'			BASE SN 1944 0 ' 00 00	AOMON PHOTO TOWER 0 ' 263 34	
1	0.00				120	
2	0.00					
3	0.00					
4	0.00					
5	0.00				075	
6	0.00					
7	0.00					
8	0.00					
9	0.00				158	
10	0.0					
11	0.0					
12	0.0					
13	0.0					
14	0.0					
15	0.0					
16	0.0					
Sum,			118		053	
Mean,					118	
Cor. for ecc.						
Direction,					118	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct., 1932

ABSTRACT OF DIRECTIONS

State [illegible]

Station KODA

Computed by [illegible]

Date [illegible]

Observer G. R. STROL

Checked by [illegible]

Inst. No. G 350

11—4680

U. S. GOVERNMENT PRINTING OFFICE: 1932

POSITION NO.		CORAL	[illegible]	[illegible]					
	(INITIAL) 0° 00′	[illegible]	[illegible]	[illegible]					
1	0.00	[illegible]	[illegible]						
2	0.00	[illegible]	[illegible]						
3	0.00	[illegible]	[illegible]						
4	0.00	[illegible]	[illegible]						
5	0.00	[illegible]	[illegible]						
6	0.00	[illegible]	[illegible]						
7	0.00	[illegible]	[illegible]						
8	0.00	[illegible]	[illegible]						
9	0.00	[illegible]	[illegible]						
10	0.00	[illegible]	[illegible]						
11	0.00	[illegible]	[illegible]						
12	0.00	[illegible]	[illegible]						
13	0.00	[illegible]	[illegible]						
14	0.00	[illegible]	[illegible]						
15	0.00	[illegible]	[illegible]						
16	0.00	[illegible]	[illegible]						
Sum.		[illegible]	[illegible]						
Mean,		[illegible]	[illegible]						
Cor. for ecc.,									
Direction,									

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ABSTRACT OF DIRECTIONS

Station [illegible] Computed by [illegible] Date 2-13-48

Observer E. C. Smith Checked by [illegible] Test. No. G 335

U. S. GOVERNMENT PRINTING OFFICE 1944 11—4669

POSITION NO.	STATIONS OBSERVED						
	SAN	[illegible]	[illegible]	[illegible]			
	USN 2954		DAC TOWER				
	(INITIAL) 0° 00'	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1	0.00						
2	0.00						
3	0.00						
4	0.00						
5	0.00						
6	0.00						
7	0.00						
8	0.00						
9	0.00						
10	0.00						
11	0.00						
12	0.00						
13	0.00						
14	0.00						
15	0.00						
16	0.00						
Sum,							
Mean,							
Cor. for ecc.,							
Direction,							

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U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct., 1932

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ABSTRACT OF DIRECTIONS

State [illegible]

Station N. BASE (SN [illegible]) Computed by [illegible] Date 2-6-48

Observer G. R. Strode Checked by [illegible] Inst. No. G 335

POSITION NO.		STATIONS [illegible]						
	RUN 1	[illegible]	[illegible]	[illegible]	[illegible]			
		USD [illegible]						
	(INITIAL) 0° 00′	[illegible]	[illegible]	[illegible]	[illegible]	° ′ ″	° ′ ″	° ′ ″
1	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
2	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
3	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
4	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
5	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
6	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
7	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
8	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
9	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
10	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
11	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
12	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
13	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
14	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
15	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
16	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
Sum,		[illegible]	[illegible]	[illegible]	[illegible]			
Mean,		[illegible]	[illegible]	[illegible]	[illegible]			
Cor. for ecc.,								
Direction,								

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ABSTRACT OF DIRECTIONS

Station RUNIT

Computed by

Date 2-15-48

Observer G.R. Strock

Checked by

Inst. No. 6335

U. S. GOVERNMENT PRINTING OFFICE 1936

POSITION NO.											
	SAND USN 1944 (INITIAL) 0° 00′							° ′	° ′	° ′	
1	0.00										
2	0.00										
3	0.00										
4	0.00										
5	0.00										
6	0.00										
7	0.00										
8	0.00										
9	0.00										
10	0.00										
11	0.00										
12	0.00										
13	0.00										
14	0.00										
15	0.00										
16	0.00										
Sum,											
Mean,											
Cor. for sec.,											
Direction,											

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U. S. COAST AND GEODETIC SURVEY
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Ed. Oct. 1, 1

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N 176 05
E 175 20

ABSTRACT OF DIRECTIONS

State [illegible]

Station SANLUSN [illegible] Computed by [illegible] Date 2-14-48

Observer [illegible] Checked by [illegible] Inst. No. [illegible]

U. S. GOVERNMENT PRINTING OFFICE 1941 11—4689

POSITION No.	[illegible]	STA. [illegible]										
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	(INITIAL) 0° 00"	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sum,		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean,		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cor. for ecc.,												
Direction,												

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25

COMPUTATION OF TRIANGLES

Marshall Islands, Eniwetok Atoll

STATIONS	DIRECTIONS	DIRECT ANGLE	REDUCTIONS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3				2591.9689m	3 413 6298
1 Canal	[illegible]	[illegible]	[illegible]	09.50	0.564 9132
2 N. 3250 [illegible]	[illegible]	[illegible]	[illegible]	55.76	9 966 3991
3 Reef	[illegible]	[illegible]	[illegible]	54.74	9 896 2271
1-3					3 944 9421
1-2					3 874 7701
	[illegible]		0.05	00.00	
2-3					3.874 7701
1 Sand [illegible]	[illegible]	[illegible]	0.04	11.69	0.202 1920
2 Canal	[illegible]	[illegible]	0.04	27.87	9 747 8359
3 N. 3250 [illegible]	[illegible]	[illegible]	0.04	20.44	9 980 3895
1-3					3.824 7980
1-2					4 057 3516
	[illegible]		0.12	00.00	
2-3					3.944 9421
1 Sand [illegible]	[illegible]	[illegible]	0.03	11.12	0.173 2968
2 Canal	[illegible]	[illegible]	0.03	18.33	9 495 1219
3 Reef	[illegible]	[illegible]	0.03	10.54	9 939 1108
1-3					3. 613 3608
1-2					4. 057 3497
	[illegible]		0.08	00.00	
2-3					3. 413 6298
1 Sand [illegible]	[illegible]	[illegible]	0.00	19.55	1 245 7478
2 N. [illegible]	[illegible]	[illegible]	0.00	34.92	8 953 9174
3 Reef	[illegible]	[illegible]	0.01	05.53	9 165 3757
1-3					3. 613 2922
1-2					3. 824 7533
	[illegible]		0.01	00.00	

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COMPUTATION OF TRIANGLES

State: .....

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STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.944 9421
1 Kodak	33 03 44.89	-0.80	44.09	0.05	44.04	0.263 1657
2 Coral	30 05 33.60	-0.80	32.80	0.05	32.75	9.700 1813
3 Runit	116 50 44.08	-0.81	43.27	0.06	43.21	9.950 4762
1-3						3.908 2891
1-2						4.158 5840
	02.57	-2.41		0.16	00.00	
2-3						4.057 3497
1 Kodak	35 55 36.07	-0.61	35.46	0.03	35.43	0.231 5490
2 Coral	11 52 14.87	-0.61	14.26	0.03	14.23	9.313 2373
3 Sand, U.S.N.	132 12 10.97	-0.60	10.37	0.03	10.34	9.869 6879
1-3						3.602 1372
1-2						4.158 5826
	01.91	-1.82			00.00	
2-3						3.613 3608
1 Kodak	02 51 51.18	-0.17	51.01	0.00	51.01	1.301 3048
2 Runit	02 47 26.84	-0.17	26.67	0.00	26.67	8.687 4452
3 Sand, U.S.N.	174 20 42.50	-0.17	42.33	0.01	42.32	8.993 5778
1-3						3.602 0968
1-2						3.908 2634
	00.52	-0.51			00.00	
2-3						
1						
2						
3						
1-3						
1-2						

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COMPUTATION OF TRIANGLES

State: Marshall Islands ~ Eniwetok Atoll

STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.874 7701
1 Graflex	45 59 53.24	-0.43	52.81	0.05	52.76	0.143 0806
2 N. Base, USN	80 21 39.08	-0.42	38.66	0.06	38.60	9.993 8247
3 Coral	53 38 29.12	-0.43	28.69	0.05	28.64	9.905 9691
1-3						4.011 6754
1-2						3.923 8198
	01.44	-1.28			00.00	
2-3						4.011 6754
1 Elgin	46 07 16.82	+0.16	16.98	0.08	16.90	0.142 1794
2 Graflex	95 38 14.34	+0.16	14.50	0.07	14.43	9.997 8945
3 Coral	38 14 28.59	+0.16	28.75	0.08	28.67	9.791 6729
1-3						4.151 7493
1-2						3.945 5277
	59.75	+0.48		0.23	00.00	
2-3						3.874 7701
1 Elgin	27 26 12.84	+0.34	13.18	0.09	13.09	0.336 5134
2 N. Base, USN	60 40 48.70	+0.34	49.04	0.09	48.95	9.940 4670
3 Coral	91 52 57.71	+0.34	58.05	0.09	57.96	9.999 7655
1-3						4.151 7505
1-2						4.211 0490
	59.25	+1.02		0.27	00.00	
2-3						4.211 0490
1 Graflex	141 38 07.58	-0.60	06.98	0.04	06.94	0.207 1425
2 N. Base, USN	19 40 50.38	-0.61	49.77	0.04	49.73	9.527 3392
3 Elgin	18 41 03.98	-0.61	03.37	0.04	03.33	9.505 6285
1-3						3.945 5307
1-2						3.923 8200
	01.94	-1.82		0.12	00.00	

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U. S. COAST AND GEODETIC SURVEY
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COMPUTATION OF TRIANGLES

State: Marshall Islands ~ Eniwetok Atoll

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STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.011 6754
1 Reef Photo tower	(62 27 20.26)	0.00	20.26	0.04	20.22	0.052 2464
2 Graflex	21 49 30.78	0.00	30.78	0.04	30.74	9.570 2816
3 Coral	95 43 09.07	0.00	09.07	0.03	09.04	9.997 8328
1-3						3.634 2034
1-2						4.061 7546
	00.11	0.00		0.11	00.00	
2-3						3.945 5277
1 Reef Photo tower	(43 02 55.95)	0.00	55.95	0.08	55.87	0.165 8199
2 Elgin	63 08 20.74	0.00	20.74	0.08	20.66	9.950 4165
3 Graflex	73 48 43.56	0.00	43.56	0.09	43.47	9.982 4306
1-3						4.061 7641
1-2						4.093 7782
	00.25			0.25	00.00	
2-3						4.151 7505
1 Reef Photo tower	(105 30 15.73)	0.00	15.73	0.05	15.68	0.016 0986
2 Elgin	1[illegible] 01 03.92	0.00	03.92	0.04	03.88	9.466 3751
3 Coral	51 28 40.48	0.00	40.48	0.04	40.44	9.925 9224
1-3						3.634 2242
1-2						4.093 7715
	00.13			0.13	00.00	
2-3						
1						
2						
3						
1-3						
1-2						

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U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

		°	′	″			°	′	″
α	2 to 3	255	01	25.04	α	3 to 2	75	02	12.88
2d∠	&	+15	48	09.52	3d∠		−112	14	55.77
α	2 to 1	270	49	34.56	α	3 to 1	322	47	17.11
Δα		+	00	58.14	Δα		+	00	10.36
		180	00	00.00			180	00	00.00
α′	1 to 2	90	50	32.70	α′	1 to 3	142	47	27.47
	First Angle of Triangle	51	56	54.76					
		45	47	27.46					

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	° ′ ″		° ′ ″		° ′ ″		° ′ ″
φ	11 32 28.[illegible]	2 [illegible]		λ	162 21 09.890		
Δφ	− 00 07 [illegible]	Δλ	162 17 10.931	φ	11 33 23.265	3 N. Bose USN	Δλ + 00 51.731
φ′	11 32 16.080 1 RUNIT		+ 04 50.690	Δφ	− 01 01.185		λ′ 162 22 01.621
		λ′	162 22 01.621	φ′	11 32 16.080	1 RUNIT	

Logarithms				Logs										Logs
s	3.777 7421	(1)	+ 04.1744	1	9.699	½(φ+φ′)	11 32 18.17	s	3.413 6298	(1)	+ 67.1835	½	9.699
+ cos α	8.158 7[illegible]	(2)	+ 0.0404	s²		Logarithms		+ cos α	9.[illegible] 336	(2)	+ 0.0013	s²	
D	[illegible] 997	Sum	+ [illegible]	K		s	3.777 7421	B	8.[illegible] 49.72	Sum	+ 67.[illegible]	K	
(1)	[illegible]	B	[illegible]	E		(−) sin α	9.999 9548	(1) −h	1.827 2626	(3)	+ 0.0000	E	
[illegible]	[illegible]	4	[illegible]	5		A	8.509 6678	s²	6.847 26	(4)	0.0000	(5)	
sin²	7.999 91	(5)		3	0.477	sec φ′	0.008 8657	sin² α	9.563 17	(5)		3	0.477
C	0.1168	(6)		cos² α		Sum	2.463 4304	C	0.117 37	(6)	+	cos² α	
(2)=K	8.6067	(7)		(6)		Arc—sin corr.	0	(2)=K	7.107 80	(7)	+	(6)	
(Δφ)²	1.2327	−Δφ	+ 04.1744	(colog) E		− Δλ	2.463 4304	(Δφ)²	3.6545	−Δφ	+ 67.1848	(colog) E	
D	1.9845	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.301 0828	D	1.9851	Δφ/2		A²arc²1″/3	5.912
(3)	3.2172			sec²φ		sec Δφ/2	0	(3)	5.6396			sec²φ	
−h	0.6164			(7)		(approx.) −Δα	1.7645132	−h	1.8273			(7)	
s² sin² α	7.8898					do	−58.145″	s² sin² α	6.3904				
E	5.6635	Arc—sin corr.				(8)	0″	E	5.6636	Arc—sin corr.			
(4)	4.1697	for s	− 1	(Δλ)³	7.390	−Δα	−58.145″	(4)	3.8813	for s	− 0	(Δλ)³	5.141
		for Δλ	+ 1	F	7.575					for Δλ	+ 0	F	7.135
		Total	0	(8)	4.965	− Δλ	−290.690″			Total	0	(8)	2.276

Logarithms				Logs
½(φ+φ′)	11 32 49.67			
Logarithms				
s	3.413 6298			
sin α	9.781 5865			
A	8.509 6678			
sec φ′	0.008 8657			
Sum	1.713 7498			
Arc—sin corr.	0			
− Δλ	1.713 7498			
sin½(φ+φ′)	9.301 4075			
sec Δφ/2	0			
(approx.) −Δα	1.015 1573			
do	10.355″			
(8)	0″			
, −Δα	−10.355″			
− Δλ	−51.7309″			

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POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	270	49	34.56	α	3	to 2	90	50	32.70
2d∠		&	+30	05	32.80	3d∠		&	−116	50	43.27
α	2	to 1	300	55	07.36	α	3	to 1	333	59	49.43
Δα			+	01	21.34	Δα			+	00	23.36
			180	00	00.00				180	00	00.00
α′	1	to 2	120	56	28.70	α′	1	to 3	154	00	12.79
		First Angle of Triangle	33	03	44.09						
			154	00	12.79						

	°	′	″			°	′	″			°	′	″			°	′	″
φ	11	32	20.255	2 CORAL	λ	162	17	10.931	φ	11	32	16.080	3 RUNIT	λ	162	22	01.621
Δφ		04	01.013 ~~00.980~~		Δλ	+	06	47.804	Δφ	−	03	56.838		Δλ	+	01	57.114
φ′	[illegible]	[illegible]	[illegible]	1 KODAK	λ′	162	23	58.735	φ′	[illegible]	[illegible]	[illegible]	1 KODAK	λ′	[illegible]	[illegible]	[illegible]

	Logarithms		″		Logs
s	4.158 5840	(1)	+ 240.9851 ~~240.9847~~	½	$\bar{9}$.699
+ cos α	9.710 8123	(2)	+ 0.0796	s²	
B	8.512 4491	Sum	+ 240.9847	K	
(1)=h	2.381 8460	(3)	+ 0.0006	E	
s²	8.512 [illegible]	(4)	− 0.0002	(5)	
sin² α	7.866 [illegible]	(5)		3	0.477
C	[illegible]	(6)		cos² α	
(2)=K	8.700 [illegible]	(7)	+	(6)	
(½Δφ)²	4.7638	−Δφ	+ 240.9851	(colog) E	
D	1.9845	Δφ/2		A²arc²1″/3	$\bar{5}$.912
(3)	6.7488			sec²φ	
−h	2.3818			(7	
s² sin² α	8.1840				
E	5.6635	Arc−sin corr.			
(4)	6.2293	for s	− 3.5	(Δλ)²	7.832
		for Δλ	+ 2.8	F	$\bar{7}$.575
		Total	−0.7	(8)	5.407

	°	′	″	Logarithms
½(φ+φ′)	11	32	19.15	
s				4.158 5840
(−) sin α				9.933 4352
A′				8.504 6684
sec φ′				0.008 7642
Sum				[illegible]
Arc−sin corr.				−1
−Δλ				2.610 4517
sin ½(φ+φ′)				9.299 8596
sec Δφ/2 (approx.)				1
−Δα				1.9103114
do				−81.342″
(8)				0″
−Δα				−81.342″
−Δλ				−4[illegible]″

	Logarithms		″		Logs
s	3.908 2891	(1)	+ 236.8308	½	$\bar{9}$.699
+ cos α	9.953 6493	(2)	+ 0.0066	s²	
B	8.512 4998	Sum	+ 236.8374	K	
(1)=h	2.374 4382	(3)	+ 0.0005	E	
s²	7.816 58	(4)	− 0.0000	(5)	
sin² α	9.283 [illegible]	(5)		3	0.477
C	0.[illegible]	(6)	+	cos² α	
(2)=K	7.811 01	(7)	+	(6)	
(½Δφ)²	4.7489	−Δφ	+ 236.8379	(colog) E	
D	1.9845	Δφ/2		A²arc²1″/3	$\bar{5}$.912
(3)	6.7334			sec²φ	
−h	2.3744			(7)	
s² sin² α	7.1004				
E	5.6635	Arc−sin corr.			
(4)	5.1383	for s	− 1.1	(Δλ)²	6.206
		for Δλ	+ 0.2	F	$\bar{7}$.575
		Total	−0.9	(8)	3.781

	°	′	″	Logarithms
½(φ+φ′)	11	32	17.66	
s				3.908 2891
(−) sin α				9.6[illegible]
A′				8.5[illegible]
sec φ′				0.008 7642
Sum				2.068 6093
Arc−sin corr.				−1
−Δλ				2.068 6092
sin ½(φ+φ′)				9.299 8380
sec Δφ/2 (approx.)				1
−Δα				1.368 4473
do				23.358″
(8)				0″
−Δα				−23.358″
−Δλ				−117.1141″

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POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&			
α	2	to 1	327	56	52.40	α	3	to 1			
Δα			+	00	23.38	Δα	Note: Position of N. Base USN 1944 and Azimuth N. Base USN to Sand USN 1944 has been Held fixed in these Computations				
			180	00	00.00				180	00	00.00
α′	1	to 2	147	57	15.78	α′	1	to 3			

φ	[illegible]					162	21	09.890	φ	3	
Δλ	− 03	04.284				+	01	56.983	Δφ		Δλ
λ′	11 30	18.981	1 Sand USN			162	23	06.873	φ′	1	λ′

Logarithms					Logs	Logarithms									Logs	Logarithms	
s	3 824 7980	(1)	+ 184.2768	½	$\bar{9}$.699	½(φ+φ′)	11 31 51.128	s		(1)		½	$\bar{9}$.699	½(φ+φ′)			
+ cos α	9 928 7334	(2)	+ 0.0066	s²				cos α		(2)		s²					
B	8 [illegible]			h		s	3 824 7980	B		Sum		K		s			
(1)=h	2.265 4706	(3)	+ 0.0003	L		− sin α	9 724 8412	(1) −h		(3)	+	E		sin α			
s²	7.649 60	(4)	0000	(5)		A′	8.509 6681	s²		(4)		(5)		A′			
sin² α	9.449 68	(5)		3	0.477	sec φ′	0.008 8154	sin² α		(5)	−	3	0.477	sec φ′			
C	0.717 37	(6)	+	cos² α		Sum	2.068 1227	C		(6)	+	cos² α		Sum			
(2)=K	7.816 65	(7)	+	(6)		Arc−sin corr.	−1	(2)=K		(7)	+	(6)		Arc−sin corr.			
$\frac{h^2}{(\delta\phi)^2}$	4.5309	−Δφ	+184.2837	(colog) E		−Δλ	2.068 1226	(δφ)²		−Δφ		(colog) E		Δλ			
D	1.9851	$\frac{\Delta\phi}{2}$		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin½(φ+φ′)	9.300 8038	D		$\frac{\Delta\phi}{2}$		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin½(φ+φ′)			
(3)	6.5160			sec²φ		sec $\frac{\Delta\phi}{2}$	0	(3)				sec²φ		sec $\frac{\Delta\phi}{2}$			
−h	2.2655			(7)		(approx.) −Δα	1.368 9264	−h				(7)		(approx.) −Δα			
s² sin² α	7.0993					do	−23.384″	s² sin² α						do	″		
E	$\bar{5}$.6636	Arc−sin corr.				(8)	0″	E		Arc−sin corr.				(3)	″		
(4)	5.0284	for s	− 1	(Δλ)²	6.204	−Δα	−23.384″	(4)		for s	−	(Δλ)²		−Δα	″		
		for Δλ	+ 0	F	$\bar{7}$.576					for Δλ	+	F					
		Total	−1	(8)	3.780	−Δλ	−116.9830″			Total		(8)		Δλ	″		

R.H.

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POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

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α	2		to 3	327	56	52.40	α	3				147	57	15.78
2d ∠			&	+107	05	20.48	3d ∠					−38	53	11.73
α	2		to 1	75	02	12.88	α	3		to 1		109	04	04.45
Δα				−	00	47.84	Δα					−	01	11.10
				180	00	00.00						180	00	00.00
α′	1		to 2	255	01	25.04	α′	1		to 3		289	02	52.95
			First Angle of Triangle	34	01	27.91								
				289	02	52.95								
	°	′	″	°	′	″		°	′	″		°	′	″
φ	11	33	23.265	2 N Base, USN	λ	162	21	09.890	φ	11	30	18.981	3 Sand USN	λ	162	23	06.873
Δφ		01	03.010		Δλ	−	00	58.757	Δφ		02	01.274		Δλ	−	05	55.942
					λ′	162	22	10.943	φ′	11	32	20.255	1 CORAL	λ′	162	17	10.931

Logarithms				Logs	Logarithms								Logs	Logarithms	
[illegible]	[illegible]	[illegible]	[illegible]	$\bar{9}.699$	½(φ+φ′)	11 32 51.76	s	4.057 3516	(1)	− 121.33	[illegible]	[illegible]	$\bar{9}.699$	½(φ+φ′)	11 31 19.6
+ cos α	9.411 7508	(2)	+ 0.0274	s²			(−) cos α	9.514 1338	(2)	+ 0.0604	s²			Logarithms	
B	8.512 4992	Sum	+ 63.0099	K	s	3.874 7701	B	8.512 5007	Sum	− 121.27	K			s	4.057 3516
(1)−h	1.799 2201	3	[illegible]	E	+ sin α	9.985 0186	(1)−h	2.083 9867	(3)	+ 0.0001	E			+ sin α	9.975 4925
[illegible]	[illegible]	4		5	A′	8.509 6677	s²	8.114 70	(4)	+ 0.0001	(5)			A′	8.509 6677
[illegible]	[illegible]	5			sec φ′	0.008 8675	sin² α	7.750 78	(5)		3	0.477		sec φ′	0.008 8675
[illegible]	[illegible]	6		3	Sum	[illegible]	C	0.715 35	(6)	+	cos² α			Sum	2.551 3795
[illegible]	[illegible]	7		cos² α	Arc−sin corr	0	(2)=K	8.781 03	(7)	+	(6)			Arc−sin corr.	0
(2)=K	8.736 [illegible]			(6)	−Δλ	2.378 3239	(Δφ)²	4.1680	−Δφ	−121.27	(colog) E			−Δλ	2.551 3795
(Δφ)²	9.5984	−Δφ	+ 63.0099	(colog) E	sin ½(φ+φ′)	9.301 4290	D	1.9833	Δφ/2		A²arc²1″/3	$\bar{5}.912$		sin ½(φ+φ′)	9.300 4785
D	1.9851	Δφ/2		A²arc²1″/3	sec Δφ/2	0	(3)	6.1513			sec²φ			sec Δφ/2	0
(3)	5.5835			$\bar{5}.912$	(approx.) −Δα	1.679 7529	−h	2.0840			(7)			(approx.) −Δα	1.851 8578
−h	1.7992			sec²φ	do	+ 47.836″	s²sin²α	8.0657						do	+ 71.098″
s² sin² α	7.7196			(7)	(8)	0	E	$\bar{5}.6632$						(8)	0
E	$\bar{5}.6636$	Arc−sin corr.			−Δα	+ 47.836″	(4)	5.8129	Arc−sin corr.					−Δα	+ 71.098″
(4)	5.1824	for s	− 1	(Δλ)² 7.135					for s	− 2	(Δλ)²	7.654			
		for Δλ	+ 1	F $\bar{7}.576$					for Δλ	+ 2	F	$\bar{7}.567$			
		Total	± 0	(8) 4.711	−Δλ	+ 238.9593″			Total	0	(8)	5.221		−Δλ	+ 355.9423″

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POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	75	02	12.88	α	3	to 2	255	01	25.04
2d ∠		&	+80	21	38.66	3d ∠		&	−53	38	28.69
α	2	to 1	155	23	51.54	α	3	to 1	201	22	56.35
Δα			−	00	23.17	Δα		•	+	00	24.82
			180	00	00.00				180	00	00.00
α′	1	to 2	335	23	28.37	α′	1	to 3	21	23	21.17
		First Angle of Triangle	45	59	52.81						

φ	[illegible]	2 N Base [illegible]	λ	[illegible]	φ	[illegible]	λ	[illegible]
Δφ	[illegible]		Δλ	[illegible] 55.322	Δφ	[illegible]	Δλ	1 02 03.631
φ′	[illegible]	GRAFLEX	λ	106 19 [illegible]	φ′	11 37 31.067	GRAFLEX	λ	162 [illegible]

	Logarithms		″		Logs	½(φ+φ′)	° ′ ″	s	Logarithms		″		Logs	½(φ+φ′)	° ′ ″
	3.923 8198	(1)	−238.3062	½	9.699		11 35 27.41		4.011 6754	(1)	−311.3174	½	9.699		11 34 55.91
cos α	9.958 6685	(2)	+ 0.0064	s²		Logarithms		cos α	9.969 0283	(2)	+ 0.0073	s²		Logarithms	
B	[illegible]	Sum	[illegible]	K		s	3.923 8198	B	[illegible]	Sum	[illegible]	K		s	4.011 6754
(1)=h	2.374 9875	(3)	0.0006	E		sin α	9.[illegible]	(1)=h	2.493 2034	(3)	+ 0.0001	E		sin α	9.567 [illegible]
s²/A	[illegible]					A	[illegible]	s′	[illegible]	(4)	+ [illegible]			A	[illegible]
sin²α	9.238 85	(5)	−	3	0.477	sec φ′	0.009 0018	sin²α	9.123 61	(5)		3	0.477	sec φ′	0.009 [illegible]8
C	0.717 37	(6)	+	cos²α		Sum	2.061 9138	C	0.116 68	(6)	+	cos²α		Sum	2.092 1482
(2)=K	7.803 86	(7)	+	(6)		Arc−sin corr.	−1	(2)=K	7.863 64	(7)	+	(6)		Arc−sin corr.	−2
(δφ)²	4.7900	−Δφ	−238.2992	(colog) E		−Δλ	2.061 9137	(δφ)²	4.9864	−Δφ	−311.3092	(colog) E		−Δλ	2.092 1480
D	1.7851	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.303 0300	D	1.9845	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.302 7065
(3)	6.7751			sec²φ		sec Δφ/2	1	(3)	6.9709			sec²φ		sec Δφ/2	1
−h	2.3950			(7)		(approx.) −Δα	1.364 9438	−h	2.4932			(7)		(approx.) −Δα	1.394 8546
s² sin² α	7.0865					do	″	s² sin² α	7.1470					do	″
E	5.6636	Arc−sin corr.				(8)	″	E	5.6635	Arc−sin corr.				(8)	″
(4)	5.1451	for s	−1.3	(Δλ)²	6.186	−Δα	+23.171	(4)	5.3037	for s	−1.9	(Δλ)²	6.276	−Δα	−24.823
		for Δλ	+0.2	F	7.576					for Δλ	+0.2	F	7.575		
		Total	−1.1	(8)	3.762	−Δλ	+115.3224″			Total	−1.7	(8)	3.851	−Δλ	−123.6369″

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			°	′	″				°	′	″
α	2	to 3	21	23	21.18	α	3	to 2	201	22	56.35
2d ∠		&	+95	38	14.50	3d ∠		&	−38	14	28.75
α	2	to 1	117	01	35.68	α	3	to 1	163	08	27.60
Δα			−	00	52.36	Δα			−	00	27.31
			180	00	00.00				180	00	00.00
α′	1	to 2	297	00	43.32	α′	1	to 3	343	08	00.29
			46	07	16.98						
		First Angle of Triangle	343	08	00.30						

φ	11 31 [illegible]	2 GRALLEX	λ	162 19 14.568	φ	11 32 20.255	3 CORAL	λ	162 17 10.931
Δφ	[illegible]		Δλ	[illegible]	Δφ	[illegible]		Δλ	102 15 [illegible]

s	[illegible]																	
cos α	[illegible]	2	[illegible]															
B	5.512 4970	Sum	[illegible]	K														
(1) h	7.[illegible]4666	3	[illegible]	E														
s²	[illegible]	4	[illegible]															
sin² α	[illegible]	5	[illegible]	A	0.477													
	[illegible]	6	[illegible]	cos² α														
2(−K)	[illegible]	7	[illegible]	6														
(δφ)²	7.2309	−Δφ	[illegible]	(colog) E														
		Δφ/2		A²arc²1″/3	5.912													
D	1.9876																	
(3)	6.2185			sec²φ														
−h	2.115 5			(7)														
s² sin² α	7.790 6																	
E	5.6643	Arc−sin corr.																
(4)	5.5704	for s	−1.4	(Δλ)³	7.242													
		for Δλ	+1.1	F	7.578													
		Total	−0.3	(8)	7.820													

s	[illegible]																	
cos α	[illegible]	(2)	[illegible]	s²														
B	8.512 4991	Sum	−441 7351	K														
(1) −h	2.645 [illegible]706	(3)	+ [illegible]	E														
s²	8.[illegible]	4	[illegible]	5														
sin² α	[illegible]	(5)	−	8	0.477													
	[illegible]	(6)	[illegible]	cos² α														
(2) = K	7.748 [illegible]	(7)	+	(6)														
(δφ)²	5.2703	−Δφ	−771.103	(colog) E														
		Δφ/2		A²arc²1″/3	5.912													
D	1.9845																	
(3)	7.2748			sec²φ														
−h	2.645 2			(7)														
s² sin² α	7.228 4																	
E	5.6535	Arc−sin corr.																
(4)	5.5271	for s	−3.6	(Δλ)³	6.399													
		for Δλ	+0.3	F	7.575													
		Total	−3.3	(8)	3.774													

s	[illegible]																	
sin α	[illegible]																	
A′	[illegible]																	
sec φ′	[illegible]																	
Sum	[illegible]																	
Arc−sin corr.	[illegible]																	
−Δλ	2.132 8780																	
sin½(φ+φ′)	9.303 3758																	
sec Δφ/2	2																	
(approx.) −Δα	1.436 2740																	
do	″ +27.307																	
(8)	″ 0.000																	
−Δα	″ +27.307																	
−Δλ	″ +135.7994																	

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			°	′	″
α	2	to 3	343	08	00.30
2d ∠		&	+17	01	03.92
α	2	to 1	000	09	04.22
Δα			-	00	00.22
			180	00	00.00
			80	09	04.00

			°	′	″
α	3	to 2	163	08	27.60
3d ∠		&	-57	28	40.48
α	3	to 1	105	39	47.12
Δα			-	00	27.39
			180	00	00.00
α′	1	to 3	285	39	[illegible]

1 Reef Photo Tower

Logarithms

s	3.637 2242	(1)		
cos α		(2)		
Logs 3	0.477			
Logs 3	5.699			

D	.9889	-Δφ	+403.8927	(colog) $\frac{A^2 \text{arc}^2 1''}{3}$ E	$\overline{5}.912$	sin½(φ+φ′)	9.303 5699
(2)−K	3.	Δφ/2		sec²φ		sec Δφ/2	2
(δφ)²	5.2125			(7)		(approx.) −Δα	9.337 2415
(3)	7.2014					do	+0.217″
−h	2.6063					(8)	0″
s² sin² α	3.0302					−Δα	+0.217″
E	$\overline{\overline{5}}$.6646						
(4)	1.3011					−Δλ	+1.0806″

sec φ		
Sum	0.033 6717	
Arc−sin corr.	3	
−Δλ	0.033 6714	

Arc−sin corr.			
for s	−2.8	(Δλ)³	
for Δλ	+ 0	F	$\overline{\overline{7}}$.580
Total	−2.8	(8)	

sin² α	9.967	(5)		3	0.477	sec φ′	
C	0.116 68	(6)	+	cos² α		Sum	2.136 3413
(2)−K	7.952 26	(7)	+	(6)		Arc−sin corr.	0
(δφ)²	3.1561	−Δφ	−37.8401	(colog) $\frac{A^2 \text{arc}^2 1''}{3}$ E	$\overline{5}.912$	−Δλ	2.136 3413
D	1.9845	Δφ/2		sec²φ		sin½(φ+φ′)	9.301 2994
(3)	5.1406			(7)		sec Δφ/2	0
−h	1.5781					(approx.) −Δα	1.437 6407
s² sin² α	7.2356					do	+27.393″
E	$\overline{\overline{5}}$.6635					(8)	0″
(4)	4.4772					−Δα	+27.393″
						−Δλ	+136.8804″

Arc−sin corr.			
for s	−0.3	(Δλ)³	6.409
for Δλ	+0.4	F	$\overline{\overline{7}}$.575
Total	+0.1	(8)	3.984

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POSITION COMPUTATION, ~~THIRD~~-ORDER ~~TRIANGULATION~~ TRAVERSE

			°	′	″				°	′	″
						— CHECK COMPUTATION —					
α	A KODAK	to A CORAL	120	56	28.70	α	3	to 2			
2d ∠		&	+202	56	19.60	3d ∠		&			
α	2	to 1	323	52	48.30	α	3	to 1	143	52	48.38
Δα			+	00	00.08	Δα			−	00	00.08
			180	00	00.0				180	00	00.0
α	1	to 2	143	52	48.38	α	1	to 3	143	52	48.38

[illegible]

[illegible] 162 23 59.82 [illegible] 28 17.242 1 KODAK [illegible] 62 23 58.76

[illegible]			[illegible]			[illegible]			[illegible]		
[illegible]			[illegible]			[illegible]			[illegible]		
[illegible]			[illegible]			[illegible]			[illegible]		
[illegible]			[illegible]			[illegible]			[illegible]		
Sin ∠	[illegible]		Sin ∠	0.008 1640		Sin ∠			Sin ∠	0.008 7642	
C	0.7408		−Δλ	9.6198202	−00.4167	C			Δλ	9.6198202	+00.4167
[illegible]			Sin ∠ + ∠	9.2986084				2d term	Sin ∠ + ∠	9.2986084	
h²	9.5014		−Δα	8.9184286	−00.083	h²			−Δα	8.9184286	+00.083
D	1.9821					D					
	1.4835	3d term	+ 0.0000					3d term	+		
		−Δφ	+00.563					−Δφ	−00.5633		

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POSITION COMPUTATION, FIRST [redacted] ORDER TRAVERSE ~~TRIANGULATION~~

CHECK COMPUTATION

		°	′	″				°	′	″
α	2 N Bose, USN to 3 Δ Runit	322	47	17.11	α 3	to 2				
2d	&	328	11	31.70	3d	&				
α	2 to 1	290	58	48.81	α 3	to 1		[illegible]	58	[illegible]
Δα		+	00	01.23	Δα				00	[illegible]

φ			λ							
[illegible]	[illegible]	23.865 2 N Base, USN	162	21	09.890	[illegible]	33	20.937 3 Runit Zero Tower	162	21 [illegible]
			+	00	[illegible]	+	00	02.326		00 [illegible]
[illegible]	33	[illegible] 1 Runit Zero Tower	162	21	16.041	11	33	23.265 1 1 Base USN	162	21 [illegible]

Logarithms

	0.366 [illegible]			λ	8.509 6676			0.366 6389	1st term	Sin	9.990 2083
	4.[illegible] 39			Sec φ′	0.008 8936			4.000 39		A′	8.509 6675
Sin	[illegible]			−Δλ	0.788 9650	−06.1513	Sin²	9.740 42		Sec φ′	0.008 8946
C	0.717 3[illegible]			Sin ½(φ+φ′)	9.301 7416		C	0.717 33		−Δλ	0.788 9649 +06.1513
	5.258 18	2d term	+ 0.0000	−Δα	0.090 7066	−01.232		5.258 14	2d term + 0.0000	Sin ½(φ+φ′)	9.301 7416
h²	0.[illegible]						h²			−Δα	0.090 7065 +01.232
D	1.9851						D				
	2.[illegible]84	3d term	+ 0.0000						3d term +		
		−Δφ	+2.3261						−Δφ −02.3662		

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

			°	′	″				°	′	″
						— CHECK COMPUTATION —					
α	N. Base, USN	to Δ Runit	322	47	17.11	α	3	to 2			
2d ∠		&	+298	54	07.00	3d ∠		&	—		
α	2	to 1	261	41	24.11	α	3	to 1	81	41	24 37
Δα			+	00	00.26	Δα			—	00	00.26
			180	00	00.0				180	00	00.0
α	1	to 2	81	41	24 37	α	1	to 3	261	41	24 11

First Angle of Triangle

	Logarithms	Values in seconds			Logarithms	Values in seconds			Logarithms	Values in seconds
	1.603 8402				1.603 8402				1.603 8402	
			Cos α		9.159 9600					
		Logarithms	Values in seconds	B	8.512 4992				Logarithms	Values in seconds
		1.603 8402							1.603 8402	
						1st term				
				Sin						
			Sin ½(φ+φ′)		9.301 7546	2d term	+	Sin ½(φ+φ′)	9.301 7546	
				D						
						3d term	+			
						−Δφ	+00.1889			

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE — CHECK COMPUTATION

			°	′	″
α	2 Δ GRAFLEX	3 Δ ELGIN	117	01	35.68
α	2		31	43	30.58
			62	19	14.568

		°	′	″
α	3 to 2			
		+	00	00.60
	3 Aomon Zero Tower			
		+	00	02.454
	GRAFLEX	62	19	4.568

C	0.720 00	Sin α	9.720 8580	B	8.512 477	Sin α	
	4.62332	A′	8.509 6669	h	0.673 0309	A′	8.509 6669
B	1.3461	Sec φ′	0.008 9998	s²	4.461 64	Sec φ	
D	1.9876	−Δλ	0.470 3424 +02.9535	Sin² α	9.441 71	−Δλ	0.470 3423 −02.9535
	3.3337	Sin ½(φ+φ′)	9.304 2784	C	0.719 97	Sin ½(φ+φ′)	9.304 2784
3d term	+0.0000	−Δα	9.774 6208 +00.595		4.62332	−Δα	9.774 6207 −00.595
−Δφ	+04.7101			h²	1.3461		
				D	1.9876		
		2d term	+0.0000		3.3337	3d term	+0.000C
						−Δφ	−04.7101

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ Traverse

			°	′	″				°	′	″
α	8 GRAFLEX	to 8 N. Base, USN	335	23	28.37	α	3	to 2			
2d ∠		&	+263	34	11.8–	3d ∠		&	–		
α	2	to 1	238	57	40.17	α	3	to 1	58	57	40.31
Δα			+	00	00.14	Δα			–	00	00.14
			180	00	00.0				180	00	00.0
α	1	to 2	58	57	40.31	α	1	to 3	238	57	40.17

Check Computation

First Angle of Triangle

φ	11 37 31.564	2 Graflex	λ	162 19 14.568	[illegible]
Δφ	00 00.420		Δλ	+ 00 00.709	[illegible]
φ	11 37 31.784	1 Aomen Photo Tower	λ	162 19 15.277	11 37 31.564 1 Graflex [illegible] 14.568

Logarithms	Values in seconds	Logarithms	Values in seconds		Logarithms	Values in seconds
s 1.398 9[illegible]		½(φ+φ′) 11 37 31.77		s 1.398 9117	½(φ+φ′) 11 37 31.77	
Cos α 9.[illegible] 2 3270				Cos α 9.717 2285		
B 8.512 4910		7.378 [illegible]		8.512 [illegible]	[illegible]	
h 1.642 [illegible]		[illegible] 8885		[illegible]	[illegible]	
s² 2.797 83		8.507 6609			[illegible] 6691	
Sin² α 9.865 78		Sin α 8.607 0020			[illegible]	
C 0.720 00		–Δλ 4.850 4691	–00.7087	C	–Δλ 4.850 4691	+00.7087
3.383 60	2d term 0.0000	Sin ½(φ+φ′) 9.304 5047		2d term	Sin ½(φ+φ′) 9.304 5047	
h² 7.2475		–Δα 9.154 7738	–00.143	h²	–Δα 9.154 7738	+00.143
D 1.9876				D		
7.2351	3d term +0.0000			3d term +		
	Δφ –00.4205			–Δφ +00.4205		

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POSITION COMPUTATION, ~~THIRD~~ First-ORDER ~~TRIANGULATION~~ Traverse

		°	′	″
α 2 ΔELGIN to 3 Δ GRAFLEX		297	00	43.32
&		-196	38	34.52
2 to 1		133	39	17.94
			00	05.98
		180	00	00.0

CHECK COMPUTATION

		°	′	″
α 3 to 2				
&				
α 3 to 1		313	39	11.86
		+	00	05.98
		180	00	00.0

Log			
s²	6.184 82		
Sin²α	9.718 89		
C	0.721 39		
	6.625 10	2d term	+0.0004
h²	2.8879		
D	1.9889		
	4.8768	3d term	+0.0000
		−Δφ	−27.7936

Log			
A'	8.509 6665		
Sec φ	0.009 0705		
−Δλ	1.470 5900	+29.5522	
Sin½(φ+φ')	9.305 7769		
−Δα	0.776 3669	+05.975	

Log			
s²	6.184 82		
Sin²α	9.718 89		
C	0.721 70		
	6.625 43	2d term	+0.0004
h²	2.8879		
D	1.9891		
	4.8770	3d term	+0.0000
		−Δφ	+27.7935

Log			
A'	8.509 6665		
Sec φ'	0.009 0584		
−Δλ	1.470 5899	−29.5522	
Sin½(φ+φ')	9.305 7769		
−Δα	0.776 3668	−05.975	

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

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		°	′	″
α	* N. Base USN to B Runit	322	47	17.11
	&	+344	17	02.5
2	to 1	307	04	19.61
		+	00	02.03
		180	00	00.0
1	to 2	127	04	21.64

Check Computation

		°	′	″
α	3 to 2			
3d ∠	&	−		
α	3 to 1	127	04	21.64
Δα	* Corrected ∠ from B.L. Loop Comp.	−	00	02.03
		180	00	00.0
α	1 to 3	307	04	19.61

	162	21	20.002	
	162	21	09.99	
33	23.265	1 N. Base USN	162	21

	Logarithms	Values in seconds
	2.587 3323	
	1.180 1930	
	8.212 4993	
	1.008 8914	
− Δλ	1.004 8275	−10.1118
Sin	9.301 7663	
− Δα	0.306 5475	−2.026
h²		
D		
3d term	+	
− Δφ	−07.5340	

	Logarithms	Values in seconds
	2.587 3323	
Sin	9.301 9318	
	8.212 4993	
Sin²	1.008 8946	
− Δλ	1.004 8274	+10.1118
Sin	9.301 1200	
− Δα	0.306 6474	+02.026

	Logarithms	Values in seconds
	2.587 3320	
	1.180 1930	
	8.212 4993	
	1.008 8914	
− Δλ	1.004 8275	−10.1118
Sin	9.301 7663	
− Δα	0.306 5475	−2.026
h²	1.25407	
D	1.9851	
	3.7391	
3d term	+00000	
− Δφ	+07.5339	

* Not a permanent station

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Form 27
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POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

	°	′	″				°	′	″
α	[illegible]	04	21.67 x	3	to 2				
	196	03	38.5 * x	3	&				
	[illegible]	08	00.14 x	α 3	to 1		143	08	04.90
	+	00	04.76	Δα	* Corrected Δ from Base line loop Comp.		–	00	04.76
							180	00	00.0
	[illegible]	[illegible]	[illegible]		[illegible]	44.486		[illegible]	[illegible]
00 31.245			23.757		[illegible]	31.244		00	23.759
** (Traverse sta. Runit)	162	21	43.761	φ	33	15.730	4(A)	162 21	20.002

Check

Sin α	[illegible]		
C	[illegible]		
	6.43184	2d term	+0.0003
h²	2.2895		
D	1.2851		
	4.9746	3d term	+0.0000
		–Δφ	+31.2446

	[illegible]	
A′	[illegible]	
	[illegible]	
–Δλ	1.375 8264	–23.7589
Sin ½(φ+φ′)	9.301 5151	
Δα	0.677 3415	–04.757

	[illegible]	1st term	[illegible]
s²	6.[illegible]5833		
Sin²	[illegible]		
C	0.71695		
	6.73149	2d term	+0.0003
h²	2.9846		
D	1.9848		
	4.9744	3d term	+
		–Δφ	–31.2445

λ 33 00.11

Sin α	9.[illegible]18 [illegible]049	
A′	8.509 6676	
Sec φ′	0.008 8914	
–Δλ	1.375 8265	+23.7589
Sin ½(φ+φ′)	9.301 5151	
–Δα	0.677 3416	+04.757

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Marked with a standard U.S.C+GS Triangulation Disk
Stamped "TRAVERSE Sta. RUNIT"

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

		°	′	″			CHECK COMPUTATION →	°	′	″
	* Aomon Zero Tower to * A GRAFLEX	211	43	29.98	α	3	to 2			
	&	-94	34	08.0-	3d		&			
2	to 1	[illegible]	[illegible]	32.98	α	3	to 1	126	11	41.20
		[illegible]	00	03.22	Δα			-	00	03.22
		+00	00	00.0				180	00	00.0
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	to 3	[illegible]	[illegible]	[illegible]

Logarithms

Sin α 7.872.66
C 0.11996
6.088.98 3d term 0.000
h² 2.1257
D 1.9876
4.155 3d term +
Δφ +11.5593

Logarithms

1.208.9947
1.203.1552 15.96+5
Sin α 9.304.1951
−Δα 0.507.3503 −03.216

Sin α 7.872.66
C 0.11984
6.088.82 3d term 0.00001
h²
D
3d term +
−Δφ −11.0594

Sec φ [illegible]
−Δλ 1.203.1553 +15.9645
Sin α 9.304.1951
−Δα 0.507.3504 +03.216

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* This point is acting with stake Aomon 12 of the Gamma Line from tape traverse.

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POSITION COMPUTATION, THIRD-ORDER ~~TRIANGULATION~~ TRAVERSE

← CHECK COMPUTATION

			°	′	″				°	′	″
α	2 Trav Sta Amman	to 3 Amman Base Trav	126	17	41.20	α	3	to 2			
Δα		&	+180	00	00	3d		&			
α	2	to 1	306	17	41.20	α	3	to 1	126	17	45.27
			+	00	04.07	Δα			−	00	04.07
			[illegible]	[illegible]	[illegible]				180	00	00
									[illegible]	[illegible]	[illegible]
	33 [illegible]	Trav Sta Amman	162	19	27.578			33 [illegible] Trav Sta B [illegible]	162	19	47.779
			+	00	20.201			[illegible] 1592.565 m	−	00	20
			[illegible]	[illegible]	[illegible]			Trav Sta Amman			

			λ	8.509 6670					λ	8.509 6670	
				3.008 1885		Sin²α	[illegible]			[illegible]	
Sin²α	[illegible]		−Δλ	1.305 3696	−20.2008	C	0.71969		−Δλ	1.305 3694	+20.2009
C	0.71187		Sin½(φ+φ′)	9.304 0611			6.273 11	2d term +0.0002	Sin½(φ+φ′)	9.304 0611	
	6.293 27	2d term +0.0002	−Δα	0.609 4301	−4.069	h²	2.3303		−Δα	0.609 4305	+4.067
h²	2.3303					D	1.9873				
D	2.8.5						4.3176	3d term +			
	4.3178	3d term +14.6275						−Δφ −14.6279			
		−Δφ +14.6275									

* This point is identical with
Stake Bijiri 11 of the
Gamma Line, Invar Traverse

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Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON INVERSE COMPUTATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
3d ∠		&	+			3d ∠		&	−		
α	2	to 1	331	58	18.62	α	3	to 1			
Δα			+	00	32.56	Δα					
			180	00	00.00				180	00	00.00
α	1	to 2	[illegible]	[illegible]	[illegible]	α	1	to 3			

First Angle of Triangle

s	4.022 0406	Logarithms
(2)−K	[illegible]	
D	[illegible]	$\overline{5}.912$
(3)	6.7458	
−h	2.4804	
$s^2 \sin^2 \alpha$	7.3881	
E	5 6636	
(4)	5 5321	

s	4.022 0406
$\sin\frac{1}{2}(\phi+\phi')$	7.300 .705 [illegible]
(approx.) Δα	1.312 6541
do	− 32.558″
(8)	—
Δα	− 32.558″
−Δλ	−163.1111″

Arc−sin corr. | for s − | for Δλ + | Total | (Δλ)² | F | (8)

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Form 662
Rev. Sept. 1941

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[illegible] COST ON COMPUTATION

in which log ΔA_1 = log ([illegible] correction for arc to sin*; and log s = log s_1 + correction for arc to sin*

1. ϕ	[illegible]	[illegible]	[illegible]	162	23′ 59.152″ E
2. ϕ'	[illegible]	[illegible]	[illegible]	162	21′ 16.041″ E
$\Delta\phi$ = ϕ' − ϕ	[illegible]	[illegible]	[illegible]	+ 02	43.111
$\frac{\Delta\phi}{2}$	[illegible]	[illegible]		+ 01	21.556
$\phi_m\left(\phi + \frac{\Delta\phi}{2}\right)$	[illegible]	[illegible]			
$\Delta\phi$ (secs.)	[illegible]	[illegible]	[illegible] (secs.)	+ 163.111″	

log $\Delta\alpha$	[illegible]		log [illegible]	2.212 4833	P
correction sin	[illegible]		[illegible]	0	
log $\Delta\phi$	[illegible]		[illegible]	2.212 4833	
log cos $\frac{\Delta A}{2}$	[illegible]		log cos [illegible]	9.991 1714	
colog B_m	[illegible]		colog A	1.490 3320	
log s cos $\left(\alpha + \frac{\alpha}{2}\right)$	[illegible]		log s sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	3.693 9867	P
			log s cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	3.967 8802	7
log $\Delta\alpha$	[illegible]		log tan $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.726 1065	
log sin ϕ_m	[illegible]		$\frac{\Delta\alpha}{2}$	151° 58′ 34.90″	
log sec $\frac{\Delta\phi}{2}$	[illegible]		log sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.671 9461	
log a	[illegible]		log cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.945 8396	
a	[illegible]		log s	4.022 0406	
b			[illegible]	0	
$\Delta\alpha$ (secs.)	[illegible]			4.022 0406	
$-\frac{\Delta\alpha}{2}$	[illegible]				
$\alpha + \frac{\Delta\alpha}{2}$	[illegible]		[illegible] on the face of this form for correction of [illegible]		
α (1 to 2)	[illegible]				
$\Delta\alpha$	[illegible]				
α' (2 to 1)	[illegible]				

TECHNICAL USE ONLY

Note. For log [illegible] for $\Delta\phi$ or $\Delta\alpha$ [illegible] that all terms below the heavy line except those printed (in white [illegible] for use under circumstances [illegible] logarithms to 7 decimal places.

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DEPARTMENT OF [illegible]
Form [illegible]
[illegible]

in which log [illegible] for arc 1 sin 1" and log s = log s_1 +

correction for arc 1 [illegible]

1. ϕ			
2. ϕ'			
$\Delta\phi$ (2) ϕ			
$\frac{\Delta\phi}{2}$			
$\phi_m\left(\phi + \frac{\Delta\phi}{2}\right)$			
$\Delta\phi$ (secs.)			119.588

log $\Delta\phi$			2.077 6876
cor. arc 1 sin 1"			0
log $\Delta\phi_1$			2.077 6876
log cos $\frac{\Delta\lambda}{2}$			9.991 0528
colog B_m			1.490 3328
log s_1 sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$			3.850 0732 p
log s_1 cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$			3.873 8225 p
Log tan $\left(\alpha + \frac{\Delta\alpha}{2}\right)$			9.8[illegible] 2507
			154 09 07.36
log sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$			9.629 4710
log cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$			9.954 2204
			3.977 6624
			c
			3.977 [illegible]

log $\Delta\lambda$			
log sin ϕ_m			
log sec $\frac{\Delta\phi}{2}$			
log a			
a			
b			
$\Delta\alpha$ (secs.)			
$\frac{\Delta\alpha}{2}$			
$\alpha + \frac{\Delta\alpha}{2}$			
α (1 to 2)			
$\Delta\alpha$			
α' (2 to 1)			

[illegible] on B back of this form for correction of

NOTE. For log [illegible] printed (in whole or in part) in heavy type or those underscored [illegible] below the heavy line except those [illegible]

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

CHECK ON INVERSE COMPUTATION

		°	'	"			°	'	"
α	2 to 3				α	3 to 2			
2d ∠	&	+			3d ∠	&			
α	2 to 1	334	08	55.35	α	3 to 1			
Δα		+	00	24.03	Δα				
		180	00	00.00			180	00	00.00
α'	1 to 2	[illegible]	09	19.38	α'	1 to 3			

Mean Angle of Triangle

φ	[illegible]	[illegible]	19	11.614	φ				
Δφ	[illegible]	[illegible]	01	59.588	Δφ				
φ'	[illegible]	[illegible]	21	11.202	φ'				

Logarithms		Logs	Logarithms		Logarithms		Logs
s	3 9.9 6622	0.800	½(φ+φ')	11 35 25.15	s		0.800
cos α	[illegible]				cos α		
B	[illegible]	Sum			B	Sum	
(1) −h	[illegible]				(1) h		
s²	[illegible]	4			s²	4	
sin² α	9.[illegible]	(5)		3 0.477	sin² α	(5)	3 0.477
C	[illegible]	(6) +		cos² α	C	(6) +	cos² α
(2)=K	7.838 21	(7) +		(6)	(2)=K		(6)
(δφ)²	4.7726	−Δφ	+243.[illegible]	(colog) E	(δφ)²	−Δφ	(colog) E
D	1.9876	Δφ/2		A²arc²1″/3 — 5.912	D	Δφ/2	A²arc²1″/3 — 5.912
(3)	6.7602			sec²φ	(3)		sec²φ
−h	2.3863			(7)	−h		(7)
s² sin² α	7.1182				s² sin² α		
E	5.6642	Arc—sin corr.			E	Arc—sin corr.	
(4)	5.[illegible]87	for s −	(Δλ)³		(4)	for s −	(Δλ)³
		for Δλ +	F			for Δλ +	F
		Total	(8)			Total	(8)

sec φ	[illegible]				sec φ				
Sum	2.077 6811				Sum				
Arc—sin corr.	2.077 [illegible]				Arc—sin corr.				
−Δλ	2.077 6877				Δλ				
sin½(φ+φ')	9.303 4133 0067				sin½(φ+φ')				
sec Δφ/2	0				sec Δφ/2				
(approx.) −Δα	1.380 6944				(approx.) −Δα				
do	"				do				
(8)	"				(8)				
−Δα	" −24.027				−Δα				
−Δλ	" −119.5880				Δλ				

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AMERICAN METHOD COMPUTATION

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

NAME OF STATION

1. ϕ	[illegible]	[illegible]	[illegible]	62 19	15.277
2. ϕ'	[illegible]	[illegible]	[illegible]	62 14	25.580
$\Delta\phi$ $(=\phi'-\phi)$	[illegible]			+ 04	49.697
$\frac{\Delta\phi}{2}$	[illegible]			+ 02	24.848
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	[illegible]				
$\Delta\phi$ (secs.)	+ 157 [illegible]		$\Delta\lambda$ secs.	+ 289.697	

log $\Delta\phi$	2.178 [illegible]		log [illegible]	2.461 9440
cor. arc—sin				0
log $\Delta\phi_1$	2.178 [illegible]		[illegible]	2.461 9440
log cos $\frac{\Delta\lambda}{2}$	9.999 [illegible]		log cos [illegible]	9.990 9636
colog B_m	1.487 5026		**colog** λ	1.490 3334
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.685 [illegible]	(opposite sin [illegible])	**log** $\left\{s \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.943 2410
			log $\left\{s \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.685 6050
			log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.257 6360
log $\Delta\lambda$	2.461 [illegible]		$\alpha+\frac{\Delta\alpha}{2}$	118 55 20.77
log sin ϕ_m	9.205 [illegible]		log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.942 1447
log sec $\frac{\Delta\phi}{2}$	[illegible]		log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.684 5087
log a	[illegible]		log s	4.001 0963
a	+ [illegible]		+	0
b				4.001 0963
$-\Delta\alpha$ **(secs.)**	[illegible]			
$-\frac{\Delta\alpha}{2}$	[illegible]			
$\alpha+\frac{\Delta\alpha}{2}$	118 [illegible]			
α (1 to 2)	118 [illegible]			
$\Delta\alpha$	[illegible]			
	180			
α′ (2 to 1)	298 [illegible]			

[illegible] on the back of this form for correction of [illegible]

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NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to [illegible] 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 7 decimal places.

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[illegible]

38A

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

CHECK ON INVERSE COMPUTATION

			°	'	"				°	'	"
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	298	54	51.47	α	3	to 1			
			+	00	58.49	Δα					
			180	00	00.00				180	00	00.00
	1		118	55	49.96	α′	1	to 3			

First Angle [illegible]

φ	[illegible]		162	7	20.582	φ		3	λ		
Δφ	[illegible]		1	07	46.695	Δλ			Δλ		
φ′	[illegible]		162	19	15.277	φ′		1	λ′		

Logarithms			Logs	Logarithms			Logs	Logarithms			Logs	Logarithms
			0.699	½(φ+φ′)	11 38 7.88	s		(1)		½	9.699	½(φ+φ′)
						cos α		(2) +		s²		
						K		Sum		K		
								3 +		E		sin φ
(1)								4		(5)		λ
						s²		5		3	0.477	sec φ′
sin² α	[illegible]	3	0.477	sec φ	[illegible]	sin² α				cos² α		Sum
C	[illegible]	(6) +		Sum	2.469 9439	C		(6) +		(6)		Arc—sin corr.
(2)=K	8.608 25	(7) +		Arc sin corr.	0	(2)=K		(7) +		(colog) E		Δλ
(δφ)²	[illegible]	Δφ	+ 157.7778	− Δλ	2.461 9439	(δφ)²		−Δφ		A²arc²1″/3	5.912	sin½(φ+φ′)
D	[illegible]	Δφ/2		sin½(φ+φ′)	9.305 1135	D		Δφ/2		sec²φ		sec Δφ/2
(3)	6.3851			sec Δφ/2	0	(3)				(7)		(approx.) −Δα
−h	2.1980			(approx.) −Δα	1.761 0574	−h						do
s² sin² α	7.8866					s² sin² α						(8)
E	5.6646			do	−58.487″	E						−Δα
(4)	5.7492			(8)	−	(4)						
				−Δα	−58.487″							Δλ
				− Δλ	−289.6969″							

Arc—sin corr.				Arc—sin corr.			
for s	−1.8	(Δλ)²		for s	−	(Δλ)²	
for Δλ	+1.4	F		for Δλ	+	F	
Total	−0.4	(8)		Total		(8)	

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U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1954

INVERSE POSITION COMPUTATION

[illegible]

in which log $\Delta\lambda_1$ = log ([illegible] $\Delta\lambda$) [illegible] correction for arc to sin*; and log s = log s_1 + correction for arc to sin*.

NAME OF [illegible]

1. ϕ	[illegible]	[illegible]	162 14′ 54.051″ E
2. ϕ'	[illegible]	[illegible]	162 21′ 16.041″ E
$\Delta\phi$ ($=\phi'-\phi$)	[illegible]	[illegible]	−06′ 21.990″
$\frac{\Delta\phi}{2}$	[illegible]	[illegible]	−03′ 10.995″
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	[illegible]		
$\Delta\phi$ (secs.)	[illegible]	[illegible]	−381.990″

log $\Delta\phi$	1.358 [illegible]		log [illegible]	2.582 0520 n	
cor. arc — sin			[illegible]	c	
log $\Delta\phi_1$	1.358 [illegible]		[illegible]	2.582 0520	
log cos $\frac{\Delta\lambda}{2}$	9.999 [illegible]		log cos [illegible]	9.999 [illegible]3	
colog B_m	1.487 [illegible]		**colog** A	1.490 3324	
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	2.846 [illegible]	(opposite [illegible]	**log** $\left\{s \sin\left(\frac{\Delta\alpha}{2}\right)\right\}$	4.063 4957 n	
			log $\left\{s \cos\left(\frac{\Delta\alpha}{2}\right)\right\}$	2.846 2727 n	
log $\Delta\lambda$	2.582 [illegible]	[illegible]	log ($\Delta\alpha$ [illegible])	2.217 2230	
log sin ϕ_m	9.301 [illegible]	[illegible] 2.576	[illegible]	266° [illegible]′ 46.89″	
log sec $\frac{\Delta\phi}{2}$	[illegible]	[illegible]	log sin [illegible]	9.999 2029	
log a	1.8[illegible]		log cos [illegible]	9.781 9998	
a	[illegible]		log [illegible]	4.064 2028	
b	[illegible]		[illegible]	0	
$-\Delta\alpha$ (**secs.**)	[illegible]		[illegible]	4.064 2028	
$-\frac{\Delta\alpha}{2}$	[illegible]				
$\alpha+\frac{\Delta\alpha}{2}$	266 [illegible]	46.89	[illegible]		
α (1 to 2)	266 [illegible]	[illegible]			
$\Delta\alpha$	[illegible]	[illegible]			
	180				
α′ (2 to 1)	86 [illegible]	[illegible]			

[illegible] form for correction of

NOTE.—For logs up to 10 [illegible] below the heavy line except those printed in whole or in part in [illegible] or those underscored, if using logarithms to 7 decimal places.

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U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

°CHECK ON INVERSE COMPUTATION

α	2 to 3					α	3 to 2			°	′	″
2d∠	&			+			3d∠	&				
α	2 to 1			266	31	08.64	α	3 to 1				
Δα				+	01	16.50	Δα					
				180	00	00.00				180	00	00.00
α	1 to 2			86	32	25.14	α′	1 to 3				

First Approximation Triangle

φ	11	32	58.095	2 CELL TOWER	λ	162	14	54.051	φ				3	λ
Δφ	+	00	22.844		Δλ	+	06	21.710	Δφ					Δλ
φ′	11	33	20.939	1 RUNIT ZERO TOWER	λ′	162	21	16.341	φ′				1	λ′

	Logarithms				Logs			Logarithms				Logs		Logarithms
s	4.064 2928	(1)			9.699	½(φ+φ′)	11 33 09.52	s		(1)		½	9.699	½(φ+φ′)
(−) cos α	[illegible]	2					Logarithms	cos α		(2)		s²		Logarithms
B	8	Sum				°	4.064 2928	B		Sum		K		s
(1)−h	1.360 0981	3				(−) sin α	4.494 1780	(1)−h		3		E		sin α
s²	8.128 59	(4)		(5)		A′	8.509 6675	s²		(4)		(5)		A′
sin² α	9.998 40	(5)		3	0.477	sec φ′	0.008 8936	sin² α		(5)	−	3	0.477	sec φ′
C	0.1710	(6)	+	cos² α		Sum	2.582 0519	C		(6)	+	cos² α		Sum
(2)=K	8.844 49	(7)	+	(6)		Arc—sin corr.	0	(2)=K		(7)	+	(6)		Arc—sin corr.
(δφ)²	2.7202	−Δφ	22.8440	(colog) E		−Δλ	2.582 0519	(δφ)²		−Δφ		(colog) E		Δλ
D	1.9849	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.301 6120	D		Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)
(3)	4.7051			sec²φ		sec Δφ/2	0	(3)				sec²φ		sec Δφ/2
−h	1.3601			(7)		(approx.) −Δα	1.883 6639	−h				(7)		(approx.) −Δα
s² sin² α	8.1270					do	″	s²sin²α						″
E	5.6636	Arc—sin corr.				(8)	″	E		Arc—sin corr.				do
(4)	5.1507	for s	−	(Δλ)³		−Δα	−76.500	(4)		for s	−	(Δλ)³		″
		for Δλ	+	F			″			for Δλ	+	F		(8)
		Total		(8)		−Δλ	−381.9899			Total		(8)		″
														−Δα
														″
														Δλ

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U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

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INVERSE POSITION COMPUTATION

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

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

$$\alpha - \Delta\alpha = \sin\phi_m \sec\frac{\Delta\phi}{2} + \text{Fig.}$$

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

NAME OF STATION

1. ϕ	11°	28'	28.095"	REEF PNCL TOWER	λ	162° 14'	54.051" E
2. ϕ'	11	3	26.854	AOMON ZERO TOWER	λ	162 19	11.614 E
$\Delta\phi$ $(=\phi'-\phi)$	+					−04	17.563
$\frac{\Delta\phi}{2}$	+					−02	08.782
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	11	3	47				
$\Delta\phi$ (secs.)		+208.789				−257.563	

log $\Delta\phi$	2.429		
cor. arc − sin			
log $\Delta\phi_1$	2.429		
log cos $\frac{\Delta\lambda}{2}$	9.999		
colog B_m	1.487		
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.916		(opposite in sign to $\Delta\phi$)
log $\Delta\lambda$	2.410		log $\Delta\lambda$ 233
log sin ϕ_m	9.302		7577
log sec $\frac{\Delta\phi}{2}$			log 48
log a	1.713		
a			
b			
$-\Delta\alpha$ **(secs.)**			
$-\frac{\Delta\alpha}{2}$			
$\alpha+\frac{\Delta\alpha}{2}$	223		43.27
α **(1 to 2)**	223		
$\Delta\alpha$			
	180		
α' **(2 to 1)**	43	3	09.14

log	2.410 8818 η
	− 0
	2.410 8818
log cos	9.991 0583
colog A	1.490 3327
log $\left\{s \sin\left(\alpha-\frac{\Delta\alpha}{2}\right)\right\}$	3.892 2728 η
log $\left\{s \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.916 8647 η
log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.975 4081
$\alpha+\frac{\Delta\alpha}{2}$	223° 22' 43.27"
log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.836 8411
log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.861 4330
log s	4.055 4317
	− 0
	4.055 4317

See table on the back of this form for correction of

NOTE.—For log s up to 4.0 and $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3°, 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 7 decimal places.

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U. S. COAST AND GEODETIC SURVEY
Form 96—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON INVERSE COMPUTATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d∠		&	+			3d∠		&	−		
α	2	to 1	223	22	17.41	α	3	to 1			
Δα			+	00	51.73	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	43	23	09.14	α′	1	to 3			

First Angle of Triangle

	°	′	″			°	′	″			°	′	″		
φ	11	35	38.095	2 KEEL PHOTO TOWER	λ	162	14	54.051	φ			3		λ	
Δφ	+	04	[illegible]		Δλ	+	04	17.562	Δφ					Δλ	
φ′	11	37	26.864	1 ADMON ZERO TOWER	λ′	162	19	11.613	φ′			1		λ′	

	Logarithms				Logs		° ′ ″		Logarithms				Logs		° ′ ″		Logarithms
s	4.055 4317	(1)	−268.7915	½	$\bar{9}$.699	½(φ+φ′)	11 35 12.47	s		(1)	″	½	$\bar{9}$.699	½(φ+φ′)	° ′		
cos α	7.861 7844	(2)	+ 0.0317	s²				cos α		(2)	+	s²					
B	8 [illegible]	Sum	[illegible]	K		s	4.055 4317	B		Sum		K		s			
(1)+h	2.4294 [illegible]	(3)	+ 0.0007	F		sin α	9.836 [illegible]	(1)+h		(3)	+	F					
s²	[illegible]	(4)	− 0.0001	(5)		A′	8.5[illegible]0067	s²		(4)		(5)		A′			
sin² α	9.673 57	(5)		3	0.477	sec φ′	0.008 9998	sin² α		(5)	−	3	0.477	sec φ′			
C	0.717 10	(6)	+	cos² α		Sum	2.410 8819	C		(6)	+	cos² α		Sum			
(2)=K	8.501 53	(7)	+	(6)		Arc—sin corr.	1	(2)=K		(7)	+	(6)		Arc—sin corr.			
(Δφ/2)²	4.8588	−Δφ	−268.7592	(colog) E		Δλ	2.410 8818′	(δφ)²		−Δφ	·	(colog) E		Δλ			
D	1.9849	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.302 8765	D		Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)			
(3)	6.8437			sec²φ		sec Δφ/2	1	(3)				sec²φ		sec Δφ/2			
−h	2.4294			(7)		(approx.) −Δα	1.713 7584	−h				(7)		(approx.) −Δα			
s² sin² α	7.7844					do	51.73″	s² sin² α						do	″		
E	5.6636	Arc—sin corr.				(8)	″	E		Arc—sin corr.				(8)	″		
(4)	5.8774	for s	−2.3	(Δλ)²		−Δα	−51.73″	(4)		for s	−	(Δλ)²		−Δα	″		
		for Δλ	+1.1	F						for Δλ	+	F					
		Total	−1.2	(8)		−Δλ	−257.5620″			Total		(8)		Δλ	″		

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept 1942

INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{\Delta\lambda_1 \cos\phi_m}{A_0}$$

$$s_1 \cos\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{\Delta\phi_1 \cos\lambda}{B_0}$$

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

[illegible] 1994

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

NAME OF STATION

1. ϕ	11	32	38.095	REEF PHOTO TOWER	162	14	54.051 E
2. ϕ'	11	40	09.782	ENGEA ZERO TOWER	162	14	25.580 E
$\Delta\phi$ $(=\phi'-\phi)$	+	07	11.687				+ 28.471
$\frac{\Delta\phi}{2}$	+	03	35.844				+14.235
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	11	36	34.938				
$\Delta\phi$ (secs.)		+ 431.687		$\Delta\lambda$ (secs.)			+ 28.471

log $\Delta\phi$	2.635 1694		
cor. arc−sin	—		
log $\Delta\phi_1$	2.635 1694		
log cos $\frac{\Delta\lambda}{2}$			
colog B_m	1.487 5025		
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.122 6715 n	(opposite in sign to $\Delta\alpha$)	
log $\Delta\lambda$	1.454 4027	log $\Delta\lambda$	4.363
log sin ϕ_m	9.303 7124		7.576
log sec $\frac{\Delta\phi}{2}$			439
log a	0.758 1151		
a	+ 0.5		
b			
−$\Delta\alpha$ **(secs.)**	[illegible]		
$-\frac{\Delta\alpha}{2}$	[illegible]		
$\alpha+\frac{\Delta\alpha}{2}$	176 [illegible]		
α (1 to 2)	176 [illegible]		
$\Delta\alpha$	[illegible]		
	180		
α′ (2 to 1)	356 6	4340	

log	454 4027	
	0	
	454 4027	
log cos	9 991 0231	
colog A	490 3330	
log s sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	2.935 7588 p	*
log s cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	4.122 6715 n	
log tan $\frac{\Delta\alpha}{2}$	8.813 0873	
$\frac{\Delta\alpha}{2}$	176 ′ 16 ″ 46.27	
log sin $\frac{\Delta\alpha}{2}$	8.812 1711	
log cos $\frac{\Delta\alpha}{2}$	9.999 0838	
log	4 123 5877	
	0	
	4 123 5877	

[illegible] back of this form for correction of

NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3 [illegible] omit all terms below the heavy line except those printed (in whole or in part) in heavy type or [illegible] logarithms to 7 decimal places.

16—81070-1

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON" INVERSE COMPUTATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	176	16	49.13	α	3	to 1			
Δα			−	00	05.73	Δα					
			180	00	00.00				180	00	00.00
α′	1		356	16	43.40	α′	1	to 3			

First Angle of Triangle

			°	′	″		°	′	″			
φ	11 22 58.696	2 REEF PHOTO TOWER λ	162	14	54.051	φ				3	λ	
Δφ	+ 07 ... .87	Δλ	−	00	28.471	Δφ					Δλ	
φ′	11 30 07.182	1 ... ZERO TOWER λ′	162	14	25.580	φ′				1	λ′	

	Logarithms				Logs		° ′ ″
s	4 ...	(1)		½	$\bar{9}$.699	½(φ+φ′)	11 36 33.394
cos α		(2) +		s²			Logarithms
B		Sum		K		s	4.123 5877
(1)=h	2.6...	(3) +		h		sin α	8.812 ...785
s²	8.2...8	(4)		(5)		A′	8.509 6665
sin² α	7.6...6	(5) −		3	0.477	sec φ′	0.009 0705
C	0.7...0	(6) +		cos² α		Sum	1.454 4032
(2)=K	6.588 44	(7) +		(6)		Arc−sin corr.	−3
(δφ)²	5.2703	−Δφ	−431.6870	(colog) E		−Δλ	1.454 4029
D	1.9849	$\frac{\Delta\phi}{2}$		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin½(φ+φ′)	9.303 7124
(3)	7.2552			sec² φ		sec $\frac{\Delta\phi}{2}$	2
−h	2.6351			(7)		(approx.) −Δα	0.758 1155
s² sin² α	5.8713					do	+ 05.729″
E	5.6636	Arc−sin corr.				(8)	0.00″
(4)	4.6700	for s	−3.2	(Δλ)²		−Δα	+ 05.729″
		for Δλ	+ 0	F			
		Total	−3.2	(8)		−Δλ	28.4710″

	Logarithms		″		Logs		° ′ ″
s		(1)		½	$\bar{9}$.699	½(φ+φ′)	
cos α		(2) +		s²			Logarithms
B		Sum		K		s	
(1)=h		(3) +		h		sin α	
s²		(4)		(5)		A′	
sin² α		(5) −		3	0.477	sec φ′	
C		(6) +		cos² α		Sum	
(2)=K		(7) +		(6)		Arc−sin corr.	
(δφ)²		−Δφ		(colog) E		Δλ	
D		$\frac{\Delta\phi}{2}$		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin½(φ+φ′)	
(3)				sec² φ		sec $\frac{\Delta\phi}{2}$	
−h				(7)		(approx.) −Δα	
s² sin² α						do	″
E		Arc−sin corr.				(8)	″
(4)		for s	−	(Δλ)²		−Δα	″
		for Δλ	+	F			
		Total		(8)		Δλ	″

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[illegible] DATED JULY, 15, 1994
[illegible] ORIGINALLY TO
[illegible]

DEPARTMENT OF COMMERCE
U.S. COAST AND GEODETIC SURVEY
FORM 20-B

Field Computation of [illegible] from [illegible] to [illegible] in the [illegible] Pacific Ocean

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Accession No. of Computation

North American 1927 Datum — Order Triangulation — State MARSHALL ISLANDS

Station	Latitude (Adjusted)	Longitude (Adjusted)	Forward Azimuth	Back Azimuth	To Station	Distance Arbitrary Meters	Distance Meters	Distance Feet
REEF USN	32 9.300	25 [illegible] 28.[illegible]	50 0853	NORTH BASE USN	3.875	609	[illegible]	[illegible]
	162 [illegible] 18.805	288 [illegible] 2069.28	55 3782	SANI USN	4.057	382	[illegible]	[illegible]
[illegible]	35 38.248	42 30 [illegible] 322	29 [illegible]	REEF USN	4.[illegible]	2870	[illegible]	[illegible]
	62 [illegible] 22.942	188 [illegible]	47 [illegible]	SANI USN	3.[illegible]	1286	[illegible]	[illegible]

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
F. I. N. 1-34

COMPUTATION OF TRIANGLES

State:

U. S. GOVERNMENT PRINTING OFFICE

Station	Adjusted Observed Angle	Spher'l Angle	Spher'l Excess	Plane Angle and Distance	Logarithm
2-3					3.824 7980 ✓
1 Peek	[illegible]		0.03	05.98	0.251 1848 ✓
2 Bas[illegible]	[illegible]		.04	16.09	9.980 9554 ✓
3 Sand	[illegible]		0.03	2.793	9.999 2263 ✓
1-3					4.057 1382 ✓
1-2					3.875 4091 ✓
	[illegible]		0.10	0.000	
2-3					4.057 1382
1 [illegible]	[illegible]		0.08	13.56	0.140 9749 ✓
2 Peek	[illegible]		0.08	6.54	9.742 8155 ✓
3 Sand	[illegible]		0.09	2.490	9.993 1739 ✓
1-3					3.940 9286 ✓
1-2					4.191 2870 ✓
	[illegible]		0.25	0.000	
2-3					4.191 2870
1 [illegible]	[illegible]		0.23	28.53	0.153 7422 ✓
2 Peek	[illegible]		0.23	56.10	9.905 6860 ✓
3 [illegible]	[illegible]		0.24	55.37	9.995 5719 ✓
1-3					4.250 7152 ✓
1-2					4.340 6011 ✓
	[illegible]		0.70	0.000	
2-3					4.250 7152
1 [illegible]	[illegible]		0.07	06.17	0.939 0510 ✓
2 [illegible]	[illegible]		0.08	04.39	9.571 6653 ✓
3 [illegible]	[illegible]		0.08	09.44	9.843 0745 ✓
1-3					3.86 4315 ✓
1-2					4.132 8407 ✓
	00.23		0.23	0.000	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Nov. 1946

COMPUTATION OF TRIANGLES

State

U. S. GOVERNMENT PRINTING OFFICE 16—70994-1

STATION	Adjusted Angles			Spherical Excess	Plane Angle and Distance	Logarithm
2-3						4.250 7152
1 STEEL USC	[illegible]	[illegible]		[illegible]	50.43	0.600 1653
2 LANTANA USC	[illegible]	[illegible]		[illegible]	44.45	8.985 1647
3 LILAC USC	[illegible]	[illegible]		[illegible]	24.62	9.996 6319
1-3						3.236 0452
1-2						4.247 5124
		0.028		0.028	0.000	
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
FORM 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

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			°	'	"				°	'	"
α	2	to 3	240	38	43.70	α	3	to 2	60	40	24.82
2d ∠		&	+05	32	44.98	3d ∠		&	-82	52	24.65
α	2	to 1	246	11	28.68	α	3	to 1	337	48	00.17
−Δα			+	01	45.30	Δα			+		24.25
			180	00	00.00				180	00	00.00
α′	1	to 2	66	13	13.98	α′	1	to 3			

First Angle of Triangle

φ	[illegible]		62	3	20.646	φ	[illegible]				
Δφ	[illegible]			02	[illegible]	Δφ					
φ′	[illegible]		162	22	44.3	φ′	[illegible]				

	Logarithms				Logs		Logarithms				Logs
	0.247 5224	(1)	[illegible]		9.699	½(φ+φ′)	[illegible]		3.336 1452	(1)	[illegible]
cos α						cos α	[illegible]				
		Sum								Sum	
sin² α	[illegible]	(5)		3	0.477	sec φ′	[illegible]				
C	[illegible]	(6)	+	cos² α		Sum	2.721 2277				
(2)=K	9.2[illegible]	(7)	+	(6)		Arc−sin corr.					
$\frac{h}{(\Delta\phi)^2}$	4.732[illegible]	−Δφ	−232.1207	(colog) E		Δλ −	2.727 2276				
D	[illegible]	Δφ/2	[illegible]	A²arc²1″/3	5.912	sin½(φ+φ′)	9.295 1842				
(3)	6.7096			sec²φ		sec Δφ/2					
−h−	2.3661			(7)		(approx.) −Δα−	2.022 4118				
s² sin² α	8.4178					do	105.2960″				
E	5.6619	Arc−sin corr.				(8)					
(4)+	6.4458	for s	− 5.5	(Δλ)²	8.182	−Δα−	105.2960″				
		for Δλ	+ 4.8	F	7.569						
		Total	− 0.7	(8)	5.751	−Δλ−	533.6146″				

	Logarithms				Logs		Logarithms				Logs
	[illegible]	(1)	[illegible]		[illegible]	½(φ+φ′)	[illegible]		3.336 1452	(1)	[illegible]
cos α						cos α	[illegible]				
		Sum								Sum	
sin² α	[illegible]	(5)		3	0.477	sec φ′	[illegible]				
C	0.7123 5	(6)	+	cos² α		Sum	[illegible]				
(2)=K	6.3370 6	(7)	+	(6)		Arc−sin corr.					
$\frac{h}{(\Delta\phi)^2}$	3.4302	−Δφ	51.8920	(colog) E		Δλ −	1.221 2055				
D	1.9805	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.296 4672				
(3)	5.4107			sec²φ		sec Δφ/2					
−h+	1.7151			(7)		(approx.) −Δα−	0.628 3627				
s² sin² α	5.6267					do	4.2497″				
E	5.6626	Arc−sin corr.				(8)					
(4)	3.0044	for s	− —	(Δλ)²	3.995	−Δα−	4.2497″				
		for Δλ	+ —	F	7.576						
		Total		(8)	1.571	−Δλ −	21.4633″				

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U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	327	56	52.40	α	3	to 2	147	57	15.78
2d ∠		&	106	53	16.13	3d ∠		&	-39	01	37.96
α	2	to 1	74	50	08.53	α	3	to 1	108	55	37.82
Δα				-	47.86	Δα				01	11.12
			180	00	00.00				180	00	00.00
α′	1	to 2	254	0	20.67	α′	1	to 3	288	54	26.70

First Angle of Triangle

											16.873
						+Δφ					76.068
						φ			62		6.805

Logarithms						Logs
	3.872 4091	(1)			s	9.699
cos α		(2)				
B		Sum			K	
(1)=h		(3)			Y	
s²		(4)				
		(6)			cos² α	
(2)=K		(7)	+		(6)	
$\frac{h}{(\Delta\phi)^2}$	3.6111	$\frac{-\Delta\phi}{2}$	+63.931		(colog) E $\frac{A^2 \sin^2 1''}{3}$	5.912
D	1.4831					
(3)	5.5762				sec²φ	
−h	1.8055				(7)	
s² sin² α	1.7200					
E	5.6636	Arc−sin corr.				
(4)	5.1891	for s	− 1	(Δλ)²	7.136	
		for Δλ	+ 1	F	7.576	
		Total	0	(8)	4.712	

Logarithms						Logs
½(φ−φ′)						
s	3.875 4091	B	3.514 5007	Sum		K
sin α′	9.984 1082	(1)=h	2.080 6742	(3)	+	Y
A		s²		(4)		
sec φ		sin² α				
Sum		C		(6)		cos² α
Arc−sin corr.		(2)=K	8.781	(7)	+	(6)
Δλ	2.378 5521	$\frac{h}{(\Delta\phi)^2}$	4.1613	−Δφ	−2.3526	(colog) E $\frac{A^2 \sin^2 1''}{3}$
sin½(φ+φ′)	9.301 1243	D	1.4833	$\frac{\Delta\phi}{2}$		
sec $\frac{\Delta\phi}{2}$		(3)	6.1446			sec²φ
(approx.) −Δα	1.679 9764	−h	-2.0807			(7)
do	47″.8604	s² sin² α	8.0660			
(8)	0.0000″	E	5.6632	Arc−sin corr.		
−Δα	47.8604″	(4)	5.8099	for s	− 1.8	(Δλ)²
				for Δλ	+ 2.2	F
−Δλ	239.0849″			Total	+ 0.4	(8)

Logarithms			
s	4.087 1382		
sin α	9.975 8116		
sec φ			
Sum	2.[illegible] 5327		
Arc−sin corr.			
Δλ	2.351 5327		
sin½(φ+φ′)	9.300 4137		
sec $\frac{\Delta\phi}{2}$			
(approx.) −Δα	1.852 0064		
do	71″.1224		
(8)			
−Δα	71.1224″		
−Δλ	356.0678″		

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U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	288	54	26.69	α	3	to 2	108	55	37.82
2d∠		&	+33	34	51.62	3d∠		&	100	07	54.99
α	2	to 1	322	29	18.31	α	3	to 1	008	47	42.83
				01	02.12	Δα			–		8.75
			180	00	00.00				180	00	00.00
	1	to 2	[illegible]	[illegible]	[illegible]	α′	1	to 3	[illegible]	[illegible]	[illegible]

Plane Angles of Triangle

	[illegible]						ε	[illegible]			φ	[illegible]				[illegible]	
	[illegible]				Δλ′		05	12.042			−Δφ		04	40.734		−Δλ	44.026
	[illegible]				λ	162	22	22.841			φ′	11	25	38.247		λ′	22.84

	Logarithms			Logs		° ′ ″		Logarithms			Logs		° ′ ″		Logarithms
	[illegible]					½(φ+φ′)	[illegible]	s	3.740 7286	(1)	[illegible]		½(φ+φ′)	[illegible]	
								cos α	9 494 8630	(2)					
								B	[illegible]	Sum					
								sin α	[illegible]	(1)=h	2 448 2923	(3)			sin α	[illegible]
								A′	8 509 6689	s²	7 881 86	(4)			A′	8 509 6689
sin² α	[illegible]	(5)		3	0.477			sec φ′	0.008 6955	sin² α	8.3688 3	(5)		3	0.477	sec φ′	0 008 6955
		(6)		cos² α				Sum	2.494 2130	C	0 715 37	(6)		cos² α		Sum	1 643 7106
(2)=K	8.6683	(7)		(6)				Arc—sin corr.	0.000 0003	(2)=K	6.96606	(7)		(6)		Arc—sin corr.	0.000 0001
$\frac{h}{(2φ)^2}$	[illegible]	Δφ	401.3314	(cosec) E				Δλ	2.494 2133	$\frac{h}{(2φ)^2}$	4.8966	−Δφ	280.1340	(cosec) E		Δλ	1.643 7105
D	[illegible]	Δφ/2	[illegible]	A²arc²1″/3	5.912			sin½(φ+φ′)	9.299 0214	D	1.9833	Δφ/2	140.37	A²arc²1″/3	5.912	sin½(φ+φ′)	9 298 3977
(3)	[illegible]			sec²φ				sec Δφ/2	0.000 0002	(3)	6.8799			sec²φ		sec Δφ/2	0.000 0001
−h	2.6032			(7)				(approx.) −Δα	1.793 2349	−h	2.4483			(7)		(approx.) −Δα	0.942 1077
s² sin² α	7.95[illegible]							do	62.1205″	s² sin² α	6.2507					do	8.7520″
E	5.6635	Arc—sin corr.						(8)		E	5.6632	Arc—sin corr.				(8)	—
(4)	6.2184	for s	− 4.3	(Δλ)²	7.483			−Δα	62.1205″	(4)	4.3622	for s	− 1.3	(Δλ)²	4.931	−Δα	8.7520″
		for Δλ	+ 1.7	F	7.575							for Δλ	+ 0.0	F	7.574		
		Total	− 2.6	(8)	5.058			−Δλ	312.0417″			Total	− 1.3	(8)	2.505	−Δλ	44.0261″

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 96—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

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			°	′	″				′	″
α	2	to 3	322	29	18.31	α	3	to 2	142	30	20.43
2d∠		&	+53	35	26.33	3d∠		&	-81	49	55.61
α	2	to 1	16	04	44.64	α	3	to 1	60	40	24.82
Δα			—		39.70	Δα				01	46.12
			180	00	00.00				180	00	00.00
α′	1	to 2	196	04	04.94	α′	1	to 3	241	39	43.70
			44	34	38.76						

First Angle of Triangle

	°	′	″			°	′	″			°	′	″			°	′	″
φ	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	φ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Δφ			25.49		[illegible]		[illegible]	[illegible]	Δφ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
φ′	11	20	24.85	1	[illegible]	162	[illegible]	[illegible]	φ′	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Logarithms				Logs
s	4.340 6011	(1)	+ 685.255	s	9.699
cos α	9.182 6693	(2)	+ [illegible]		
B	8.512 4491	Sum	685.1447	E	
(1)=h	2.835 70[illegible]	(3)	+ [illegible]	F	
s²	[illegible]	4			
sin² α	[illegible]	5			
	[illegible]	6			
(2)=K	8.28277	(7)		6	
h/(Δφ)²	5.6715	−Δφ/2	685.144	(colog) E/A²arc²1″/3	5.912
D	1.9842		342.5		
(3)	7.6560			sec²φ	
−h	2.8358			(7)	
s² sin² α	7.5660				
E	5.6635	Arc−sin corr.			
(4)−	6.0653	for s	− 8.5	(Δλ)³	
		for Δλ	+ .7	F	7.5775
		Total	− 7.8	(8)	

	Logarithms				
½(φ′−φ)	[illegible]				
s	4.340 2011				
sin α	[illegible]				
sec φ	[illegible]				
Sum	[illegible]				
Arc sin corr	[illegible]				
Δλ	[illegible]				
sin ½(φ′+φ)	[illegible]				
sec Δφ/2 (approx.)	0.000 0006				
−Δα	1.598 8150				
	″				
do	″				
(8)	″				
−Δα	39.7022				
	″				
−Δλ	200.1019				

	Logarithms				
s	4.336 7052				
cos α	[illegible]				
B	[illegible]	Sum	[illegible]		
(1)=h	[illegible]	3	[illegible]		
s²	[illegible]	4			
sin² α	[illegible]				
	[illegible]				
(2)=K	[illegible]				
h/(Δφ)²	[illegible]	−Δφ/2	[illegible]	(colog) E/A²arc²1″/3	
D	[illegible]				
(3)	6.8869			sec²φ	
−h	2.4532			(7)	
s² sin² α	[illegible]				
E	5.6626	Arc−sin corr.			
(4)−	6.4981	for s	− [illegible]	(Δλ)³	
		for Δλ	+ [illegible]	F	[illegible]
		Total	− [illegible]	(8)	

sec Δφ/2 (approx.)	[illegible]	
−Δα	[illegible]	
	″	
(8)	″	
−Δα	[illegible]	
	″	
Δλ	512.054	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
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POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	'	"				°	'	"
α	2	to 3	240	38	43.70	α	3	to 2	60	40	24.82
2d ∠		&	+21	53	54.47	3d ∠		&	-44	09	[illegible]
α	2	to 1	262	32	38.17	α	3	to 1	16	30	25.30
Δα			+	01	21.44	Δα			–		[illegible]
			180	00	00.00				180	00	00.00
			82	34	05.61	α	1	to 3	[illegible]		

s²	[illegible]				
sin²α	[illegible]	3		3	0.477
	0.[illegible]	(6)		cos² α	
(2)=K	8.[illegible]	(7)		(6)	
$(\frac{h}{\Delta\phi})^2$	3.[illegible]	–Δφ	[illegible].2544	(colog) E $\frac{A^2 arc^2 1''}{3}$	5.912
D	[illegible]	$\frac{\Delta\phi}{2}$		sec²φ	
(3)	5.4943			(7)	
+h	1.7585				
s² sin² α	8.2583				
E	5.6619				
(4) +	5.6787				

Arc–sin corr.				
for s	– 3.3	(Δλ)³	7.942
for Δλ	+ 3.3	F	7.569
Total	0.0	(8)	5.511

sec φ'	0.0035995	s²	[illegible]
Sum	[illegible]	sin²α	8.[illegible]
Arc–sin corr.	0.	C	[illegible]
Δλ	2.6474218	(2)=K	7.3422
sin½(φ+φ')	9.2942682	$(\frac{h}{\delta\phi})^2$	4.7113
sec $\frac{\Delta\phi}{2}$		D	1.9805
(approx.) –Δα –	1.9416900	(3)	6.6918
do	87.4359	–h	2.3556
(8)	0.0000	s² sin²α	6.6299
–Δα –	87.4359	E	5.6626
		(4)	4.6481
–Δλ –	444.0397		

(6)		3	0.477
(7) +		(6)	
Δφ	[illegible]	(colog) E $\frac{A^2 arc^2 1''}{3}$	5.912
$\frac{\Delta\phi}{2}$	[illegible]	sec²φ	
		(7)	

Arc–sin corr.			
for s	– 0.9	(Δλ)³	5.500
for Δλ	+ 0.0	F	7.576
Total	0.9	(8)	3.076

sec φ'	[illegible]
Sum	1.83[illegible]
Arc–sin corr.	0.0000001
Δλ	1.833[illegible]
sin½(φ+φ')	9.29[illegible]
sec $\frac{\Delta\phi}{2}$	0.0000001
(approx.) –Δα +	1.1289765
do	
(8)	
–Δα +	13.4579
–Δλ +	68.1117

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GEOGRAPHIC POSITIONS

Locality KWIKETOK, Marshall Islands — 2nd order triangulation Astro *Datum* — *State* Pacific Ocean — USS BOWDITCH - 1944 — Archive No. 305697/1

Stations	Latitude	Seconds in Meters	Longitude	Seconds in Meters	Azimuth	Back Azimuth	To Station	Distance Meters	Logarithms	
PETUNIA	[illegible]	1823.957	162 09	40.138	1215.740	239 34 23.79	59 34 48.57	SAGE	4305.72	3.634 0460
						243 33 46.69	63 34 28.48	ZINNIA	6990.82	3.844 5280
						270 33 20.46	90 34 32.30	ASTER	10,777.10	4.032 5006
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59 34 48.97	239 34 23.79	PETUNIA	4305.72	3.634 0459
						[illegible]	[illegible]	ZINNIA	2712.13	3.433 3102
						[illegible]	107 56 45.39	ASTER	7424.24	3.870 6519
						291 10 00.03	[illegible]	CAMELLIA	11,271.60	4.051 9852
						325 30 39.85	145 31 45.84	REEF	[illegible]	[illegible]
ZINNIA	[illegible]	[illegible]	162 [illegible]	[illegible]	822	63 34 28.48	243 33 46.69	PETUNIA	6990.82	3.844 5280
						69 54 58.90	249 54 41.89	SAGE	2712.13	3.433 3102
						[illegible]	[illegible]	ASTER	3545.29	3.743 9238
SAGE	[illegible]	[illegible]	162 [illegible]	[illegible]	923	[illegible]	[illegible]	PETUNIA	777.10	4.032 5006
						[illegible]	288 [illegible]	SAGE	7424.24	3.870 6519
						[illegible]	[illegible]	ZINNIA	[illegible]	743 9238
						[illegible]	[illegible]	CAMELLIA	3881.83	3.589 0367
						346 43 32.85	166 43 51.92	REEF	4,519.30	4.097 5728
CAMELLIA	11 37 57.805	1776.116	162 17	29.721	900.279	03 09 27.99	183 09 24.19	REEF	10,615.70	4.017 6901
						[illegible]	291 10 00.03	SAGE	11,271.60	4.051 9852
						117 22 47.25	297 22 24.29	ASTER	3881.83	3.589 0368
						302 57 25.15	122 57 58.18	GARDENIA	5922.17	3.772 4806
						321 39 33.90	141 40 18.15	NORTH BASE	10,753.90	4.031 5685
GARDENIA	11 36 12.938	397.533	162 20	13.749	416.526	37 41 02.45	217 40 25.76	REEF	9069.22	3.957 5692
						122 57 58.18	302 57 25.15	CAMELLIA	5922.17	3.772 4806
						341 55 44.09	161 55 55.27	NORTH BASE	5483.79	3.739 0812

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FINAL VALUES GEOGRAPHIC POSITIONS

ENIWETOK, Marshall Islands 2nd order triangulation Astro *Datum* *State* Pacific Ocean USS BOWDITCH - 1944 Archive No. 305697/1

STATIONS	LATITUDE			LONGITUDE			Geodetic Meters	AZIMUTH			BACK AZIMUTH			TO STATIONS	DISTANCE		COORDINATES
ENIWETOK ASTRO PIER	11	33	29.480	162	21	10.250	310.575										
SOUTH BASE	11	33	29.264	[illegible]	[illegible]	[illegible]	299.667	238	44	37.63	58	44	37.70	ENIWETOK ASTRO PIER	12.747	[illegible]	[illegible]
								325	59	32.56	145	59	43.57	SOUTH BASE	2981.42	[illegible]	[illegible]
								327	56	52.60	147	57	15.77	SAND	6680.87	3.824	8331
								74	50	08.53	254	49	20.67	REEF	7506.61	3.875	4441
								141	40	18.15	321	39	33.90	CAMELLIA	10,753.90	4.031	5685
								161	55	55.27	341	55	44.00	GARDENIA	5483.79	[illegible]	3812
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	149.086	129	32	32.64	349	32	44.01	SAND	[illegible]	[illegible]	[illegible]
								357	21	58.32	177	22	01.87	LILAC	[illegible]	[illegible]	[illegible]
								[illegible]	[illegible]	50.96	[illegible]	[illegible]	[illegible]	REEF	[illegible]	[illegible]	[illegible]
								145	59	43.57	125	59	32.56	NORTH BASE	5981.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	125.033	145	32	45.84	325	30	39.85	SAGE	17,555.80	4.244	2200
								166	43	51.92	346	43	32.85	ASTER	12,519.30	4.097	5798
								183	09	24.19	03	09	27.99	CAMELLIA	10,415.70	4.017	6901
								217	40	25.76	37	41	02.45	GARDENIA	9069.22	3.957	5698
								254	49	20.67	74	50	08.53	NORTH BASE	7506.61	3.875	4441
								273	14	52.17	93	15	50.99	SOUTH BASE	8927.19	3.950	7152
								288	54	26.68	108	55	37.81	SAND	11,407.00	4.057	1732
								322	29	18.30	142	30	20.43	LILAC	15,535.40	4.191	3221
								16	04	44.63	196	04	04.93	LANTANA	21,909.70	4.340	6362

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FINAL VALUES GEOGRAPHIC POSITIONS

Locality **ENIWETOK, Marshall Islands** **2nd order triangulation** **ASTRO** *Datum.* *State* **Pacific Ocean** **USS BOWDITCH - 1944** **Archive No. 305697/1**

STATIONS	LATITUDE	Seconds in Meters	LONGITUDE	Seconds in Meters	AZIMUTH	BACK AZIMUTH	TO STATIONS	DISTANCE Meters	COORDINATES	
BAND	11 30 18.966	582.749	162 23 06.883	208.596	08 47 42.82	188 47 34.07	LILAC	8728.98	3.940	9636
					44 11 17.84	224 09 27.65	LANTANA	24,196.90	4.383	7598
					108 [illegible] [illegible]	[illegible] [illegible] [illegible]	ROCKY	[illegible] 407.00	[illegible]	1733
					147 [illegible] [illegible]	[illegible] [illegible] [illegible]	SOUTH BASIN	6,880.87	[illegible]	3331
					149 [illegible] [illegible]	[illegible] [illegible] [illegible]	SOUTH BASIN	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	PRIVILEGE	7268.86	[illegible]	6665
					50 40 24.82	240 38 43.69	LANTANA	17,813.50	4.250	7502
					[illegible] 30 20.43	322 [illegible] 28.30	ROCKY	[illegible] 535.40	[illegible]	3221
					177 22 01.87	357 23 38.31	SOUTH BASIN	[illegible] 830.00	[illegible]	3854
					188 47 34.07	08 47 42.82	BAND	8728.98	3.940	9636
					337 [illegible] [illegible] 17	[illegible] [illegible] [illegible]	STEEL	1722.19	3.236	0804
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ROCKY	[illegible] 909.70	[illegible]	6362
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
					[illegible] [illegible] [illegible]	[illegible] [illegible] [illegible]	LILAC	[illegible] 813.50	[illegible]	7502
					240 11 28.67	[illegible] [illegible] [illegible]	STEEL	[illegible] 682.70	[illegible]	[illegible]
					262 32 38.16	[illegible] [illegible] [illegible]	PRIVILEGE	[illegible] 579.20	[illegible]	[illegible]
STEEL	[illegible]	[illegible]	[illegible]	1422.998	162 [illegible] [illegible]	019 1343.530	26 48 36.39	206 48 18.70	PRIVILEGE	6022.03	[illegible]	7427
					66 13 13.97	246 11 28.67	LANTANA	17,682.70	4.247	5474
					157 48 04.42	337 48 00.17	LILAC	1722.19	3.236	0804
PRIVILEGE	11 21 51.383	1578.743	162 21 14.736	446.800	82 34 05.60	262 32 38.16	LANTANA	13,579.20	4.132	8757
					196 30 11.84	16 30 25.30	LILAC	7268.86	3.861	6665
					206 48 18.70	26 48 36.39	STEEL	6022.03	3.779	7427

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: ELGIN
STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. P[illegible]
YEAR: 194[illegible] LOCALITY: Engebi Island

Surface-station mark, No. [illegible]
Underground-station mark No. [illegible]
Reference mark, No. [illegible]
Reference mark, No. [illegible]
Azimuth mark, No. [illegible]
Witness mark, No. [illegible]
Height of light above station mark [illegible] meters.
Height of telescope above station mark [illegible] meters.†

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

DISTANCE	DIRECTION	AZIMUTH
	° ′ ″	° ′ ″

Detailed description: The station is located on Engebi Island, approximately 700 feet north of the south end of the island, [illegible] feet east of the seaward side, 300 feet west of the lagoon side, and 45 feet south of the southeast corner of a small quonset hut. The disk is a standard USC&GS station disk set in a 12 by [illegible] inch concrete mark that projects 2 inches above the surface of the ground and is stamped ELGIN.

Described by G.R.S. Marked by G.A.J.

NOTE.—The initial direction [illegible] scheme station

† Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
‡ Nearest meter only, when no trigonometric leveling is being done.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: GRAFLEX
STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. P[illegible]
YEAR: 1948 LOCALITY: Aomon Island

Surface-station mark, No. [illegible]
Underground-station mark No. [illegible]
Reference mark, No. [illegible]
Reference mark, No. [illegible]
Azimuth mark, No. [illegible]
Witness mark, No. [illegible]
Height of light above station mark [illegible] meters.
Height of telescope above station mark 19 meters.†

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

DISTANCE	DIRECTION	AZIMUTH
	° ′ ″	° ′ ″

Detailed description: The station is located on the north end of Aomon Island, about 500 feet west of the east shoreline of the island, [illegible] feet south of the north shoreline, and 75 west of the northwest leg of the photo-tower. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that projects 6 inches above the surface of the ground and is stamped GRAFLEX.

No reference marks were established at this station.

Described by G.R.S. Marked by G.A.J.

NOTE.—The initial direction [illegible] scheme station

† Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
‡ Nearest meter only, when no trigonometric leveling is being done.

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M.D.

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U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

STATE: Marshall Islands COUNTY: Eniwetok Atoll
YEAR: 1948 LOCALITY: Eniwetok Lagoon

NAME OF STATION: CORAL
CHIEF OF PARTY: R. L. Pfau

Surface-station mark, Note,*
Underground-station mark, Note,*
Reference mark, Note,*
Reference mark, Note,*
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark meters
Height of telescope above station mark 1 meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
			° ′ ″

Detailed description: The station is located atop a circular concrete cell that is 15 feet in diameter, about 2 miles east-southeast of the reef [illegible] tower, about 5 miles west of Runit Island, and 0.15 mile west of buoy No. 15. The [illegible] is a standard USC&GS station disk set in the center of the structure, about [illegible] feet above the high water mark, stamped CORAL, and is surrounded by a sheet met[illegible] projects 10 feet out of the water.

Described by G.R.S.

Marked by G.R.L.

NOTE.—The initial direction must be to main scheme station

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter when trigonometric leveling is being done.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

STATE: Marshall Islands COUNTY: Eniwetok Atoll
YEAR: 1948 LOCALITY: Eniwetok Lagoon

NAME OF STATION: REEF PHOTO TOWER
CHIEF OF PARTY: R. L. Pfau

Surface-station mark, Note,*
Underground-station mark, Note,*
Reference mark, Note,*
Reference mark, Note,*
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark meters
Height of telescope above station mark meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
			° ′ ″
This is a [illegible]ersection station.			

Detailed description: The station is a 4 leg steel structure constructed atop 4 steel piles encased in concrete ~~pilings~~ located on a reef that is approximately 7 staute miles south of Engebi, 7 miles west of the northend of Runit Island, and 2 miles west northwest of station CORAL.

Directions were observed on a temporary point established at the intersection of the diagonals of the opposite legs of the tower and this point was marked on a wood deck that was constructed about 5 feet above the high water mark. No permanent mark was set and the station was not occupied due to the [illegible] present.

Described by G.R.S.

Marked by

NOTE.—The initial direction must be to main scheme station

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter when trigonometric leveling is being done.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION [redacted] STATION

NAME OF STATION: KODAK
STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau
YEAR: 1948 LOCALITY: Aniyaanii Island

Surface-station mark, Note
Underground-station mark, Note
Reference mark, No. 1 Note
Reference mark, No. Note
Azimuth mark, Note
Witness mark, Note
Height of light above station mark
Height of telescope above station mark

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

Mark	Distance	Direction	Azimuth
Coast	meters	0°00'00.0"	° ' "
Reference mark	17.495	113 01 16	
Aniyaanii photo tower	21.425	202 56 19.6	
Reference mark	33.777	224 07 02	

Detailed description: The station is located about [illegible] feet south of the end of vegetation in a small clearing on the lagoon side of Aniyaanii Island, 80 feet south of the north edge of the clearing, 125 feet east of the high-water mark on the lagoon beach, and 75.5 feet north of the northwest leg of the photo tower. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground and is stamped KODAK.

Reference mark No. 1 is 47.398 feet east of the station, 74 feet north-northeast of the northeast leg ~~of the northeast leg~~ of the photo tower, and 25 feet west of the east edge of the clearing. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground and is stamped KODAK MK 1.

Described by [illegible] Marked by G.A.J.

*NOTE.—The initial directions are [illegible]

* Refers to pages 108 and 109, Special Publication No. 120, or to pages [illegible] 112 and 113, Special Publication No. 145.
(b) To nearest meter only, when no trigonometric leveling is being done.

11—5761

M.B.

[redacted] Islands County: Eniwetok Atoll
Station: KODAK
Chief: R. L. Pfau Year: 1948 Locality: Aniyaanii Island

Reference mark No. 11 is 110.819 feet south-southeast of the station, 37 feet north of the south edge of the clearing, and 35 feet southwest of the southwest leg of the photo tower. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground and is stamped KODAK MK 11.

The Aniyaanii photo tower is 21.425 meters southeast of the station. The tower is a 4-leg steel structure 75 feet in height. Distance and direction were taken from a stake with a nail in the center that is under the center of the tower.

M.B.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

SECRET

NAME OF STATION: RUNIT

STATE: Marshall Islands COUNTY: Eniwetok Atoll

CHIEF OF PARTY: R. L. Pfau

YEAR: 1948 LOCALITY: Runit Island

Surface-station mark, Note,* 1
Underground-station mark, Note,* 7
Reference mark, No. 1 Note,* 1a
Reference mark, No. 2 Note,* 1a
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark 6 meters.
Height of telescope above station mark 6 meters.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
SAND U.S.N. 1941	meters	0° 00′ 00″.0	° ′ ″
Reference mark No. 1	12.520	180 12 25	
Reference mark No. 2	12.550	278 37 39	

Detailed description: The station is located approximately 250 feet north of the south end of Runit Island, 60 feet east of the high water mark on the lagoon side of the island, and 130 feet west of the high water mark on the seaward side. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that projects 2 inches above the ground, and is stamped RUNIT.

Reference mark No. 1 is 41.075 feet north-northwest of the station, 60 feet east of the high water mark of the lagoon, and 2 feet south of the southwest corner of the southernmost quonset hut on Runit Island. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark that is flush with the ground and is stamped RUNIT.

Reference mark No. 2 is 48.072 feet east of the station, 90 feet west of the high water mark on the seaward side of the island, and 45 feet south of a quonset hut. The disk is a standard USC&GS disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground, and is stamped RUNIT.

Described by G.R.S. Marked by G.A.J.

NOTE.—The initial direction must be to main station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter only when no trigonometric leveling is being done.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRAVERSE STATION

SECRET

NAME OF STATION: ACMON TRAVERSE STA.

STATE: Marshall Islands COUNTY: Eniwetok Atoll

CHIEF OF PARTY: R. L. Pfau

YEAR: 1948 LOCALITY: Acmon

Surface-station mark, Note * 1a
Underground-station mark, Note *
Reference mark, Note *
Reference mark, Note *
Azimuth mark, Note *
Witness mark, Note *
Height of light above station mark meters
Height of telescope above station mark meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
		° ′ ″	° ′ ″

Detailed description: The station is located in the southwestern corner of Acmon Island, about 500 feet northeast of the southwest corner of the island, [illegible] feet northwest of the northwest corner of the causeway, and 120 feet east of the high-water mark of the lagoon. The disk is a standard USC&GS triangulation disk set in a [illegible] concrete mark that projects 2 inches and is stamped ACMON TRAVERSE [illegible]

Described by G.R.S. Marked by G.A.J.

NOTE.—The initial direction must be to main station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter only when no trigonometric leveling is being done.

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SECRET

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: BIIJIRI TRAVERSE STA. STATE Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: Ralph L. Pfau YEAR 1948 LOCALITY: Biijiri Island

Surface-station mark, Note 1
Underground-station mark, None
Reference mark, None
Reference mark, None
Azimuth mark, None
Witness mark, None
Height of light above station mark feet.
Height of telescope above station mark feet.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

Object	Distance	Direction ° ′ ″	Azimuth ° ′ ″

Detailed description: The station is located in the southwestern corner of Biijiri Island, about 550 feet northeast of the southwestern tip of the island, 180 feet north of the south end of the island, and 11[illegible] feet west of the tide-mark of the lagoon. The disk is a standard USC&GS triangulation disk set in a [illegible] concrete mark that projects 2 inches and is stamped BIIJIRI TRAVERSE STA.

Described by G.A.J. Marked by G.A.J.

NOTE.—The initial direction is [illegible] pages 108 and 109, Special Publication No. 120, or to pages [illegible] Special Publication No. 145. [illegible] when no trigonometric leveling is being done. ... 11—5761

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

SECRET

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: RUNIT TRAVERSE STA. STATE Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau YEAR 1948 LOCALITY: Runit Island

Surface-station mark, Note 1
Underground-station mark, None
Reference mark, None
Reference mark, None
Azimuth mark None
Witness mark, None
Height of light above station mark feet.
Height of telescope above station mark feet.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

Object	Distance	Direction ° ′ ″	Azimuth ° ′ ″

Detailed description: The station is located in the central part of Runit Island, about 1200 feet northeast of the [illegible] larger sections of the island, 221 feet west of the [illegible] side of the island, and 121 feet east of a pontoon, 1 [illegible] of the island. The disk is a standard USC&GS disk set [illegible] that projects 1 inch above the ground and is stamped [illegible]

Described by [illegible] Marked by G.A.J.

NOTE.—2 [illegible] pages 108 and 109, Special Publication No. 120, or to pages [illegible] Special Publication No. 145. [illegible] when no trigonometric leveling is being done. ... 11—5761

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Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: SOUTH BASE STATE: MARSHALL ISLANDS COUNTY: ENIWETOK ATOLL
ESTABLISHED BY: U.S.S. BOWDITCH [illegible] 1944 [illegible]
RECOVERED BY: * R.L.Pfau [illegible] 1947-8

Detailed statement as to the fitness of the recovered station: This station has been destroyed

J.C.H.

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~~SECRET~~

* Name of the officer [illegible] recovery note.

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Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: ENIWETOK ASTRO STATE: MARSHALL ISLANDS COUNTY: ENIWETOK ATOLL
ESTABLISHED BY: U.S.S. BOWDITCH [illegible] 1944 [illegible]
RECOVERED BY: * R.L.Pfau [illegible] 1947-8

Detailed statement as to the fitness of the recovered station: This station has been destroyed

J.C.H.

~~SECRET~~

* Name of the officer [illegible] recovery note.

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Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION SAND ISL 1944 [illegible] Isl, Is COUNTY Eniwetok Atoll
ESTABLISHED BY [illegible] 1944
RECOVERED BY* R. L. [illegible] 1948

Detailed statement as to the [illegible] description. The station was recovered and found to be in good condition. A complete description follows:

The station is located on the third [illegible] south of Runit Island, about 450 feet south of the [illegible] the island and [illegible] feet east of the high-water mark on the lagoon beach. The disk is a standard USN triangulation survey disk set in an 8 by 8 inch concrete [illegible] projects [illegible] surface of the ground and is not stamped.

No reference [illegible] established [illegible]

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* Name of [illegible] should sign his name at the end of the recovery note.
U. S. GOVERNMENT PRINTING OFFICE [illegible] recovery note. Gordon P. Strode 16—26488-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION NORTH [illegible] 1944 [illegible] Marshall Islands COUNTY Eniwetok Atoll
ESTABLISHED BY [illegible] 1944 [illegible] Runit Island
RECOVERED BY* R. L. [illegible] 1948

Detailed statement as to the [illegible] description. The station was recovered and found to be in good condition. A complete description follows:

The station is located on the north end of Runit Island, 180 feet southeast of the north tip of the main island, 120 feet west of the northwest leg of the photo tower, and 35 feet east of the high-water mark on the lagoon side of the island. The disk is a standard USN triangulation station disk set in an 8 by 8 inch concrete mark that projects [illegible] above the surface of the ground. There is no stamping on the disk.

No reference mark was established [illegible]

SECRET

* Name of [illegible] should sign his name at the end of the recovery note.
U. S. GOVERNMENT PRINTING OFFICE [illegible] Gordon P. Strode 16—26488-1

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SECRET

IV B

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[illegible]

[illegible]

[illegible]

(Page [illegible] of [illegible] pages included)

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Page [illegible]

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[illegible]

CONTENTS

(1) Brief [illegible] of the general features of the [illegible] expansion figures.

(2) Base [illegible]

(3) Comp[illegible]

(4) Base [illegible]

(5) Abstract of [illegible]

(6) List of [illegible] samples.

(7) [illegible] order [illegible] Nos. [illegible] and [illegible]

[illegible]

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[illegible]

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TRIANGULATION

A scheme of first-order [illegible] composed of check figures was executed [illegible] from a first-order base line on [illegible] northward to Engebi Island and [illegible] Anlyaan [illegible] were executed for the the purpose of [illegible] the activated islands and to establish [illegible] between certain installations.

All observations were made [illegible] standard procedure was followed throughout. The maximum [illegible] closure for the entire scheme was [illegible] seconds and the average [illegible] seconds. The maximum triangle closure [illegible] was 01.30 seconds and the average [illegible] seconds.

With the exception of [illegible] NRAR, which could not be occupied because of excessive [illegible] all stations were occupied. Traverse ties were made to the [illegible] beacon towers on Engebi, Aomon, Runit, and Anlyaan Islands.

In order to conform to the [illegible] of the U.S.S. BOWDITCH with the new navy stations [illegible] and SAMP USN, 1944 were incorporated into the scheme.

BASE LINE

A first-order base line was [illegible] on Runit Island between stations [illegible] established station RUNIT. The configuration of the island [illegible] the adoption of a broken base consisting of four sections [illegible] lengths. First-order invar tapes [illegible] were followed throughout.

The [illegible] measurement is 1 part in 8,100,000.

This base [illegible] second-order base line measured on the same [illegible] due to the fact that it consisted of [illegible] extending off the south end of the [illegible] base line.

The base [illegible] through station CORAL, a newly established station [illegible] the same general area as station [illegible] but not [illegible] that station. This is the most [illegible] for construction of a station suitable for observations and [illegible].

The base [illegible] specifications for first-order triangulation in the [illegible] figure is larger than is generally [illegible] on first-order [illegible]. This is the only respect in which the [illegible] first-order specifications, and it [illegible] extent of the scheme.

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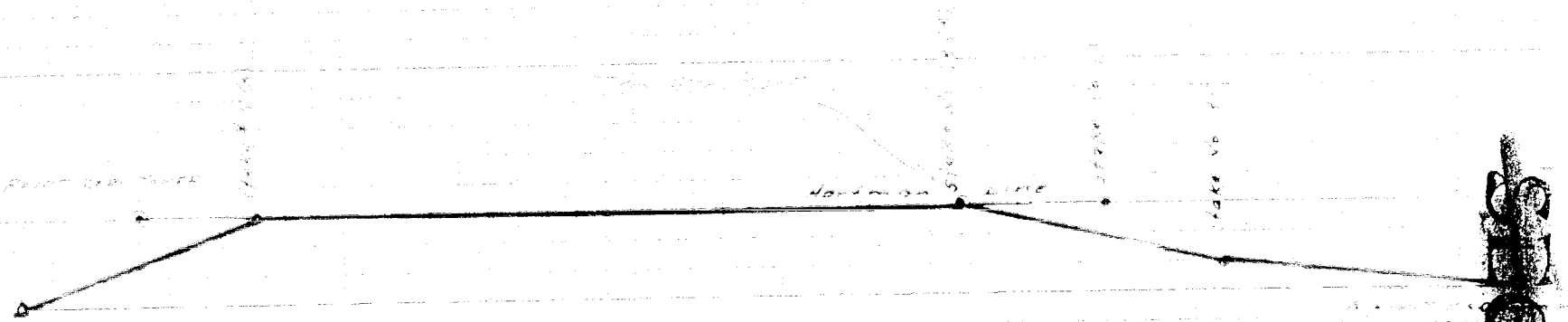
BASE LINE
(No. 5 [illegible])



Note: The Hartman line was staked out first, using "[illegible]" [illegible] of the numbers thru stake No 33.
The portion of this line from stake No 4 thru stake No 28 was also used as a section of the Triangulation Base line and stakes 4 + 28 of the Hartman line were designated 4(A) and 28(B) to indicate that they were angle stations in the Base line. Following the same system of designation angle station "C" of the base line was designated 9(C), 9 being the stake No ~ The designations were used in all record book + computations.

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Form 589
Rev. April 1935

[redacted]

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COMPUTATION OF *Runit I* BASE LINE

						Uncorrected length		COR-			RECTIONS			Reduced length	Adopted length		
											Sat. hole			Meters	Meters		
	[illegible]	B	733	1	11	[illegible]	33.4	+0.0048	-0.0405		0.0832	-0.0415		580.9923		±1.4	1.96
		B	733	2	½	[illegible]	[illegible]	+0.0013	0.0018								
		B	3661	2	–		30.9	+0.0001	+0.0003		5.9868						

Pe entire measurement = 1.245 mm

= 1:2,100,[illegible]

DECLASSIFIED PER DOE
LETTER DATED JULY 15,
FROM ANTON SINISGALLI
DIANE S. NIXON

[redacted]

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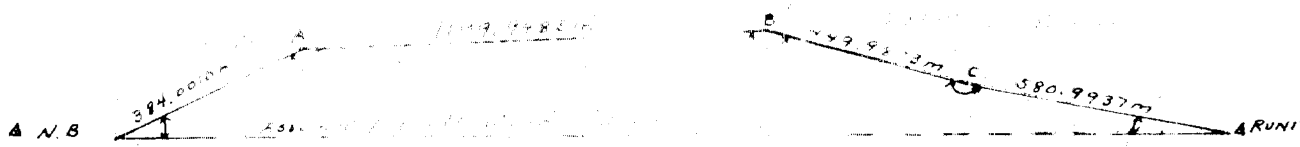

OBSERVED

N.B. – Runit	2.017 0[illegible]13 ✓	+104.0139 ✓
	9.[illegible] [illegible]590 ✓	
N.B. – A	2.584 [illegible]23 ✓	
	9.983 4532 ✓	
	2.567 [illegible]855 ✓	369.6456 ✓
A – B	0.858 5066 ✓	+ 7.2195 ✓
	[illegible].779 [illegible]440 ✓	
	3.0[illegible]9 626 ✓	
B – C	9.999 9921 ✓	
	3.0[illegible]9 [illegible]547 ✓	1199.9266 ✓
	1.939 8407 ✓	+ 87.0644 ✓
C – Runit	9.286 [illegible]404 ✓	
	2.653 [illegible]003 ✓	
	[illegible].99[illegible] [illegible]150 ✓	
Runit – N.B.	[illegible].644 9153 ✓	+41.4843 ✓
	0.987 3814 ✓	+ 9.7136 ✓
	[illegible] 2100 ✓	
	[illegible].764 [illegible] ✓	
	9.999 9393 ✓	
	[illegible].764 [illegible] ✓	580.9124 ✓

Σ -0.0164 ✓ 2591.9689 ✓

Log = 3.4136298 ✓

✓RLB.

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Form 685

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

(Result I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	[illegible]	MEAN ELEVATION	REMARKS
	Meters	[illegible]	[illegible]	[illegible]	Meters	
Mark N. Base USN 1944 Bench N. Base USN 1944	0	[illegible]	[illegible]			
N. Base Setup	2 984	[illegible]	19			
1	50	[illegible]	[illegible]			
2	50	[illegible]	[illegible]			
2 + 25	25	[illegible]	[illegible]			
3	50	[illegible]	[illegible]			
4	50	[illegible]	[illegible]			
5	50	[illegible]	[illegible]			
6	50	[illegible]	[illegible]			
4(A)	50	[illegible]	[illegible]			
			750			

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Form 635

SECRET

ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	Meters	Meters	Meters	
4 (A)						
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			
12	[illegible]	[illegible]	[illegible]			
13	[illegible]	[illegible]	[illegible]			
14	[illegible]	[illegible]	[illegible]			
15	[illegible]	[illegible]	[illegible]			
16	[illegible]	[illegible]	[illegible]			
17	[illegible]	[illegible]	[illegible]			
18	[illegible]	[illegible]	[illegible]			
19	[illegible]	[illegible]	[illegible]			
20	[illegible]	[illegible]	[illegible]			
21	[illegible]	[illegible]	[illegible]			
22	[illegible]	[illegible]	[illegible]			
23	[illegible]	[illegible]	[illegible]			
24	[illegible]	[illegible]	[illegible]			
25	[illegible]	[illegible]	[illegible]			
26	[illegible]	[illegible]	[illegible]			
27	[illegible]	[illegible]	[illegible]			
28 (B)	[illegible]	[illegible]	[illegible]			

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	[illegible]	MEAN ELEVATION	REMARKS
	Meters	[illegible]	[illegible]	[illegible]	Meters	
28 (B)						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9 (C)	[illegible]	[illegible]	[illegible]			

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters		Meters	Meters	
9 (C)						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
6+25	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			
Bench Δ Run 7	[illegible]	[illegible]	[illegible]			
Mark Δ Run 7	[illegible]	[illegible]	[illegible]			

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET

DIRECTIONS

Station NORTH BASE, U.S.N. 1944 State Marshall Is. Eniwetok Atoll

Chief of party Ralph L. Pfau Date 20 January 1944 Computed by R.L.P.

Observer G.R. Strode Instrument Repeater No. 534 Checked by R.L.P.

11—9503

OBSERVED STATION	Observed direction	Excentric correction	Reduced direction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
4 (A)	0 0 00.00			0 00 00.00	
RUNIT, U.S.C&GS 1948	[illegible]				

No [illegible]

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SECRET

LIST OF DIRECTIONS

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Station 4 (A)

Chief of party Ralph [illegible]

Observer G.R. Stroop

State Ma-[illegible] [illegible] Kwajalein Atoll

Date 2[illegible]

Instrument [illegible] H-334

Computed by R.L.P.

Checked by R.L.P.

OBSERVED STATION	Observed direction	[illegible]	[illegible] reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		°	° ′ ″	° ′ ″
28 (B)	[illegible]			0 00 00.00	
North Base [illegible]	[illegible]				

* These columns are for office use and should [illegible]

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U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

~~SECRET~~

Station 28 (B) Majuro Marshall Is. Eniwetok Atoll

Chief of party Ralph L. Pfau Date 19 Jan 1948

Observer [illegible]

Computed by R. L. P.

R.L.P.

Adjusted direction*

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N BASE

(2)

(3)

53

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET
LAST OF COLLECTION

Station 28(B)
Chief of party Ralph L. Pfau
Observer G.R. Strode

State Marshall Is. [illegible] Atoll
Date 29 Jan [illegible]
Instrument 7" Repeat[illegible] 334

Computed by R.L.P.
Checked by R.L.G.

U.S. GOVERNMENT PRINTING OFFICE 1932 11—9503

OBSERVED STATION	Observed direction	Eccentric correction	Reduction to center*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
29 (C)	[illegible]			[illegible] 00 00.00	
24 (A)	[illegible]				

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Rev. Oct., 1932

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LIST OF DIRECTIONS

Station 9 (C)
Chief of party Ralph [illegible]
Observer G. R. Strowe

State Marshall Is. Eniwetok Atoll
Date 29 [illegible] 1948
Instrument Repsold #H-334

Computed by R. L. P.
Checked by R. L. C.

OBSERVED STATION	Observed direction	Correction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
Runit, USCGS [illegible] 28 (B)	[illegible]			0 00 00.00	

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U. S. COAST AND GEODETIC SURVEY
Form 24 A
Rev. Oct., 1932

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LIST OF DIRECTIONS

Station RUNIT U.S.C&GS 1944 State Marshall Is - Eniwetok Atoll

Chief of party Ralph L. Flaus Date [illegible] Computed by R.L.P.

Observer G.R. Strode Instrument [illegible] Repeater # [illegible] 334 Checked by R.L.P.

[illegible] 11—9508

OBSERVED STATION	Observed direction	Eccentric relation	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	° ′ ″		° ′ ″	° ′ ″
North Base, U.S.N. 1944	0 00 00.00			0 00 00.00	
9 Co	[illegible]				

No [illegible]

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[illegible]

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UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

for

[illegible] METER IRON NICKEL ALLOY TAPE

(Low Expansion [illegible])
NBS No. [illegible]

U.B.C. & G.B. No. [illegible]

SUBMITTED BY

United States Coast & Geodetic Survey,
Washington, D. C.

This tape has been compared with the standards of the United States under a horizontal tension of 15 kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C. under the conditions given below.

Supported at the 0, 25 and 50 meter points [illegible] meters

Supported at the 0, 12.5, [illegible], 37.5, and 50 meter points, with the 12.5- and 37.5-meter points 6 inches above the plane of the 0- and 50-meter supports [illegible] meters

Thermometers weighing [illegible] grams were attached at points 1 meter inside the terminal marks.

These comparisons were made on the section of the lines near the end on the edge of the tape marked with a small "u" or "v" or dots near the graduation.

The values for the lengths are not in error by more than [illegible] per [illegible] °C. [illegible] probable error does not exceed 1 part in 1,500,000.

The values for the lengths were obtained from measurements made [illegible] °C. and in reducing to 25 °C. the thermal expansion of [illegible] millimeter per 50 meters per degree centigrade was used.

The weight per meter of this tape previously determined is [illegible] grams.

[illegible]
Chief, Length Section
Metrology Division

XXXXXXX 2.1/114409
Test completed October [illegible]

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

for

[illegible] METER IRON NICKEL ALLOY TAPE

(Low Expansion [illegible])
NBS No. [illegible]

SUBMITTED BY

United States Coast & Geodetic Survey,
Washington, D. C.

This tape has been compared with the standards of the United States under a horizontal tension of [illegible] kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C. under the conditions given below.

Supported at the 0, 25 and 50 meter points 49.99748 meters

Supported at the 0, 12.5, [illegible], 37.5 and 50 meter points, with the 12.5- and 37.5-meter points 6 inches above the plane of the 0 and 50 meter supports 49.9971.2 meters

Thermometers weighing [illegible] grams were attached at points 1 meter inside the terminal marks.

These comparisons were made on the section of the lines near the end on the edge of the tape marked with a small "u" or "v" or dots near the graduation.

The values for the lengths are not in error by more than 1 part in 500,000, the probable error does not exceed [illegible] part in 1,500,000.

The values for the lengths were obtained from measurements made at 22.6 °C., and in reducing to 25 °C. the thermal expansion of [illegible] millimeter per 50 meters per degree centigrade was used.

The weight per meter of this tape previously determined is [illegible] 25.6 grams.

For the Director,

Lewis V. Judson
Chief, Length Section
Metrology Division.

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

for

[illegible] METER IRON NICKEL ALLOY TAPE

Low Expansion Coefficient
NBS No. [illegible]

SUBMITTED BY

United States Coast & Geodetic Survey,
Washington, D. C.

This tape has been compared with the standards of the United States under a horizontal tension of [illegible] kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C. under the conditions given below.

Supported at the 0, 25 and 50 meter points. [illegible] meters

Supported at the 0, 12.5, [illegible], 37.5, and 50 meter points, with the 12.5- and 37.5-meter points 6 inches above the plane of the 0 and 50 meter supports [illegible] meters

Thermometers weighing [illegible] grams were attached at points 1 meter inside the terminal marks.

These comparisons were made on the section of the lines near the end on the edge of the tape marked with a small "u" or "v" or dots near the graduation.

The values for the lengths are not in error by more than [illegible] per [illegible] °C. [illegible] probable error does not exceed 1 part in 1,500,000.

The values for the lengths were obtained from measurements made [illegible] °C. and in reducing to 25 °C. the thermal expansion of [illegible] millimeter per [illegible] meters per degree centigrade was used.

The weight per meter of this tape previously determined is [illegible]

Lewis V. Judson
Chief, Length Section
Metrology Division

XXXXXXX [illegible]
Test completed [illegible]

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Form 579
[illegible]

SECRET

U. S. DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

FOR

[illegible] 0-Meter Steel Tape
NBS No. 8305

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Maker's Identification Mark
The Lufkin Rule Co.
C.C.& G.S. No. 3661

SUBMITTED BY [illegible] OCT 5 1947

United States Coast & Geodetic Survey,
Washington [illegible]

This tape has been compared with the standards of the United States. It complies with the specifications for a standard tape, and the intervals specified have the following lengths at 68° Fahrenheit (20° centigrade under the conditions given below:

Supported on a horizontal [illegible] surface;
Tension 4 1/2 [illegible] pounds

Interval	Length
(0 to [illegible] meters)	[illegible] meters

Tension 5 [illegible]

Interval	Length	Interval	Length
(0 to 1 meter)	1.000[illegible] meters	(0 to [illegible] meters)	16.0006 meters
(0 to 2 meters)	2.000[illegible] "	(0 to [illegible] meters)	17.0010 "
(0 to 3 meters)	3.000[illegible] "	(0 to [illegible] meters)	18.0007 "
(0 to 4 meters)	4.000[illegible] "	(0 to [illegible] meters)	19.0009 "
(0 to 5 meters)	5.000[illegible] "	(0 to [illegible] meters)	20.0008 "
(0 to 6 meters)	6.000[illegible] "	(0 to [illegible] meters)	21.0007 "
(0 to 7 meters)	7.000[illegible] "	(0 to [illegible] meters)	22.0008 "
(0 to 8 meters)	8.00[illegible] "	(0 to [illegible] meters)	23.0010 "
(0 to 9 meters)	9.00[illegible] "	(0 to [illegible] meters)	24.0010 "
(0 to 10 meters)	10.00[illegible] "	(0 to [illegible] meters)	25.0008 "
(0 to 11 meters)	11.00[illegible] "	(0 to [illegible] meters)	26.0012 "
(0 to 12 meters)	12.00[illegible] "	(0 to [illegible] meters)	27.0008 "
(0 to 13 meters)	13.00[illegible] "	(0 to [illegible] meters)	28.0012 "
(0 to 14 meters)	14.00[illegible] "	(0 to [illegible] meters)	29.0015 "
(0 to 15 meters)	15.00[illegible] "	(0 to [illegible] meters)	30.0017 "

Test No. 2.1/113718

SECRET

The comparisons of this tape with the [illegible] and in reducing to 68° Fahrenheit (20° [illegible] temperature of 24.9° Centigrade degree Fahrenheit (0.0000116 per degree [illegible] is assumed to be 0.00000645 per

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Tape Certificate Continued [illegible] NBS No. 8305

When supported as indicated below:

Tension 5 kilograms

Points of Support	Interval	Length
0 and 5 meters	(0 to 5 meters)	5.0003 meters
0 and 10 meters	(0 to 10 meters)	10.0002 "
0 and 15 meters	(0 to 15 meters)	14.9997 "
0 and 20 meters	(0 to 20 meters)	19.9989 "
0 and 25 meters	(0 to 25 meters)	24.9971 "
0 and 30 meters	(0 to 30 meters)	29.9953 "

The above values for the lengths are not in error by more than 0.0002 meter.

The comparison of this tape with the Bench Standards were made at the center of the ends of the lines farthest from the observer when the [illegible] of the tape [illegible] his left hand.

The weight per meter of this tape was found to be 12.0 grams.

For the Director,

Lewis V. Judson,
Chief, Length Section,
Metrology Division

Test No. 2.1/113715
Test completed: Sept. [illegible] 1947

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V A. GENERAL METHOD ADOPTED [illegible] ESTABLISHMENT OF OF STAKES FOR INSTALLA[illegible] ALL ISLANDS.

The general method adopted [illegible] establishing stakes on all islands consisted of the precise measurement of one line, using a Tellurometer [illegible] standard base line procedure, and the establishment of other points by normal or chord off-sets from this line.

Since tape ends were not [illegible] on the stakes for the forward and [illegible] measurements, the tape ends of the forward measurement of the line were semi-permanently marked on the stakes to be used in a proportional correction applied to differences determined in the forward measurement of [illegible] magnitude [illegible] to make the resulting total length of line equal to the [illegible] of the forward and backward measurements.

In all cases, one of the [illegible] (Martian, Gamma or Timing) radiating from the Zero [illegible] was selected for precise measurement. Which of the [illegible] line was selected was dictated by local conditions on each island.

Although the [illegible] line was [illegible] most economical line to measure, since the [illegible] number of stations could be established by direct set up on and [illegible] from the base line stakes, and necessitated the least [illegible] of pre-computing, it was possible to measure this line [illegible] only on [illegible] of the islands.

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Since t[illegible] between the AEC lines on [illegible] used was well adapted to the purpose, [illegible] necessity for the measurement [illegible] the posibility of a systematic error that [illegible] been present in the direct measurement of [illegible] with inferior tapes and methods.

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[illegible]

On Engebi Island, the line used by standard base line procedure was the Zero Tower - triangulation station ELGIN line. This was the only [illegible] the AEC lines which was not obstructed at the time. [illegible] error of the measurement was [illegible]

The timing station is located on this line, and the timing station stake was established [illegible] from stake No. 23 of the line.

The Gamma A and Gamma B station stakes were established by chord off-sets from the Zero Tower - Elgin line.

Stakes for the blast footings [illegible] including the footing at 3900 feet from Zero were established by chord off-sets from the Zero Tower - Elgin line. The blast footing stakes at 4200 and 4800 feet from Zero were established by prolonging the line beyond the 3900 foot stake. Distances beyond the 3900 foot stake were established by use of a 300 foot steel tape.

The centerline for the Mt. [illegible] was selected so as to run diagonally across the [illegible], thus affording a clear line of sight. From the Zero Tower a traverse was run along the centerline, ~~and~~ stakes set flush with the runway surface at the required distances from Zero, and chord off-set stakes [illegible] either edge of the runway.

Measurements were made with a 300 foot steel tape.

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The orientation of the centerline is determined by an observed angle at the Zero Tower [illegible] the Bu. Y&D centerline and triangulation stations [illegible].

A line of reference rods was [illegible] feet in front of each line of Bu. Y&D units with two [illegible] measurements made to each of two marked points on each [illegible].

The 3000 foot north-bound station on the Bu. Y&D was selected as determining the centerline of the Bu. S. units. With the instrument [illegible] over this [illegible] and oriented back to Zero a traverse was run back to [illegible] Zero and stakes set at the required intervals.

A 300 foot steel tape was used for these measurements. The azimuth of the centerline is determined by previously computed Bu. Y&D [illegible].

The O.C.E. building stake at [illegible] feet from Zero was established by direct measurement of [illegible] and distance from the Zero Tower [illegible].

The most northerly O.C.E. [illegible] stakes at 1000 and 2500 feet from Zero were established by [illegible] off-sets from the Bu. Y&D centerline. The [illegible] southwesterly stakes at these distances were established by [illegible] off-sets from the northeasterly stakes. A 300 foot steel tape was used for these measurements.

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Four reference [illegible] each of the O.C.E. buildings, with the exception [illegible] "J" structure at 2500 feet fro[illegible] [illegible]rements made to drill holes in eight [illegible] project horizontally from the building [illegible] are on the front face of the building (two near the [illegible] two near the top), and four are similarly located [illegible] back of the buildings.

All reference measurements to the O.C.E. buildings and to Bu. Y&D units [illegible] were made with steel tape No. [illegible] 5074. [illegible] was left in the area for use in making [illegible] measurements.

In order to further tie the [illegible] O.C.E. buildings with reference to points which will not be destroyed, a traverse line was run from the Zero Tower to the 2500 foot stake of the Bu. Y&D [illegible] reference stakes set near each of the O.C.E. buildings, back to the Zero Tower. The traverse stakes were in [illegible] to the reference stakes at each building. This line was measured with a 300 foot steel tape.

Range pole No. [illegible] normal off-set from the Zero Tower - [illegible] poles No. 2 and No. 3 were similarly [illegible] moved. Range pole No. 3 was moved 40 feet [illegible] normal to the original line of poles. Range pole [illegible] was moved 20 feet northeastward [illegible] normal to the original line of poles. Thus the poles are still on a straight line, but the line is no longer parallel to the Zero - Timing Station Line.

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The sta[illegible], as selected by Dr. Clark of [illegible] located [illegible] angle and distance fro[illegible].

The winch [illegible] located by [illegible] angle and distance from triangulation [illegible].

The tank re[illegible] located by [illegible] angle and distance from the [illegible] at the [illegible] position of range pole No. 3.

A line of [illegible] every 10 feet was run along the [illegible] for a distance of 500 feet on [illegible] side of the [illegible]. This line is tied in to tri[illegible] and other points in the vicinity of [illegible].

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Since the base line extends from Ponon Island to Rojoa Island, [illegible] the only [illegible] of obstructions, it was selected [illegible] standard base line procedure.

This line [illegible] over [illegible], making it necessary to carry the distance from [illegible] by triangulation.

This was accomplished by [illegible] short auxiliary base line - [illegible] with [illegible] standard base line procedure- on [illegible] and Rojoa Islands.

The probable error of the base line, including sections determined by triangulation, does not exceede 1 part in 850,000. [illegible] in this manner because in its [illegible] it was necessary to use the two determinations of distance [illegible] each water gap one of which distance is determined from [illegible] metrically stronger figure than the other in each case. Only the distance determined from the strongest figure is used as the distance across the gap, the weaker determination being used as a check only.

Gamma stations A, B, and C were located by set ups or set backs from stations of the base line. Gamma A was set at 2130 feet from [illegible], since this was the maximum distance obtainable on Ponon Island.

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The blast footing stakes were established by chord off-sets from the measured Gamma line.

The **Timing** station stake was established by chord off-set from the 6946 front blast footing stake.

The range pole stakes were originally set by off-sets from the Zero Tower - Timing Station line and at the positions specified in the [illegible] drawings. Range pole No. 1 was set in the specified position, but range poles No. 2 and No. 3 were not set in accordance with the plans. This change was made by the resident engineer because range pole No. 3 fell in front of the [illegible] tree which had been spotted in by eye prior to the arrival of the survey party on the island.

The positions of range poles No. 2 and No. 3 as actually set were determined by the [illegible] angles and distances from stakes of the recorded Gamma line. The poles as set are on a straight line, but the line is not parallel to the Zero Tower - Timing Station line.

Stakes for the [illegible] of the [illegible] MP units at each specified distance from Gamma were established by chord off-sets from the Gamma line. However, [illegible] starting this report Lieut. Comdr. [illegible], USN, advises that all of these stakes have been destroyed or removed. The section of computations pertaining to the MP [illegible] shots on Aomon, Biijiri and Mejoa [illegible] information was of no significance, and should be disregarded.

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The wind [illegible], [illegible] and [illegible] revetment which were in the pr[illegible] the survey party arrived on the [illegible] measured angles and distances from [illegible] (an a line.

The Photo t[illegible] observed angle and distance from triangulat[illegible] station Gu[illegible].

The causeway [illegible] established by offset from the [illegible] line [illegible] purpose of orienting the AEC installat[illegible] being the only line available [illegible] required.

One causeway [illegible] above high water line on Aomon I [illegible] I. The distance between these s[illegible] triangulation from an auxiliary base [illegible] steel tape. Additional [illegible] were later set on both Aomon and Biijiri Islands.

A bench [illegible] and xxxxx xxxxxxx the [illegible] upon an assumed elevation [illegible] water line on the beach. This [illegible] for the Aomon bench mark. A [illegible] established on Biijiri I., [illegible] the bench mark on Aomon I.

Pile cut-off [illegible] determined by leveling from these [illegible] the centerline and pile line stakes.

[redacted]

[illegible] recordings [illegible] 10 [illegible] intervals [illegible] profile.

Pre-grading [illegible] levels [illegible] Bonca and Biijiri Islands, use [illegible] the Gamma [illegible] as a centerline. Rod readings were [illegible] every [illegible] the centerline, and side shots [illegible] 100 feet [illegible] and at breaks in grade for a distance of 100 feet [illegible] the centerline. These side shots were taken at [illegible] intervals along the centerline, [illegible] line [illegible] the centerline.

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On Kunit [illegible] of t e [illegible] es were unobstructed and available [illegible] Hartman line was selected as th [illegible] because it was the most economical [illegible] the standpoint of establishing [illegible] and because it was so situated t[illegible] could be used as one section of [illegible] base line.

The Hartm[illegible] three sections. The first section [illegible] station mark to stake 4(A). Th[illegible] also one section of the first-or[illegible] stake 4(A)to stake 28(B). Th[illegible] from stake 28(B) to stake 33. [illegible] by a standard USC&GS triangulati[illegible] concrete post and stamped "[illegible]

The Hartman [illegible] to stake 33 has a computed probable error of [illegible] 78,000. The probable error of [illegible] line which was measured betwee[illegible] 1944 and newly established [illegible] section titled "BASE LINE".

The blank [illegible] by set ups or set backs from [illegible] measurement.

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The Timing [illegible] was located by [illegible] off-set from the Hartman Line.

The Gamma [illegible] were located by [illegible] off-sets from the Hartman Line.

The 1000 foot [illegible] was located by chord off-set from the [illegible] foot point on the [illegible] Timing station line.

The range pole [illegible] were set in [illegible] by chord off-sets from the Hartman Line [illegible] the [illegible] line and thence to the range pole [illegible] by setting out in each case the chord angle and distance computed for the [illegible] off-set from the 1500 foot point on the Two-[illegible] station line to range pole [illegible] on a line parallel to the [illegible] line.

The winch house was located by an observed angle and distance from station [illegible] of the [illegible] line. From this data the distance [illegible] from the [illegible] Tower was computed.

The tank revetment was located by an observed angle and distance from station No. [illegible] of the [illegible] (D) section of the first-order [illegible] line.

The Photo Tower was located by an observed angle and distance from triangulation station [illegible], 1944.

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A standard [illegible] triangulation stick stamped "TRAVERSE STA RUNIT" and [illegible] a concrete [illegible] was established as a permanent mark [illegible] surface base [illegible] 28 B).

Pre-grading [illegible] section [illegible] were run on Runit Island using the [illegible] line [illegible] centerline. Rod readings were taken every [illegible] centerline, and side shots taken at [illegible] breaks in grade for a distance of [illegible] from the centerline. These side shots were [illegible] 100 [illegible] intervals along the centerline, and along [illegible] normal to the centerline.

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ENGEBI ISLAND

LOCATION OF STRUCTURES FROM [illegible] TOWER

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO
Timing Station	3900 ft	323 39 12
Blast Footing	1200 "	326 17 53
" "	1600 "	" " "
" "	2000 "	" " "
" "	2200 "	" " "
" "	2400 "	" " "
" "	2700 "	" " "
" "	3000 "	" " "
" "	3300 "	" " "
" "	3600 "	" " "
" "	3900 "	" " "
" "	4200 "	" " "
" "	4800 "	" " "
Blast Building	4700 "	314 45 43
Gamma A Station	2250 "	314 01 41
" B "	2900 "	" " "
Ionization Sta.	3000 "	314 24 17
Ctr. of Line of Cubes Bu Y&D	3000 "	262 28 12
" " "	1400 "	" " "
" " "	2200 "	" " "
" " "	2600 "	" " "
" " "	3000 "	" " "
" " "	3600 "	" " "

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STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO *
O.C.E. Type A	1000 [illegible]	289 22 42
" " A	1500 [illegible]	281 33 51
" " B	1500 [illegible]	287 00 33
" " B	2500 [illegible]	279 44 01
" " C	2500 [illegible]	283 14 31
Range Pole # 1	1200 [illegible]	304 18 05
" " # 2	Distant from Pole #1 [illegible]	Az. AZ from Pole #1 312 53 22
" " # 3	[illegible]	" " " " " "
Tank Revetment	[illegible] # [illegible]	" " #3 ~~348 56 22~~ 346 29 19
Winch Base	4481 [illegible]	311 02 32
Bu S Stakes	2200 [illegible]	257 02 48
" " "	2300 [illegible]	" " "
" " "	2400 [illegible]	" " "
" " "	2500 [illegible]	" " "
" " "	2600 [illegible]	" " "
" " "	2700 [illegible]	" " "
" " "	2800 [illegible]	" " "
" " "	2900 [illegible]	" " "
" " "	3000 [illegible]	" " "

* Except where state otherwise

[redacted]

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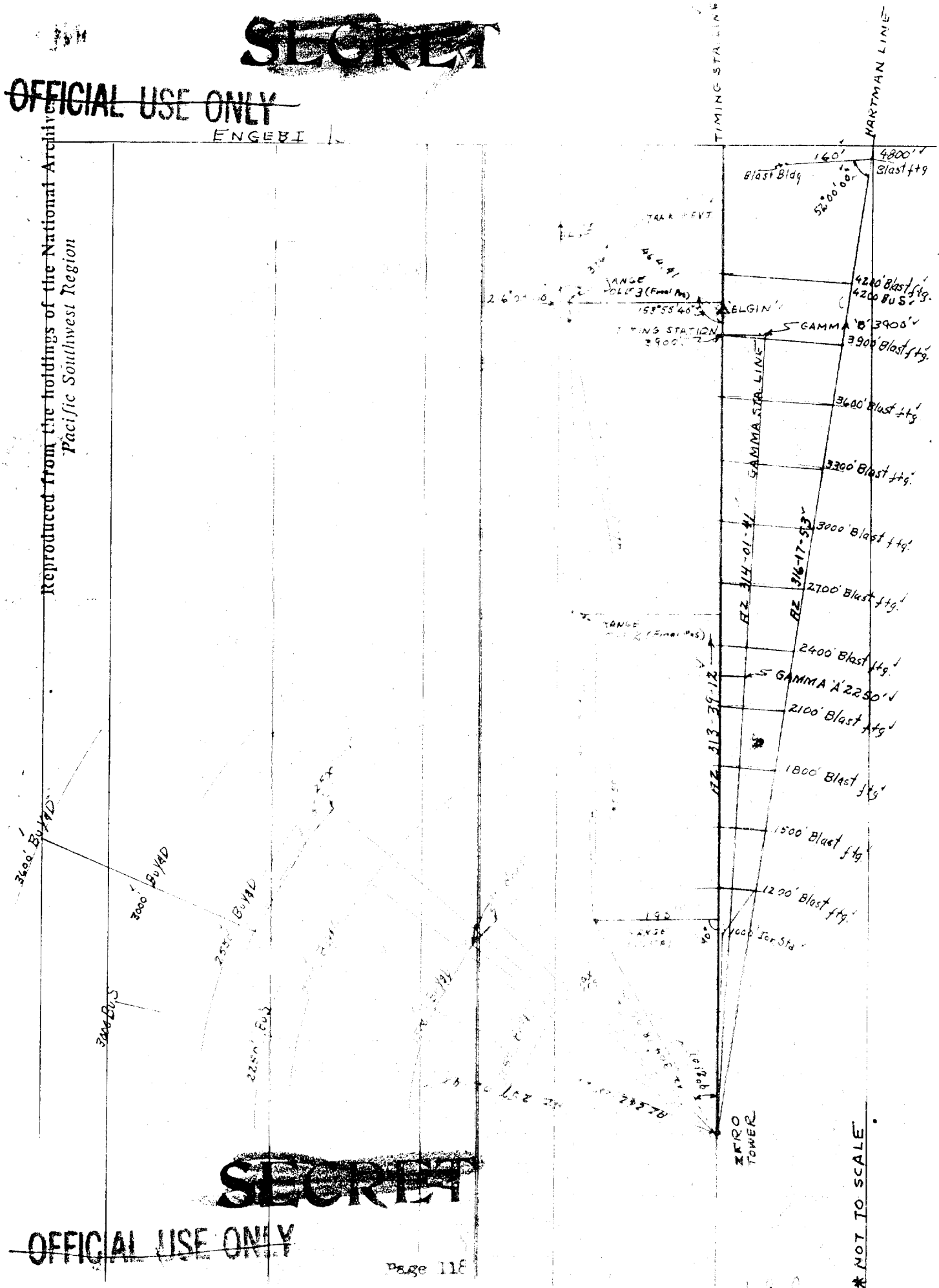

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COMPUTATIONS OF TRAVERSE BETWEEN

ENGEBI ZERO TOWER AN[redacted]ANGULATION

STATION [redacted]LGIN

DISTANCES TO STAKES OF [redacted] ABOVE

LINE USED IN ESTABLISHIN[redacted]THER

POINT[redacted]

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Form 549
Rev. April 1935

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COMPUTATION OF ENGEBI TRAVERSE ~~BASE~~ LINE

U. S. GOVERNMENT PRINTING OFFICE

Fold in Back

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP	COR.: Temp. Meters	COR.: Tape end Catenary Meters	REDUCTIONS: Set up Set-back Meter	REDUCTIONS: Inclination Meters	REDUCTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	* mm	** mm
Bench ENGEBI ZERO	11-16-47	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	-0.0816	[illegible]	[illegible]					
to		[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	-0.0017							
Bench L A ELGIN			[illegible]				[illegible]	[illegible]	+[illegible]							

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70'

70

[redacted] ~~OFFICIAL USE ONLY~~ 70'

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 589
Rev. April 1935

[redacted]

COMPUTATION OF ENGEBI TRAVERSE ~~BASE~~ LINE

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SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP	COR.: Temp. Meters	COR.: Tape and Catenary Meters	RECTIONS: Set-up Set-back Meters	RECTIONS: Inclination Meters	RECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH* Meters	DISTANCE (m) (cm) FROM ENGEBI ZERO TO TOWER — FEET —
Bench FROM: ENGEBI ZERO TO															
Stake No 7	2-16-47	E	921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.0238	0.0000	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 0306	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	E	921	[illegible]	8	900	29.5	+0.0006	0.0012	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
		E	921	[illegible]	[illegible]	[illegible]	30.0	+0.0001	[illegible]						
		E	3661	[illegible]	[illegible]	[illegible]	29.0	+0.0013	±0.0000	[illegible]					

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[redacted]

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COMPUTATION OF ENGEBI TRAVERSE ~~BASE LINE~~

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP.	CORRECTIONS: Temp. Meters	CORRECTIONS: Tape and Catenary Meters	CORRECTIONS: Setup Set back Meters	CORRECTIONS: Inclination Meters	CORRECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH* Meters	DISTANCE FROM ENGEBI ZERO	DISTANCE FROM ENGEBI TOWER
From ENGEBI ZERO to [illegible]																

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[redacted]

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U. S. COAST AND GEODETIC SURVEY
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ABSTRACT OF THE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Km	[redacted] Meters	Mm	Meters	Meters	
Mark ENGEBI ZERO				[illegible] (assumed)		
Bench ENGEBI ZERO		[illegible]				
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			Σ Crn = 2.4 mm
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			Σ Crn = 4.2 mm
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			Σ Crn = 7.4 mm
12	[illegible]	[illegible]	[illegible]			
13	[illegible]	[illegible]	[illegible]			Σ Crn = 10.6 mm
13 + 25	[illegible]	[illegible]	[illegible]			
13+25 Setup	[illegible]	[illegible]	[illegible]			Σ Crn = 11.3 mm
14	[illegible]	[illegible]	[illegible]			Σ Crn = 11.7 mm
15	[illegible]	[illegible]	[illegible]			Σ Crn = 11.7 mm
16	[illegible]	[illegible]	[illegible]			Σ Crn = 11.8 mm
17	[illegible]	[illegible]	[illegible]			Σ Crn = 11.9 mm
18	[illegible]	[illegible]	[illegible]			Σ Crn = 12.0 mm
19	[illegible]	[illegible]	[illegible]			Σ Crn = 12.1 mm
20	[illegible]	[illegible]	[illegible]			
21	[illegible]	[illegible]	[illegible]			Σ Crn = 12.3 mm
22	[illegible]	[illegible]	[illegible]			
23	[illegible]	[illegible]	[illegible]			Σ Crn = 20.0 mm
Bench Δ ELGIN	[illegible]	[illegible]	[illegible]			
Mark Δ ELGIN		[illegible]				

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ABSTRACT OF WYE LEVELING -- ENGEBI ZERO - Δ ELGIN TRAVERSE 12/16/47

FROM Mark	To Bench	Diff in Elevation F Run	B Running	MEAN
ENGEBI ZERO	ENGEBI ZERO	[illegible]	+2.118	[illegible]
Bench ENGEBI ZERO	1	[illegible]	+0.373	[illegible]
1	2	[illegible]	+0.520	[illegible]
2	3	[illegible]	[illegible]	[illegible]
3	4	[illegible]	+0.324	[illegible]
4	5	[illegible]	[illegible]	[illegible]
5	6	[illegible]	[illegible]	[illegible]
6	7	[illegible]	[illegible]	[illegible]
7	8	[illegible]	[illegible]	[illegible]
8	9	[illegible]	1.265	[illegible]
9	10	[illegible]	[illegible]	[illegible]
10	11	[illegible]	[illegible]	[illegible]
11	12	[illegible]	[illegible]	[illegible]
12	13	[illegible]	[illegible]	[illegible]
13	13+25	[illegible]	[illegible]	[illegible]
13+25	13+25 Set up	[illegible]	[illegible]	[illegible]
13+25 Set up	14	[illegible]	[illegible]	[illegible]
14	15	[illegible]	[illegible]	[illegible]
15	16	[illegible]	[illegible]	[illegible]
16	17	[illegible]	0.389	[illegible]
17	18	[illegible]	[illegible]	[illegible]
18	19	[illegible]	[illegible]	[illegible]
19	20	[illegible]	[illegible]	[illegible]
20	21	[illegible]	[illegible]	[illegible]
21	22	[illegible]	[illegible]	[illegible]
22	23	[illegible]	[illegible]	[illegible]
23	Bench Δ ELGIN	[illegible]	[illegible]	[illegible]
Bench Δ ELGIN	Mark Δ ELGIN	[illegible]	[illegible]	[illegible]
MARK Δ ELGIN	Water line at 1500 hrs	[illegible]		

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73 A

MEAN TEMPERATURES OR FULL TAPE LENGTHS (INVAR) ~ ENGEBI ZERO TOWER ~ Δ ELGIN.

~SEC.~ STAKE Nos.	End Thermo °C	[illegible]	[illegible]
Bench Engeb Zero ~ 1	28 [illegible]	[illegible]	[illegible]
1 - 2	28.5	[illegible]	[illegible]
2 - 3	29.3	[illegible]	[illegible]
3 - 4	29.5	[illegible]	[illegible]
4 - 5	29.2	[illegible]	[illegible]
5 - 6	29.5	[illegible]	[illegible]
6 - 7	29.6	[illegible]	[illegible]
		[illegible]	[illegible] stake #7
7 - 8	29.5	[illegible]	[illegible]
8 - 9	29.5	[illegible]	[illegible]
		[illegible]	[illegible] stake #9
9 - 10	29.3	[illegible]	[illegible]
10 - 11	29.3	[illegible]	[illegible]
		[illegible]	[illegible] stake #11
11 - 12	29.1 ~~[illegible]~~	[illegible]	[illegible]
12 - 13	30.1	[illegible]	[illegible]
		[illegible]	[illegible] stake #13
13 - 14	29.2	[illegible]	[illegible]
		[illegible]	[illegible] stake #14
14 - 15	29.6	[illegible]	[illegible]
		[illegible]	[illegible] stake #15
15 - 16	29.2	[illegible]	[illegible] stake #16
16 - 17	29.1	[illegible]	[illegible]
		[illegible]	[illegible] stake #17
17 - 18	31.0	[illegible]	[illegible]
		[illegible]	[illegible] stake #18
18 - 19	30.3	[illegible]	[illegible] stake #19
19 - 20	29.5	[illegible]	[illegible]
20 - 21	29.8	[illegible]	[illegible]
		[illegible]	[illegible] stake #21
21 - 22	[illegible]	[illegible]	[illegible]
22 - 23	29.7	[illegible]	[illegible]
		[illegible]	[illegible] stake #23
23 - Bench Δ Elgin	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible] Bench Δ Elgin

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COMPUTATIONS OF RESULTANT SETBACKS
AND OFFSETS FROM THE TIMING STATION
LINE FOR USE IN ESTABLISHING OTHER
POINTS

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ENCLOSURE I

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COMPUTATION OF "SET UPS" [illegible] THE ZERO TOWER - Δ ELGIN (TIMING LINE) TRAVERSE TO PROPER DISTANCES [illegible] ESTABLISHING OTHER POINTS BY CHORD OFFSET:

Object to Be Established	Dist. from Zero Tower Feet	[illegible]	[illegible]	Dist. Zero Tower to Closest Sta.	[illegible]	Closest Sta. Feet	Set Back from Closest Sta. [illegible]	Set Back from Closest Sta. Feet
Hartman Sta.	1200'	365.76	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1500'	457.20	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1800'	548.64	[illegible]	580.002	[illegible]	[illegible]	4.359'	4.459'
Hartman Sta.	2100'	640.08	[illegible]	650.004	[illegible]	[illegible]	9.9268'	32.601'
Hartman Sta.	2400'	731.52	[illegible]	[illegible]	[illegible]	[illegible]	8.5950'	18.356'
Hartman Sta.	2700'	822.96	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3000'	914.40	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3300'	1005.84	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3600'	1097.28	[illegible]	[illegible]	[illegible]	[illegible]	—	—
TIMING STA GAMMA "B" Hartman Sta.	3900'	[illegible]	[illegible]	1152.68	[illegible]	[illegible]	—	—

COMPUTATION OF "SET UPS" AND SET BACKS FROM [illegible] THE ZERO TOWER - Δ ELGIN TRAVERSE TO PROPER DISTANCE FOR ESTABLISHING POINTS BY NORMAL OFFSETS

Object to Be Established	Distance from Zero Tower Ft.	Distance required on SET LINE Ft.	Closest Sta.	[illegible]	Dist. Zero To Closest Sta. Ft.	[illegible]	[illegible]	Set Back Ft.	Length of Normal offset. Ft.
Range Pole #1	1200'	1184.11	[illegible]	[illegible]	1148.34	[illegible]	[illegible]	[illegible]	195.0'
GAMMA "A"	2250'	2249.95	[illegible]	[illegible]	2254.32	[illegible]	[illegible]	[illegible]	14.71
*Range Pole #2	—	2684.11	[illegible]	[illegible]	2746.42	[illegible]	[illegible]	[illegible]	195.0' *
*Range Pole #3	—	4187.11	[illegible]	[illegible]	4058.28	[illegible]	[illegible]	[illegible]	195.0' *

* Poles No. 2 + No 3 were [illegible] range pole #3 fell on line between [illegible] Dr Clark, AEC, and Zero Tower. [illegible] pole #2 [illegible] to original pole line. Pole #2 was [illegible] normal to original pole line. This [illegible] parallel to the Zero Tower Timing [illegible]

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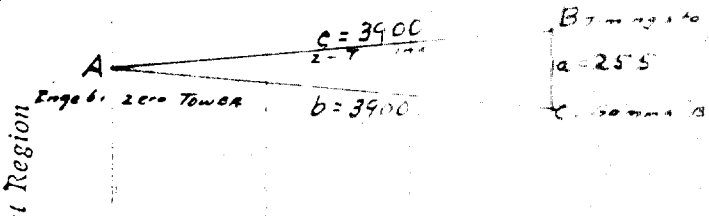
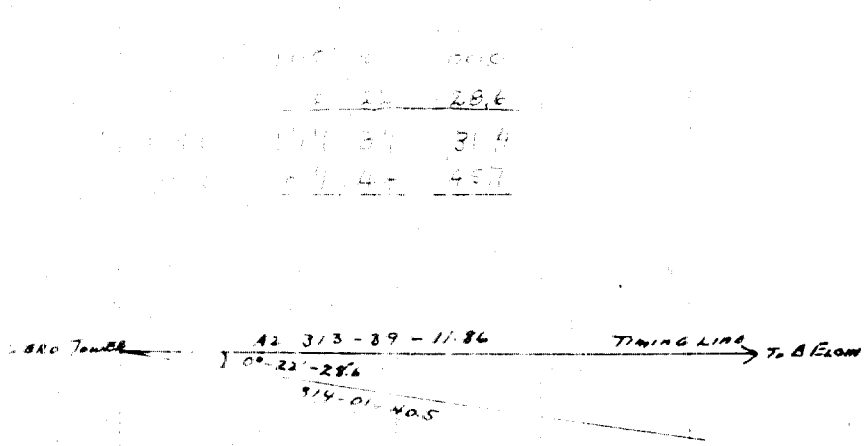
∡ Zero-Time to γB

COMPUTATION OF CHORD ∡ B' to Chord offset from 1900 point on zero-Time Line to Gamma "B"



a = 25.5
b = 3900.0
c = 3900.0
2S = 7825.5
S = 3912.7

S-a = 3887.25
S-b = 12.7
S-c = 12.7



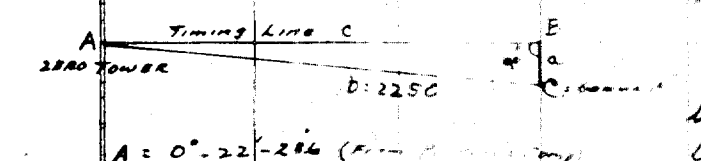
log S-a = 3.589 6425
" S-b = 1.105 5100
" S-c = 1.105 5100
5.800 6629
log S = 3.592 4821
2.208 1808
log r = 1.104 0904

$\tan \frac{1}{2} A = \frac{r}{S-a}$

log r = 1.104 0904
log (S-a) = 3.589 6425
log tan ½A = 7.514 4479
½A = 0° 11' 14.3"
A = 0° 22' 28.6"

COMPUTATION OF PROP. DIST. ZERO TIME LINE TO SOUTH ... Normal offset from Z-T line to Gamma A at 2250' from ZERO Tower

DIST Z T Line to γA



A = 0°-22'-28.6 (from ...)

a = b sin A
log 2250 = 3.352 1825
log Sin = 7.815 4549
log a = 167 6374
a = 14.71

c = b Cos A
log 2250 = 3.352 1825
log Cos A = 9.999 99 or 15
log c = 3.352 1740
c = 2249.95

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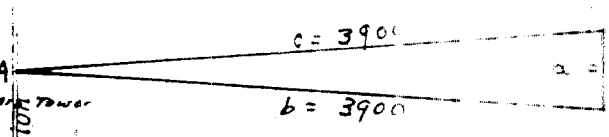
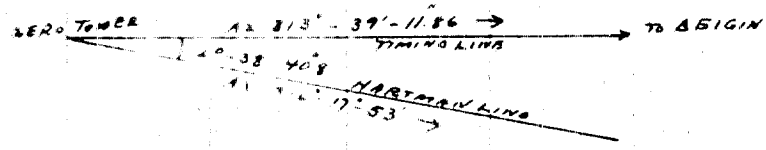
∠ Zero-Time Line to Blast Line

COMP. OF Chord ∠ "B" for Chord Offsets from ZERO Tower to Hartman stations (Blast footings)



a = 180
b = 3900
c = 3900
2S = 7980
S = 3990

S-a = 3810
S-b = 90
S-c = 90



log (s-a) = 3.580 9250
" (s-b) = 1.954 2425
" (s-c) = 1.954 2425
7.489 4100
log S = 3.600 9729
3.888 4371
log r = 1.944 2186

$\tan \frac{1}{2} A = \frac{r}{s-a}$

log r = 1.944 2186
log (s-a) = 3.580 9250
log tan ½ A = 8.363 2936
½ A = 1° 19' 20.4"
A = 2° 38' 40.8"

$\tan \frac{1}{2} B = \frac{r}{s-b} = \tan \frac{1}{2} C$

log r = 1.944 2186
log (s-b) = 1.954 2425
log tan ½ B = 9.989 9761
½ B = 44° 20' 19.8"
B = 88° 40' 39.6"
A = 2 38 40.8
C = 88 40 39.6
Σ = 180 00 00.0

check: $\cos A = \frac{b^2+c^2-a^2}{2bc}$

b^2 = 15210000
c^2 = 15210000
b^2+c^2 = 30420000 = 2bc
a^2 = 32400
30387600

log 30387600 = 7.482 6964
log 30420000 = 7.483 1592
log Cos A = 9.999 5372
A = 2° 38' 41"

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ENGEBI I

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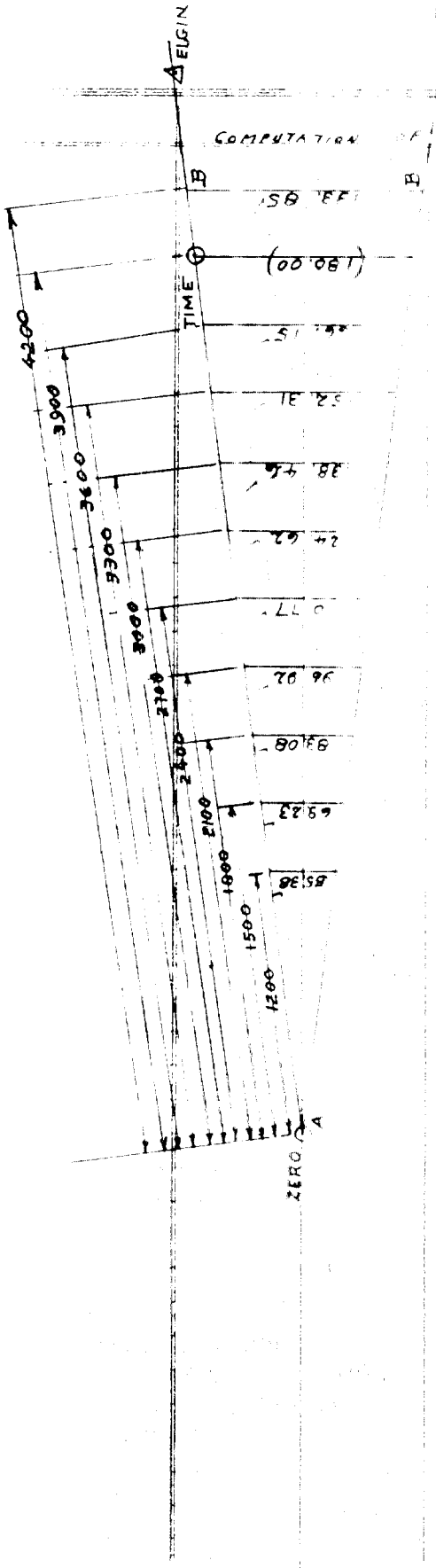
100 yd. Blast Stations

COMPUTATION OF CHORD DISTANCES for man stations from Z-T Line



$a = \frac{b \sin A}{\sin B}$

1	log 2700 3.431 3638	log 2700: 3.431 3638
	log Sin A 8.664 094	log Sin A: 8.664 0941
	2.095 4579	
	log Sin B 9.999 8843	log Sin B: 9.999 8843
	2.095 5736	
	125.38	6. dist. = 124.62
2	log 3000 3.477 0913	log 3000: 3.477 1213
	log Sin A 8.664 094	log Sin A: 8.664 0941
	2.141 1854	
	log Sin B 9.999 8843	log Sin B: 9.999 8843
	2.141 3011	
	69.23	7. dist. = 138.46
3	log 3300 3.255 2725	log 3300: 3.518 5139
	log Sin A 8.664 094	log Sin A: 8.664 0941
	2.182 3666	
	log Sin B 9.999 8843	log Sin B: 9.999 8843
	2.182 4823	
	65.08	8. dist = 152.31
4	log 3600 3.322 2193	log 3600: 3.556 3025
	log Sin A 8.664 0941	log Sin A: 8.664 0941
	2.220 3134	
	log Sin B 9.999 8843	log Sin B: 9.999 8843
	2.220 4292	
	83.92	9. dist. = 166.15
5	log 4200 3.380 2112	log 4200 3.623 2493
	log Sin A 8.664 0941	log Sin A: 8.664 0941
	2.287 3053	
	log Sin B 9.999 8843	log Sin B: 9.999 8843
	2.287 4212	
	96.77	10. dist 193.85

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ENGE131

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

TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

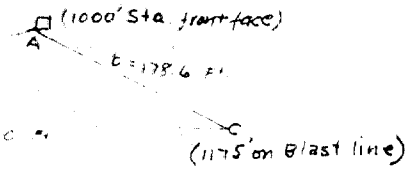
$\left[\frac{a}{b}=\tan(45^\circ+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$: $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

Comp of Dist. from Zero Tower To Near face of 1000 ionization station.

C_s			Log a	[illegible]	Log m
Sph. excess / 3			Log b	[illegible]	Log sin C_s
C_s	10°	3	Log tan ϕ	[illegible]	Log a
C_p	5	[illegible]	$(45^\circ+\phi)$	26	Log b
$90^\circ-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	[illegible]	[illegible]	ϕ	26	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	[illegible]	[illegible]	Log tan ϕ	[illegible] 9438	Sph. excess —
Sum $=A_p$	[illegible]	[illegible]	Log tan $\frac{1}{2}(A_p+B_p)$	[illegible] 46	
Diff $=B_p$	[illegible]	[illegible]	Log tan $\frac{1}{2}(A_p-B_p)$	[illegible] 84	
C_p	10	[illegible]		(Sketch)	

Log a	3.070	[illegible]
Log sin C_p	9.26	[illegible]
Colog sin A_p	6.662	[illegible]
Log c	3.[illegible]	[illegible]

$c=1000.02$ ft



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.000 0147
	1	[illegible]			0.732 8291
	2	1-53-36			2.519 0254
	3	162-26-44			9.237 941
	1-3			[illegible]	2.251 8692
	1-2			[illegible]	3.070 0379
	[illegible]				
	2-3				
	1	[illegible]			
	2				
	3				
	1-3				
	1-2				

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*The subscripts [illegible] on this form refer to spherical and plane angles respectively.

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Pole # from Z-T Line

Comp of Dst [illegible] TOWER [illegible] for Normal offset to Range pole #1 (1200' from 2)

B Range pole #1

c = 1200

a = 145

A — [illegible]

ZERO TOWER

Sin [illegible]

log 145 = 2.2[illegible] 0346
log 1200 = 3.079 1812
log Sin = 9.2[illegible] 2534
A = 9[illegible]

b = c Cos A

log 1200 = 3.079 1812
log Cos A = 9.994 2097
log b = 3.073 3909
b = 1184.11 Dist o[illegible] line for Normal offset to pole #1
1500.00 spa[illegible] between Poles (Pole line ∥ to 2-T Line.)
2684.11 Dis[illegible] for Normal offset to pole #2 *
1500.00
1184.11 [illegible] for Normal offset to pole #3 *

* [illegible] #3 later Moved — pole #3 moved Northerly [illegible] ⊥ to original line of poles
[illegible] moved Northerly 20.0 on line ⊥ to original [illegible] poles — Thus poles are still on a straight [illegible] line is no longer ∥ to 2-T Line.
[illegible] next Sheet for Range Poles
#[illegible] #3 as re-set

A2 304 18-05 [illegible]
90-01-07 [illegible] line to [illegible]
A2 = 31[illegible]

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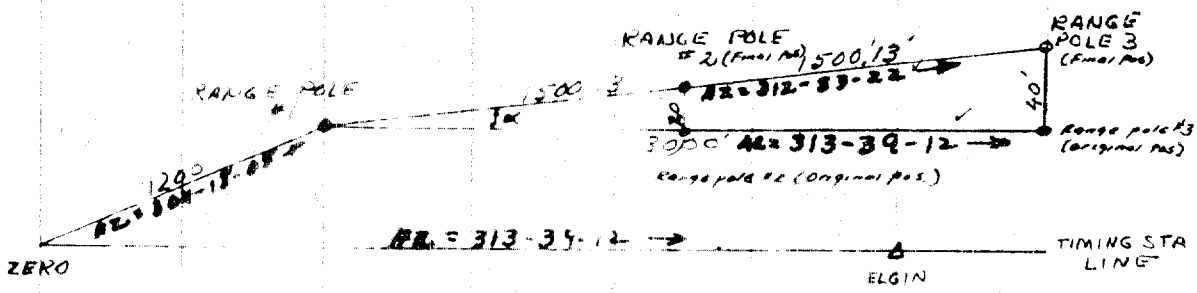
RANGE POLES, ENGEBI

Distances + Azimuth - Range Poles, after Poles #2 + #3 were re-set.

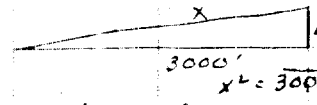


log 40

4000

log Tan α

α



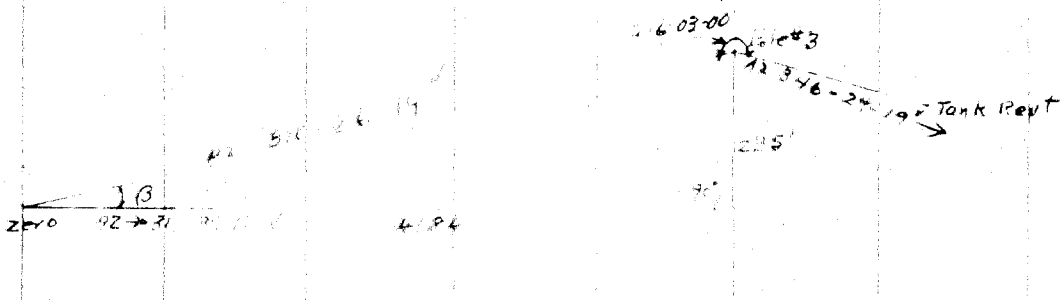
$x^2 = \overline{3000}^2 + \overline{40}^2$

$\log x^2 = 6.9543197$

$x = 3.4771598$

$x = 3000.27$ FT.

Azimuth 312°53'22"



log 235

4184

log tan β

β

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

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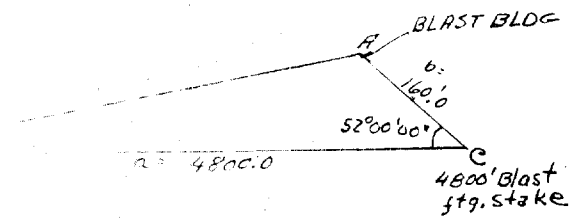
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi \quad \tan\phi \tan\tfrac{1}{2}(A_p+B_p) \qquad c=\frac{a\sin C_p}{\sin A_p}\right]^*$

C_s	2412	Log m
Sph. excess / 3	1200	Log sin C_s
C_p	1212	Log a
$\frac{1}{2}$ C_p	27.0	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p-B_p)$	270	Log sph. ex.
$\frac{1}{2}$ (A_p-B_p)	2361	Sph. excess
Sum $=A_p$	8182	
Diff $=B_p$	8543	
C_p	(Sketch)	

Log a	
Log sin C_p	9.890
Colog sin A_p	0.494
Log c	3.672



CHECK COMPUTATION

No.	STA	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3			3.672 3918
	1			0.103 4679
	2			8.428 2637
	3			9.905 3815
	1-3		160.0	2.204 1234
	1-2		4800.0	3.681 2412
	2-3			
	1			
	2			
	3			
	1-3			
	1-2			

*The subscripts s and p on this form refer [illegible] respectively.

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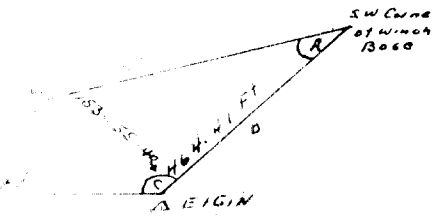
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 665
Ed. Dec. 1929

TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer [illegible] $\tan \frac{1}{2}(A_p + B_p)$ $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log [illegible]		Log m
Sph. excess / 3		Log [illegible]		Log sin C_s
C_p	153 [illegible]	Log tan [illegible]		Log a
$\frac{1}{2}$ C_p	[illegible]	$(45° + \phi)$		Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]			Log sph. ex.
$\frac{1}{2}$ $(A_p - B_p)$	[illegible]	Log tan [illegible]		Sph. excess
Sum $= A_p$	[illegible]	Log tan [illegible]		
Diff $= B_p$	[illegible]	Log tan [illegible]		
C_p	153 [illegible]		(Sketch)	

Log a	3.668 [illegible]
Log sin C_p	9.64[illegible] [illegible]
Colog sin A_p	0.399 [illegible]
Log c	3.65[illegible] 3.[illegible]



448[illegible] CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.651 3315
	1				0.357 0374
	2				9.600 6235
	3				8.658 5293
	1-3				3.608 3924
	1-2				2.666 8982
				Winch Base (S.W. Corner)	
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

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1994

COMPUTATIONS AND MEASUREMENTS

REQUIRED FOR LOCATING AND

CHECKING THE Bu Y&D STRUCTURES

12-23-47 ENGEBI I

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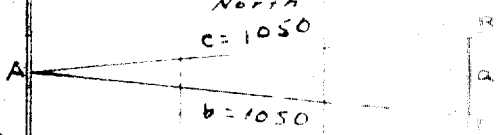
ENGEBI 2- BUOYED to chord or edge Runway.

COMPUTATION For Chord offset stake on N side of runway



a:	50
b:	1050
c:	1050
2S:	2150
S:	1075
S-a:	1025
S-b:	25
S-c:	25
log (S-a):	3.010 7239
log (S-b):	1.397 9400
log (S-c):	1.397 9400
	5.806 6039
log S:	3.031 4085
	2.775 1954
log r:	1.387 5977

log r =	1.387 5977
log (S-a):	3.010 7239
log tan ½A:	8.376 8738
½A:	1° 21' 27"
A:	2° 43' 42"

log r =	1.387 5977
log (S-b):	1.397 9400
log tan ½B:	9.989 6577
½B:	44° 19' 04"
B:	88 38 08.8

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ENGEBI I
12-23-47

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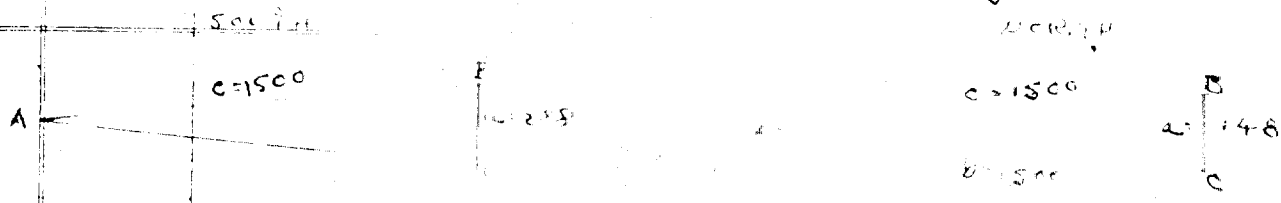
ENGEBI 2-Bu Y# [illegible] on edge of Runway.

COMPUTATION For Chord offset stakes [illegible] sides of runway



a =	288	a =	148
b =	1500	b =	1500
c =	1500	c =	1500
2S =	3288	S =	3148
S =	1644	S =	1574
S-a =	1356	S-a =	1426
S-b =	144	S-b =	74
S-c =	144	S-c =	74
log (S-a) =	3.132 2597	log (S-a) =	3.154 1195
log (S-b) =	2.158 3625	log (S-b) =	1.869 2317
log (S-c) =	2.158 3625	log (S-c) =	1.869 2317
	7.448 9847		6.892 5829
log S =	3.215 9018	log S =	3.197 0047
	4.233 08[illegible]		3.695 5782
log r =	2.116 54[illegible]	log r =	1.847 7891
log r =	2.116 5415	log r =	1.847 7891
log (S-a) =	3.132 2597	log (S-a) =	3.154 1195
log tan ½A =	8.984 28[illegible]	log tan ½A =	8.693 6696
½A =	5° 30 [illegible]	½A =	2° 49' 35.8"
A =	11° 01 [illegible]	A =	5° 39' 19.6"
log r =	2.116 5415	log r =	1.847 7891
log (S-b) =	2.158 3625	log (S-b) =	1.869 2317
log tan ½B =	9.958 17[illegible]	log tan ½B =	9.978 5574
½B =	42° 14' 44.[illegible]	½B =	43° 35' 10.1"
B =	84 29 28[illegible]	B =	87° 10' 20.2"

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COMPUTATION For Choice of cat-stakes [illegible] edges of runway

SOUTH | NORTH

	South	North
a	224	[illegible]
b	[illegible]	[illegible]
c	[illegible]	2100
2s	4467	4424
s	2234	2212
s-a	1967	1988
s-b	132	[illegible]
s-c	132	[illegible]

	South	North
log (s-a)	3.294 [illegible]	[illegible] 4164
log (s-b)	2.120 [illegible]	[illegible] 2180
log (s-c)	2.120 [illegible]	2.049 2180
	7.535 [illegible]	7.396 8524
log s	3.348 [illegible]	3.348 7851
	4.187 [illegible]	4.052 0673
log 2	2.093 [illegible]	2.026 0336

	South	North
log 2	2.093 [illegible]	2.026 0336
log (s-a)	3.294 [illegible]	3.298 4164
log tan ½ A	8.71[illegible] [illegible]	8.727 6172
½ A	3° 36 [illegible]	3° 03 26.0
A	7° 12 [illegible]	6 06 52.0

	South	North
log 2	2.093 [illegible]	2.026 0336
log (s-b)	2.120 [illegible]	2.049 2180
log tan ½ B	9.972 [illegible]	9.976 8156
½ B	43° [illegible]	43° 28 17.0
B	86° 23 [illegible]	86° 56 34.0

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ENGEBI I.
12-23-47

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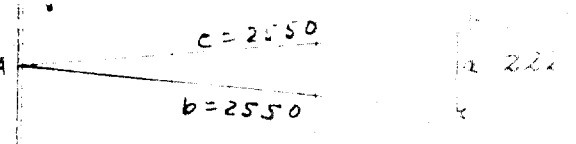
ENGEBI I: Bm. Y & ℄ to Chords on edge Runway

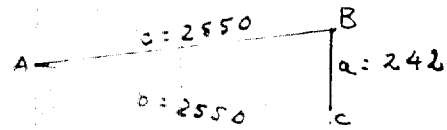
COMPUTATION FOR Chord offset stakes on N & S sides of Runway

SOUTH



a =	222
b =	2550
c =	2550
2S =	5322
S =	2661
S-a =	2439
S-b =	[illegible]
S-c =	[illegible]
Log (S-a) =	3.387 2118
Log (S-b) =	2.045 3230
Log (S-c) =	2.045 3230
	7.477 8578
½ S	3.425 0449
	4.052 8129
Log r =	2.026 4065
Log r =	2.026 4065
Log (S-a) =	3.387 2118
Log Tan ½ A	8.639 1947
½ A =	2° 29' [illegible]
A =	4° 59' [illegible]
Log r =	2.026 4065
Log (S-b) =	2.045 3230
Log Tan ½ B =	9.981 0835
½ B =	43 45 [illegible]
B =	87° 30' [illegible]

NORTH



a =	242
b =	2550
c =	2550
2S =	5342
S =	2671
S-a =	2429
S-b =	121
S-c =	121
Log (S-a) =	3.385 4275
Log (S-b) =	2.082 7854
Log (S-c) =	2.082 7854
	7.550 9983
Log S	3.426 6739
	4.124 3244
Log r =	2.062 1622
Log r	2.062 1622
Log S-a	3.385 4275
Log Tan ½ A	8.676 7347
½ A =	2° 43' 11.1"
A =	5° 26' 22.2"
Log r	2.062 1622
Log (S-b) =	2.082 7854
Log Tan ½ B =	9.979 3768
½ B =	43 38 24.4
B =	87° 16' 48.8"

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EXGER1

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Comp for Chord off [illegible] point on Edge of Runway
[illegible] stake [illegible] edge of Runway.

SOUTH

c = 3000

b = 3[illegible]

a = 246

b = 3000

c = 3000

2S = [illegible]

S = 3[illegible]

S-a = 287[illegible]

S-b = 12[illegible]

S-c = 12[illegible]

Log (S-a) = 3.458 [illegible]

Log (S-b) = 2.089 [illegible]

Log (S-c) = 2.08[illegible] 9[illegible]

7.6[illegible]

Log S = 3.494 [illegible]

4.14[illegible]

Log r = 2.072 [illegible]

$\tan \frac{1}{2} A = \frac{r}{S-a}$

Log r = 2.072 08[illegible]

Log (S-a) = 3.458 93[illegible]

Log tan ½ A 8.613 1[illegible]

½ A = 2° - 2[illegible]

A = 4° - 4[illegible]

$\tan \frac{1}{2} B = \frac{r}{S-b} = \tan$ [illegible]

Log r = 2.072 08[illegible]

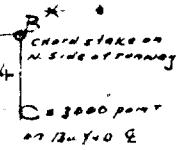
Log S-b = 2.089 9[illegible]

tan ½ B 9.982 1[illegible]

½ B = 43°-4[illegible]

87 - [illegible]

NORTH



[illegible]84

[illegible]00

[illegible]00

[illegible]84

[illegible]42

[illegible]58

[illegible]42

[illegible]42

3.456 0622

2.[illegible]52 2883

2.[illegible]52 2883

7.760 6388

3.497 2062

4263 4326

[illegible] 7163

[illegible] 7163

3.456 0622

4.675 6541

[illegible] 42 46.8

[illegible] 23.6

[illegible] 7163

2.[illegible]52 2883

[illegible] 4280

[illegible] 38 36.6

[illegible] 13.2

* This Chord stake Later used as 3000 ℄ stake of Bu.S. Line.

Bu. S. ℄

12° 25' - 02" - 48"

5° - 25' - 34"

Bu Yld ℄

4° 2[illegible] - 28 - 22

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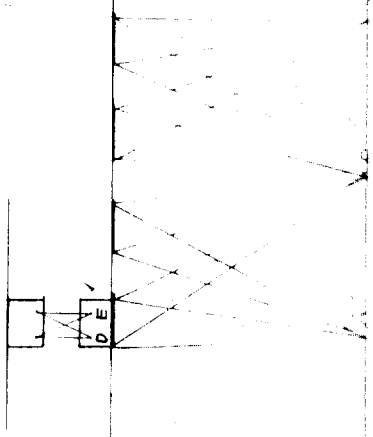
U.S.C.&G.S. Tape #3774

*NOTE — [illegible] measurements are from the E [illegible] the tape and not from the zero point to true distance. ADD 0.4 FT [illegible] the following

1050' CUBES

A-R 27.467 'true distance
R-C 26.835 'true distance



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NOTE [illegible]
from the [illegible]
from the [illegible]
ADD [illegible]

Transcript Tape 3114

1500' CUBES

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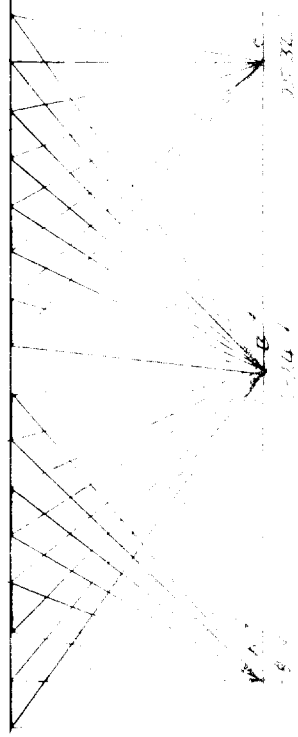
A B = 61.758 true distance
B-C = 63.030 true distance



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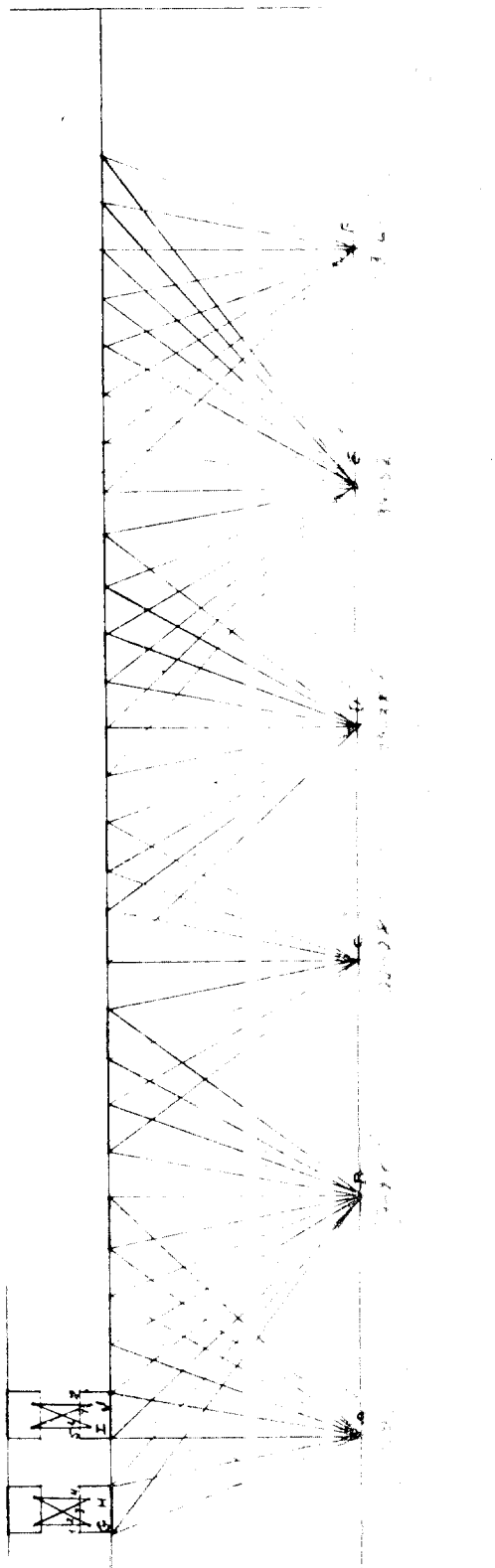
U.S.C.&G.S. Tape #3774

NOTE— These measurements
from the EN[illegible] tape
from the [illegible]
ADD 0.4[illegible]

2100' CUBES



[illegible]	[illegible]	23.46'	I	
[illegible]	[illegible]	20.46'	5	6.04'
[illegible]	[illegible]	22.49'	6	6.57'
[illegible]	[illegible]	26.7'	J	
[illegible]	[illegible]	34.37'	7	6.80'
[illegible]	[illegible]	37.08'	8	5.82'
[illegible]	[illegible]	64.9[illegible]		
[illegible]	[illegible]	56.6[illegible]		
[illegible]	[illegible]	46.36'		
[illegible]	[illegible]	28.74'		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	2.77		
[illegible]	[illegible]	2.2[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	2.7[illegible]		
[illegible]	[illegible]	22.82'		
[illegible]	[illegible]	29.59'		
[illegible]	[illegible]	32.6'		
[illegible]	28.9	41.23'		
[illegible]	[illegible]	44.4'		
[illegible]	[illegible]			
[illegible]	[illegible]	54.80'		
[illegible]	[illegible]	26.[illegible]		
[illegible]	[illegible]	46.[illegible]		
[illegible]	[illegible]	42.[illegible]		
[illegible]	[illegible]	33.84'		
[illegible]	[illegible]	26.6[illegible]		
[illegible]	[illegible]	34.7[illegible]		
[illegible]	[illegible]	22.4'		
[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	6.6[illegible]		
[illegible]	46.6[illegible]			
[illegible]	[illegible]	6.7[illegible]		
[illegible]	29.32	5.78'		

A-B = 49.950 true dist
B-C = 49.980 " "
C-D = 49.945 " "
D-E = 50.013 " "
E-F = 47.950 " "

~~SECRET~~

PAGE [illegible]

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2550 CUBES

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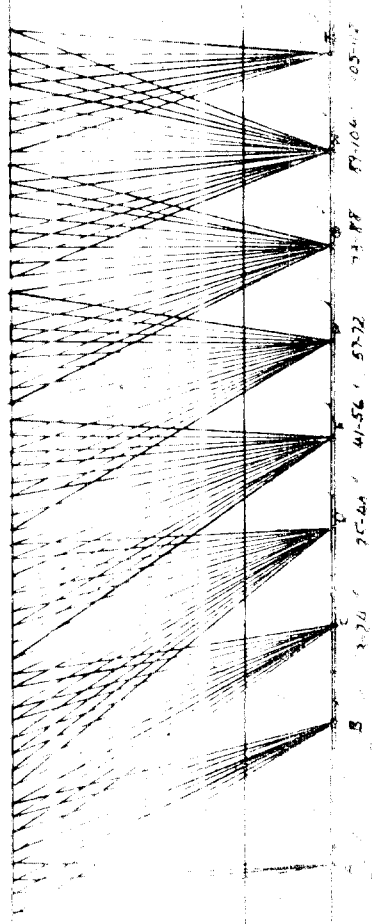

2550 RADIUS
LINE OF BU YAD
CUBES

A B	50.030'	true dist.
B C	50.118'	" "
C D	49.975'	" "
D E	49.933'	" "
E F	49.990'	"
F G	49.840'	"
G H	50.145'	"
H I	50.042'	"

USE AGS Tape #3774

SECRET

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44A

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NOTE – These measurements [illegible]
from the E[illegible] of the tube [illegible]
from the Z[illegible] for the [illegible]
ADD 54 [illegible]

SECRET

2550' CUBES

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USC&GS TAPE
3774

A		33	[illegible]	[illegible]	[illegible]	[illegible]
1	19.65	34	[illegible]	68	22.38	[illegible]
2	20.65	35	[illegible]	69	[illegible]	40.34
3	23.58	36	[illegible]	70	31.76	[illegible]
4	25.72	37	[illegible]	[illegible]	[illegible]	
B		38	[illegible]	[illegible]	[illegible]	[illegible]
5	56.11	39	[illegible]	[illegible]		[illegible]
6	53.24	40	[illegible]	[illegible]	[illegible]	32.31
7	41.57	5[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	39.31	4[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	29.30	42	[illegible]	[illegible]	[illegible]	[illegible]
10	26.92	43	[illegible]	[illegible]	[illegible]	21.33
11	20.80	44	[illegible]	[illegible]	[illegible]	22.46
12	19.99	45	[illegible]	[illegible]	[illegible]	
C		46	[illegible]	80	[illegible]	
13	74.62	47	[illegible]	81	[illegible]	
14	71.25	48	[illegible]	82	[illegible]	
15	60.84	49	[illegible]	83	[illegible]	
16	57.56	50	[illegible]	84	[illegible]	
17	47.57	51	[illegible]	85	[illegible]	
18	44.53	52	[illegible]	86	[illegible]	
19	35.21	53	[illegible]	87	[illegible]	
20	32.51	54	[illegible]	88	[illegible]	
21	24.61	55	[illegible]	[illegible]		
22	22.50	56	[illegible]	[illegible]	[illegible]	
23	19.72	F		[illegible]	[illegible]	
24	20.40	57	[illegible]	[illegible]	[illegible]	
D		58	[illegible]	[illegible]	[illegible]	
25	95.12	59	[illegible]	[illegible]	[illegible]	
26	91.75	60	[illegible]	[illegible]	[illegible]	
27	81.30	61	[illegible]	[illegible]	[illegible]	
28	77.97	62	[illegible]	[illegible]	[illegible]	
29	67.42	63	[illegible]	[illegible]	[illegible]	
30	63.39	64	[illegible]	90	[illegible]	
31	53.19	65	[illegible]	91	[illegible]	
32	49.42	66	[illegible]	[illegible]	[illegible]	

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NOTE – The measurements [illegible] from the END of the tape [illegible] from the Z[illegible] for true [illegible]
ADD 0.4 [illegible] the fo[illegible]

U.S.C.&G.S. Tape # 3774

3000' CUBES.

SECRET

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SAME AS SKETCH FOR 2100' CUBES

1	[illegible]	[illegible]	2524	I	
[illegible]	24[illegible]	[illegible]	2299	5	5.91
3	[illegible]	[illegible]	[illegible]75	6	6.71
2	[illegible]	[illegible]	[illegible]34	J	
4	33[illegible]	[illegible]	2360	7	6.69
5	[illegible]	[illegible]	[illegible]42	8	5.99
[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]68		
[illegible]	[illegible]		[illegible]489		
[illegible]		[illegible]	2463		
[illegible]	[illegible]	[illegible]	[illegible]45		
10	[illegible]		[illegible]		
11	[illegible]		[illegible]		
12	[illegible]		[illegible]		
13	[illegible]	[illegible]	2565		
14	[illegible]	[illegible]	2057		
15	[illegible]	[illegible]	[illegible]83		
16	23[illegible]5	[illegible]	2231		
17	30[illegible]	[illegible]	[illegible]464		
[illegible]	34[illegible]	[illegible]	[illegible]		
[illegible]	43[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]		
[illegible]	22[illegible]32	[illegible]	[illegible]96		
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]422		
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]			
		[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]			
31	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]89		

A-B – 50.00[illegible]
B-C – 49.93[illegible]
C-D – 49.99[illegible]
D-E – 50.18[illegible]
E-F – 49.92[illegible]

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NOTE- These measurements are from the end of the tape and not from the zero mark. For true distances ADD 0.4' to the following

U.S.C&G.S. Tape #3774

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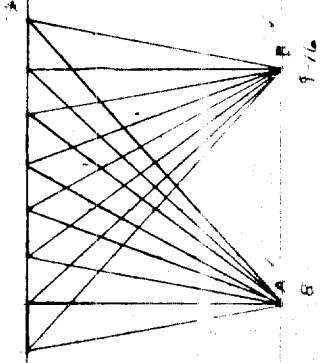
3600' CUBES

~~SECRET~~

21.96'
19.14'
20.10'
23.32'
30.88'
35.77'
48.10'
52.15'

63.10'
57.19'
47.19'
42.28'
32.77'
28.32'
20.98'
20.64'



A-B = 2860 true dist

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~~SECRET~~

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[illegible] AND [illegible]

[illegible] FOR [illegible]

[illegible] BERLIN [illegible]

[redacted]

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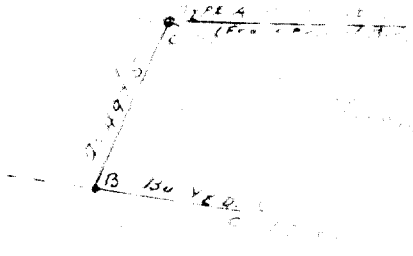
COMPUTATION OF [illegible] on BUYED & to OCE Bldg. TYPE A
(1500' from ZERO)



a = [illegible]
b = [illegible]
c = 15000
2s = [illegible]
s = [illegible]

Log (s-a) [illegible]
Log (s-b) [illegible]
Log (s-c) 2.39[illegible]
2 [illegible]
Log s [illegible]
[illegible]
Log [illegible]
Log (s-a) 3.09[illegible]
Tan ½ A [illegible]
½ A = [illegible]
A = [illegible]

[illegible] 15.6
[illegible] 15.6
[illegible] 15.28.6
[illegible]

Be 250 g

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

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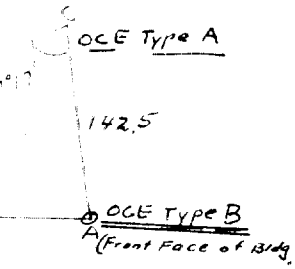
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) $\tan\phi$ (ϕ = $\frac{1}{2}$ diff.) $\tan\phi \tan\frac{1}{2}(A_p-B_p)$; $\left.c=\frac{a \sin C_p}{\sin A_p}\right]$*

COMP. OF Dist from ZERO + ∡ from OCE BLDG A for OCE BLDG TYPE B stake set By 18th Engrs. 41
(Stak originally Set by Discos was removed out of [illegible] by 18th Engrs)

C_s			Log m
Sph. excess / 3			Log sin C_s
C_p			Log a
$\frac{1}{2}$ C_p			Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$			Log sph. ex.
$\frac{1}{2}$ (A_p-B_p)			Sph. excess
Sum $=A_p$			
Diff $=B_p$			
C_p			

(Sketch)



Log a		
Log sin C_p		
Colog sin A_p		
Log c		

CHECK COMPUTATION

No.	STATION	DIRECTION	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				
	2-3				
	1			TYPE "A" OCE Bldg stake (1500' from 2)	
	2				
	3				
	1-3				
	1-2			TYPE "B" OCE BLDG STK (1500' from 2)	

SECRET

*The sub scripts [illegible] angles respectively.

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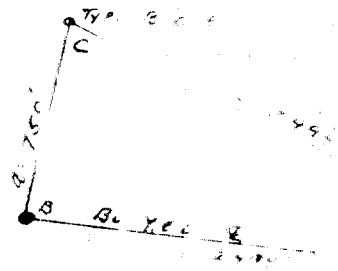
COMPUTATION OF ∡ "B" for Chord offset from 2499' point on BUYED ℄ To O.C.E BLDG. TYPE B (2499' from Z)

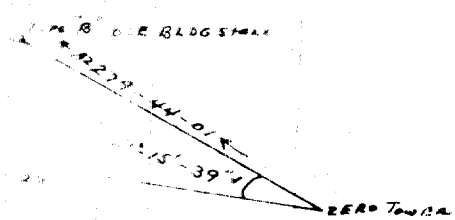


NOTE: In Building this structure Batter boards were set so that Front Face of structure is 2500' From ZERO TOWER

ZERO TOWER

a = 750.0
b = 2499
c = 2499
2S = 5748
S = 2874

Log (s-a) = 3.327 1545
Log (s-b) = 2.574 0313
Log (s-c) = 2.574 0313
Σ 8.475 217
Log S 3.458 4868
5.016 7303
Log r = 2.508 3652

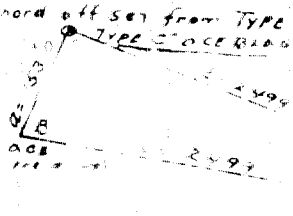


Log r = 2.508 3652
Log (s-b) 2.574 0313
Log tan ½B 9.934 3339
½B 40 41 05.3
B 81 22 10.6
C 81 22 10.6
A 17 15 39.0
Σ 180 00 00.2

COMPUTATION OF ∡ "B" for Chord off set from Type B OCE Bldg (2499' from Z) To Type "C" OCE BLDG. (2499' from Z)

a = 153'
b = 2499'
c = 2499'
2S = 5151
S = 2575.5

(s-a) = 2422.5
(s-b) = 76.5
(s-c) = 76.5



NOTE: In Building to this stake, Bldg. was erected so as to have a dist. of 2500' to back of 4' Crown at top

ZERO TOWER

Log (s-a) = 3.384 2638
Log (s-b) = 1.883 6614
Log (s-c) = 1.883 6614
7.151 5866
Log S = 3.410 8616
3.740 7250
Log r = 1.870 3625

1.870 3625
Log (s-b) 1.883 6614
Log tan ½B 9.986 7011
B 44°-07'-22.4
C 88 14 44.8
A 88 14 44.8
3 30 30.4
Σ 180 00 00.0

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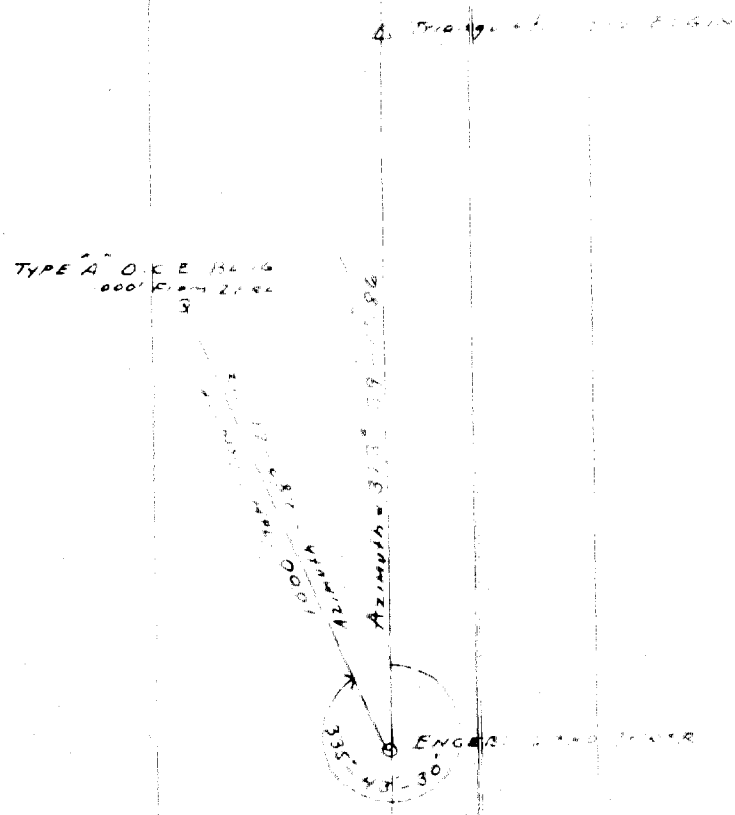
SKETCH SHOWING LOCATION OF TYPE A [illegible] BLDG (1000 FROM ZERO TOWER)



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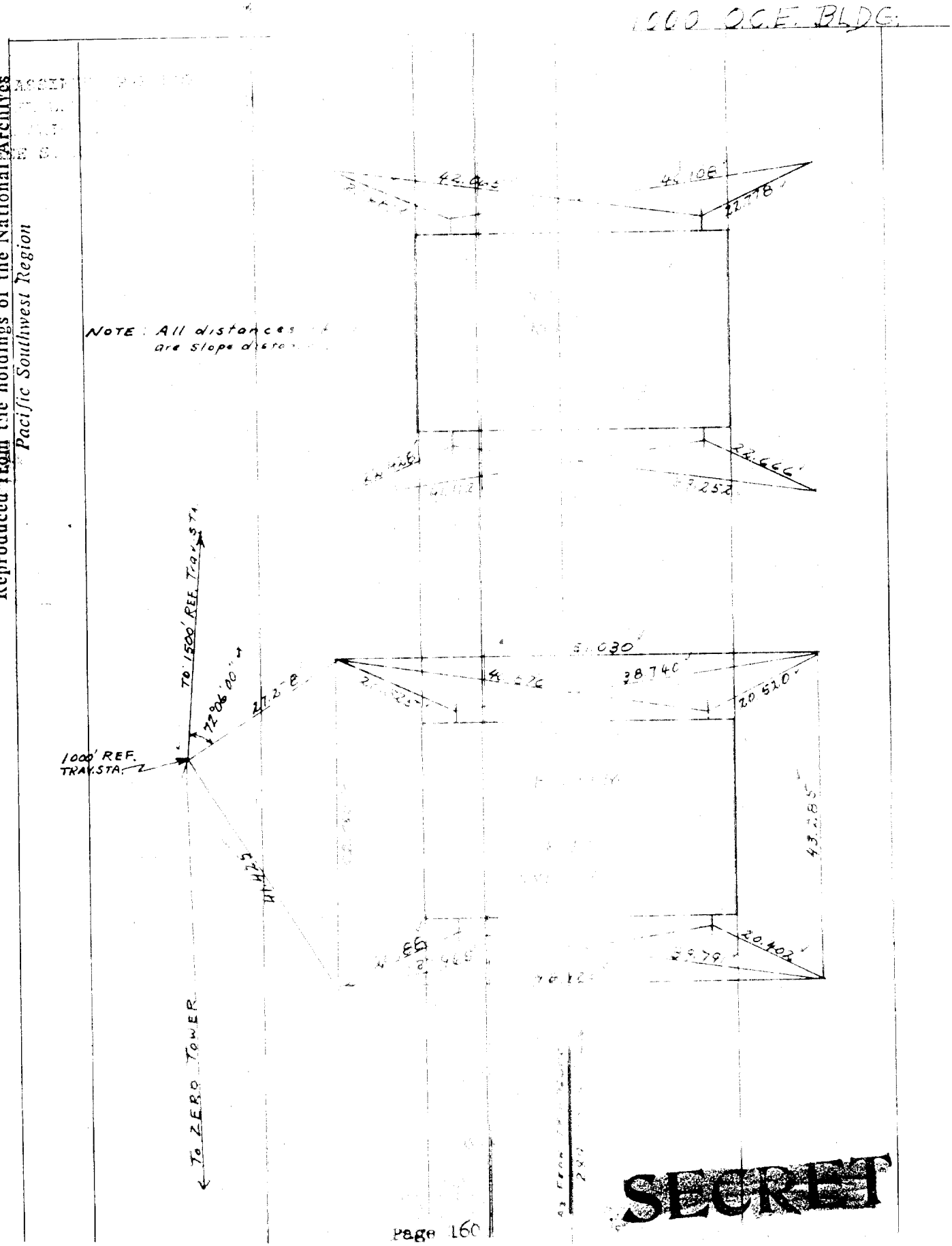

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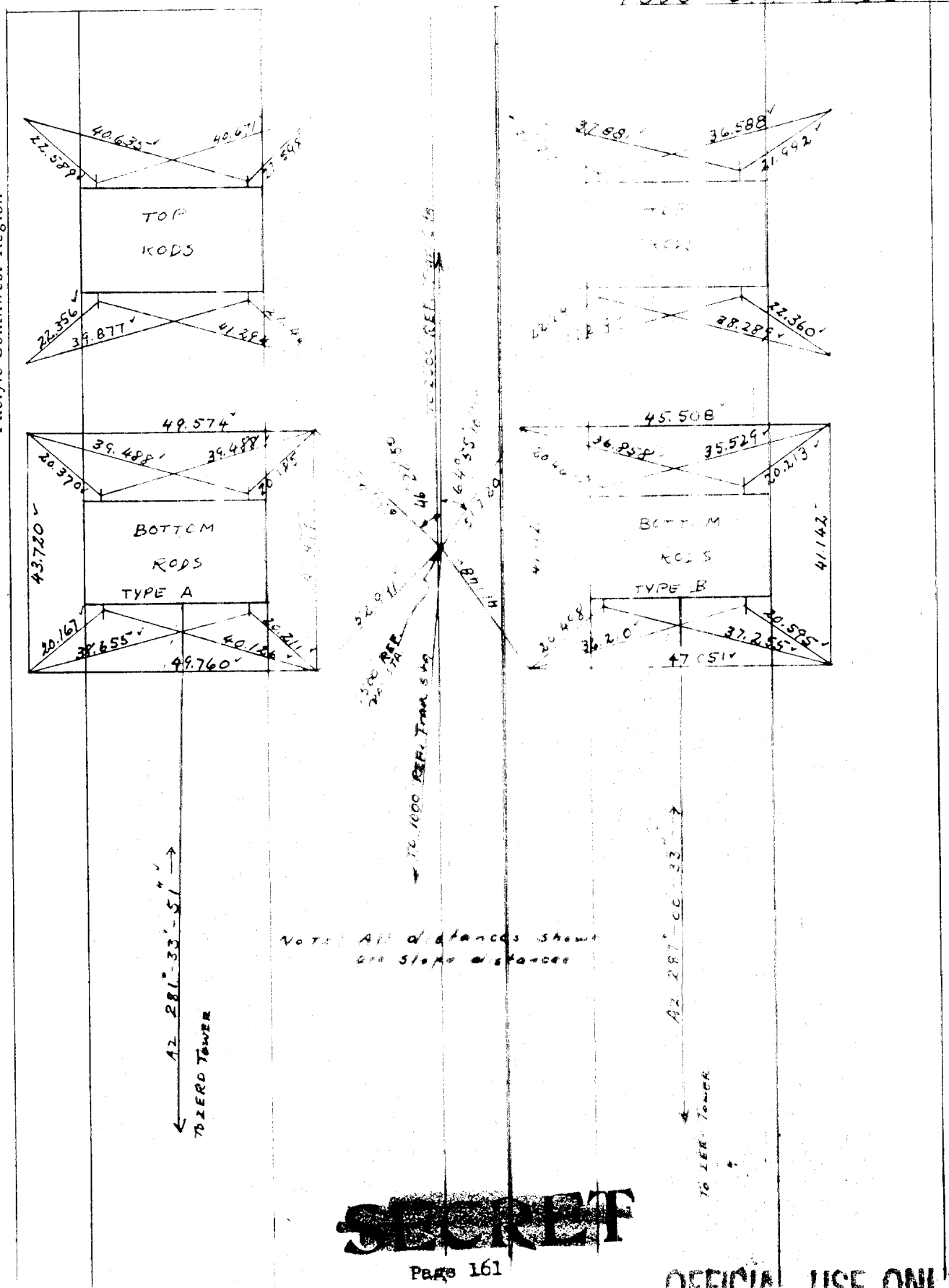
1500 O.C.E. BLDGS.



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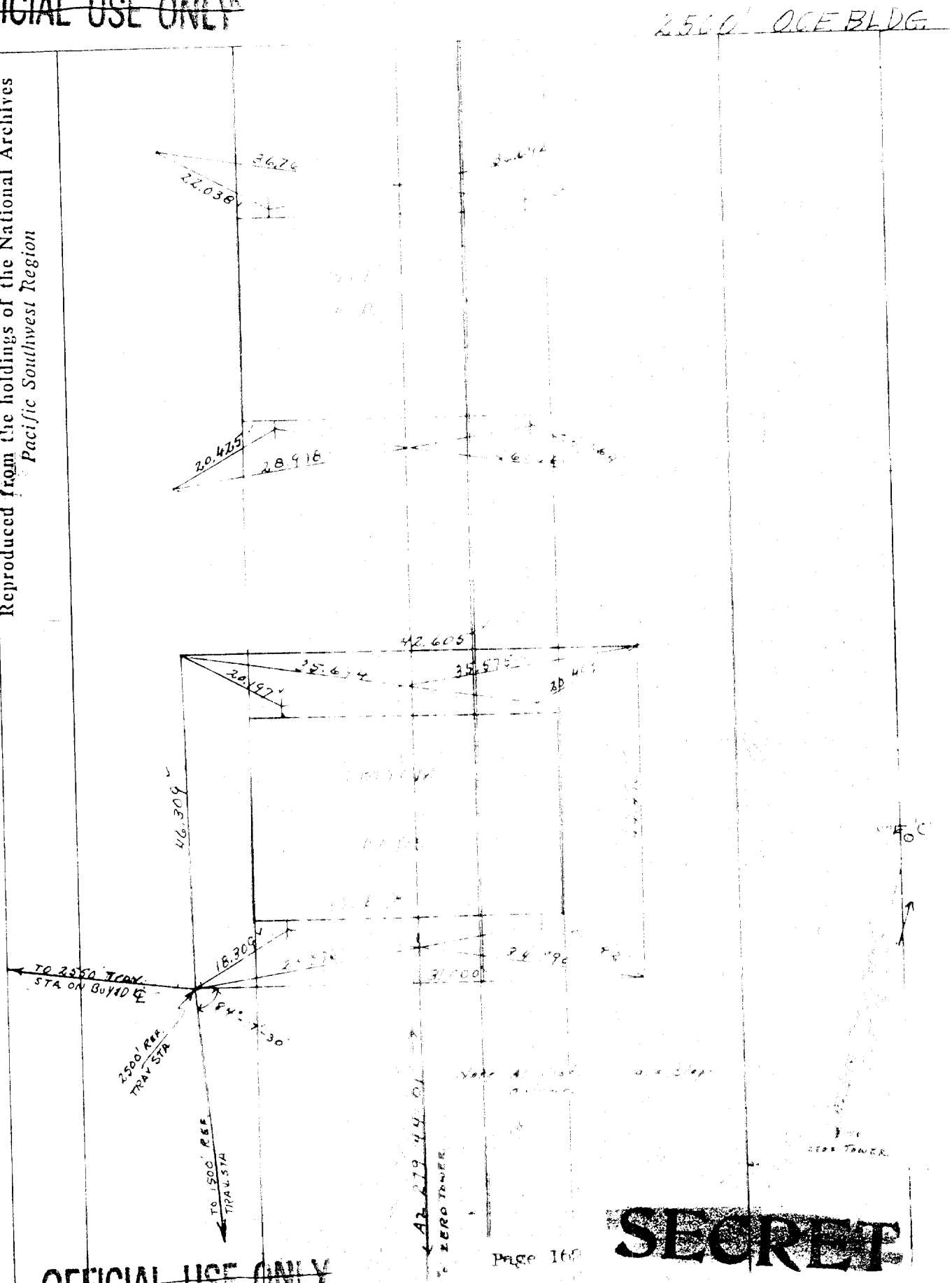

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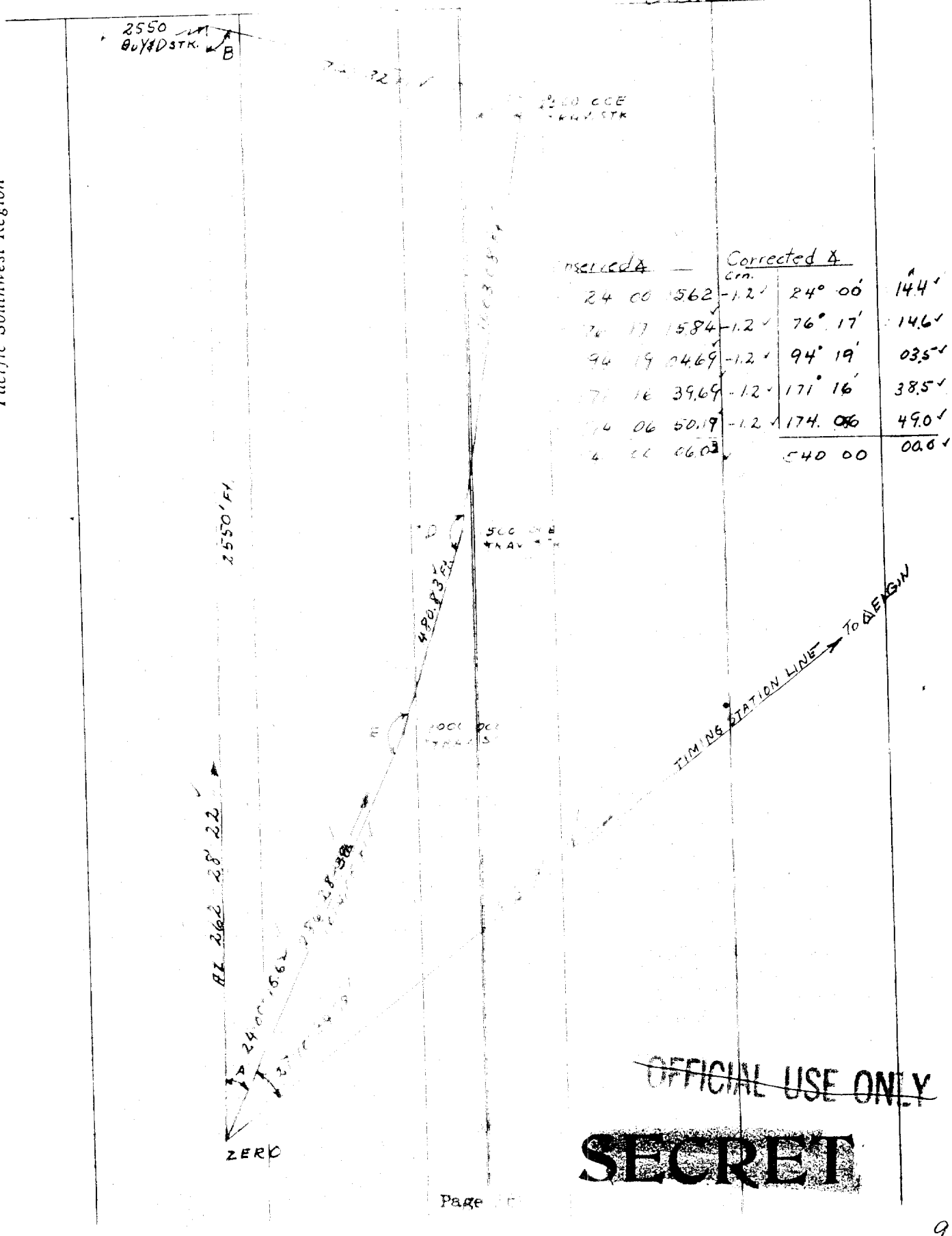
C.C.E. Traverse



Observed ∆			Corr.	Corrected ∆	
24	00	15.62	-1.2	24° 00'	14.4
76	17	15.84	-1.2	76° 17'	14.6
94	19	04.69	-1.2	94° 19'	03.5
171	16	39.69	-1.2	171° 16'	38.5
174	06	50.19	-1.2	174. 06	49.0
4	00	06.03		540 00	00.0

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BUS LINE

3000 STK

2900'STK.

2800 STK

2700 STK

2600 STK

2500 STK

2400 STK

2300 STK

2250 STK

3000' Bu YSL STK

The 3000 ℄ stake of the [illegible] is the 3000 Chord stake [illegible] the N side of the runway [illegible] Bu YSL Line. (Computation [illegible] Bu YSL Section of Engebi Comps) [illegible] this 3000' Chord stake. [illegible] rods were set at [illegible] intervals on line to [illegible] as indicated [illegible]

[illegible] the Bu Ship point [illegible] the 4200' blast [illegible]

A.P.C. CHANGE AZ. 257 02 46"

ZERO

SECRET

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SECRET

ZERO TOWER

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el. 6.850 ELGIN

el. 7.483 GEN HSE x in conc. floor

el. 6.698 corner conc. f

TIMINGSTA

el. 6.79 510' back from zero on zero Elgin line

el. 7.00 ZERO TOWER

el. 3.78 end paving

el. -0.82 zero-Elgin line extended 495'

ELEVATIONS FOR ... 5' ON EXTEND ... ZERO ELGIN LINE

* Assumed Elevation

3.78 — end of oiled area

2.47 ** sand, coral

1.54

0.70

0.04

-0.82

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SECRET

V

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[redacted]

95

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[illegible] - BUILD - [illegible]

Location of Structures from the Zero Tower

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO
Gamma Station A	2130 ft.	006 17 38
" " B	3900 "	" " "
" " C	5400 "	" " "
Blast Footings	1200 "	004 05 24
" "	1500 "	" " "
" "	1800 "	" " "
" "	2100 "	" " "
~~" "~~	~~2400~~	~~" " "~~
" "	2700 "	" " "
" "	3000 "	" " "
" "	3300 "	" " "
" "	3600 "	" " "
" "	3900 "	" " "
" "	4200 "	" " "
" "	4450 "	" " "
Blast Building	4300 "	101 39 27
Timing Station	5900 "	101 33 10
Center one of line of Bu Y&D conc. cubes	1050 "	275 08 07 *
" "	1500 "	285 53 41 *
" "	2000 "	287 39 13 *
" "	3000 "	~~287 05 13~~ 292° 40' 45"
" "	3600 "	284 20 08 *
" "	4050 "	285 14 31 *
Ion. Station	3000 "	272 13 24
Range Pole #1	1500 "	294 25 57
" " #2	2848 "	297 43 02
" " #3	4192 "	298 55 19
Triang. Sta. Graflex	658.015 ft.	271 49 30
Photo Tower	652.43 "	295 29 02
Tank Revetment	4298 "	298 54 32
Winch Base	4240 "	194 17 12

[redacted]

* Since preparing this Table the Lieut. [illegible] has reported that all of these stakes have been [illegible] that location of Bu Y&D Units will be determined by [illegible]

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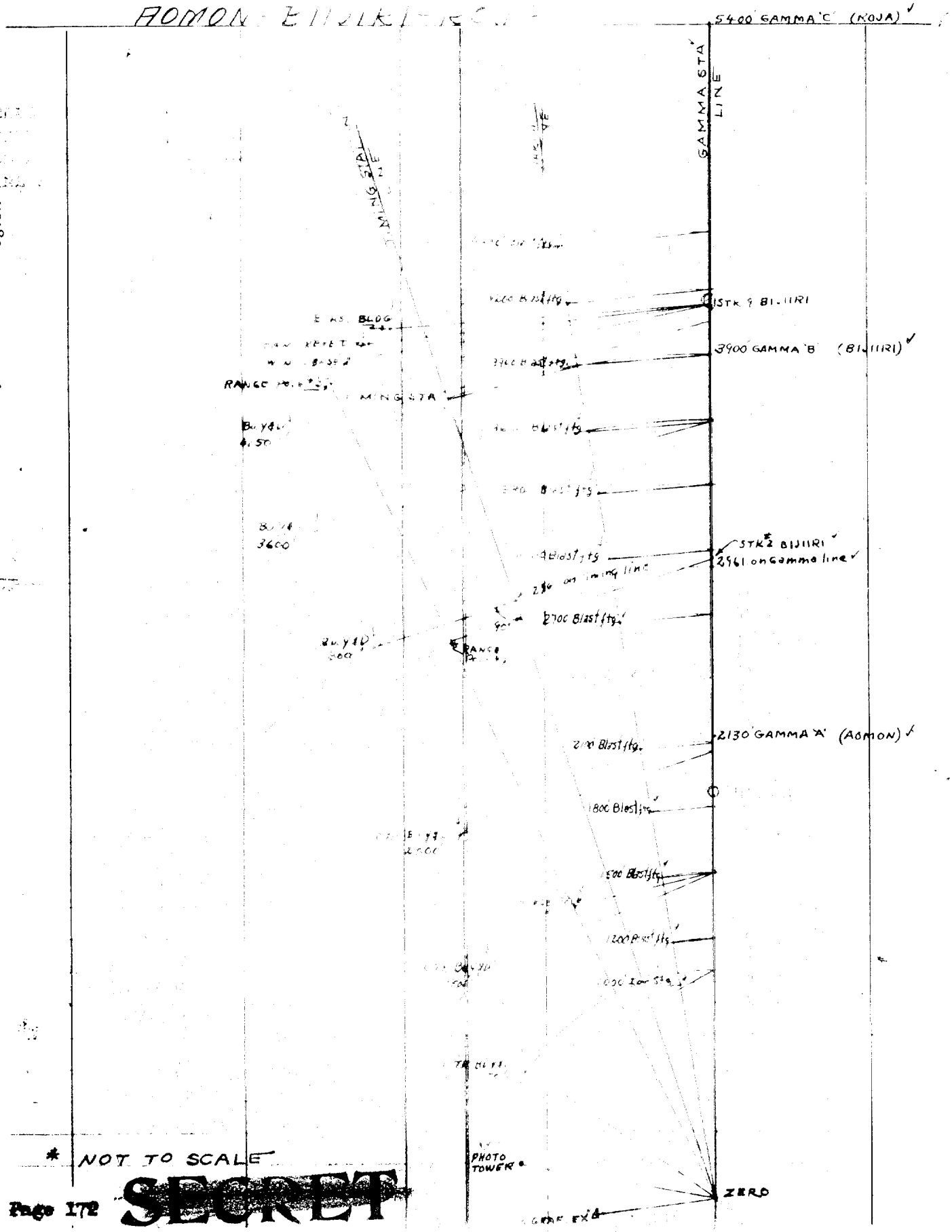
GEOGRAPHIC POSITIONS

STRUCTURE	LATITUDE			LONGITUDE		
Zero Tower	11	37	26.[illegible]	162	19	11.614
Photo Tower	11	37	3[illegible].[illegible]	162	19	15.277
Traverse Station Aomon	11	37	1[illegible].[illegible]	162	19	27.578
Traverse Station Bjiiri	11	37	[illegible].[illegible]	162	19	47.779
Triangulation Station Graflex	11	37	2[illegible].[illegible]	162	19	14.568



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COMPUTATIONS OF SETUPS, SETBACKS AND OFFSETS FROM THE GAMMA STATION LINE FOR USE IN ESTABLISHING OTHER POINTS

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Aomon, Bijiri & Rojoa Is.

SECRET

COMPUTATION OF "SET UPS" AND "SET BACKS" FROM STAKES OF THE GAMMA LINE TRAVERSE TO PROPER DISTANCES FOR FOR ESTABLISHMENT OF OTHER POINTS BY CHORD OFFSETS

OBJECT TO BE ESTABLISHED	DIST. FROM ZERO TOWER FEET	METERS	CLOSEST STAKE NO.	DIST. ~ ZERO TOWER TO CLOSEST STK METERS	SET UP from Closest stk m.	Ft.	SET BACK from Closest stk m.	Ft.
Ion STA	1,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Bu. YED	1050	320.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1200	365	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta / Range Flag	1500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1800	548.[illegible]	[illegible]	[illegible]	—	—	1.3743	4.509
Bu YED	2050*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman sta	2100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
GAMMA A	2130	[illegible]	[illegible]	[illegible]	—	—	[illegible]	2.550
Hartman sta	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman sta	3000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman sta.	3300	005.[illegible]	[illegible]	[illegible]	—	—	3.3985	11.150
Hartman Sta.	3600	097.[illegible]	[illegible]	[illegible]	—	—	11.9532	39.216
~~Bu. S~~	~~3750~~	[illegible]	[illegible]	[redacted]	—	—	[redacted]	[redacted]
TIMING STA. / GAMMA 'B' / Hartman Sta.	3900	188	[illegible]	[illegible]	—	—	20.5380	67.382
HARTMAN STA	4200	280	[illegible]	[illegible]	[illegible]	68.58	—	—
Bu. YED	4050	234.[illegible]	[illegible]	[illegible]	—	—	24.8152	81.415
Hartman sta.	4500	371.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
GAMMA C	5400	645.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

* This stake fell off high [illegible] line to zero tower [illegible]

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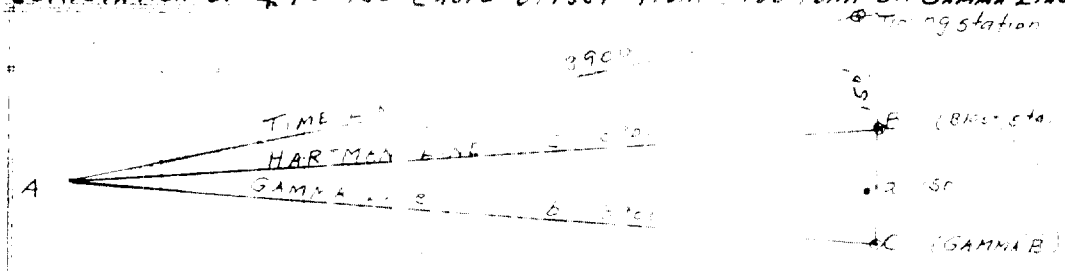
COMPUTATION OF ∡ FOR 150 Chord offset from 3900' Point on GAMMA LINE To 3900' Hartman sta.

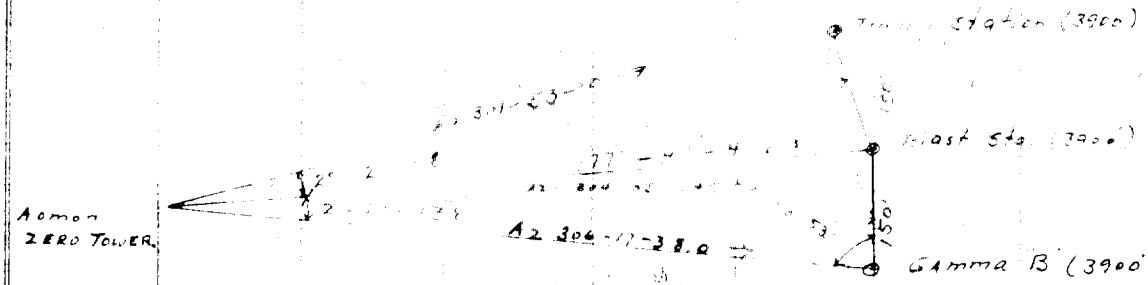


a = 150
b = 3900
c = 3900
2S = 7950
S = 3975

S-a = 3825
S-b = 75
S-c = 75

Log (S-a) 3.583
Log (S-b) 1.875
Log (S-c) 1.875
Σ 7.332
Log S = 3.599
3733
Log R = 1.866

log R = 1.866 7084
log (S-b) 1.875 0613
Log tan ½B 9.991 6471
½B = 44° 26' 56.55
B 88 53 53.1
C 88 53 53.1
A 2° 12' 13.81
180 00 00.0



Timing station stake set by 150' Chord offset from 3900 Hartman sta. stake as shown in above sketch.

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Aomon + Bijiri Is.

CHORD DIST [illegible] GAMMA LINE TO Hartman Line

[illegible] HARTMAN LINE

[illegible] GAMMA LINE

A = 2° - 12' - 17"
B = 88° - 53' - 53"
C = 88° - 53' - 53"
180 [illegible]

[illegible] DIST GAMMA LINE TO HARTMAN LINE

Log 1200	3.079 18	Log 1500	[illegible]	Log 1800	3.255 2725 ✓
Log Sin A	8.584 94	Log Sin A	[illegible]	Log Sin A	8.584 9491
Σ	1.664 13	Σ	[illegible]	Σ	1.8402216
Log Sin B	9.999 91	Log Sin B	[illegible]	Log Sin B	9.999 9197
Log Dist	1.664 2	Log Dist	[illegible]	Log Dist	1.8403019
Dist	46.54	Dist	[illegible]	Dist	69.231 ✓

Log 2100	3.322 2	Log 2700	3.43 36 8	Log 3000	3.477 1213 *
Log Sin A	8.584 94	Log Sin A	8.584 94	Log Sin A	8.584 9491 ✓
Σ	1.907 16	Σ	[illegible]	Σ	2.062 0704
Log Sin B	9.999 919	Log Sin B	9.999 9	Log Sin B	9.999 9197
Log Dist	1.907 248	Log Dist	[illegible]	Log Dist	2.062 1507
Dist	80.770	Dist	[illegible]	Dist	115.385 ✓

Log 3300	3.518 5	Log 3600	[illegible]	Log 4500 *	3.653 2125 ✓
Log Sin A	8.584 94	Log Sin A	[illegible]	Log Sin A	8.584 9491
Σ	2.103 46	Σ	[illegible]	Σ	2.238 1616
Log Sin B	9.999 9	Log Sin B	[illegible]	Log Sin B	9.999 9197
Log Dist	2.103 54	Log Dist	[illegible]	Log Dist	1238 2419
Dist	126 92	Dist	[illegible]	Dist	173 078 ✓

(Dist [illegible] Gamma L)

		Log 4200	3.623 2493
		Log Sin A	8.584 9491
		Σ	2.208 1984
3900'	Blast Star [illegible] 150 & hold [illegible] Gamma Line)	Log Sin B	9.999 9197
		Log Dist	2.208 2787
		Dist	161.540

* This stake was set back 50.0 Towards Zero Tower by Island Condr. giving a distance from Zero Tower of 4450 Feet.

98A

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Norman I.

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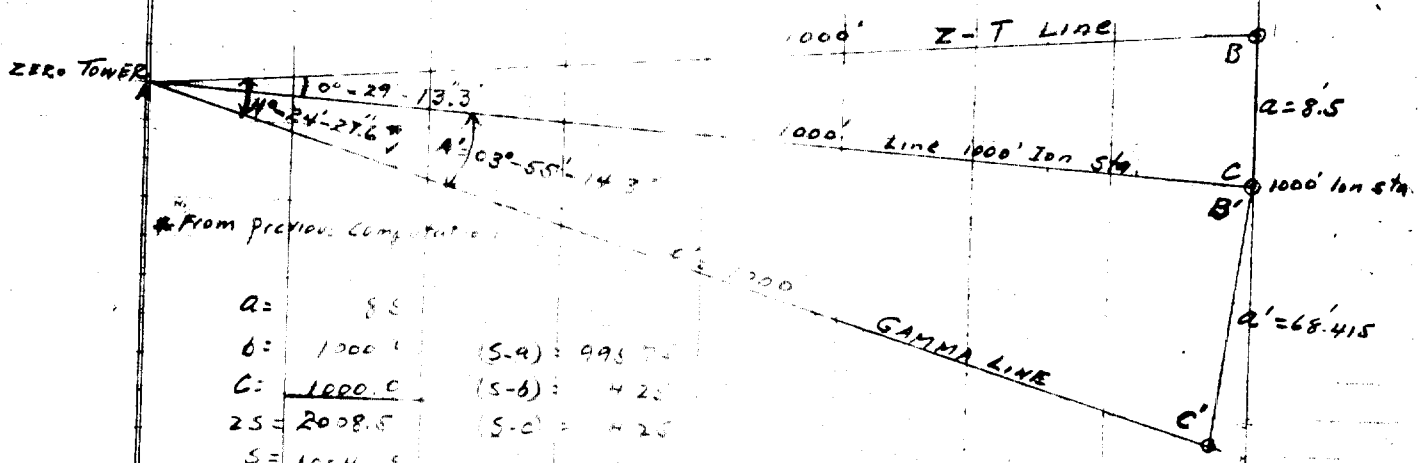
Comp. of Chord dist. & ∠C for Chord offset from GAMMA LINE to 1000' Ionization sta



*From previous computation

a:	8.5		
b:	1000.0	(S-a):	995.7
c:	1000.0	(S-b):	4.25
2S =	2008.5	(S-c):	4.25
S =	1004.25		

Log(S-a)	2.998 1503	Log r =	0.026 5432	Log r =	0.626 5432
Log(S-b)	0.628 3889	Log(S-a)	2.998 1503	Log(S-b) =	0.628 3889
Log(S-c)	0.628 3889	Log tan ½A	7.628 3929	Log tan ½B	9.998 1543
Σ	4.254 9281	½A =	0°-14'-36.63	½B =	44°-52'-41.72
Log S =	3.001 8418	A =	0°-29'-13.3	B =	89°-45'-23.4
	1.253 0863			C =	89-45-23.4
Log r =	0.026 5432			A =	0°-29'-13.3
					180 00 00.1

A' = (03-55-14.3)
B' = (88-02-22.8)
C' = (88-02-22.8)

$$a' = \frac{b \sin A'}{\sin B}$$

Log 1000 =	3.000 0000
Log Sin A° =	8.834 8952
Σ	1.834 8952
Log Sin B' =	9.999 7458
Log a' = Dist =	1.835 1494
a =	68.415 Ft

= Chord dist from 1000' point on GAMMA LINE To center of front of 1000' Ion station Nearest Zero Tower.

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Aomon Island

Comp of Chord ∡s + offsets for location of Range pole #1

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ZERO TOWER A — TIME LINE — GAMMA LINE — 1500'

B — C (115.364)

A = 4° - 24 - 27.0 ← from pole
B = (87-47-46.2)
C = (87-47-46.2)

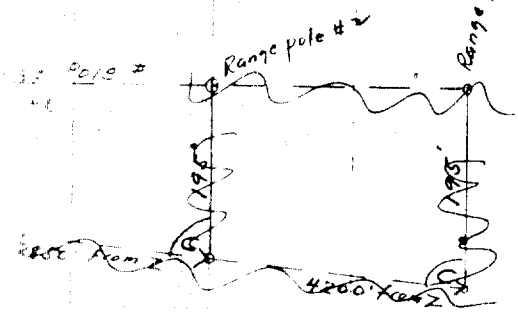
a = b sin A / sin B

Range poles stakes were set as shown by computations. HOWEVER, Range poles #2 + 3 were set in different positions by the Island Commander. — Measurements were taken to actual positions of poles #2 + 3 and on computes as shown on pages (2 side lined ∡ Comp)

Log 1500 =	3.176 09 3	Log 2850	Log 4200 3.623 2493
Log sin A	8.885 6577	Log sin A 8.885 6577	Log sin A 8.885 6577
Σ	2.061 7490	Σ 2.34 5	Σ 2.508 9.070
Log sin B	9.999 6786	Log sin B 9.999 6786	Log sin B 9.999 6786
Log Dist	2.062 07	Log Dist 2.34	Log Dist 2509 2284
Dist	115.364	Dist 2 9. 9	Dist 323.019

(Checked by S. Nav 4)

ZERO TOWER A — 1500 — (7°-21'-13.3) — 1500



a = 195'
b = 1500'
c = 1500'
2S = 3195'
S = 1597.5'

Log (S-a) =	3.146 902		Log a = 1.960 7356
Log (S-b)	1.989 0046		Log (S-b) 1.989 0046
Log (S-c) =	1.989 0046		Log tan ½B 9.971 7310
Σ	7.124 912		½B = 43-08-11.67
Log S =	3.203 440		B = 86°-16'-23.3
	3.921 471		C = 86 16 23 3
Log rc =	1.960 7350		A = 7 27 13.3
			179° 59 59.9

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Bijiri I

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TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

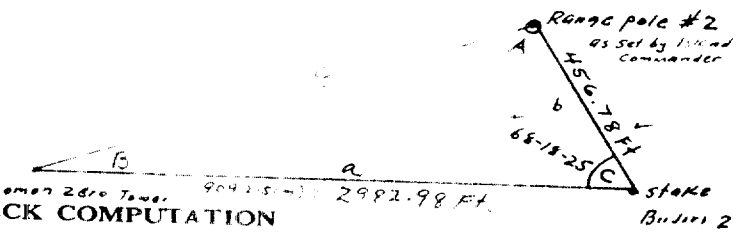
$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call origin set ... tan ... $\tan \phi \tan \frac{1}{2}(A_p + B_p)$ $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

(A)

C_s		Log	4 4 6504	Log m
Sph. excess / 3		Log	659 [illegible]071	Log sin C_s
C_p	68 [illegible]	Log a[illegible]	[illegible] 4 9433	Log a
$\frac{1}{2}$ C_p	34 [illegible]	45 [illegible]	[illegible] 18.29	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	5[illegible]	[illegible]	[illegible] 8839	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log [illegible]	[illegible] 9396	Sph. excess —
Sum $= A_p$	103 06 [illegible]	Log [illegible]	[illegible] 5060	
Diff $= B_p$	08 34 [illegible]	Log [illegible]	[illegible] 4456	
C_p	68 18 25		(Stated)	
	180 00 [illegible]			

Log a	3.474 6504
Log sin C_p	9 968 0786
Colog sin A_p	0 0[illegible]
Log c	3.454 2[illegible]

$c = 2845.9$[illegible]



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.454 2296
	1 C			6[illegible]-18-25	0.031 9014
	2 B			[illegible] 34 36.2	9.173 5756
	3 A			[illegible] 06 [illegible]8.8	9.988 5194
	1-3			[illegible]56.78	2.659 7066
	1-2			[illegible]982.98	3.474 6504
	2-3				
	1			[illegible] Range pole #2	
	2				
	3			[illegible] 7-18.0	
	1-3	Aomon [illegible]			
	1-2				

*The subscripts s and p [illegible] plane angles respectively

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BIJIRI I.

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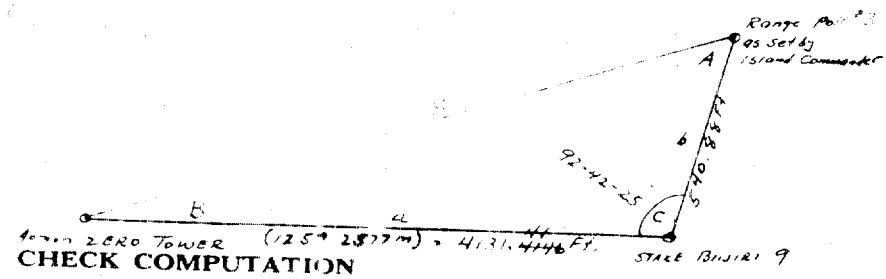
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

(B)

C_s		Log a	3.616 0983	Log m
Sph. excess / 3		Log b	[illegible]	Log sin C_s
C_p	92-42-25	Log tan 45	0.0892 9974	Log a
$\frac{1}{2}C_p$	46-[illegible]-12.5	$(45°+\phi)$	[illegible] 32 28.75	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	43-[illegible]	ϕ	[illegible] 32 28.75	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	36 [illegible]	Log tan ϕ	9.885 6229	Sph. excess —
Sum $=A_p$	79 [illegible]	Log tan [illegible]	9.979 4741	
Diff $=B_p$	07 [illegible]	Log tan [illegible]	0.086 1030	
C_p	92 4[illegible]		(Sketch)	
	180 0[illegible]			

Log a	3.616 09[illegible]3
Log sin C_p	9.999 49[illegible]0
Colog sin A_p	0.006 79[illegible]2
Log c	3.622 39[illegible]5



$c = 4191.74'$

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				
	1 C				3.622 3945
	2 B			92-42-25.9	0 000 5030
	3 A			07 24 18.6	9 110 2024
	1-3			79 53 16.4	9 993 2008
	1-2			540.88	2.733 0999
				4131.41	3.616 0983
	2-3				
	1				
	2				
	3				
	1-3				
	1-2	Aomon Zero Tower	Gamma Line		

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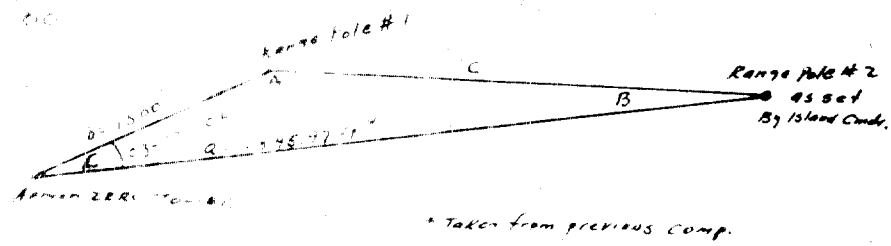
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Cal long side a): tan ϕ (Cal $\tan\phi \tan\frac{1}{2}(A_p+B_p)$): $\left.c=\frac{a \sin C_p}{\sin A_p}\right]$*

(c)

C_s		Log [illegible]	4.54 2296*	Log m
Sph. excess / 3		Log [illegible]	[illegible] 0913	Log sin C_s
C_p	03-17-04.7[illegible]	Log tan [illegible]	0.278 1383	Log a
$\frac{1}{2}$ C_p	01 38 22.35	[illegible]	62 12' 28.76"	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	88 [illegible] 27.65	[illegible]	[illegible] 7 12 28.76	Log sph. ex.
$\frac{1}{2}$ (A_p-B_p)	84 [illegible] 76	Log tan [illegible]	9.490 9475	Sph. excess —
Sum $=A_p$	[illegible]	Log tan [illegible]	B_p 1.542 5461	
Diff $=B_p$	03 [illegible] 4.89	Log tan [illegible]	B_p 033 4936	
C_p	03 [illegible] 04.70		Sketch)	
	18[illegible]			
Log a	3.454 [illegible]			
Log sin C_p	8.758 [illegible]			
Colog sin A_p	0.918 [illegible]			
Log c	3.130 [illegible]			



* Taken from previous comp.

C = 135.17 ±

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.130 7086
	1 C			03 17 04.70	1.241 8730
	2 A			73 04 06.41	9.081 6480
	3 B			03 38 47.89	8.803 5097
	1-3			2845.97	3.4542296
	1-2			1500.00	3.1760913
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

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Aomon & Bijuri I

TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

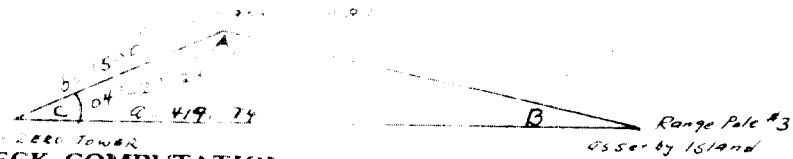
$\frac{a}{b}=\tan(45^\circ+\phi)$ (Call longer side a tan ½ $(A_p - B_p)$ tan ½ $(A_p - B_p)$: $c=\frac{a \sin C_p}{\sin A_p}$]*

(D)

C_s			Log m
$\frac{\text{Sph. excess}}{3}$			Log sin C_s
C_p	04 27 22 3	log tan (45	Log a
	02 13 41	45	Log b
$90-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	87 46 18 5		Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	85 17 48 0	log tan	Sph. excess
Sum $=A_p$	173 04 07 5	log	
Diff $=B_p$	02 28 30 5	log	
C_p	04 27 22		
	180 00 00		

Log a	3.622 3945
Log sin C_p	8.890 4030
Colog sin A_p	0.918 3718
Log c	3.431 1699

c = 2698.80 ✓ ft.



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.431 1699
	1 C			04 27 22.30	1.109 5964
	2 A			173 04 07.65	9.081 6282
	3 B			02 28 30.15	8.635 3248
	1-3			4191.74	3.622 3945
	1-2			2500.0	3.176 0911
	2-3				
	1				
	2				
	3				
	1-3				
	1-2 Aomon Zero Tower			GAMMA LINE	

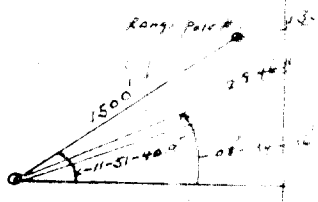


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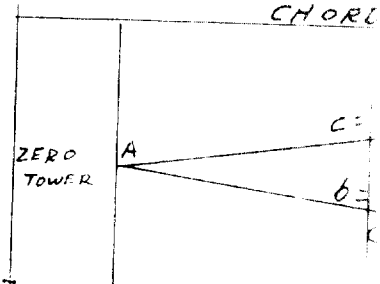
CHART A · DISTANCE BA[illegible] from Zero Tower. 19

[illegible] of 7 BURED Cubes

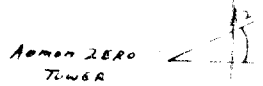


a=	564
b=	1050
c=	1050
2S	2664
S	1332

Log(s-a)	2.885 36.2
Log(s-b)	2 450 2491
Log(s-c)	2.450 2491
Σ	7.785 8594
Log S	3.124 5042
	4.661 3552
Log r	2 3306776

Log r =	2.330 6776
Log (s-b) =	2.450 2491
Log tan ½B	9.880 4285
½B	37-12-37.39
B	74 25-146
C =	74 25-146
A:	31 09 308
	180-00-000

[illegible] form (stake)



* Light [illegible] Bearing [illegible]

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Aomon I

CHORD & DIST COMP - BY T&D = 1500 from ZERO TOWER

Cubes

ZERO TOWER A

c = 1500

b = 1500

a = 600

b = 1500

c = 1500

2S = 3600

S = 1800

Log (s-a)	3.079 1812	Log r	2.389 0756
Log (s-b)	2.477 1213	Log (s-c)	2.477 1213
Log (s-c)	2.477 1213	Log tan ½B	9.911 9543
Σ	8.033 4238	½B	39 13 53.47
Log S	3.255 2725	B	78 27 46.9
	4.778 1513	C	78 27 46.9
Log r	2.389 0756	A	23 04 26.1
			179 59 59.9

Aomon
ZERO TOWER

23-04-26.1

Az 300

GAMMA

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Aomon I

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Computation of Chord & Dist Bu Y&D ~2050* From ZERO TOWER in

ZERO TOWER

21 Bu Y&D. Cubes

a = 664'
b = 2050'
c = 2050'
2S = 4764'
S = 2382'

Log(s-a)	3.235 0232	2.450 1788	Log a = 2.450 1788
Log(s-b)	2.521 138	3.235 0232	Log (s-b) = 2.521 1381
Log(s-c)	2.521 138	9.215 1576	Log tan ½B = 9.929 0407
Σ	8.277 2991	9-19-12.61	½B = 40 20 23.70
Log S =	3.376 9418	8' 38 252	B = 80 40 47.4
	4.900 3570		C = 80 40 47.4
Log r =	2.450 1788		A = 18 38 252
			180 00 000

* Note: Stake set as computed above fell off high part of Island. Stake was set [illegible] on line to ZERO TOWER giving Radius of 2000 ft from Zero [illegible] Stake set at this point.

[illegible] 2050' from Zero [illegible] to center one of [illegible] 2000' from Zero.

Aomon ZERO TOWER

GARMI LINE

* Note: Lieut Cmdr Everson CEC USN reports his stake as having been removed or destroyed.

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Bikini I

~~Appendix I~~

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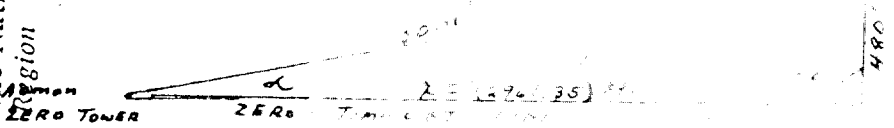
Comp for Normal offset [illegible] Zero-Time [illegible] Bo YED = 3000' from Zero Tower *

[illegible] center line of 21 Bo YED units.



$\chi^2 = 3000^2 - 480^2$

$= 9000000 - 230400$ [illegible]

Log χ^2 [illegible]

Log χ [illegible]

χ [illegible]

$\tan \alpha = \frac{480}{2961.35}$

Log 480 2.681 [illegible]

Log (2961.35) 3.471 4891

Log tan α 9.209 [illegible]

α [illegible]

$\sin \alpha = \frac{480}{3000}$

Log 480 2.681 [illegible]

Log (3000) 3.477 [illegible]

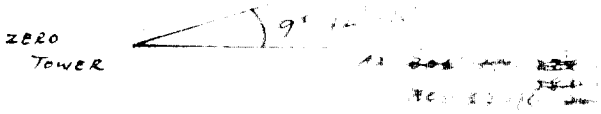
[illegible] 9.204 [illegible]

α [illegible]

[illegible] Cp. R.40

292-40 [illegible]

~~297-00~~ [illegible]



~~[illegible]~~ TIMING STA. LINE

* Lt Cdr. Crosso[illegible] USN Reports this stake as being here removed [illegible] destroyed

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Biggin I

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COMPUTATION OF CROSS ∡ & DIST. BY YFD ~ 3600' FROM ZERO TOWER in

center one of 3 BY YFD units

ZERO TOWER A c = 36 b = 36

a = 750'
b = 3600'
c = 3600'
2S = 7950'
S = 3975'

Log(s-a)	3.508 5297	Log = 2.5.8		Log r	2.528 6276
Log(s-b)	2 574 0313	Log(s-a)	3.508	Log(s-b) =	2.574 0313
Log(s-c)	2.574 0313	Log tan A	9.0.0	Log tan ½B =	9.954 5963
Σ	8 656 5923		5 8	½B =	42 00 37.52
Log S =	3.599 3371			B =	84 01 150
	5.057 2552			C =	84 01 150
Log r =	2.528 6276			A =	11 57 29.9
					179 59 59.9

* Stake for center one of 3 By YFD units

ZERO TOWER → GAMMA LINE

* Lieut Col [illegible], CEC [illegible] reports this stake as having been removed or destroyed

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COMP. OF CHORD X = DIS BUYSD – 4050 from ZERO TOWER

ZERO TOWER A

c = 4051

b = 4050

GAMMA LINE

X =	780	(S-c)	
=	4050	(S-b)	
=	4050	(S-c)	
S =	8880		
=	4440		

Log(S-a)	3.563 4811	Log a	2.549	Log a =	2.549 1136
Log(S-b)	2.591 0646		3.563 48	Log (S-b)	2.591 0646
Log(S-c)	2.591 0646	Log tan	8.985 6	tan ½	9.958 0490
Σ	8.745 6103			½	42-14-13.30
Log S	3.647 3830		11-03	B	84 28 26.6
	5.098			C	84 28 26.6
Log r	2.549			A	11 03 067
					179 59 59.9

STAKE for center one of 37 BUYSD units.

ZERO TOWER

GAMMA LINE

* Last Center Contractor [illegible] report this stake as [illegible]

Aomon I

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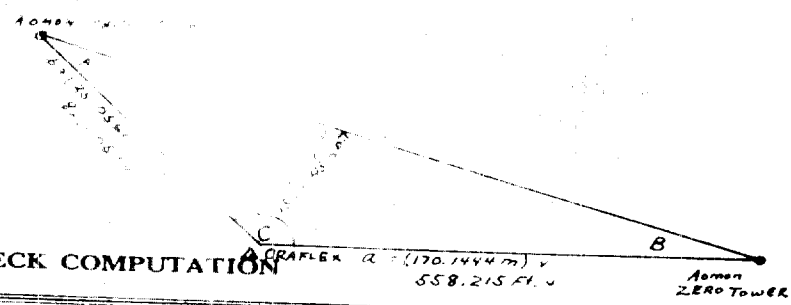
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call larger side a) $\tan\phi = \frac{a-b}{a+b}\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

C_s	Log	[illegible]	Log m
Sph. excess / 3	Log	[illegible]	Log sin C_s
C_p	Log tan [illegible]	[illegible]	Log a
$\frac{1}{2}C_p$	45 + ϕ	[illegible] 21 40	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	ϕ	[illegible] 21 40	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	Log tan	[illegible] 1513	Sph. excess
Sum $=A_p$	Log tan [illegible]	[illegible] 2768	
Diff $=B_p$	Log tan [illegible]	[illegible] 4281	
C_p		(Sketch)	

Log a	2.746 [illegible]
Log sin C_p	9.660 [illegible]
Colog sin A_p	0.393 [illegible]
Log c	2.801 [illegible]



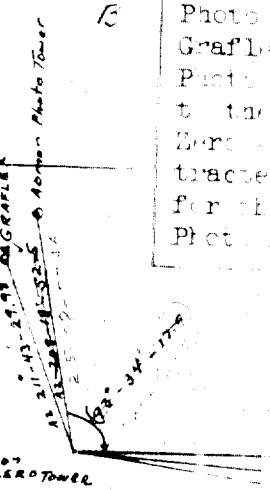
C = 632.43 Ft

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				
	1	C			2.801 0095
	2	A		154 45 50.7	0 339 4615
	3	B		23 49 3.84	9 606 3305
	1-3			03 24 37.46	8 774 4269
	1-2			558.215	2 746 8015
				[illegible]	1 914 8979
	2-3				
	1				Corp RAS
	2				
	3				
	1-3				
	1-2 Aomon ZERO Tower				Timing station

NOTE

The azimuth shown on this page for the line Aomon Zero - Aomon Photo is in error. The angle Graflex - Aomon Zero - Aomon Photo should have been added to the azimuth of the line Aomon Zero - Graflex rather than subtracted. The correct azimuth for the line Aomon Zero - Aomon Photo is 113° [illegible]



HARTMAN LINE A2 = 304°-05'-24.2"

GAMMA LINE A2 = 306°-17'-38.8"

*The subscripts s and p on this form refer to [illegible] the angles respectively.

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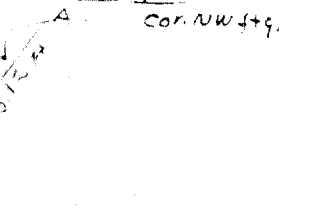
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\frac{c}{b}$ = tan (45° + φ) (Call longer side c) tan ½ (A_p − B_p) = c tan ½ (A_p − B_p): $c = \frac{a \sin C_p}{\sin A_p}$]*

C_s			
$\frac{\text{Sph. excess}}{3}$			Log m
C_p		Log tan (45° + φ)	Log sin C_s
$\frac{1}{2}C_p$			Log a
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$			Log b
$\frac{1}{2}(A_p - B_p)$		Log tan φ	Log sph. ex.
Sum $= A_p$		Log tan ½ (A_p + B_p)	Sph. excess
Diff $= B_p$		Log tan ½ (A_p − B_p)	
			(Sketch

Log a	3.616 0983
Log sin C_p	9.949 [illegible]
Colog sin A_p	0.068 7264
Log c	3.634 3672
	4308.91



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				
	1 C				3 634 3672
	2 B				6.050 4577
	3 A				8.875 2404
	1-3				9.931 2734
	1-2			[illegible]	2.660 0653
				[illegible]	3.616 0983
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

Azimuth Zero

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

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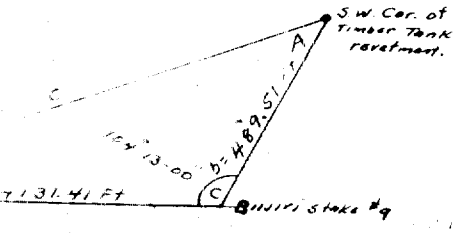
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° - \phi)\right.$ (Cal [illegible]) [illegible] $\tan\phi \tan\frac{1}{2}(A_p + B_p)$: $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s	[illegible]	3.616 0983	Log m
Sph. excess / 3	[illegible]	2.659 7616	Log sin C_s
C_p	[illegible]	2.926 3367	Log a
$\frac{1}{2}$ C_p	[illegible]	14 34"	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]	14 34	Log sph. ex.
$\frac{1}{2}$ $(A_p - B_p)$	[illegible]	9.896 5994	Sph. excess
Sum $= A_p$	[illegible]	9.891 1165	
Diff $= B_p$	[illegible]	9.787 7159	
C_p	[illegible]	(Sketch)	

Log c	3.616 [illegible]
Log sin C_p	9.986 [illegible]
Colog sin A_p	0.028 [illegible]
Log c	3.631 [illegible]
	42 [illegible]



CHECK COMPUTATION

No.	STATION	LATITUDE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.631 2435
	1				0.013 5087
	2				9.971 3461
	3				9.045 0165
	1-3			4131.41	3.616 0983
	1-2			489.51	2.689 7627
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

S.W. Cor. of Timber Tank revetment

GAMMA LINE

*The subscripts [illegible] on this [illegible] spherical and plane angles respectively.

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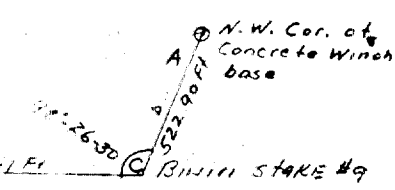
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\frac{a}{b} = \tan(45° + \phi)$ (Call longer [illegible] $\tan \frac{1}{2}(A_p - B_p)$ $\tan \frac{1}{2}(A_p + B_p)$ $c = \frac{a \sin C_p}{\sin A_p}$]*

C_s		Log [illegible]	[illegible]	Log m
Sph. excess / 3		Log [illegible]	[illegible]	Log sin C_s
C_p	98 [illegible]	Log tan (45° [illegible]	6799	Log a
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	49 [illegible]	(45° [illegible]	[illegible]	Log b
$\frac{1}{2}(A_p - B_p)$	32 [illegible]	Log tan [illegible]	4768	Log sph. ex.
Sum $= A_p$	74 [illegible]	Log tan $\frac{1}{2}(A_p + B_p)$	7835	Sph. excess
Diff $= B_p$	07 [illegible]	Log tan $\frac{1}{2}(A_p - B_p)$	2583	
C_p	98 [illegible]		(Sketch)	

Log a 3.616 [illegible]
Log sin C_p 9.995 2617
Colog sin A_p 0.015 [illegible]
Log c 3.627 3495



[illegible] 4234.84 [illegible] 4234.41

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				
	1	C			3.627 3495
	2	A			0.104 7309
	3	B			9.984 0179
	1-3				0.086 3367
	1-2			[illegible]	3.616 0983
				[illegible]	2.718 4[illegible]7
	2-3				
	1				
	2			[illegible]	
	3	Atmos 2880 TOWER	[illegible]		
	1-3				
	1-2				GAMMA LINE

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*The subscripts s and p on the form [illegible] respectively.

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[illegible] FOR [illegible]
[illegible] ORGANIZATION [illegible]
[illegible] GRAFIX [illegible]
[illegible] POWER

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[illegible]

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Form 759
Jan. 31, 1935

[redacted]

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COMPUTATION OF A.G. BAFLER — ACMOR PHOTO TOWER TRAVERSE ~~BASE~~ LINE

U.S. GOVERNMENT PRINTING OFFICE 16—7536

Fold here

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Length	UNCORRECTED LENGTH Meters	TEMP	CORR Temp Meters	CORR Tape and Catenary Meters	CORRECTIONS Setup Set-back Meters	CORRECTIONS Inclination Meters	CORRECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(x) mm	(xx) mm
Bench [illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Page [illegible]

[redacted]

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Form 635

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	m.	Meters	Meters	
Bench Δ GRAFLEX						
Bench AOMON PHOTO TOWER	2					

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109 v 8 8

11—6126

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COMPUTATIONS FOR TRAVERSE BETWEEN
TRIANGULATION STATION [illegible] AND
AOMCN [illegible] POINTS

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U. S. COAST AND GEODETIC SURVEY
Form 589
Rev. April 1935

[redacted]

COMPUTATION OF Δ GRAFLEX – ADMIRAL ZERO TWO TRAVERSE ~~BASE~~ LINE

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH Tape Length	UNCORRECTED LENGTH Meters	TEMP °C	COR. Temp Meters	COR. Tape and Catenary Meters	REDUCTIONS Set-up Set back Meters	REDUCTIONS Inclination Meters	REDUCTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(xx) mm	(yy) mm
Bench																
Δ																
			927													
Bench			164													

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[redacted]

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ABSTRACT OF LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	Meters	Meters	Meters	
Mark △ Graflex						
Bench △ Graflex						
1						
2						
3						
4						
Bench Aomon Zero Tower						
Mark Aomon Zero Tower						

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COMMUTATION OF AGRICULTURAL [illegible] ROJOA ISLAND AND HISPANIC [illegible]

STATE #[illegible] TO ROJOA STATE [illegible]

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U. S. COAST AND GEODETIC SURVEY
Form 599
Rev. April 1935

[redacted]

COMPUTATION OF AUXILIARY BASE LINE

For determining Indirect Base Line II
To Reduce "0" by Triangulation

U. S. GOVERNMENT PRINTING OFFICE

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Field Book

SECTION	DATE	DIR. OF MEAS.	T/FF NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP °C	COR Temp Meters	COR Tape and Catenary Meters	CORRECTIONS Set up Set back Meters	CORRECTIONS Inclination Meters	CORRECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(v) mm	(wv) mm
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
To																
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28.0	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			

Page [illegible]

[redacted]

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Path to your family history

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 635

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ABSTRACT OF LINE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	[redacted] feet	[redacted]	Meters	Meters	
Rojoa 0						
BL 1	[illegible]	[illegible]				
BL 2	[illegible]	[illegible]				
BL 3	[illegible]	[illegible]				

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U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET

Station Bijiri II

State Marshall Islands (Majuro Atoll)

Chief of party Ralph L. Phan

Date 7 February 1941

Computed by R.L.P.

Observer G.R. Strode

Instrument H 2

Checked by R.L.P.

U. S. GOVERNMENT PRINTING OFFICE: 1933 11—9503

OBSERVED STATION	Observed direction	Eccentric correction	Reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
RO JOA "O"	0 00 00.00			0 00 00.00	
RO JOA BL 3	[illegible]				
RO JOA BL 2	[illegible]				

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* These columns are for office use and should be left blank in the field

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U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

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Station Rojoa Bl 3 State Marshall Is (Eniwetok Atoll)

Chief of party Ralph L. Pfau Date 7 February 1948 Computed by R.L.P.

Observer G.R. Strode Instrument [illegible] Checked by R.H.

U. S. GOVERNMENT PRINTING OFFICE: 1935 11—8503

OBSERVED STATION	Observed direction	Correction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	′ ″	′ ″	° ′ ″	′ ″
Rojoa "O"	0 00 00.00			0 00 00.00	
Biijiri 11	[illegible]				

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U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET

Station Rojoa B L 2 State Marshall Islands (Kwajalein Atoll)

Chief of party Ralph L Pfarr Date 9 Feb [illegible] Computed by R.L.P.

Observer G.R. Strode Instrument [illegible] Checked by R.L.P.

U. S. GOVERNMENT PRINTING OFFICE: 1933 11—8503

OBSERVED STATION	Observed direction	Eccentric [illegible]	[illegible]	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	° ′ ″
Rojoa "O"	[illegible] 00 00.00			0 00 00.00	
Bijiri 11	[illegible]				

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Station ROJOA 0

Chief of party Ralph L [illegible]

Observer G. R. Strode

State [illegible] (Eniwetok Atoll)

Date [illegible]

Instrument [illegible]

Computed by R. L. P.

Checked by

OBSERVED STATION	Observed direction	Eccentric direction	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	° ′ ″
BIJIRII 11	0 00 00.00			0 00 00.00	
ROJOA BL 2	[illegible]				
ROJOA BL 3	[illegible]				

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COMPUTATION OF TRIANGLES

Sta. MARSHALL [illegible]

U. S. GOVERNMENT PRINTING OFFICE 16—[illegible]

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	STATION	[illegible] BASE ANGLE	[illegible]	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3					49.9936 m	2.176 0727
	1 Bingham	[illegible]				644	0.278 2108
Base △	2 Rojoa BL3	[illegible]				16.5	9.942 7447
for dist.	3 Rojoa [illegible]	[illegible] 28				39.1	9.999 3954
	1-3					49.4757 m	2.397 0282
	1-2						2.453 6789
	2-3					49.9956 m	1.999 98~~17~~ 09 ✓
	1 Bingham	[illegible]				249	0.421 9443
Check △	2 Rojoa BL3	[illegible]				56.2	9.975 0983
	3 Rojoa [illegible]	[illegible] 36.6				38.9	9.999 3954
	1-3	[illegible]				49.4757	2.397 02~~43~~ 35
	1-2						2.421 32~~14~~ 06
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						

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COORDINATIONS OF AUXILIARY BASE LINE
AOLON ISLAND AND THE AOLON STAKE
#1 TO AUXILIAR STAKE #2

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 589
Rev. April 1935

[redacted]

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COMPUTATION OF AUXILIARY BASE LINE

(For determination of dist from Auxiliary to Base C)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP.	CORRECTIONS: Temp (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set-back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	(+) mm	(++) mm
Auxiliary to	2 5 48	F	72	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		

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ABSTRACT OF AWY LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	Meters	Meters	Meters	
Aomon 12						
BL 1	[illegible]	[illegible]	[illegible]			
BL 2	[illegible]	[illegible]	[illegible]			
BL 2+25	[illegible]	[illegible]	[illegible]			

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Station Aomon "12" State Marshall Is (Eniwetok Atoll) Aomon "12"

Chief of party Ralph L. Pfau Date 5 February [illegible] Computed by R.L.P.

Observer G.R. Strode Instrument 7" Repeating Checked by RLG

11—9503

OBSERVED STATION	Observed direction	Elements used	Observer's initials	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	′ ″
Siri "0"	[illegible] 00.00			00 00.00	
BL 2	266 [illegible]				
BL 2+25	266 [illegible]				

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Station BL 2 State Marshall Is (Eniwetok Atoll) (Aomon I)

Chief of party Ralph L Pfau Date 5 February 1948 Computed by R.L.P.

Observer G. R. Strode Instrument 7" Repeater Checked by R.L.P.

U. S. GOVERNMENT PRINTING OFFICE: 1940 11—9503

OBSERVED STATION	Observed direction	Eccentricity to	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	′ ″
Biijiri "C"	0 00 00.00			0 00 00.00	
Aomon 12	6 [illegible] 9 12.7				

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FORM [illegible]

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Station BL 2 + 25 State MARSHALL Is. (ENIWETOK Atoll) (Aomon I.)

Chief of party Ralph L. Pfau Date 5 February 1948 Computed by R.L.P.

Observer G.R. Strode Instrument 7" Repeater Checked by R.L.P.

11—9503

OBSERVED STATION	Observed direction	Eccentric reduction	Corrected direction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
Bejiri "0"	0 00 00.00			0 00 00.00	
Aomon "12"	[illegible]				

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Station Bijiri 0 State Marshall Is. (Eniwetok Atoll) (Bijiri I)

Chief of party Ralph L. Pratt Date 5 February 1948 Computed by R.L.P.

Observer G.R. Strode Instrument T. Theodolite Checked by R.L.P.

U. S. GOVERNMENT PRINTING OFFICE: 1948 11—0503

OBSERVED STATION	Observed direction	Reduction	Solar reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	° ′ ″
Aomon "12"	0 00 00.00			0 00 00.00	
BL 2	[illegible]				
BL 2 +25	[illegible]				

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COMPUTATION OF TRIANGLES

State: Marshall Is[illegible]

U. S. GOVERNMENT PRINTING OFFICE 16—50265-1

	STATION	OBSERVED ANGLE	SPHE[illegible]	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				24[illegible]886m	2 096 8704
	1 Bijiri 2	[illegible]			[illegible]65	0.326 7454
Legit Triangle	2 Aomon 1.	[illegible]			[illegible]53	9 993 5996
(used for distance)	3 BL 2+25	[illegible]			8.2	9 896 9563
	1-3	[illegible]			[illegible]	2 417 2154
	1-2				209 2050m	2 320 5721
	2-3				99[illegible]89[illegible]m	[illegible] 999 9522
	1 Bijiri 2	[illegible]			[illegible]529	0.398 7540
Check Triangle	2 Aomon 12	[illegible]			[illegible]540	9 993 5964
	3 BL 2	[illegible]			13.1	9 921 8751
	1-3	[illegible]			[illegible]	2 392 3026
	1-2				209 2095m	2 320 5813
	2-3					
	1					
	2					
	3					
	1-3					
	1-2					
	2-3					
	1					
	2					
	3					
	1-3					
	1-2					

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[redacted]

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DISTANCES AND BEARINGS OF THE GAGE
STATION FROM TRAVERSE [illegible] OFFSETS
TO ESTABLISH OTHER [illegible]

[redacted]

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Rev. April 1935

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COMPUTATION OF TRAVERSE ~~BASE~~ GAMMA LINE Gamma 1

(Agana Is)

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP	COR Temp. Meters	COR Tape and Catenary Meters	REDUCTIONS Set-up Corrections Meters	REDUCTIONS Inclination Meters	REDUCTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	[illegible] min	[illegible] min
Agana Zero Tower To																
6																

Page 27[illegible]

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Armon 2010 Tower — Armon 12 = 600.0164m
Armon 12 — Biijiri "0" = 209.2050m
Armon 2010 Tower — Biijiri "0" = 809.2214m

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[redacted]

COMPUTATION OF

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~ TRAVERSE ~ GAMMA ~~BASE~~ LINE ~ BIIJIRI I

U. S. GOVERNMENT PRINTING OFFICE

Field Book

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP	CORRECTIONS FOR: Temp Meters	CORRECTIONS FOR: Tape and Catenary Meters	CORRECTIONS: Setup Setback Meters	CORRECTIONS: Inclination Meters	CORRECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	DISTANCE Armon 2010 Tower to Biijiri "0" Meters
F. Sam Biijiri "0" To										± 0.0017	0.0004				809.2214

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	~~ELEVATION~~	MEAN ELEVATION	REMARKS
	Meters	~~Meters~~ feet	**	~~Meters~~	Meters	
Mark				Σ		
Aomen Zero Tower				[illegible]		
Bench Aomen Zero Tower	[illegible]	+2.[illegible]	[illegible]	0.0		
1	[illegible]	0.566	[illegible]	0.3		
2	[illegible]	0.808	[illegible]	0.9		
3	[illegible]	+0.0[illegible]6	[illegible]	0.7		
4	[illegible]	+0.2[illegible]9	[illegible]	0.9		
5	[illegible]	+0.632	[illegible]	[illegible]		
6	[illegible]	+0.366	[illegible]	[illegible]		
7	[illegible]	0.220	[illegible]	[illegible]3		
8	[illegible]	0.3[illegible]3	[illegible]	4		
9	[illegible]	0.410	[illegible]	[illegible]		
10	[illegible]	0.2[illegible]4	[illegible]	[illegible]5		
11	[illegible]	0.9[illegible]2	[illegible]	[illegible]2		
12	[illegible]	+0.12[illegible]	[illegible]	[illegible]		
13	[illegible]	+0.156	[illegible]	2.3		
		Σ	[illegible]			
					Corr R.Y.B.	
					1 R.Y.B.	

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters		Meters	Meters	Meters	
Bench "O"						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	0.2			
			6.7			

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MEAN TEMPERATURES - 3. Gamma Line Traverse

Points Bisecting To				
				35.6 To stk #1'
1-2				
				34.9 to stk #2'
2-3				
3-4				
				34.0 to stk #4
4-5				
5-6				
				34.0 to stk #6'
6-				
7-8				
				33.8 to stk #8'
8-9				
				33.7 to stk #9'
9-10				
10-11				
				33.3 To stk #11

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MEAN TEMPERATURE [illegible] Line Traverse

SECTION [illegible] TOWER [illegible]

Point	Fwd Tha[illegible]	[illegible]	[illegible]	
AMMOZERO TOWER -1	[illegible]	[illegible]	[illegible]	
1-2	[illegible]	[illegible]	[illegible]	
2-3	[illegible]	[illegible]	[illegible]	
3-4	[illegible]	[illegible]	[illegible]	
4-5	[illegible]	[illegible]	[illegible]	
5-6	[illegible]	[illegible]	65.2	
		5	[illegible]	[illegible] to STK #6
6-7	[illegible]	[illegible]	66.2	
		2	[illegible]	[illegible] to STK #7
7-8	[illegible]	[illegible]	[illegible]	
8-9	[illegible]	[illegible]	64.2	
		5	[illegible]	[illegible] to STK #9
9-10	[illegible]	[illegible]	[illegible]	
10-11	[illegible]	[illegible]	65.2	
		8	[illegible]	[illegible] to STK No. 11
11-12	[illegible]	[illegible]	64.2	
		9	[illegible]	[illegible] to STK #12
12-13	[illegible]	[illegible]	63.4	
		5	[illegible]	[illegible] to STK #13

[illegible]

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COMPUTATIONS OF THE [illegible] STATION
LINE [illegible]

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[redacted]

COMPUTATION OF [illegible] BASE LINE

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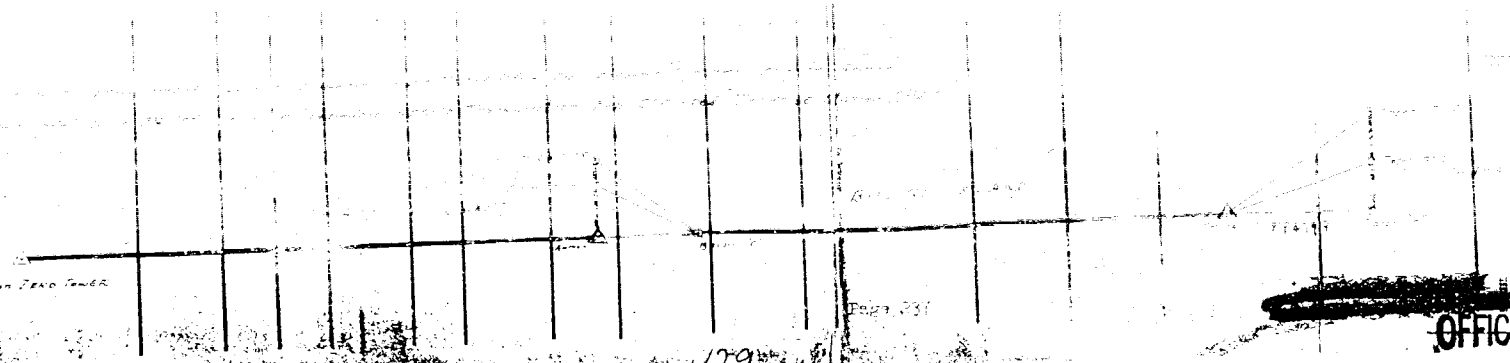
Field Book	SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP.	COR: [illegible] Meters	COR: Tape and Stations Meters	REDUCTIONS: Setup Offset Meters	REDUCTIONS: Inclination Meters	REDUCTIONS: Sea Level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	DISTANCE FROM [illegible] AGMON ZERO TOWER METERS
	Bench Agmon Zero Tower															



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ABSTRACT OF ~~WYE LEVELS~~
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	m	Meters	Meters	
Mark Aomon Zero Tower						
Bench Aomon Zero Tower						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

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ABSTRACT OF LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	m.	Meters	Meters	
BUSIRI 0						
1	50	[illegible]	[illegible]			
2	50	[illegible]	[illegible]			
3	50	[illegible]	[illegible]			
4	50	[illegible]	[illegible]			
5	50	[illegible]	[illegible]			
6	50	[illegible]	[illegible]			
7	50	[illegible]	[illegible]			
8	50	[illegible]	[illegible]			
9	50	[illegible]	[illegible]			
10	50	[illegible]	[illegible]			
11	50	[illegible]	[illegible]			
			[illegible]			

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Location of Structures on Runit Island from Zero Tower

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO
Blast Footing	1200 ft	323 08 00
" "	1500 ft	" " "
" "	18[illegible] ft	" " "
" "	2100 ft	" " "
" "	2400 ft	" " "
" "	2700 ft	" " "
" "	30[illegible] ft	" " "
" "	3300 ft	" " "
" "	3600 ft	" " "
" "	39[illegible] ft	" " "
" "	42[illegible] ft	" " "
Blast Building	8260 ft	" " "
Gamma Station A	2150 ft	32[illegible] 19 31
" " B	39[illegible] ft	" " "
" " C	54[illegible] ft	" " "
Timing Station	2[illegible] ft	32[illegible] 31 02
Ion. Station	1000 ft	32[illegible] 00 15
Winch Base	3[illegible] ft	32[illegible] 08 58
Tank Revetment	3[illegible] ft	324 54 25

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STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO
Photo Tower	[illegible] ft.	117 47 20
Triang. Sta. North Base	[illegible] "	110 58 50
Range Pole #1	[illegible]	316 44 28
" " #2 [illegible] st. from #1	[illegible]	Az. from #1 321 31 02
" " #3 [illegible] " "	[illegible]	" " " "

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[illegible] UNIT ISLAND

STRUCTURE	LATITUDE	LONGITUDE
Triangulation Station North Base	[illegible] 38 [illegible]	162 21 09.890
Triangulation Station Runit	[illegible] 31 [illegible]	162 22 01.621
Zero Tower	[illegible] 33 [illegible]	162 21 16.041
Photo Tower	[illegible] 33 [illegible]	162 21 11.202
Traverse Station Runit	[illegible] 32 [illegible]	162 21 43.761

[redacted]

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COMPUTATION OF HARTMAN LINE TRAVERSE

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Form 889
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COMPUTATION OF TRAVERSE HARTMAN ~~BASE~~ LINE

(Key-I Island)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP °C	CORRECTIONS: Temp Meters	CORRECTIONS: Tape and Catenary Meters	CORRECTIONS: Set-up Set-back Meters	CORRECTIONS: Inclination Meters	CORRECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(+) mm	(−) mm
Bench, Runit Zero Tower to 4 (A)	1-26-48	F	927	3	4	200	32.8	+0.0015	0.0101	+0.0176	−0.0027	—	[illegible]	[illegible]		
	1-27-48	B	933	[illegible]	4	200	32.4	+0.0015	−0.0147	+0.0244	−0.0017	—	[illegible]			

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COMPUTATION OF TRAVERSE HARTMAN BASE LINE

Distance Runit Zero Tower to 4(A) = 200.0075 m

(RUNIT ISLAND)

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP °C	CORRECTIONS Temp Meters	CORRECTIONS Tape and Catenary Meters	CORRECTIONS Set-up Setback Meters	CORRECTIONS Inclination Meters	CORRECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(+) Distance From Runit Zero Meters	(++)
4(A) To													99.9930	99.99[illegible]	300.	0006
Stake No. 6	1 27 48	F	921	3	2	100	26.5	[illegible]	0.0068	±0.0000	0.0007		[illegible]	[illegible]	[illegible]	[illegible]
Stake No. [illegible]	[illegible] 48	F	921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	±0.0000	[illegible]	—				
Stake No. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Total [illegible]																
Stake No. 28(B)	[illegible]	F	921	3	24	2400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Stake No. 28(B)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					

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By A.R.P.

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COMPUTATION OF TRAVERSE HARTMAN ~~BASE~~ LINE

(RUNIT ISLAND)

DISTANCES
RUNIT ZERO TOWER – 4(A) 200.0075 m
4(A) to 28(B) 1199.9485 m
Σ 1399.9560 m

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SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP °C	COR: Temp Meters	COR: Tape and Catenary Meters	RECTIONS: Set-up Set-back Meters	RECTIONS: Inclination Meters	RECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(x) DISTANCE FROM RUNIT ZERO TOWER Meters	(y)
FROM 28(B) To:																
Stake No. 41	[illegible]	[illegible]	42	[illegible]	[illegible]	[illegible]	28.5	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]	404.9435	[illegible]
Stake No. 42	[illegible]	[illegible]	42	[illegible]	[illegible]	[illegible]	28.5	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	~~ELEVATION~~	MEAN ELEVATION	REMARKS
	Meters	~~Meters~~ feet	mm	~~Meters~~ m m	Meters	
28 (B)				[illegible]		
29	50	0.59	[illegible]	3		
30	50	-1.79	3.0	3		
31	50	+0.0	0.0	3		
32	50	+0.48		4		
33	50	-0.45	0.2	4		
			Σ [illegible]			

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

RUNIT 15

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	Meters	Meters	Meters	
MARK RUNIT ZERO TOWER BENCH RUNIT ZERO TOWER	0	[illegible]	0			
1	50	[illegible]	[illegible]			
2	50	[illegible]	0			
3	50	[illegible]	[illegible]			
4 (A)	50	[illegible]	0			
		[illegible]	[illegible]			

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EVELS

COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	[redacted]	MEAN ELEVATION	REMARKS
	Meters	Meters	mm	Meters mm	Meters	
4(A)				5-4 Crns.		
5	50	+0.04	[illegible]	0.0		
6	50	-0.62	[illegible]	0.4		
7	50	+1.04	[illegible]	1.4		
8	50	+0.44	[illegible]	[illegible].6		
9	50	+0.54	[illegible]	[illegible].9		
10	50	-0.04	[illegible]	[illegible].0		
11	50	-0.40	[illegible]	2.5		
12	50	-1.16	[illegible]	3.2		
13	50	-0.16	[illegible]	3.2		
14	50	-0.00		3.2		
15	50	+1.38	[illegible]	5.0		
16	50	+0.74	[illegible]	5.6		
17	50	-0.58	[illegible]	5.9		
18	50	+0.50	[illegible]	6.1		
19	50	+0.95	[illegible]	6.9		
20	50	+0.42	[illegible]	[illegible]		
21	50	-0.18	[illegible]	[illegible]		
22	50	-0.54		[illegible].4		
23	50	-0.74		[illegible].9		
24	50	-0.32		[illegible].0		
25	50	-0.40		[illegible]		
26	[illegible]	-0.90		[illegible].9		
27	[illegible]	+0.3[illegible]		[illegible]		
28(B)	[illegible]	-0.34	[illegible]	[illegible]		

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MEAN TEMPERATURE COMPUTATION (RUNIT ISLAND)

HARTMAN LINE TRAVERSE

SECTION 4(A) – 28 (B) FORWARD MEAN

STAKE	Fwd. Therm	Rear Therm	Σ	
4A-5	26.9	[illegible]	[illegible]	
5-6	27.0	26.6	53.6	
			10[illegible]3	Mean [illegible] To stake No 6
6-7	27.1	26.[illegible]	53.8	
			16[illegible]	Mean [illegible] To stake No [illegible]
7-8	27.1	26.5	53.6	
8-9	26.9	26	53.6	
			26[illegible]	Mean [illegible] To stake No. 9
9-10	27.1	[illegible]	[illegible]	
10-11	26.9	[illegible]	53.9	
			37[illegible]	Mean [illegible] To stake No 11
11-12	27.1	[illegible]	[illegible]	
12-13	27.1	[illegible]	54.6	
			48[illegible]	Mean [illegible] To stake No. 13
13-14	27.2	[illegible]	54.3	
			539.4	Mean [illegible] To stake No 14
14-15	27.0	27.5	54.5	
			593.9	Mean [illegible] To stake No. 15
15-16	27.1	[illegible]	54.3	
			648.2	Mean [illegible] To stake No. 16
16-17	27.0	[illegible]	[illegible]	
17-18	27.0	[illegible]	54.2	
			[illegible]	Mean [illegible] To stake No 18
18-19	26.9	[illegible]	[illegible]	
19-20	27.2		54.7	
			[illegible]	Mean [illegible] To stake No. 20
20-21	27.1	[illegible]	[illegible]	
21-22	27.0	[illegible]	54.0	
			[illegible]	Mean [illegible] To stake No 22
22-23	27.1	[illegible]	[illegible]	
23-24	27.4	[illegible]	55.7	
			[illegible]	Mean [illegible] To stake No 24
24-25	27.7	[illegible]	[illegible]	
25-26	27.6	[illegible]	[illegible]	
			[illegible]	Mean [illegible] To stake No. 26
26-27	27.9	[illegible]	[illegible]	
27-28(B)	27.4	[illegible]	[illegible]	
			309.5	Mean [illegible] To stake No. 28

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(RUNIT I)

MEAN TEMPERATURE COMPUTATION

~ HARTMAN LINE TRAVERSE ~

SECTION 28(B) – 33 ~ FORWARD MEAS.

STAKE	Fwd Therm	Rear Therm	Σ	
28(B) – 29	28.0	8.9	56.9	
29 – 30	27.8	8.5	56.3	
30 – 31	28.0	8.5	56.5	
		8.5	169.7	To stake No. 31
31 – 32	28.8	[illegible]	58.8	
		8.5	228.5	To stake No. 32
32 – 33	29.0	[illegible]	60.1	
			288.6	To stake No. 33

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COMPUTATION OF SETUPS, SETBACKS AND OFFSETS
FROM SHAFTS OF THE HARTMAN LINE TRAVERSE
TO ESTABLISHMENT OF OTHER POINTS

[redacted]

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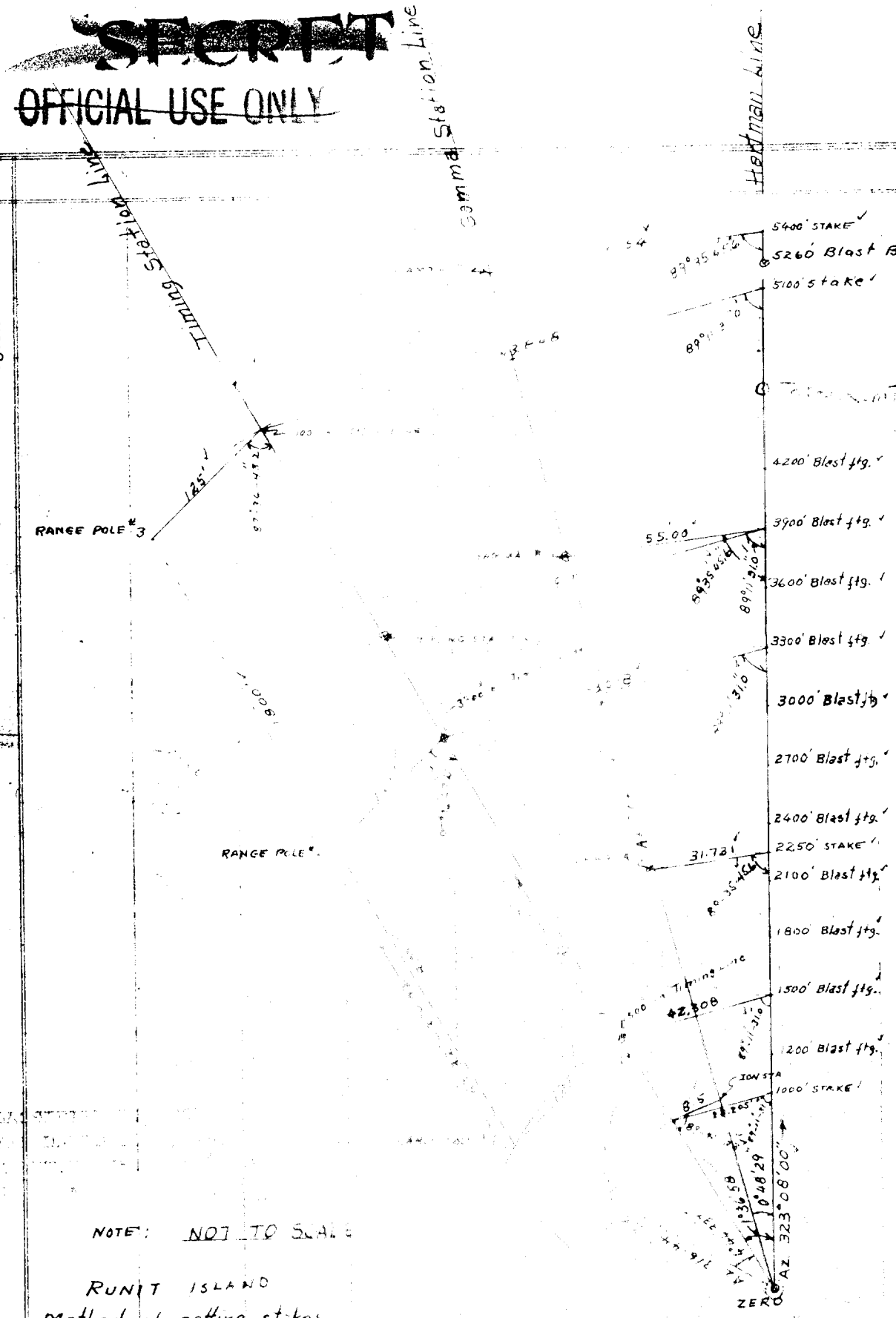

NOTE: NOT TO SCALE

RUNIT ISLAND
Method of setting stakes
by offset from
HARTMAN TRAVERSE LINE

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Computation "Set up" and "Set Backs" [illegible] of the HARTMAN LINE Traverse To proper distances [illegible] points by Chord offsets.

OBJECT TO BE ESTABLISHED	DIST. FROM ZERO TOWER Feet	Meters	NEAREST STAKE NO.	DIST. PER TOWER OFFSET [illegible]	SET UP FROM CLOSEST STK Ft	SET BACK FROM CLOSEST STK m	Ft.
Ionization Sta.	1000	[illegible]	[illegible]	[illegible]	[illegible] 748		
Hartman Sta. & Range Pole #1	1500	[illegible]	[illegible]	[illegible]	[illegible] 2.574		
Hartman Sta.	1800	[illegible]	[illegible]	[illegible]	—	3679	4.488
Hartman Sta.	2100	[illegible]	[illegible]	[illegible]	—	9.9199	32.546
Gamma A	2250	[illegible]	[illegible]	[illegible]	—	14.2225	46.662
Hartman Sta.	2400	[illegible]	[illegible]	[illegible]	—	18.4973	60.687
Hartman Sta.	2700	[illegible]	[illegible]	[illegible]	[illegible]	35.284	
Hartman Sta.	3000	[illegible]	[illegible]	[illegible]	[illegible]	37.224	
Hartman Sta. & Range Pole #2	3300	[illegible]	[illegible]	[illegible]	[illegible]	39.231	
Hartman Sta.	3600	[illegible]	[illegible]	[illegible]	—	2.6915	8.830
TIMING STA. GAMMA B	3900	[illegible]	[illegible]	[illegible]	—	11.2442	36.890
HARTMAN STA.	4200	[illegible]	[illegible]	[illegible]	—	19.7868	64.917
Hartman Sta. & Range Pole #3	5100	[illegible]	[illegible]	[illegible]	[illegible]	14.894	
Gamma C	5400	[illegible]	[illegible]	[illegible]	—	4.0344	13.236
Hartman Sta.	1200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 720	

Blast Bldg ~ Set 10.88 [illegible] Hartman [illegible] Stake #30 = 5260.0 from zero Tower [illegible] Bldg [illegible] original location to the [illegible]

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CHORD & For offset from HARTMAN LINE Distance to 3900' stake for Timing station.

A = 1°36'58"

a = 110
b = 3900
c = 3900
2S = 7810
S = 3905

RUNIT ZERO TOWER
3900' Timing Sta stake.
110' stake on Hartman Line

S-a	3845
S-b	55
S-c	55

log (S-a)	3.584 896
log (S-b)	1.740 362
log (S-c)	1.740 362
	7.065 621
log S	3.597 146
	3.468 475
log r	1.734 237

log r	1.734 237
log (S-a)	3.584 896
log tan ½ A	8.149 34[illegible]
½ A	0-46-27
A	1°-36'-58"

log r	1.734 237
log (S-b)	1.740 362
log tan ½ B	9.993 874
½ B	44-32-[illegible]
B=C=	89-11-3[illegible]

[redacted]

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RUNIT

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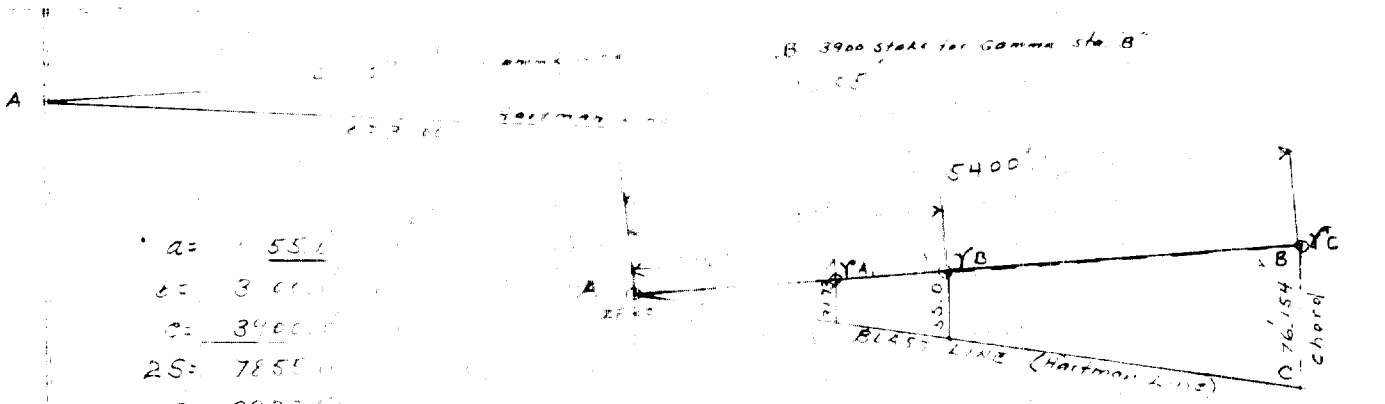
CHORD ∡ + Distances for offsets from Hartman Line Traverse to GAMMA A, B, + C



a = 5551
b = 3 00
c = 3900
2S = 7855
S = 3927.5

S-a = 3872.5
S-b = 27.5
S-c = 27.5

Log S-a = 3.587
" S-b = 1.439
" S-c = 1.439
Σ 6.466
Log S 3.594
2.872
Log r = 1.436

Tan ½ A = $\frac{r}{S-a}$

Log r = 1.436
Log S-a = 3.587
Log tan ½ A = 7.848
½ A = 0° - 24
A = 0° - 48

Log r = 1.436
Log S-b = 1.439
Log tan ½ B = 9.996
½ B = 44° - 4
B = C = 89 - 35 - 4

∡ A = 0° 48 - 28.9
∡ B = 89°-35'-45.6
∡ C = 89°-35-45.6

$\frac{b \sin A}{\sin B}$ = Chord dist ~ Blast line to Gamma

Log 2250 3.352 1825
Log Sin A = 8.149 2893 ✓
Σ 1.501 4718
Log Sin B 9.999 9892
Log dist = 1.501 4826
dist = 31.731 Ft. ✓ GAMMA "A"

Log 5400 3.732 3938
Log Sin A 8.149 2893
Σ 1.881 6831
Log Sin B 9.999 9892
Log dist 1.881 6939
dist = 76.154 Ft. ✓ GAMMA "C"

(Dist to Gamma Checked by similar △)

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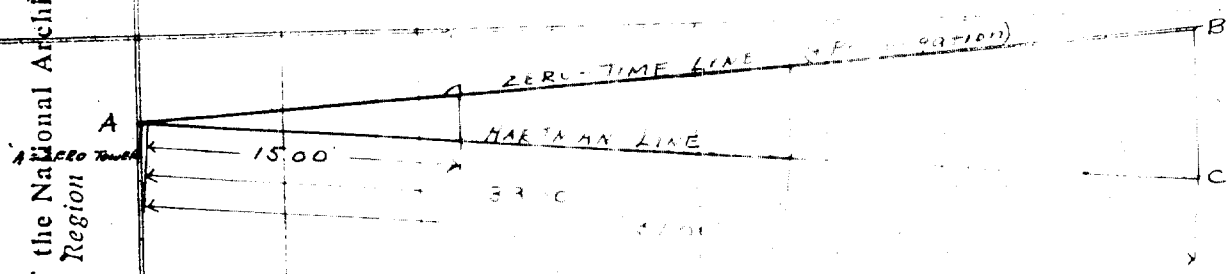
CHORD OFF SETS FROM Hartman Line To [illegible] LINE (For use in setting Range Poles)

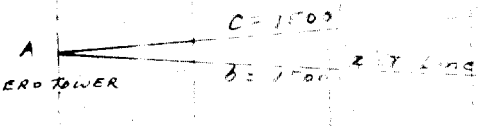


A = 1°-36'-58.0"
B = 89°-N'-31.0"
C = 89°-N-31.0
} From [illegible]

$a = \frac{b \sin A}{\sin B}$ = Chord [illegible] Hartman [illegible]

Log 1500 =	3.176 0913	Log 3300 =	3.707 5702
Log sin A =	8.450 2910	Log sin A =	8.450 2910
Σ	1.626 3823	Σ	2.1578612
Log sin B	9.999 9568	Log sin B	9.999 9568
Log dist =	1.626 4255	Log dist	2.157 0044
Dist =	42.308 Feet	Dist =	143.848 Feet

(Distance [illegible] Chord [illegible] at A)



a =	125.0		
b =	1500.0		
c =	1500.0		
2S =	3125.0		
S =	1562.5		

Log (S-a) =	3.157 60[illegible]	Log r =	1.777 7740
Log (S-b) =	1.795 88[illegible]	Log (S-b) =	1.795 8800
Log (S-c) =	1.795 8800	Log tan ½ B	9.981 8940
Σ	6.749 3677	½ B =	43°-48-21.6
Log S =	3.193 8200	B =	87°-36-43.2
	3.555 5477	C =	87° 36' 43.2
Log r =	1.777 7740	A =	04° 46' 33.7
		Σ	180° 00' 00.1

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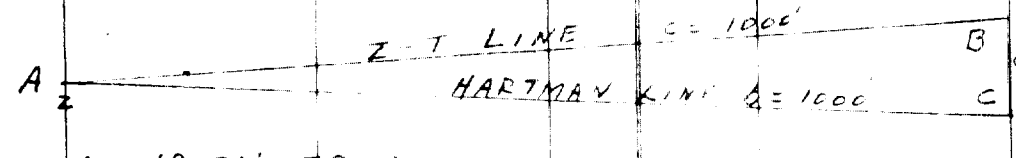
CHORD ∠ + Dist from 1000' pt on HARTMAN LINE TRAVERSE To 1000' point on Zero-Timing station Line

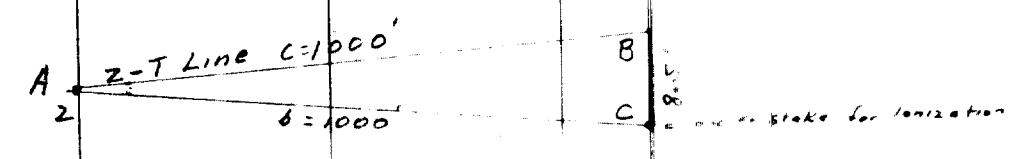


A = 1°-36'-58.0"
B = 89°-11'-31.0" > From previous computation
C = 89°-11'-31.0"

$a = \frac{b \sin A}{\sin B}$ Chord dist Hartman Line to Time Line

Log 1000 = 3.000 0000
Log Sin A = 8.450 2910
Σ = 1.450 2910
Log Sin B = 9.999 9568
Log Dist = 1.450 3342
Dist = 28.205' (Checked by Similar △

CHORD ∠ + Dist From 1000' point on Zero-Timing stn Line to 1000' stake for Ionization Structure.



a = 8.5' s-a 995.75
b = 1000.0 s-b = 4.25
c = 1000.0 s-c = 4.25
2s = 2008.5
s = 1004.25

Log (s-a) = 2.998 1503
Log (s-b) = 0.628 3889
Log (s-c) = 0.628 3889
Σ 4.254 9281
Log s = 3.001 8478
1.253 0864
Log r 0.626 5432

Log r = 0.626 5432
Log (s-a) 2.998 1503
Log tan ½A 7.628 3929
½A 0°-14'-36.63
A 0°-29'-13.3

Log r = 0.626 5432
Log (s-b) = 0.628 3889
Log tan ½B = 9.998 1543
½B = 44-52-41.72
B = 89-45-23.4
C = 89-45-23.4
A = 0-29-13.3
180 00 00.1

Chord dist is Computed to Center of Face of 7'x7' structure Nearest Zero Tower

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TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side a) $\tan \frac{1}{2}(A_p - B_p) = \tan \phi \tan \frac{1}{2}(A_p + B_p)$; $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

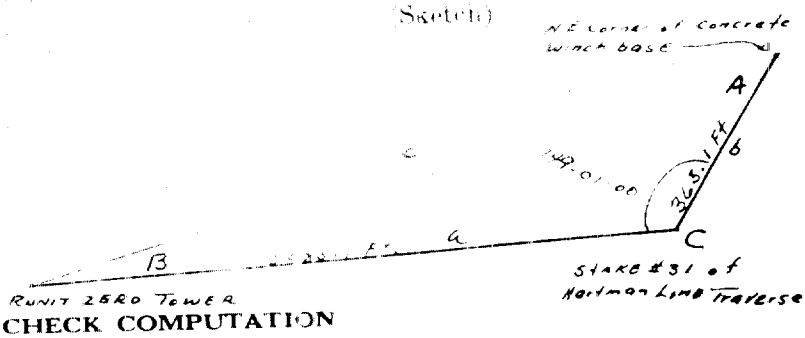
C_s		Log a	3.706 2995
Sph. excess / 3		Log b	3.660 0262
C_p	149 01 00	Log tan (45 + φ)	9.676 2733
$\frac{1}{2} C_p$	74 30 00	(45 + φ)	80 54 56.68
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	15 29 00	φ	44 54 56.68
$\frac{1}{2}(A_p - B_p)$	13 30 [illegible]	Log tan φ	9.997 8729
Sum $= A_p$	28 59 [illegible]	Log tan ½ (A + B)	9.412 7430
Diff $= B_p$	01 59 [illegible]	Log tan ½ (A − B)	9.410 6159
C_p	149 01 00		
	180 00 00		

Log m	
Log sin C_s	
Log a	
Log b	
Log sph. ex.	
Sph. excess	0.0

Log a 3.706 2995
Log sin C_p 9.711 6290
Colog sin A_p 0.314 4354
Log c 3.732 3639

$c = 5399.65$ Ft

(Sketch)



CHECK COMPUTATION

No.	STATION	HORIZONTAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.732 3639
	1 C			149 01 00	0.288 3710
	2 B			01 59 01.74	8.539 2920
	3 A			28 59 58.26	9.685 5647
	1-3			363.1	2.560 0269
	1-2			5085.1	3.706 2996
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

*The subscripts a and p on this form refer [illegible] respectively

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Exhibit A

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COMPUTATION FOR DETERMINING DISTANCE AND AZIMUTH

BETWEEN ZERO TOWER AND PHOTO TOWER

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Ed. Dec. 1929

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RUNIT I

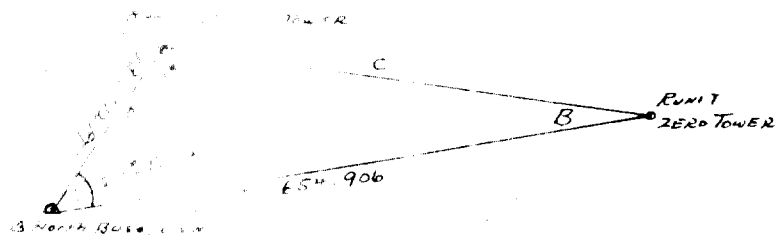
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side [illegible] $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

C_s		Log [illegible]	[illegible] 79[illegible]	Log m
Sph. excess / 3		Log 2	[illegible] 8230	Log sin C_s
C_p	29[illegible]	Log tan 45	[illegible] 496 3559	Log a
$\frac{1}{2}C_p$	[illegible]	$(45°+\phi)$	[illegible] 37 2482	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p-B_p)$	[illegible]	[illegible]	[illegible] 37 2482	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	[illegible]	Log tan	[illegible] 822 8 60	Sph. excess
Sum $=A_p$	143 [illegible]	Log tan [illegible]	0 [illegible] 2 8[illegible]54	
Diff $=B_p$	66 [illegible]	Log tan [illegible]	0 [illegible] 5 6414	
C_p	23 [illegible]			

(Sketch)

Log a	2.816 1[illegible]
Log sin C_p	9.689 5 5[illegible]
Colog sin A_p	0.229 7[illegible]
Log c	2.735 4[illegible]



$C=543.82$ ft

CHECK COMPUTATION

No.	STATION	SUPERIOR ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				2.735 4514
	1	C		29[illegible] 247	0 310 4841
	2	A		143 [illegible] 05 77	9 770 2435
	3	B		66 [illegible] 2953	9 073 8891
	1-3			654.906	2.816 1790
	1-2			[illegible] 22	2 119 8246
	2-3				
	1				
	2				
	3			RUNIT ZERO TOWER	
	1-3				
	1-2				

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*The subscripts [illegible] form refer to spherical and plane angles respectively

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COMPUTATION OF TRAVERSE BETWEEN TRIANGULATION STATION NORTH BASE AND PHONE TOWER

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U. S. COAST AND GEODETIC SURVEY
Form 589
Rev. April 1935

[redacted]

COMPUTATION OF [illegible] TRAVERSE BASE LINE

(RUNIT ISLAND)

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP	COR: Temp. Meters	COR: Tape and Catenary Meters	CORRECTIONS: Setup Set-back Meters	CORRECTIONS: Inclination Meters	CORRECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	[illegible] min	[illegible] min
Base N-BASE USA 944	[illegible]	F	94	[illegible]	[illegible]	[illegible]	29	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
TO BRICK [illegible]		F	166	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
			166	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						

[redacted]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	[redacted] feet	mm	Meters	Meters	
Mark N. Base, U.S.N.						
Bench N. Base, USN	0 "	+ 1.348 "	0			
1	50 "	- 0.31[illegible] "	0			
Bench Runit Photo tower	83[illegible] "	0.00[illegible] "	0			
Mark Runit Photo Tower	0 "	388 "	0			
		Σ				

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COMPUTATION OF TRAVERSE BETWEEN TRIANGULATION STATION NORTH BASE AND ZERO TOWER

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[redacted] ~~OFFICIAL USE ONLY~~

COMPUTATION OF N Base, USN – Run 1 ZERO Temp TRAVERSE ~~BASE~~ LINE

U. S. GOVERNMENT PRINTING OFFICE 11—7896 (RUNIT 5)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Length	UNCORRECTED LENGTH: Meters	TEMP °C	COR: Temp Meters	COR: Tape and Catenary Meters	RECTIONS: Set-up Set-back Meters	RECTIONS: Inclination Meters	RECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(*) mm	(**) mm
Bench																
N. Base USN 1944	2-1-48	F	921'	3	4	200	28.1	+0.0007	-0.0101	+0.0285	0.0014		199.6155	199.6156		
To		F	366'	2			28.4	±0.0000	±0.0000	-0.3940						
Bench Run 1 ZERO Temp							29.1	+0.0004	-0.0136	+0.0285	-0.0014					

[redacted]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	~~Millimeters~~ feet	mm	Meters	Meters	
MARK N. BASE, USN						
Bench N. Base, U.S.N	0	+1.347	0.0			
1	50	+0.517	[illegible]			
2	50	+0.151	[illegible]			
3	50	+0.545	[illegible]			
4	50	+0.846	[illegible]			
Bench RUNIT ZERO	0.3940	-0.034	[illegible]			
MARK RUNIT ZERO	0	-1.870	0.0			
		Σ	[illegible]			

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COMPUTATION FOR DETERMINING TANK REVETMENT LOCATION

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For comp. of Pos. of Tank recement, Route I.

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Form 549
Rev. April 1935

[redacted]

COMPUTATION OF 28(B) to SIK #5 Portion of 28(B) TO 9(E) section BASE LINE

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Length	UNCORRECTED LENGTH Meters	TEMP	COR Temp. Meters	COR Tape and Catenary Meters	RECTIONS Set-up Set-back Meters	RECTIONS Inclination Meters	RECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(x) mm	(yy) mm
28(B) To State Rd 5	28-48	[illegible]	[illegible]											250 [illegible]		

[redacted]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters or feet	mm	Meters	Meters	
28 (B)						
1	50	-0.25	0.0			
2	50	-1.60	2.4			
3	50	-0.35	0			
4	50	-0.60	0.3			
5	50	+0.22	0.0			
			2.8			

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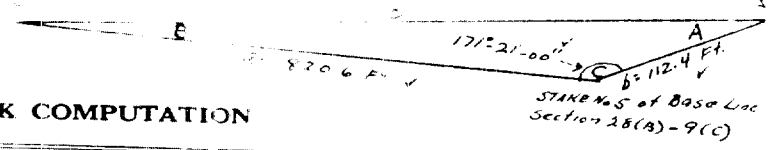
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$: $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

	° ′ ″		
C_s		Log a	4 1315 — Log m
Sph. excess / 3		Log b	7663 — Log sin C_s
C_p	171 21 00	Log tan 45	3652 — Log a
$\frac{1}{2}C_p$	85 4 30	$(45°+\phi)$	2 02 03 — Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	04 19 30	ϕ	2 02 03 — Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	03 17 00	Log tan ϕ	880 2743 — Sph. excess
Sum $=A_p$	07 36 28 63	Log tan $\frac{1}{2}(A_p+B_p)$	878 6895
Diff $=B_p$	01 02 2	Log tan $\frac{1}{2}(A_p-B_p)$	58 9638
C_p	171 21 00		(Sketch)
	180 00 00		

Log a	2.914 1315
Log sin C_p	9.177 2425
Colog sin A_p	0.877 9800
Log c	2.969 3576



c = 931.88 Ft.

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3			93.9 Ft	2.969 3576
	1 C			171 21 00	0.822 7575
	2 B			01 02 21.97	8.258 6513
	3 A			07 36 38.03	9.122 0164
	1-3				2.050 7664
	1-2				2.914 1315
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

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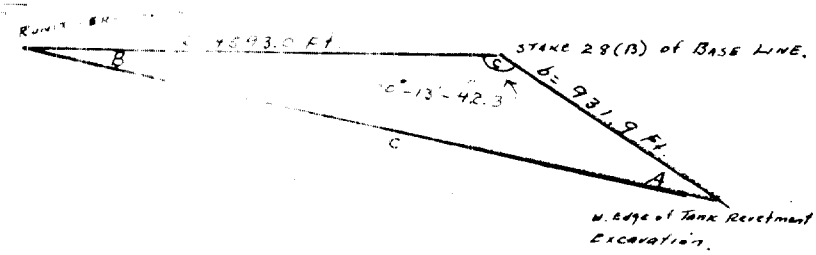
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\varphi)\right.$ (C.I. on side a); $\tan(\ldots)=\tan\varphi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

C_s		Log	0.2[illegible] 0964	Log m
Sph. excess / 3		Log	9.67[illegible] 3576*	Log sin C_s
C_p	[illegible] 42 3'	Log tan [illegible]	[illegible].65[illegible] 7388	Log a
$\frac{1}{2}C_p$	85 [illegible] 51 15	(45 [illegible]	[illegible] 27 28.62"	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p-B_p)$	[illegible] 08 85	[illegible]	[illegible] 27 28.62	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	23 [illegible] 43 38	Log tan [illegible]	9.8[illegible]3 4837	Sph. excess —
Sum $=A_p$	[illegible] 52 24	Log tan [illegible] B_p	9.[illegible] 86 ~~55~~ 67	
Diff $=B_p$	[illegible] 46 25 49	Log tan [illegible] B_p	8.735 ~~3492~~ 3504	
C_p	76 [illegible] 42.3		(Sketch)	* Taken from previous comp.

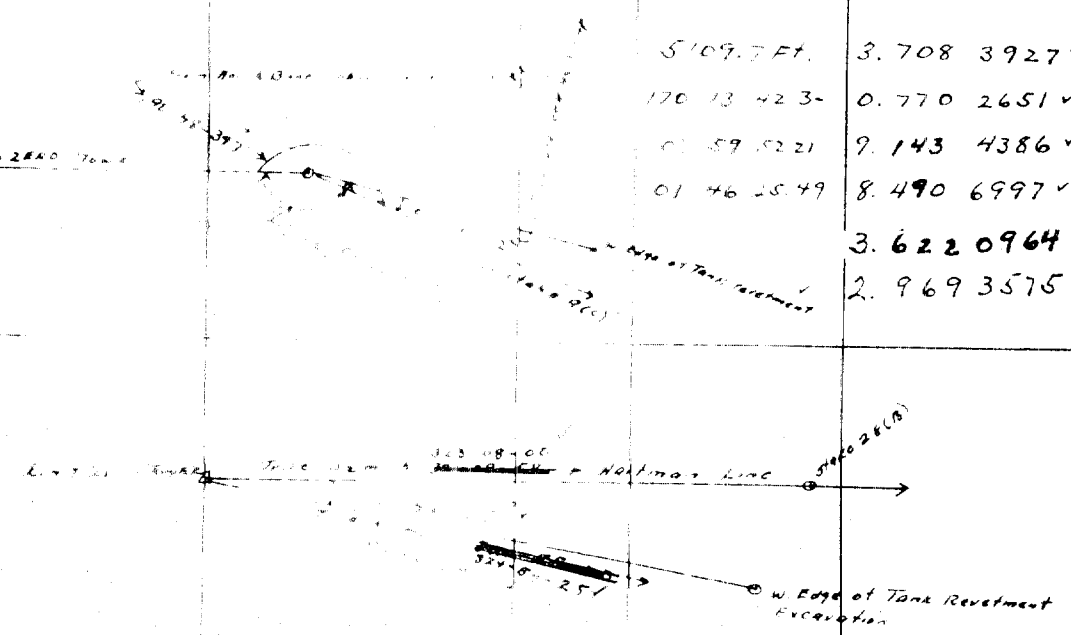
Log a	3.622 [illegible]
Log sin C_p	9.229 [illegible]
Colog sin A_p	0.856 [illegible]
Log c	3.708 [illegible]



C = 5109.7 Ft

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3			5109.7 Ft.	3.708 3927 ✓
	1 C			170 13 42.3	0.770 2651 ✓
	2 A			[illegible] 59 52.21	9.143 4386 ✓
	3 B			01 46 25.49	8.490 6997 ✓
	1-3				3.622 0964
	1-2				2.969 3576
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				



*The subscripts [illegible] in this form refer to spherical [illegible] respectively.

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