CAMPUS MONUMENT SURVEY

Thesis for the Degree of B. S.

J. S. Aldrich W. L. Alston
L. J. Samppala

1935

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Campus Monument Survey

A Thesis Submitted to

The Faculty of

MICHIGAN STATE COLLEGE

of

AGRICULTURE AND APPLIED SCIENCE

By

J. S. Aldrich W. L. Alston L. J. Samppala

Candidates for the Degree of

Bachelor of Science

June 1935

THESIS

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ACKNOWLEDGEMENT

In presenting this thesis it is only fair to acknowledge that without the splendid help and cooperation given us the work would have been impossible. We wish to convey our thanks to the Civil Engineering Department of Michigan State College, as a whole, for their willing advice and the loan of equiptment.

Especially do we wish to express our appreciation to Mr. Smith for his patient supervision, and to Professor Cade for information and equiptment obtained from him both as an individual and as the United States Coast & Geodetic Survey representative. We, at all times, found any request for help promptly and cheerfully supplied, and were never lacking in advice nor guidance

J. S. A.

W. L. A.

L. J. S.

INTRODUCTION

For many years it has been the custom for elementary surveying classes at Michigan State College, to practice surveying on the lawns of the campus. In the course of their work many stakes had been driven and most of them, having served their purpose, were left in the ground. This was a very bad condition in several respects. First, the stakes driven in at traverse points were located more or less at the student's own discretion, resulting in some surveys being completed with amazing accuracy while others showed horrible results. In either case there was no way for an instructor to check up on the location of errors or to discover which part of the data had been "dogged". A second, and perhaps a more or less minor difficulty, was the multitude of stakes which covered the campus. A party might start out with one set of

Chapter 2

stakes and finish up on an entirely different group. This of course, led to much confusion and error.

The main reason for finding a new method to supplant the old system came as an outgrowth of the many complaints from the Buildings and Grounds Department. Power mowers are used by thie department in the upkeep of the lawns of the campus. Many blades were broken off as these machines ran across stakes left projecting above the ground. It was a common event to hear the peacefull purr of a lawn mower stopped with a clang and have the balmy spring air rent with the profanity of an outraged mechanic. It was decided that a remedy must be found to alter these conditions. The remedy chosen was that of concrete monuments whose tops would set flush with the surface of the ground. These originally consisted of fifteen (15) groups, A, to P, with I, omitted. Each group consists of four (4) monuments numbered , one to four (1 to 4).

The area covered was to be from Farm Lane Road on the

east to the Hospital on the west; and from the R.E.Olds Hall of Engineering on the south to Grand River Avenue on the north.

It is planned that at later dates othe groups will be added to the present system.

PURPOSE AND SCOPE

The purpose of this thesis was to accurately determine the coordinates of groups A, to P, inclusive, of the campus monuments.

To do this it was necessary to determine the distances between the points with an accuracy of at least one in ten thousand (1 in 10,000). Angles were to be measured by twenty four (24) repetitions. When these preliminary investigations were completed the data was to be adjusted by the principles of Least Squares. The coordinates of all points were to be computed. The computations were to be based on the United Stases Coast & Geodetic triangulation station, "State" having the X and Y coordinates of 5,000--5,000 respectively.

The following pages relate in detail how this work was done showing results by means of tabulated data, and maps.

When these

FIELD WORK

The field work done by our party can be divided into three parts chaining, turning angles, and sketch mapping.

The chaining was done with as great an accuracy as was possible with three men. A transit was used for lining in from point to point. I n addition to the transit the other tools used in chaining were an invar steel tape, thermometer, spring scales, two chaining bucks or stools, a level rod, a hand level, two marking pins, and two range poles.

The positions of work were as follows: number one man acted as head chainman and rod-man for levels. Number two man was rear chainman, rear marker, and note keeper. Number three man was transit man, front marker, and hand level man.

The tape used was one belonging to the United

States Coast& Geodetic Survey. It had been standardized at known tension and temperature. This tension was carefully held at each reading and the temperature of the tape recorded.

The chaining done was between the number one point of each station or group of monuments. The system was tied in to the triangulation station "State", and the east and west azimuth points to "State". Each line was measured at least two times, the measuring the second time beeing done in the opposite direction from the first and on different days. If the error was found to be greater than one in ten thousand(1 in 10,000), the line was measured the third time. The greatest error on any one line was one in twelve thousand (1 in 12,000) and the least error was one in two hundred and fifty thousand (1 in 250,000). The distances were corrected for temperature, inclination and tape correction.

Turning angles was done with an ordinary 30" engineers transit. Accuracy was obtained by measuring 6 direst then 6 reversed with the telescope inverted, and then measuring the explement of the angle in the same manner. Thus eveyy angle was actually measured twenty four (24) times. Signals used were the flat United States Coast & Geodetic's rods tripods to hold them in place. The rods were leveled up by means of a flat bubble or spirit level.

The accuracy obtained by this method was very satisfactory. Only one angle had to be re-measured, this being due to the faulty placing of a signal.

The before mentioned facts took care of the main traverse. In addition the transit was set up over each number one point and angles weme turned to the subsiderary points, two, three, and four. These angles were not measured by repetition but were taken with great care.

Distances were alse taken from number one (1) to the other monuments of each group, in the ordinary manner.

No corrections were applied to these distances.

The sketch maping consisted of tying each group of monuments into existing structures.

The tools used for sketch mapping were a plane table, an alidade, a compass, a metalic tape, and a set of pins. The sketches were with reasonable accuracy and all tying in distances were measured to tenths of a foot. These sketches were subsequently traced and blueprints made which are contained in the following pages.

The traverse itself was plotted up on a map of the campus which was allready in existence. This map is contained in a pocket in the back of this book.

It is important to note that the traverse itself is accurate but the map is not. When trying to locate any of the points , always refer to the point sketches and not to this map.

COMPUTATIONS AND RESULTS

The following pages show examples of our computations in detail.

It was originally planned to compute the system of points as outlined by the United States Coast & Geodetic Survey methods. The first thing that had to be done was to figure the x and y coordinates of the point, West Azimuth. This was done but due to the fact that this method involved reducing angles and distances to grid angles and distances thus lengthening the computations far beyond the time available this method was discarded along with the computations for the West Azimuth. It was decided to use the plain rectangular coordinate system using the government triangulation station "State", located in front of the power house, as the reference, or datum point. "State" was given the coordinate

values of X=5,000 and Y=5,000 . This brings the origin or zero point, of the system about thirteen hundred (1300) feet west and six thousand (6000) feet south of the intersection of Harrison Road and Michigan Avenue. By placing the coordinate axis in this position it is believed that all future additions to the present system will fall in the first quadrant of the axis.

As worked out , this system is composed of three interconnected traverses and three auxillary points. The distances and angle measurements given for these auxillary points are uncorrected values as taken in the field. Therefore, when using them in the future this fact should be kept in mind and corrections made. They do however contain the field note corrections.

LIST OF OBSERVED ANGLES OF THE SYSTEM

Station	From	To	
State	W. Azimuth	E. Azimuth	172° 10' 30.20"
W. Azimuth	State	A-1	2° 23' 55.00"
State	B-1	W.Azimuth	00° 03' 40.00"
State	E. Azimuth	C-1	9° 51' 43.75"
E. Azimuth	State	D-1	2° 08' 55.70"
A-1	W. Azimuth	B-1	174° 48' 06.50"
A-1	N-1	B-1	114° 27' 50.00"
A-1	B-1	M. B. M.	40° 53' 33.80"
B-1	A-1	State	182° 44' 07.50"
B-1	A-1	C-1	184° 09' 23.10"
C-1	B-1	D-1	164° 37' 48.80"
C-1	D-1	E. AZ.	00° 43' 28.70"
D-1	C-1	E-1	124° 46' 10.30"
D-1	E. AZ.	C-1	171° 39' 51.25"
D-1	E. AZ.	E-1	295° 44' 11.90"
E-1	D-1	F-1	77° 41' 50.60"
F-1	E-1	G-1	139° 36' 31.25"
G-1	F-1	H-1	194° 52'41.90"
G-1	F-1	P-1	297° 14' 30.00"
H-1	G-1	J-1	210° 55' 52.50"
J-1	H-1	K-1	164° 08' 18.80"
K-1	J-1	L-1	178° 36' 57.50"

Station	From	To	
L-1	K-1	M-1	43° 44' 37.50"
M-1	L-1	N-1	121° 54' 15.00"
NW1	A-1	O-1	170° 56' 04.40"
N-1	M-1	A-1	260° 27' 45.00"
C-1	State	D-1	163° 57' 14.38"

REDUCTION TO [illegible]

[illegible]

Average elevation
850 feet

Elevation factor
.[illegible]9[illegible]957

STATION	CORRECTED [illegible] DISTANCE	GEODETIC [illegible]	[illegible]	[illegible]
[illegible].Az.-State	[illegible]01.042	901.004	.[illegible]999971	901.[illegible]01
E.Az.-State	1084.934	1084.[illegible]90		1084.[illegible]7
W.Az.-A,1	337.935	3[illegible]7.919		[illegible]7.91[illegible]
A,1-[illegible],1	329.512	32[illegible].[illegible]		[illegible].993
B,1-State	185.030	185.[illegible]22		185.021
[illegible],1-C,1	57[illegible].012	575.909		575.9[illegible]
C,1-I,1	[illegible]42.488	[illegible]42.4[illegible]2		[illegible]42.460
C,1-State	390.4625	3[illegible].447		3[illegible].440
D,1-E,1	770.080	770.0[illegible]		770.047
D,1-E.Az.	[illegible]1.4[illegible]			
E,1-[illegible],1	509.077	[illegible]		509.061
F,1-G,1	[illegible]20.390	42[illegible].776		420.372
[illegible],1-[illegible],1	352.0005	352.[illegible]		352.[illegible]52
[illegible],1-[illegible],1	[illegible]00.570	[illegible]00.540		[illegible]00.542
J,1-K,1	027.0315	[illegible]7.007		[illegible].005
[illegible],1-[illegible],1	[illegible]35.8[illegible]	[illegible]36.207		[illegible]
L,1-[illegible],1	7[illegible]	[illegible]		[illegible].731
[illegible],1-[illegible],11	64[illegible].[illegible]1	[illegible]		64[illegible].3[illegible]
[illegible],1-O,1	320.5045	[illegible]		[illegible].494
[illegible],1-A,1	4[illegible].407	[illegible]		4[illegible].3[illegible]

Mean latitude = 42° 43' 50.501"

Elevation factor = $\frac{Ra}{Ra + Ave.\ Elev.}$

Log Ra = 5.8304093 - $\frac{1}{2}$ log A - $\frac{1}{2}$ log B

= 5.8304093 - $\frac{1}{2}$ (8.5090488-10) - $\frac{1}{2}$ (8.5106427-10)

= 5.8304093-(9.2545244-10)-(9.25532135-10)

= 7.3205635

Ra = $2^{0920087.661}$

Elevation factor = $\frac{20920088}{29920938}$ = 0.99995937

TRAVERSE NUMBER 1

Scale 1" = 200'

W. L. A.

COMPUTATION OF AZIMUTHS OF TRAVERSE Nº I

Line	Azimuth	Corr.	Corrected Azimuth
W. Az. to State	278° 15' 56.30"		278° 15' 56.30"
∠ State to A-1	2° 23' 55.00"	2.8	57.80"
W. AZ. to A-1	280° 39' 51.30"		280° 15' 54.10"
A-1 to W. AZ.	100° 39' 51.30"		100° 39' 54.10"
∠ W. Az. to B-1	174° 48' 06.50"	2.7	9.20"
A-1 to B-1	275° 27' 57.80"		275° 28' 3.30"
B-1 to A-1	95° 27' 57.80"		95° 28' 3.30"
∠ A-1 to State	182° 44' 07.50"	2.8	10.30"
B-1 to State	278° 12' 05.30"		278° 12' 13.60"
State to B-1	98° 12' 05.30"		98° 12' 13.30"
∠ B-1 to W. Az.	00° 03' 40.00"	2.7	42.70"
State to W. Az.	98° 15' 45.30"		98° 15' 56.30"
State to W.Az(F)	98° 15' 56.30"		
Discrepancy	-11.00"		

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

COMPUTATIONS OF LATITUDE AND DEPARTURE

TRAVERSE N° I

West Azimuth to A-1

Lat.		71.7936
Log Lat.		1.8560875
Log Cos	79° 20' 05.90"	9.2673285-10
Log	387.935	2.58875897-10
Log Sin	79° 20' 05.90"	9.99243242-10
Log Dep.		2.58119139
Dep.		381 .234

A-1 to B-1

Lat.		31.3491
Log Lat.		1.49622518
Log Cos	84° 31' 56.70"	8.97901344-10
Log	329.012	2.51721174
Log Sin	84° 31' 56.70"	9.99801957-10
Log Dep		2.51523131
Dep.		327.515

B-1 to State

Lat		26.4884
Log Lat		1.42305446
Log Cos	81° 47' 46.40"	9.15440630-10
Log	185.630	2.26864816
Log Sin	81° 47' 46.40"	9.99553289-10
Log Dep		2.26418105
Dep		183.7304

Hyperbolic-1

Root (sqrt) to 1-1

Inc.		4.72E8C
Dec. Ter.		7.8E0E0AD
Log Gcd	434.40, 0E.38	0.0E4D.0F-7E
Log	4E7.4,	3.EE9A-3B4-7E
Mod Sin	38, E., 0E.40,	A.A (3E3D-7D
Tot Dec.		0.8E1790.5
Dec.		8EF .5A:

A-1 to 1-1

Inc.		31.D+0I
Pol Ter.		1.4D8E.4E4
Cos Sin	C, 1, 0C.A0,	0.E3D3714-7D
Dec	C.1.0 -	9.01A71A
Tot Sin	0E, 11, 1.A0,	9.9DDF1B.A-7A
Log Deb		9.1I3E.1EI
Cos.		3A.+1I

Inv Sqrt

Cos		4.+.D4
-Sq Sin		I.3D0.7E0
Log Cos	7I, 4D, 47.+,	C.IE.4D+D-ID
Inc	A2.D++	E.4E3-4I3
Tc Inv	1, 1, 1. .4D	D.D++.4D8E-D
Tot Deb		7.D++7D9E
Dec		I3C.+D+

State to West Azimuth

Lat		129.651
Log Lat		2.11277680
Log Cos	81° 44' 03.70"	9.15764635-10
Log	901.842	2.95513045
Log Sin	81° 44' 03.70"	9.99546504-10
Log Dep		2.95059549
Dep		892.474

CORRECTIONS FOR LATITUDE AND DEPARTURE

TRAVERSE N° I

$$\text{Corr.} = \frac{\text{Total error} \cdot \text{Latitude (Departure)}}{\text{Sum of all the Latitudes (Deparatures) with out regard to sign}}$$

Constants;

$$\text{Lat.} = \frac{0.257}{136.76} = 0.00015197$$

$$\text{Dep.} = \frac{.005}{892.479} = 0.0000056$$

Line	Lat	Corr.	Dep	Corr.
West Azimuth to A-1	71.7938	.0109	381.234	.0021
A-1 to B-1	31.3490	.0048	327.515	.0020
B-1 to State	26.4884	.0040	183.730	.0010
		.0197		.0050

Name	r_{ij}	r_{ij}^2	Job	Corr.
Test Method	1.1250	.0109	107.345	.3011
Y-I to -	1.3-.0	.0040	308.415	.0000
P-I Do [illegible]	01.1000	.0020	748.230	.0010

$$r_{ij} = \frac{\text{[illegible]}}{\text{[illegible]}} = 0.0001\text{[illegible]}$$

$$r_{ij} = \frac{\text{[illegible]}}{\text{[illegible]}} = 0.0001\text{[illegible]}$$

Corr. Est. to:

$$\text{Corr. Est.} = \frac{\text{[illegible]}}{\text{[illegible]}}$$

Corr. of Pooled Est. to [illegible]:

Pooled Corr. Estimate (Do Not Use)

Pooled Corr. Estimate (Do Not Use)

Deg	01.1000
Do [illegible]	2.1 .0001
Do [illegible]	01 [illegible] 01.1021
Deg [illegible]	01.1021
Deg [illegible]	0.1.3-01-10
Not Int	7.110 2.01
Int	1.80.01

COMPUTATION OF COORDINATE POINTS OF TRAVERSE N°I

Point	X	Y
State	5,000.000	5,000.000
	-892.474	66 129.651
West Azimuth	4,107.526	5,129.651
	+381.232	- 71.8047
A-1	4,488 .758	5,057.8463
	+327 .513	- 31.3539
B-1	4,816.271	5,026.4924
	+ 183.729	- 26.4924
State	5,000.000	5,000.0000

[illegible]

TABULATED RESULTS OF

Pt.	Line	Azimuth	Bearing	Distance	Latitude	
					N	S
W.Az M.	AZ-A	280 39 54.10	S79 20 05.90E	387.935		71.7938
A	A-B	275 28 03.30	S84 31 56.70E	329.012		31.3491
B	B-St.	278 12 13.60	S81 47 46.40E	185.630		26.4884
St	St-Waz	98 15 56.30	N81 44 03.70W	901.842	129.651	
					129.651	129.6313
					129.6313	
				Diff	.0197	

TRAVERSE N^{o} I

Departure		Corrections				Balanced	
						Latitude	Departure
E	W	N	S	E	W		
381.234			.011	.002		- 71.805	381.232
327.515			.005	.002		- 31.3539	327.513
183.730			.004	.001		- 26.492	183.729
	892.474					129.651	892.474
892.479	892.474						
892.474							
.005	Diff						

Documents		Corrections				Retained	
N						No. Stamps	Declarations
852.854			.011	.012		- 81.402	781.452
852.852			.012	.014		- 21.752	741.752
152.752			.014	.021		- 12.092	132.752
	092.452					752.521	092.472
852.752	092.752						
852.752							
852.	752.						

Traverse Number 2

Scale 1" = 200'

W.L.A.

COMPUTATIONS OF AZIMUTHS OF TRAVERSE NO II

Line	Azimuth	Corr.	Corrected Azimuths
E. AZ to State	90° 26' 26.50"		90° 26' 26.50"
∠ State to D-1	2° 08' 55.70"	+.29	55.99"
E. AZ. to D-1	92° 35' 22.20"		92° 26' 26.50"
D-1 to E. AZ	272° 35' 22.20"		272° 35' 22.49"
∠ E.AZ to C-1	171° 39' 51.25"	+.30	51.55"
D-1 to C-1	84° 15' 13.45"		84° 15' 14.04"
C-1 to D-1	264° 15' 13.45"		264° 15' 14.04"
∠ D-1 to State	196° 02' 45.62"	+.24	45.91"
C-1 to State	100° 17' 59.07"		100° 17' 59.95"
State to C-1	280° 17' 59.07"		280° 17' 59.95"
∠ C-1 to E.AZ.	350° 08' 16.25"	+.30	16.58"
State to E. AZ.	270° 26' 25.32"		270° 23' 26.50"
State To E. AZ (Fixed)	270° 26' 26.50"		
Discrepancy	- 1.18		

Item	[illegible]	Some	[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]	[illegible]

[illegible] - T-IE

(In [illegible])

COMPUTATIONS OF LATITUDE AND DEPARTURE

TRAVERSE Nº II

East Azimuth to D-1

Lat.		2.7775
Log Lat		0.44365757
Log Cos	87° 24' 37.41"	8.65495893-10
Log	61.485	1. 78869854
Log Sin	87° 24' 37.41"	9.99955627-10
Log Dep		1.78825481
Dep		61.412

D-1 to C-1

Lat.		64.3257
Log Lat		1.80858461
Log Cos	84° 15' 14.04"	9.00052230-10
Log	642.488	2.80736231
Log Sin	84° 15' 14.04"	9.99781232-10
Log Dep		2.80567463
Dep		639.256

C-1 to State

Lat		69.656
Log Lat		1.84295219
Log Cos	79° 42' 0.05"	9.25137231-10
Log	390.463	2.59157988
LogSin	79° 42' 0.05"	9.99294437-10
Log Dep		2.59452425-10
Dep		384.171

CORRECTIONS FOR LATITUDES AND DEPARTURES

TRAVERSE No. II

$$\text{Corr} = \frac{\text{Total error} \cdot \text{Latitude (Departure)}}{\text{Sum of all the Latitudes (Departure) without regard to sign}}$$

Constants;

$$\text{Lat.} = \frac{0.237}{136.76} = 0.0017329$$

$$\text{Dep.} = \frac{0.063}{1084.639} = 0.00005807$$

Line	Lat	Corr	Dep	Corr
E. Az. to D-1	2.778	.005	61.412	.0036
D-1 to C-1	64.326	.111	639.256	.0371
C-1 to State	69.656	.121	384.171	.0223
		.237		.0630

COMPUTATION OF COORDINATES OF TRAVERSE N° II

Point	X	Y
State	5,000.000	5,000.000
	+ 1,084.902	- 8.345
East Azimuth	6,084.902	4,991.655
	- 61.416	+ 2.783
D-1	6,023.486	4,994.438
	- 639.293	- 64.215
C-1	5,384.193	4,930.223
	- 384.193	+69.777
State	5,000.000	5,000.000

[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]

TABULATED RESULTS OF

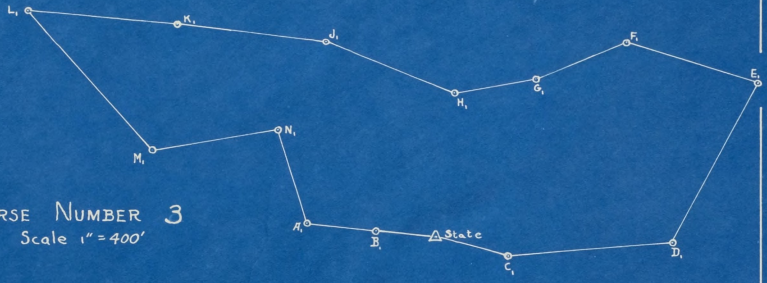
Pt.	Line	Azimuth	Bearing	Distance	Latitude	
					N	S
St.	St.-E. Az.	270 26 26.50	S89 33 33.50E	1084.934		8.345
E.Az.	E.Az.-D	92 35 22.49	N87 24 37.51W	61.485	2.778	
D	D-C	84 15 14.04	S84 15 14.04W	642.488		64.326
C	C-St.	100 17 59.95	N79 42 00.05W	390.463	69.656	
					72.434	72.671
						72.434
						Diff. .237

TRAVERSE N° II

Departure		Corrections				Balanced	
		Latitude		Deparature		Lat.	Dep.
E	W	N	S	E	W		
1084.902			.			- 8.345	1084.902
	61.412	.005			.004	2.783	-61.416
	639.256		.111		.037	-64.215	-639.293
	384.171	.121			.022	69.777	-384.193
1084.902	1084.839						
1084.839							
.063	Diff.						

TRAVERSE N° II

Departure		Corrections				Balanced	
		Latitude		Departure		Lat.	Dep.
E	W	N	S	E	W		
1084.902			.			- 6.345	1084.902
	61.412	.005			.004	2.783	-61.416
	639.246		.111		.037	-64.215	-639.283
	384.171	.121			.022	69.777	-384.193
1084.902 1054.839	1084.839						
.063	Diff.						



TRAVERSE NUMBER 3

Scale 1" = 400'

W. L. R.

COMPUTATIONS OF AZIMUTHS OF TRAVERSE N°III

Line	Azimuth	Corr.	Corrected Azimuth
D-1 to C-1	84° 15' 14.04"		84° 15' 14.04"
∠ C-1 to E-1	124° 46' 10.30"	-.10	10.20"
D-1 to E-1	209° 01' 24.34"		209° 01' 24.24"
E-1 to D-1	29° 01' 24.34"		29° 01' 24.24"
∠ D-1 to F-1	77° 41' 50.60"	-.10	50,50"
E-1 to F-1	106° 43' 14.94"		106° 43' 14.74"
F-1 to E-1	286° 43' 14.94"		286° 43' 14.74"
∠ E-1 to G-1	139° 36' 31.25"	-.09	31.16"
F-1 to G-1	66° 19' 46.19"		66° 19' 45.90"
G-1 to F-1	245° 19' 46.19"		245° 19' 45.90"
∠ F-1 to H-1	194° 58' 41.90"	-.10	41.80"
G-1 to H-1	81° 12' 28.09"		81° 12' 27.70"
H-1 to G-1	261° 12' 28.09"		261° 12' 27.70"
∠ G-1 to J-1	210° 55' 52.50"	-.10	52.40"
H-1 to J-1	112° 08' 20.59"		112° 08' 20.10"

Line	Azimuth	Corr.	Corrected Azimuth
J-1 to H-1	292° 08' 20.59"		292° 08' 20.10"
∠ H-1 to K-1	164° 08' 18.80"	-.10	18.70"
J-1 to K-1	96° 16' 39.39"		96° 16' 38.80"
K-1 to J-1	276° 16' 39.37"		276° 16' 39.80"
∠ J-1 to L-1	178° 36' 57.50"	+.09	57.41"
K-1 to L-1	94° 53' 36.87"		94° 53' 36.21"
L-1 to K-1	274° 53' 36.87"		274° 53' 36.21"
∠ K-1 to M-1	43° 44' 37.50"	-.10	37.40"
L-1 to M-1	318° 38' 14.37"		318° 38' 13.61"
M-1 to L-1	138° 38' 14.37"		138° 38' 13.61"
∠ L-1 to N-1	121° 54' 15.00"	-.10	14.90"
M-1 to N-1	260° 32' 29.37"		260° 32' 28.51"
N-1 to M-1	80° 32' 29.37"		80° 32' 28.51"
∠ M-1 to A-1	260° 27' 45.00"	-.10	44.90"
N-1 to A-1	341° 00' 14.37"		341° 00' 13.41"
A-1 to N-1	161° 00' 14.37"		161° 00' 13.41"
∠ N-1 to B-1	114° 27' 50.00"	-.09	49.90"
A-1 to B-1	275° 28' 04.37"		275° 28' 03.30"
A-1 to B-1 (Fixed)	275° 28' 03.30"		
Discrepancy	+ 1.07"		

COMPUTATIONS OF LATITUDE AND DEPARTURES

TRAVERSE Nº III

D-1 to E-1

Lat.		673.899
Log Lat		2.82859498
Log Cos	29° 01' 24.24"	9.94172089-10
Log	770.680	2.88687409
Log Sin	29° 01' 24.24"	9.68589106-10
Log Dep		2.57276515
Dep		373.908

E-1 to F-1

Lat		169.483
Log Lat		2.22912266
Log Cos	73° 16' 45.36"	9.45895059-10
Log	589.077	2.77017207
Log Sin	73° 16' 45.36"	9.98123785-10
Log Dep		2.75140992
Dep		564.170

F-1 to G-1

Lat		168.777
Log Lat		2.22731371
Log Cos	66° 19' 45.90"	9.60366133-10
Log	420.390	2.62365238
Log Sin	66° 19' 45.90"	9.96183329-10
Log Dep		2.58548567
Dep		385.022

G-1 to H-1

Lat.		53.815
Log Lat		1.73089901
Log Cos	81° 12' 27.70"	9.18427431-10
Log	352.0665	2.54662470
Log sin	81° 12' 27.70"	9.99486635-10
Log Dep		2.54149105
Dep		347.930

H-1 to J-1

Lat		226.322
Log Lat		2.35473618
Log Cos	67° 51' 39.90"	9.57617255-10
Log	600.570	2.77856363
Log Sin	67° 51' 39.90"	9.96673895-10
Log Dep		2.74530258
Dep		556.292

J-1 to K-1

Lat		68.562
Log Lat		1.83608039
Log Cos	83° 43' 21.20"	9.03879103-10
Log	627.0315	2.79728936
Log Sin	83° 43' 21.20"	9.99738817
Log Dep		2.79467753
Dep		623.272

K-1 to L-1

Lat.		54.194
Log Lat		1.73395383
Log Cos	85° 06' 23.79"	8.93095925-10
Log	635.323	2.80299458
Log Sin	85° 06' 23.79"	9.99841416-10
Log Dep		2.80140874
Dep		633.008

L-1 to M-1

Lat.		590.522
Log Lat		2.77123643
Log Cos	41° 21' 45.63"	9.87537484-10
Log	786.795	2.89586159
Log Sin	41° 21' 45.63"	9.82008520-10
Log Dep		2.71594679
Dep		519.932

M-1 To N-1

Lat.		90.196
Log Lat		1.95518802
Log Cos	80° 32' 29.37"	9.21572565-10
Log	548.861	2.73946237
Log Sin	80° 32' 29.37"	9.99405521-10
Log Dep		2.73351758
Dep		541.399

left		[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]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]

N-1 to A-1

Lat.		406.022
Log Lat		2.60854897
Log Cos	18° 59' 46.50"	9.97567985-10
Log	429.407	2.63286912
Log Sin	18° 59' 46.50"	9.51255936-10
Log Dep		2.14542848
Dep		139.775

CORRECTIONS FOR LATITUDE AND DEPARATURE

TRAVERSE Nº III

Constants: Lat. $= \frac{.112}{2501.792} = 0.00004477$

Dep. $= \frac{.048}{4684.71} = 0.000010246$

Line	Lat.	COrr.	Dep.	Corr.
D-1 E-1	673.899	.030	373.908	.004
E-1 to F-1	169.483	.008	564.170	.006
F-1 to G-1	168.777	.007	385.022	.004
G-1 to H-1	53.815	.002	387.930	.004
H-1 to J-1	226.322	.010	556.292	.006
J-1 to K-1	68. 562	.003	623.272	.006
K-1 to L-1	54.194	.002	633.008	.007
L-1 to M-1	590.522	.026	519.932	.005
M-1 to N-1	90.196	.004	541.399	.005
N-1 to A-1	460.022	.020	139.775	.001
		.112		.048

[illegible]

[illegible]

[illegible]

COMPUTATION OFF COORDINATES OF TRAVERSE Nº III

Point	X	Y
D-1	6,023.486	4,994.438
	+373.904	+673.869
E-1	6,397.390	5,668.307
	- 564.176	+ 169.475
F-1	5,833.214	5,837.782
	- 385.026	- 168.784
G-1	5,448.188	5,668.998
	- 347.934	- 53.817
H-1	5,100.254	5,615.181
	- 556.298	+226.312
J-1	4,543.956	5,841.493
	- 623.278	+ 68.559
K-1	3,920.678	5,910.052
	-633.015	+ 54.192
L-1	3,287.663	5,964.244
	+ 519.927	- 590.548
M-1	3,807.590	5,373.696
	+ 541.394	+ 90.192
N-1	4,348.984	5,463.888
	+ 139.774	- 406.042
A-1	4,488.758	5,057.846

Ref.	Line	Departure	Distance	Latitude	
E	E-F	[illegible]	740.689	673.899	
F	F-G	[illegible]	402.044	169.488	
G	G-H	[illegible]	430.890		158.777
H	H-J	[illegible]	439.067	85.819	
J	J-K	[illegible]	900.850	838.382	
K	K-L	[illegible]	897.065	56.882	
L	L-M	[illegible]	336.225	96.194	
M	M-N	[illegible]	765.748	893.888	
N	N-	[illegible]	948.881	91.796	
P	P-	[illegible]	439.407	406.022	
Q	Q-	[illegible]	615.615	81.884	
R	R-			86.482	
Set	[illegible]			8.845	
				8.708	
T	T-U	(Point)			
			7238.847	1288.847	
			1288.847		

TABULATED RESULTS OF

Pt.	Line	Azimuth	Bearing	Distance	Latitudes	
D	D-E	209 01 24.24	N29 01 24.24E	770.680	673.899	
E	E-F	106 43 14.74	N73 16 45.36W	589.077	169.483	
F	F-G	66 19 45.90	S 66 19 45.90W	420.390		168.777
G	G-H	81 12 27.70	S81 12 27.70W	352.067		53.815
H	H-J	112 08 20.10	N67 51 39.90W	600.570	226.322	
J	J-K	96 16 38.80	N83 43 21.20W	627.032	68.562	
K	K-L	94 53 36.21	N85 06 23.79W	635.323	54.194	
L	L-M	318 38 14.37	S41 21 45.63E	786.795		590.522
M	M-N	260 32 29.37	N80 32 24.37E	548.861	90.196	
N	N-A	341 40 13.41	S18 59 46.52E	429.407		406.022
A	A-B	275 28 03.30	S84 31 56.70EE	329.012		31.354
B	B½ State					26.492
St.	State-- E.Az. (These Computations					8.345
E.Az.	From Traverse #2)					
	E.Az.---D				2.783	
D	D-E	(Above)				
					1285.439	1285.327
					1285.327	
					.112	

TRAVERSE NUMBER THREE

Departures		Corrections				----Balanced-------- Latitudes	Departures	
E	W	N	S	E	W			
373.908		.030		.004		673.869	373.904	D
	564.170	.008			.006	169.475	564.176	E
	385.022		.007	/ØØ7	.004	168.784	/385.026	F
	347.930		.002	/ØØ2/	.004	53.817	347.934	G
	556.292	.010			.006	226.312	556.298	H
	623.272	.003			.006	68.559	623.278	J
	633.008	.002			.007	54.192	633.015	K
519.932			.026	.005		590.548	519.927	L
541.399		.004		.005		90.192	541.394	M
139.775			.020	.001		406.042	139.774	N
327.513								A
								E
183.729								B
1084.902								St.
								E/A/
								E.Az.
	61.416							D
3171.158	3171.110							
3171.110								
.048								

COMPUTATION OF AZIMUTH OF EXTRANEOUS POINTS

Line	Computation	Azimuth
A-1 to B-1	275° 28' 03.30"	
/ B-1 to M.B.M.	40/ 53' 33.80"	
A-1 to M.B.M.	316° 21' 37.10"	316° 21' 37.10"
G-1 to F-1	246° 19' 45.90"	
/ F-1 to P-1	297° 14' 30.00"	
G-1 to P-1	183° 34' 15.90"	183° 34' 15.90"
N-1 to A-1	341° 00' 13.41"	
/ A-1 to O-1	170° 56' 04.40"	
N-1 to O-1	151° 56' 17.81"	151° 56' 17.81"

Coordinates of M.B.M.

Azimuth of A-1 to B-1	275	28	03.3
Angle B-1,A-1,M.B.M.	40	53	33.8
Azimuth of A-1 to M.B.M.	316	21	3711
Bearing of A-1 to M.B.M.	S 43	38	22.9 E
Distance	134.795 ft.		

Lat.	97.550
Log Lat.	1.98922870
Log Cos.	9.85955492
Log Line	2.12967378
Log Sin.	9.83892430
Log Dep.	1.96859808
Dep.	93.024

	Y-Lat.	X-Dep.
Coordinates of A-1	5057.846	4488.758
- M.B.M.	97.550	93.024
Coordinates of M.B.M.	4960.296	4581.782

Increase in [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Increase of [illegible]	[illegible]	[illegible]
	[illegible]	
Dep.	[illegible]	
Cap Dep.	[illegible]	
Dep Exp.	[illegible]	
Fed Tax	[illegible]	
Tax Inc.	[illegible]	
Cap Exp.	[illegible]	
Net.	[illegible]	
Discount	[illegible]	
Earned of [illegible]	[illegible]	[illegible]
Wages of [illegible]	[illegible]	[illegible]
Wages of [illegible]	[illegible]	[illegible]
Wages of [illegible]	[illegible]	[illegible]

COORDINATES OF O-1

Azimuth of N-1,A-1	341	00	13.41
Angle ∠,N,O	170	56	04.40
	511	56	17.81
	360		
Azimuth of N-1	151	56	17.81
Bearing of N-1 to O-1	N 28	03	42.19 W
Distance	226.505 ft.		
Lat.	199.877		
Log Lat.	2.30076286		
Log Cos.	9.94568607		
Log Line	2.35507679		
Log Sin.	9.67248725		
Log Dep.	2.02756404		
Dep.	106.553		

	Y-Lat.	X- Dep.
Coordinates of N-1	5463.888	4348.984
O-1	199.877	106.553
Coordinates of O-1	5663.765	4455.537

COORDINATES OF O-J

Coordinates of O-J	5805.965	4585.084
J-I	190.814	108.880
Coordinates of I-J	4450.889	4584.344
	X-Dist.	X- Dep.
Dep.		108.088
Log Dep.		2.034358C4
Log Sin.		9.679492S8
Log Time		8.3540726
Log Cos.		9.9468858C
Log Tat.		8.4009582C
Tat.		159.044
Distance		256.884 Ft.
Bearing of I-J to O-J	N 28 0E	17.2E
Azimuth of I-J	INI E	17.2E
	S6C	
	SII SE	17.2E
Angle #J,O	110 [illegible]	162.40
Azimuth of J-I,J-J	S11 OE	17.2E

Coordinates Of P-1

Azimuth	G-1,F-1	246	19	45.9
Length	G-1, P-1	222.622 ft.		
Angle	F,G,P	297	14	30.0
		246	19	45.9
		543	34	15.9
		360		
Azimuth	G-1, P-1	183	34	15.9
Bearing		N. 3	34	15.9
Lat.		222.194		
Log. Lat.		2.34672597		
Log. Cos.		9.99915589		
Log. Line		2.34757008		
Log. Sin.		8.79439951		
Log. Dep.		1.14196959		
Dep.		13.8665		

	Y-Lat.	X-Dep.
Coordinates of G-1	5668.988	5448.188
P-1	222.194	13.866
Coordinates of P-1	5891.182	5462.054

Coordinates of A-1, A-2, & A-3

Azimuth of A,B	275°	28'	03.3"
A-2	1	09	30.0
	276	37	33.3
A-3	1	48	30.0
	277	16	03.3
A-4	1	58	30.3
	277	36	33.3

Bearings					Distances
A-1, A-2	S. 83°	22'	26.7"	E.	9.965
A-1, A-3	S. 82	43	26.7	E.	19.960
A-1, A-4	S. 82	23	26.7	E.	29.851

Latitude	1.150	2.528	3.953
Log. Lat.	90.06063217	0.40276773	0.59696275
Log. Cos.	9.06215487	9.10259719	9.12200387
Log. Line	0.99847730	1.30016054	1.47495888
Log. Sin.	9.99708948	9.99648880	9.99615874
Log. Dep.	0.99556678	1.29664934	1.47111762
Departure	9.898	19.799	29.588

Coordinates of A-1 X=4488.758, Y=5057.846

4488.758	5057.846	4488.758	5057.846	4488.758	5057.846
9.898	1.150	19.799	2.528	29.588	3.953
4498.656	5056.696	4508.557	5055.318	4518.346	5053.893

	X	Y
A-2	4498.656	5056.696
A-3	4508.557	5055.318
A-4	4518.346	5053.893

Coordinates of B-2, B-3, B-4.

Azimuth of B-1---A-1		95	28	03.3
∠	B-2	232	22	00.00
Azimuth		327	50	03.3
∠	B3	232	33	00.0
Azimuth		328	01	03.3
	B-4	232	19	00.0
Azimuth		327	47	03.3

Bearings:		Distances
B-1 to B-2	S 32 09 56.7 E	9.903 ft.
B-1 " B-3	S 31 58 56.7 E	19.980 "
B-1 " B-4	S 32 12 56.7 E	30.029 "

Latitude	8.383	16.760	25.406
Log Lat.	0.92339967	1.22427341	1.40494385
Log Cos.	9.92763289	9.92367793	9.92729298
Log Line	0.99576678	1.30059548	1.47754087
Log Sin.	9.72621386	9.73590347	9.72681591
Log Dep.	0.72198064	1.03649895	1.20435678
Departure	5.272	10.877	16.010

Coordinates of B-1 Y--5026.492 X-- 4816.271

5026.492	4816.271	5026.492	4816.271	5026.492	4816.492
8.383	5.272	16.760	10.877	25.406	16.010
5018.109	4821.543	5009.732	4827.148	5001.086	4832.281

	X	Y
B-2	4821.543	5018.109
B-3	4827.148	5009.732
B-4	4832.281	5001.086

Element of ...		...	...
$\sqrt{}$	...	...	...
Element	...	...	...
$\sqrt{}$	...	...	...
Element	...	...	...
Element	...	...	...
Element	...	...	...
Constant:			...
... to ...	...	...	...
... ...	...	...	...
... ...	...	...	...

Function	...	...	...
log ...	...	...	...
log ...	...	...	...
log ...	...	...	...
log ...	...	...	...
log ...	...	...	...
log ...	...	...	...

Conversion ...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...

COORDINATES OF C-1, C-2, & C-3

Azimuth of C-1, D-1	264°	15'	14.04"
C-2	91	32	00.00
	355	47	14.04
C-3	91	42	00.00
	355	57	14.04
C-4	92	03	00.00
	356	18	14.04

Bearing				Distance
C-1, C-2	S. 04°	12'	45.96 E	9.977
C-1, C-3	S. 04	02	45.96 E	19.980
C-1, C-4	S. 03	41	45.96 E	30.035

Lat.	9.950	19.9302	29.969
Log. Lat.	0.99882497	1.29951169	1.47672336
Log. Cos.	9.99882500	9.99891621	9.99909572
Log. Line	0.99899997	1.30059548	1.47762764
Log. Sine	8.86605453	8.84855415	8.80932115
Log. Dep.	9.86505450	0.14914963	0.28694877
Dep.	0.73292	1.40977	1.93619

Coordinates of C-1 X=5384.193 Y=4930.223

4930.223	5384.193	4930.223	5384.193	4930.223	5384.193
9.950	0.733	19.930	1.409	29.969	1.936

	X	Y
C-2	5384.926	4920.273
C-3	5385.603	4910.293
C-4	5386.129	4900.254

| | | |

COORDINATES OF D-2, D-3, & D-4

Azimuth of D-1, E-1	209°	01'	24.24"
D-2	131	05	00.00
	340	06	24.24
D-3	131	14	30.00
	340	15	54.24
D-4	130	54	00.00
	339	55	24.24

Bearing					Distance
D-1, D-2	S. 19°	53'	35.76"	E.	9.991
D-1, D-33	S. 19	44	05.76	E.	19.880
D-1, D-4	S. 20	04	35,76	E.	29.985

Lat.	9,3948	18.7133	28.163
Log. Lat.	0.97288820	1.27212804	1.44967791
Log. Cos.	9.97327924	9.97371166	9.97277386
Log, Line	0.99960896	1.29841638	1.47690405
Log. Sin	9.53182384	9.52849287	9.53564499
Log. Dep.	0.53143260	0.82690925	1.01254904
Dep.	3.3996	6.129	10.2932

Coordinates of D-1 X =6023.466 Y = 4994.438

D-2x	D-2y	D-3x	D-3y	D-4x	D-4y
6023.466	4994.438	6023.466	4994.438	6023.466	4994.438
3.400	9.395	6.129	18.713	10.293	28.163

	X	Y
D-2	6026.886	4985.043
D-3	6029.615	4975.725
D-4	6033.779	4966.275

COORDINATES OF POINTS E-2, E-3, E-4

Azimuth of E-1 toF-1		106° 43' 14.74"
	E-2	309° 23' 00.00"
		56° 06' 14.74"
	E-3	309° 39' 00.00"
		56° 22' 14.70"
	E-4	309° 16' 00.00"
		56° 59' 14.74"

Line	Bearing	Distance
E-1 to E-2	S 56° 06' 14.74" W	9.862
E-1 to E-3	S 56° 22' 14.74" W	19.876
E-1 to E-4	S 56° 59' 14.74" W	30.051

Lat	5.5012	11.0002	16.3724
Log Lat	0.74045377	1.04169408	1.21411356
Log Cos	9.74638877	9.74336509	9.73625463
Log Line	0.99396500	1.29832899	1.47785893
Log Sin	9.91910574	9.92045697	9.92352986
Log Dep	0.90407074	1.21878596	1.40138879
Dep	8.2044	16.9495	25.257

Coordinates of E-1 X = 6397.390 Y = 5668.307

E-2x	E-2y	E-3x	E-3y	E-4x	E-4y
6397.390	5668.307	6397.390	5668.307	6397.390	5668.307
- 8.204	- 5.501	-16.950	-11.000	-25.257	-16 .372

	X	Y
E-2	6389.186	5662.806
E-3	6380.440	5657.307
E-4	6372.133	5651.935

COORDINATES OF POINTS F-1, F-2, F-3, & F-4

Azimuth of F-1 to E-1		286° 43' 14.74"
	F-2	370 26' 45.00"
		324° 09' 59.74"
	F-3	26° 20' 00.00"
		3 12° 03' 14.74"
	F-4	26° 12' 00.00"
		312° 56' 14.74"

Line	Bearing	Distance
F-1 to F-2	S 35° 50' 00.26" E	10.322
F-1 to F-3	S 46° 56' 45.26" E	20.083
F-1 to F-4	S 47° 03' 45.26" E	30.279

	F-2	F-3	F-4
Lat	8.3683	13.7107	20.626
Log Lat	0.92263654	1.13705954	1.31441402
Log Cos	9.90887269	9.83422095	9.83327249
Log Line	1.01376385	1.30283859	1.48114153
Log Sin	9.76747455	9.86374620	9.86457071
Log Dep	0.78123840	1.16658479	1.34571224
Dep	6.0428	14.6753	22.167

Coordinates of F-1 X = 5833.214 Y 5837.788

F-2x	F-2y	F-3x	F-3y	F-4x	F-4y
5833.214	5837.788	5833.214	5837.788	5833.214	5837.788
+ 6.042	- 83368	14.675	- 13.710	22.167	- 20.626

	X	Y
F-2	5839.256	5829.414
F-3	5847.889	5824.072
F-4	5855.381	5817.156

COORDINATES OF POINTS G-2, G-3, G-4.

Azimuth of G-1 to F-1	246°	19' 45.90"
G-2	83°	21' 00.00"
G-3	329°	40' 45.90"
G-3	66°	59' 30.00"
	313°	19' 25.90"
G-4	83°	39' 30.00"
	329°	58' 25.90"

Line	Bearing	Distance
G-1 to G-2	S 30° 19' 14.10" E	9.976
G-1 to G-3	S 46° 40' 34.10" E	21.069
G-1 to G-4	S 30° 01' 34.10" E	29.689

	G-2	G-3	G-4
Lat	8.6114	14.4559	25.710
Log Lat	0.93507516	1.16004509	1.41001187
Log Cos	9.93611872	9.83640117	9.93741630
Log Line	0.99895644	1.32364398	1.47259557
Log Sin	9.70215147	9.86182509	9.69931263
Log Dep	0.70210791	1.18546901	1.17190820
Dep	5.0633	15.3274	14.8562

Coordinates of G-1 X 5448.188 Y 5668.988

G-2x	G-2y	G-3x	G-3y	G-4x	G-4y
5448.188	5668.988	5448.188	5668.988	5448.188	5668.988
5.062	- 8.611	15.327	-14.456	14.856	- 25.710
5453.251	5660.377	5463.515	5654.532	5463.044	5643.278

	X	Y
G-2	5453.251	5660.377
G-3	5463.515	5654.532
G-4	5463.044	5643.278

COORDINATES OF POINTS H-2, H-3, H-4.

Azimuth of G-1 to H-1		261° 12' 27.70"
	H-2	1° 31' 30.00"
		262° 43' 57.70"
	H-3	1° 14' 30.00"
		262° 26' 57.70"
	H-4	1° 10' 00.00"
		262° 22' 27.70"

Line	Bearing	Distance
H-1 to H-2	N 82° 43' 57.70" E	9.735
H-1 to H-3	N 82° 26' 57.70" E	19.790
H-1 to H-4	N 82° 26' 27.20" E	29.770

	H-2	H-3	H-4
Lat	1.23429	2.3313	3.9598
Log Lat	0.09141668	0.42017227	0.59767053
Log Cos	9.10308072	9.11959852	9.12388170
Log Line	0.98833596	1.30057375	1.47378883
Log Sin	9.99649721	9.99621794	9.99614193
Log Dep	0.99483317	1.29679169	1.46993076
Dep	9.8817	19.8057	29.507

COORDINATES OF H-1 X 5100.254 Y 5615.181

H-2x	H-2y	H-3x	H-3y	H-4x	H-4y
5100.254	5615.181	5100.254	5615.181	5100.254	5615.181
9.882	-1 .234	19.806	- 2.631	29.507	- 3.960
5110.136	5613.947	5120.060	5612.550	5129.761	5611.221

	X	Y
H-2	5110.136	5613.947
H-3	5120/060	5612.550
H-4	5129.761	5611.221

COORDINATES OF POINTS J-2, J-3, J-4.

Azimuth of J-1 to K-1		96° 16' 38.80"
	J-2	187° 32' 30.00"
		283° 49' 8.80"
	J-3	187° 24' 30.00"
		283° 40' 8.80"
	J-4	186° 55' 00.00"
		283° 11' 38.80"

Line	Bearing	Distance
J-1 to J-2	S 76° 10' 51.20" E	9.990
J-1 to J-3	S 76° 19' 51.20" E	20.075
J-1 to J-4	S 76° 19' 21.20" E	30.025

	J-2	J-3	J-4
Lat	2.3862	4.7440	7.0996
Log Lat	0.37770584	0.67614735	0.85123446
Log Cos	9.37384035	9.57349180	9.37375144
Log Line	0.99956549	1.30265555	1.47748302
Log Sin	9.98724357	9.98752167	9.98750630
Log Dep	0.98680906	1.29017722	1.46498932
Dep	9.7008	19.5064	29.174

Coordinates of J-1 X 4543.956 Y 5841.493

J-2x	J-2y	J-3x	J-3y	J-4x	J-4y
4543.956	5841.493	4543.956	5841.493	4543.956	5841.493
9.701	- 2.386	19.506	- 4.744	29.174	- 7.100
4553.657	5839.107	4563.462	5836.749	4573.130	5834.393

	X	Y
J-2	4553.657	5839.107
J-3	4563.462	5836.749
J-4	4573.130	5834.393

COORDINATES OF POINTS K-2, K-3, & K-4

Azimuth of	**K-1, L-1**	94°	53'	36.21"
	K-2	159°	24'	30000"
		254°	18'	06.21"
	K-3	159°	41'	00.00"
		254°	34'	36.21"
	K-4	159°	50'	00.00"
		254°	43'	36.21"

Line	Bearing	Distance
K-1, K-2	N. 74° 18' 06.2" E.	9.965
K-1, K-3	N. 74° 34' 36.2" E.	20.115
K-1, K-4	N. 74° 43' 36.2" E.	29.931

	K-2	K-3	K-4
Lat.	2.6963	5.6319	7.8845
Log Lat.	0.43076083	0.72931794	0.89677673
Log Cos	9.43228356	9.42579790	9.42065550
Log Line	0.99847730	1.30352004	1.47612123
Log Sin	9.98349080	9.98407126	9.98438333
Log Dep	0.98196810	1.28759130	1.46050456
Dep	9.5933	19.3906	28.874

Coordinates of K-1 X=3930.271 Y=5912.748

K-2x	K-2y	K-3x	K-3y	K-4x	K-4y
3930.271	5912.748	3930.271	5912.748	3930.271	5912.748
+9.598	+9.698	+19.302	+5.362	+28.874	+7.885
3930.271	5912.748	3940.069	5915.414	3949.592	5917.937

	X	Y
K-2	3930.271	5912.748
K-3	3940.069	5915.414
K-4	3949.592	5917.937

COORDINATES OF POINTS L-2, L-3, & L-4

Azimuth of	L-1, K-1	274°	53'	36.2"
	L-2	24°	49'	00.00"
		299°	42'	36.2"
	L-3	23°	12'	30.00"
		298°	05'	06.20"
	L-4	23°	03'	30.00"
		297°	56'	06.20"

Line	Bearing	Distance
L-1, L-2	S. 60° 17' 23.8" E.	9.934
L-1, L-2	S. 61° 54' 53.8" E.	19.953
L-1, L-4	S. 62° 03' 53.8" E.	30.043

	L-2	L-3	L-4
Lat	4.923	9.415	14.074
Log Lat.	0.69226445	0.97382706	1 1.14842470
Log Cos.	9.69514029	9.67381886	9.67068140
Log Line	0.99712416	1.30000820	1.47774330
Log Sin	9.93879234	9.94559174	9.94619654
Log Dep	0.93791650	1.24599945	1.42593984
Dep	8.668	17.604	26.542

Coordinates of L-1 X=3287.663 Y=5964.244

L-2x	L-2y	L-3x	L-3y	L-4x	L-4y
3287.663	5964.244	3287.663	5964.244	3287.663	5964.244
+8.668	-4.923	+17.604	-9.415	+26.542	-14.074
3296.331	5959.321	3305.267	5954.829	3314.205	5950.170

	X	Y
L-2	3296.331	5959.321
L-3	3305.267	5954.829
L-4	3314.205	5950.170

ОБЪЕМЫ ГРУЗОВ ПО ПОРТАМ I-Е, I-З, И I-Ч

Импорт по I-й, т.

I-Ч	[illegible]	[illegible]	[illegible]
I-Ъ	[illegible]	[illegible]	[illegible]
I-Ы	[illegible]	[illegible]	[illegible]
I-Э	[illegible]	[illegible]	[illegible]
I-Ю	[illegible]	[illegible]	[illegible]
I-Я	[illegible]	[illegible]	[illegible]

Грузооборот по I-й, т.

I-Ч	[illegible]	[illegible]	[illegible]
I-Ъ	[illegible]	[illegible]	[illegible]
I-Ы	[illegible]	[illegible]	[illegible]
I-Э	[illegible]	[illegible]	[illegible]
I-Ю	[illegible]	[illegible]	[illegible]
I-Я	[illegible]	[illegible]	[illegible]

Грузооборот по I-й, т. [illegible]

	I-Э	I-Ъ	I-Ч
Нефть	[illegible]	[illegible]	[illegible]
Уголь	[illegible]	[illegible]	[illegible]
Руда	[illegible]	[illegible]	[illegible]
Лес	[illegible]	[illegible]	[illegible]
Зерно	[illegible]	[illegible]	[illegible]
Сахар	[illegible]	[illegible]	[illegible]
Хлопок	[illegible]	[illegible]	[illegible]
Прочие	[illegible]	[illegible]	[illegible]

Средний вес 1 т груза, т

Импорт	[illegible]	[illegible]
Экспорт	[illegible]	[illegible]
Транзит	[illegible]	[illegible]

Грузооборот по I-й, т.км

I-Ч	[illegible]	[illegible]	[illegible]
I-Ъ	[illegible]	[illegible]	[illegible]
I-Ы	[illegible]	[illegible]	[illegible]
I-Э	[illegible]	[illegible]	[illegible]
I-Ю	[illegible]	[illegible]	[illegible]
I-Я	[illegible]	[illegible]	[illegible]

Среднее расстояние перевозки по I-й, км

I-Ч	[illegible]	[illegible]
I-Ъ	[illegible]	[illegible]
I-Ы	[illegible]	[illegible]
I-Э	[illegible]	[illegible]
I-Ю	[illegible]	[illegible]
I-Я	[illegible]	[illegible]

COORDINATES OF POINTS M-2, M-3, & M-4

Azimuths of	M-1, N-1	260°	32'	29.37"
	M-2	24°	05'	00.00"
		284°	37'	29.37"
	M-3	24°	17'	30.00"
		284°	49'	59.37"
	M-4	24°	11'	30.00"
		284°	43'	59.37"

Line	Bearing	Distance
M-1, M-2	S. 75° 22' 30.6" E.	9.770
M-1, M-3	S. 75° 10' 0.6" E.	19.674
M-1, M-4	S. 75° 16' 0.6" E.	29.784

	M-2	M-3	M-4
Lat	2.467	5.037	7.574
Log Lat.	0.39213339	0.70214653	0.87936462
Log Cos	9.40223683	9.40825366	9.40538160
Log Line	0.98989456	1.29389267	1.47398302
Log Sin	9.98569600	9.98528021	9.98546035
Log Dep	0.97559056	1.27917296	1.45946337
Dep	9.453	19.018	28.805

Coordinates of M-1 X=3807.590 Y=5373.696

M-2x	M-2y	M-3x	M-3y	M-4x	M-4y
3807.590	5373.696	3807.590	5373.696	3807.590	5373.696
+9.453	-2.467	+19.018	-5.037	+28.805	-7.574
3817.043	5371.229	3826.608	5368.659	3836.395	5366.122

	X	Y
M-2	3817.043	5371.229
M-3	3826.608	5368.659
M-4	3836,695	5366.122

Antimony	of J-1, T-1	NOS	[illegible]	[illegible]
	J-2	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]
	T-2	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]
	J-4	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]

Item	Cost /	Index
M-1, M-3	[illegible]	[illegible]
M-1, M-2	[illegible]	[illegible]
M-1, M-4	[illegible]	[illegible]

	B-T	B-S	T-1
T-4	[illegible]	[illegible]	[illegible]
Ind Cost	[illegible]	[illegible]	[illegible]
Ind Cost	[illegible]	[illegible]	[illegible]
Ind Cost	[illegible]	[illegible]	[illegible]
Ind Cost	[illegible]	[illegible]	[illegible]
Def	[illegible]	[illegible]	[illegible]

Documentation of J-1 [illegible] [illegible]

M-Ex	J-Ex	B-Ex	T-Ex	J-Ex
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	M	A
M-4	[illegible]	[illegible]
M-3	[illegible]	[illegible]
M-1	[illegible]	[illegible]

COORDINATES OF POINTS N-2, N-3, & N-4

Azimuth of N-1, A-1	341°	00.00'	13.41"
N-2	335°	08'	30.00"
	316°	08'	43.41"
N-3	335°	36'	00.00"
	316°	36'	13.41"
N-4	335°	53'	30.00"
	316°	53'	43.41"

Line	Bearing	Distance
N-1, N-2	S. 43° 51' 16.6" E.	10.120
N-1, N-3	S. 43° 23' 46.6" E.	20.100
N-1, N-3	S. 43° 06' 16.6" E.	30.075

Coordinates of N-1 X=4348.984 Y=5463.988

	N-2	N-3	N-4
Lat	7.297	14.540	21.958
Log Lat	0.86317531	1.16255323	1.34159153
Log Cos	9.85799480	9.86130614	9.86336589
Log Line	1.00518051	1.30124709	1.47820564
Log Sin	9.84062806	9.83698311	9.83463300
Log Dep	0.84580857	1.13823020	1.31283864
Dep	7.011	13.748	20.551

4348.984	5463.988	4348.984	5463.988	4348.984	5463.988
+7.011	-7.297	+13.748	-14.540	+20.551	-21.958
4355.995	5456.591	4362.732	5449.348	4369.535	5441.930

	X	Y
N-2	4355.995	5456.591
N-3	4362.732	5449.348
N-4	4369.535	5441.930

COORDINATES OF 0-2, 0-3, & 0-4

Azimuth of 0-1, N-1	331° 56' 17.8"	
0-2	329° 53' 00.0"	
	301° 49' 17.8"	
0-3	330° 15' 00.0"	
	302° 11' 17.8"	
0-4	330° 55' 00.0"	
	302° 51' 17.8"	

Line	Bearing	Distance
0-1, 0-2	S. 58° 10' 42.2" E.	9.921
0-1, 0-3	S. 57° 48' 42.2" E.	19.809
0-1, 0-4	S. 57° 08' 42.2" E.	29.849

	0-2	0-3	0-4
Lat	5.231	10.552	16.194
Log Lat	0.71859372	1.02334781	1.20934107
Log Cos	9.72203827	9.72848526	9.73441228
Log Line	0.99655545	1.29686255	1.47492979
Log Sin	9.92926249	9.92752546	9.92430345
Log Dep	0.92581794	1.22438801	1.39923324
Dep	8.430	16.764	25.074

Coordinates of 0-1 X=4455.537 Y=5663.765

4455.537	5663.765	4455.537	5663.765	4455.537	5663.765
+8.430	-5.231	+16.764	-10.552	+25.074	-16.194
4463.967	5658.534	4472.301	5653.213	4480.611	5647.571

	X	Y
0-2	4463.975	5658.534
0-3	4472.301	5653.213
0-4	4480.611	5647.571

COORDINATES OF P-2, P-3, & P-4

Azimuth of	P-1, C-1	3°	54'	15.9"
	P-2	188°	35'	00.0"
		192°	09'	15.9"
	P-3	187°	56'	00.0"
		191°	05'	15.9"
	P-4	187°	58'	00.0"
		191°	32'	15.9"

Line	Bearing	Distance
P-1, P-2	N. 12° 09' 15.9" E.	4.985
P-1, P-3	N. 11° 05' 15.9" E.	19.876
P-1, P-4	N. 11° 32' 15.9" E.	30.051

	P-2	P-3	P-4
Lat	9.7612	19.130	29.445
Log Lat	0.98950198	1.29014571	1.46899328
Log Cos	9.99015391	9.99181672	9.99113435
Log Line	0.99934807	1.29832899	1.47785893
Log Sin	9.32335028	9.28400782	9.30106040
Log Dep	0.32269835	0.58233681	0.77891933
Dep	2.1023	3.8224	6.0106

Coordinates of P-1 X=5462.054 Y=5891.182

5462.054	5891.182	5462.054	5891.182	5462.054	5891.182
+2.102	+9.761	+3.822	+19.130	+6.011	+29.443
5464.156	5900.943	5465.876	5910.312	5468.065	5920.625

	X	Y
P-2	5464.156	5900.943
P-3	5465.876	5910.312
P-4	5468.065	5920.625

TABULATED COORDINATES

STATION	X-Coordinate	Y-Coordinate
State	5000.000	5000.000
West Azimuth	4107.526	5129.651
East Azimuth	6084.902	4991.655
Master B. M.	4581.782	4960.296
A-1	4488.758	5057.843
A-2	4498.656	5056.696
A-3	4508.557	5055.318
A-4	4518.346	5053.893
B-1	4816.271	5026.492
B-2	4821.543	5018.109
B-3	4827.148	5009.732
B-4	4832.281	5001.086
C-1	5384.193	4930.223
C-2	5384.926	4920.273
C-3	5385.603	4910.293
C-4	5386.129	4900.354
D-1	6023.483	4994.438
D-2	6026.886	4985.043
D-3	6029.615	4975.725
D-4	6033.779	4966.275
F-1	5833.214	5837.788
F-2	5839.256	5829.414
F-3	5847.699	5824.072
F-4	5855.381	5817.156

State	X-Coordinate	X-Coordinate
State	[illegible]	[illegible]
West [illegible]	[illegible]	[illegible]
West [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
W-7	[illegible]	[illegible]
W-8	[illegible]	[illegible]
W-9	[illegible]	[illegible]
W-1	[illegible]	[illegible]
-T	[illegible]	[illegible]
B-8	[illegible]	[illegible]
B-1	[illegible]	[illegible]
-2	[illegible]	[illegible]
T-T	[illegible]	[illegible]
C-8	[illegible]	[illegible]
C-9	[illegible]	[illegible]
C-4	[illegible]	[illegible]
T-F	[illegible]	[illegible]
-1	[illegible]	[illegible]
E-8	[illegible]	[illegible]
T-4	[illegible]	[illegible]
F-T	[illegible]	[illegible]
F-5	[illegible]	[illegible]
F-N	[illegible]	[illegible]
F-O	[illegible]	[illegible]

TABULATED COORDINATES (cont.)

STATION	X-Coordinate	Y-Coordinate
E-1	6397.390	5668.307
E-2	6389.186	5662.806
E-3	6380.440	5657.307
E-4	6372.135	5651.935
G-1	5448.188	5668.968
G-2	5453.251	5660.377
G-3	5458.315	5654.532
G-4	5463.044	5643.278
H-1	5100.254	5615.181
H-2	5110.136	5613.947
H-3	5120.000	5612.500
H-4	5129.761	5611.231
J-1	4543.958	5841.493
J-2	4553.657	5839.107
J-3	4563.462	5836.749
J-4	4573.130	5834.393
K-1	3930.276	5912.748
K-2	3930.271	5912.748
K-3	3940.069	5915.414
K-4	3949.592	5917.937
L-1	3287.363	5964.214
L-2	3296.331	5959.321
L-3	3305.267	5954.829
L-4	3314 205	5950.170

TABLE IV. CONTINUED (CONT'D.)

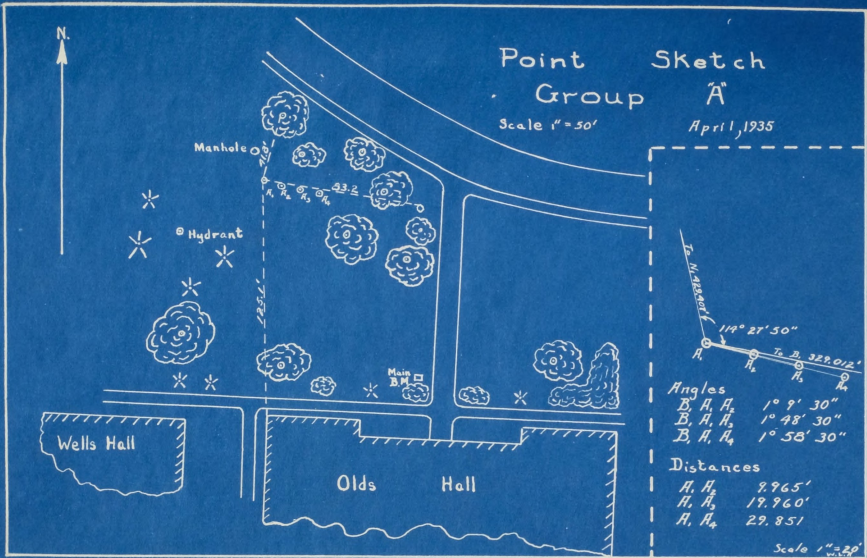
STATION	X-COORDINATE	Y-COORDINATE
M-1	2884.40	1978.264
M-2	6798.21	4.0.0.0.0
M-3	6110.05	3814.70
M-4	6527.30	4981.80
O-1	8419.60	5.0.0.0.0
O-2	7838.10	5478.280
O-3	84 [illegible]	[illegible]
O-4	8560.04	6.14.280
P-1	8716.20	6512.10
P-2	8772.70	7.0.0.0.0
P-3	8730.40	7.0.0.0.0
P-4	8173.70	6.0.0.0.0
Q-1	7.38.00	4.0.0.0.0
Q-2	8586.10	4.0.0.0.0
Q-3	8.0.0.0.0	4.0.0.0.0
Q-4	8.0.0.0.0	4.0.0.0.0
R-1	8.0.0.0.0	4.0.0.0.0
R-2	8.0.0.0.0	4.0.0.0.0
R-3	8.0.0.0.0	4.0.0.0.0
R-4	8.0.0.0.0	4.0.0.0.0

TABULATED COORDINATES (cont)

Station	X-Coordinate	Y-Coordinate
M-1	3807.590	5373.696
M-2	3817.043	5371.229
M-3	3826.603	5368.659
M-4	3836.095	5366.122
N-1	4348.984	5463.988
N-2	4358.905	5456.591
N-3	4362.732	5449.349
N-4	4369.535	5441.930
O-1	4455.537	5663.765
O-2	4463.973	5658.534
O-3	4472.301	5653.213
O-4	4480.611	5647.571
P-1	5462.054	5891.582
P-2	5464.156	5900.943
P-3	5465.876	5910.312
P-4	5468.065	5920.625

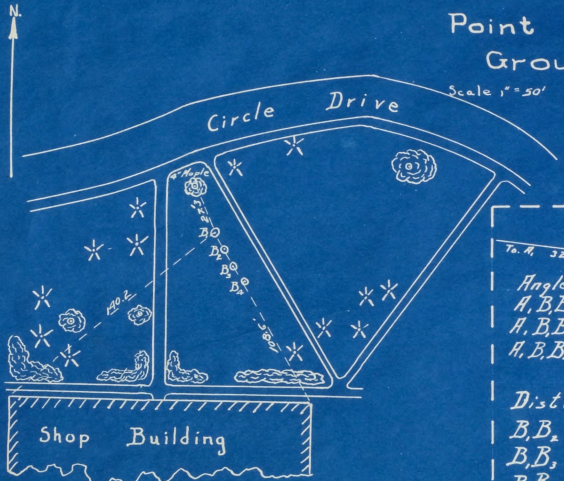
Elevation Coordinate Report

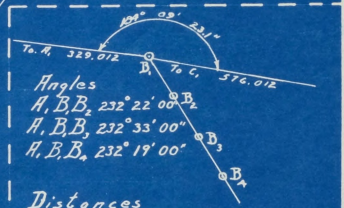
Station	Y-Coordinate	Z-Coordinate
P-4	7408.0470	9480.6BA
P-2	6468.0AC	6210.31A
P-3	9994.7E6	9000.9A6
P-1	7CC0.0CA	6497.6A0
O-4	6A0.6A1	7A4A.6A7
O-2	AA.4A1	6A0.AA0
O-1	6A00.ACC	0688.1C8
O-3	4A66.AA2	0881.1E4
M-4	6A01.AC	6E1T.0A0
M-2	4A0C.AA	6A49.9E7
M-3	4E0C.AA	8E6E.8A8
M-1	4648.CA1	6A.A.0A0
M-4	9858.1C1	8C60.1E8
M-2	38EC.AC	8E4A.0E6
M-3	3ET1.6A	8A1.1E8
M-1	380A.E0A	6A82.880


Point Sketch
Group "A"
Scale 1" = 50'
April 1, 1935
N.
Manhole
41.8'
A1 A2 A3 A4
83.2
Hydrant
125.1'
Main B.M.
Wells Hall
Olds Hall
To N, 429.408'
114° 27' 50"
To B, 329.012'
A1 A2 A3 A4
Angles
B, A1 A2 1° 9' 30"
B, A1 A3 1° 48' 30"
B, A1 A4 1° 58' 30"
Distances
A1 A2 9.965'
A1 A3 19.960'
A1 A4 29.851
Scale 1" = 20'

Point Sketch
Group "B"

Scale 1" = 50' April, 1935





Angles

A, B, B_2 232° 22' 00"

A, B, B_3 232° 33' 00"

A, B, B_4 232° 19' 00"

Distances

B, B_2 9.903

B, B_3 19.930

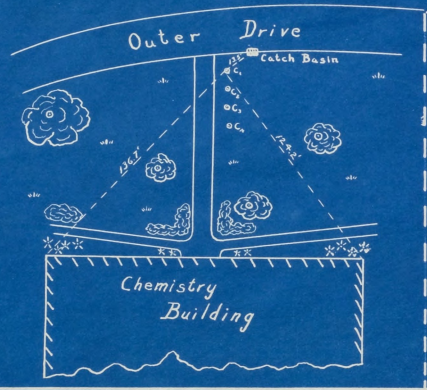
B, B_4 30.022

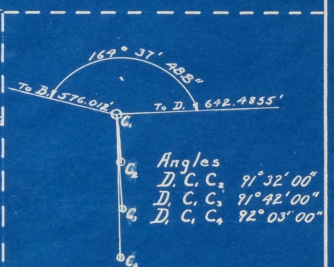
Scale 1" = 20'

Point Sketch Group "C"

Scale 1" = 50' April, 1935

N.





Angles

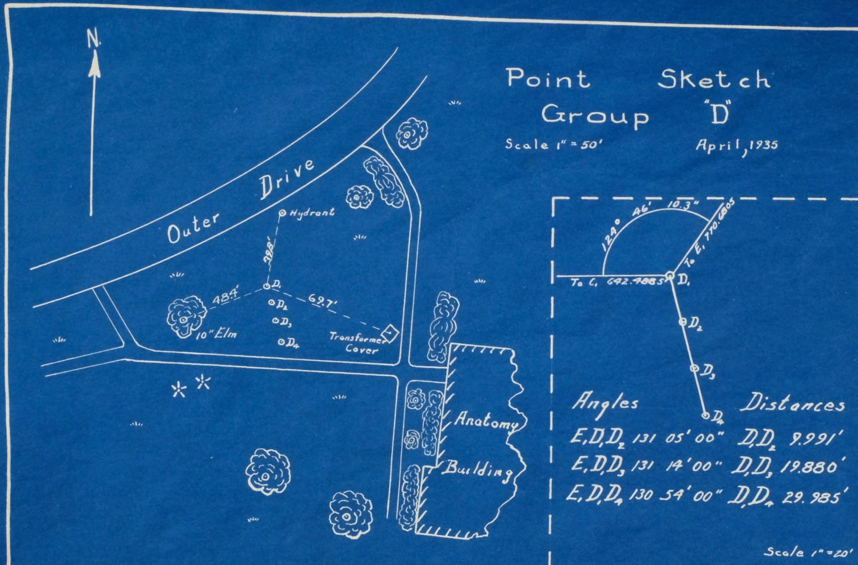
D. C. C_2	91° 32' 00"
D. C. C_3	91° 42' 00"
D. C. C_4	92° 03' 00"

Distance

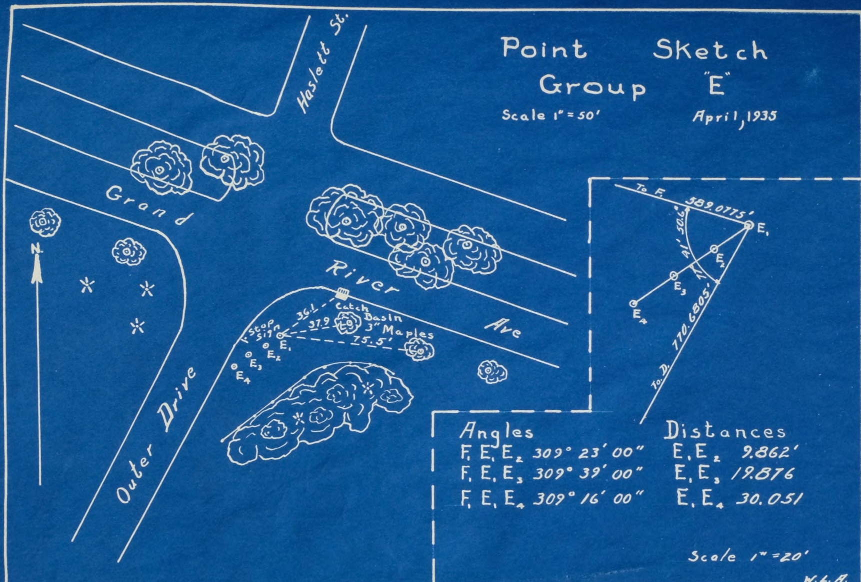
$C_1 C_2$	9.977
$C_1 C_3$	19.980
$C_1 C_4$	30.035

Scale 1" = 20'

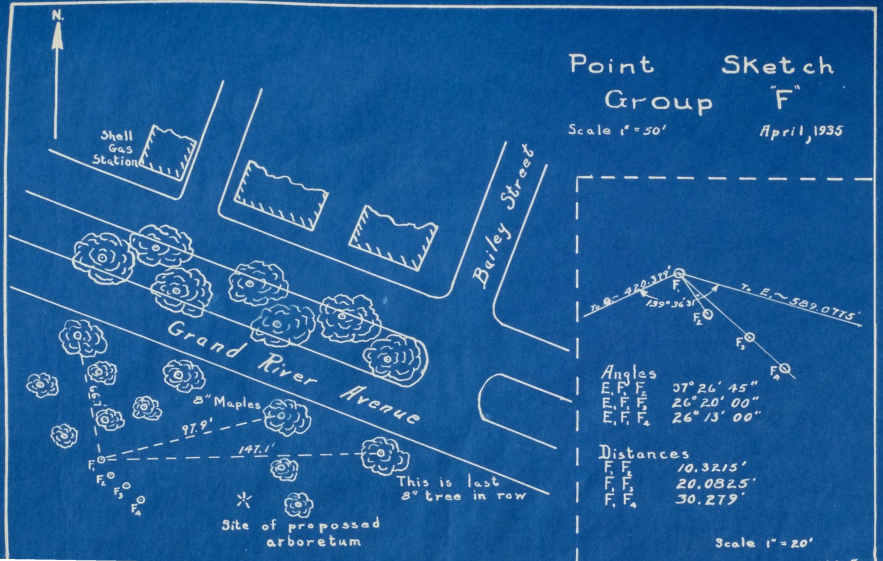
W.L.A.

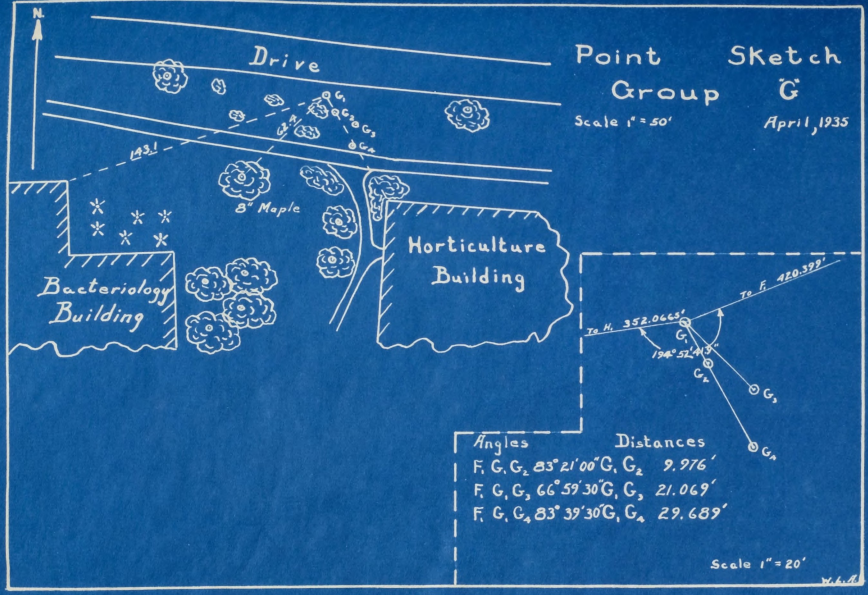


Point Sketch
Group "D"
Scale 1" = 50'
April, 1935
N.
Outer Drive
Hydrant
39.8'
48.4'
62.7'
D1
D2
D3
D4
10" Elm
Transformer Cover
Anatomy Building
124° 46' 10.3"
To E, 770.6805
To C, 642.4885
D1
D2
D3
D4
Angles
E,D,D2 131 05' 00"
E,D,D3 131 14' 00"
E,D,D4 130 54' 00"
Distances
D,D2 9.991'
D,D3 19.880'
D,D4 29.985'
Scale 1" = 20'



Point Sketch
Group "E"
Scale 1" = 50'
April, 1935
Haslett St.
Grand
River
Ave
Outer Drive
N.
Catch Basin
3" Maples
Stop Sign
36.1
37.9
75.5'
E1
E2
E3
E4
To F.
589.0775'
41' 50.6"
770.6805'
To D.
Angles
F. E. E2 309° 23' 00"
F. E. E3 309° 39' 00"
F. E. E4 309° 16' 00"
Distances
E. E2 9.862'
E. E3 19.876
E. E4 30.051
Scale 1" = 20'
W.L.A.

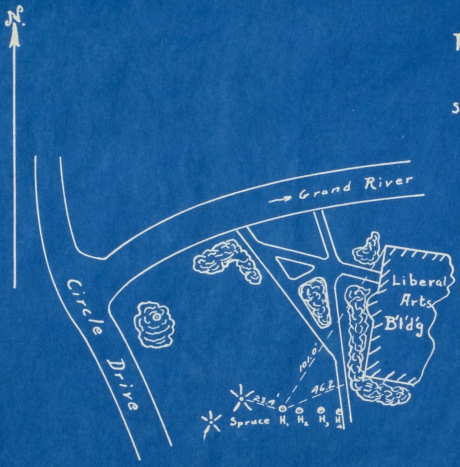

N.
Shell Gas Station
Bailey Street
Grand River Avenue
8" Maples
97.9'
147.1'
F1
F2
F3
F4
This is last 8" tree in row
Site of proposed arboretum
Point Sketch
Group "F"
Scale 1" = 50'
April, 1935
To E. ~ 589.0775'
139° 36' 30"
Angles
E, F, F2 37° 26' 45"
E, F, F3 26° 20' 00"
E, F, F4 26° 13' 00"
Distances
F, F2 10.3215'
F, F3 20.0825'
F, F4 30.279'
Scale 1" = 20'

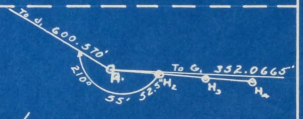

N
Drive
Point Sketch
Group G
Scale 1" = 50'
April, 1935
193'
8" Maple
Horticulture Building
Bacteriology Building
To H. 352.0665'
To F. 420.399'
194° 52' 43"
Angles
Distances
F. G. G2 83° 21' 00" G1 G2 9.976'
F. G. G3 66° 59' 30" G1 G3 21.069'
F. G. G4 83° 39' 30" G1 G4 29.689'
Scale 1" = 20'

Put on a Margin

Point Sketch Group "H"

Scale 1"=50' April, 1935





Angles

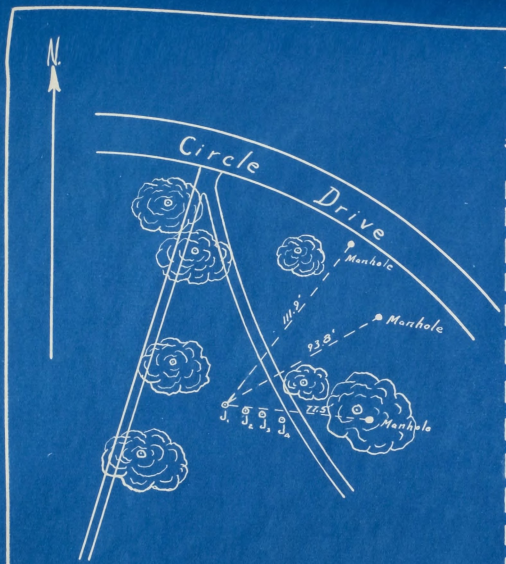
G, H, H_2 1° 31' 30"
G, H, H_3 1° 19' 30"
G, H, H_4 1° 10' 00"

Distances

H, H_2 9.735'
H, H_3 19.790'
H, H_4 29.770'

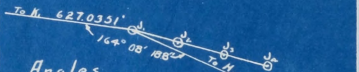
Scale 1"=20'

W.L.H.



Point Sketch
Group J

Scale 1" = 50' April, 1935



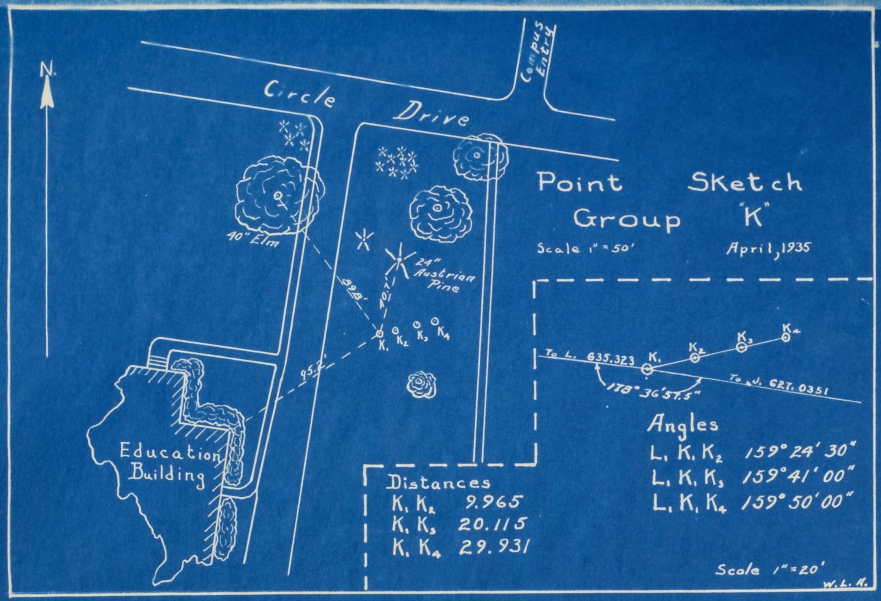
Angles

K, J, J_2 187° 32' 30"
K_3 J, J_3 187° 29' 30"
K, J, J_4 186° 55' 00"

J, J_2 9.990'
J, J_3 20.075'
J, J_4 30.025'

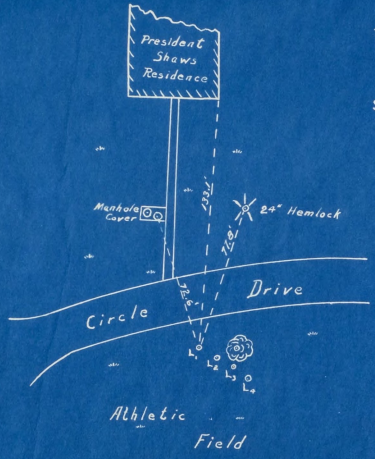
Scale 1" = 20'

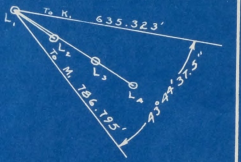
W.L.H.


N.
Circle Drive
Campus Entrance
10" Elm
24" Austrian Pine
Education Building
Point Sketch
Group "K"
Scale 1" = 50'
April, 1935
To L. 635.323
To W. 627.0351
178° 36' 57.5"
Angles
L, K, K2 159° 24' 30"
L, K, K3 159° 41' 00"
L, K, K4 159° 50' 00"
Distances
K, K2 9.965
K, K3 20.115
K, K4 29.931
Scale 1" = 20'
W.L.A.

Point Sketch
Group "L"

Scale 1" = 50' April, 1935





Angles

K, L, L_2 24° 49' 00"

K, L, L_3 23° 12' 30"

K, L, L_4 23° 03' 30"

Distances Scale 1" = 20'

L, L_2 9.934'

L, L_3 19.953'

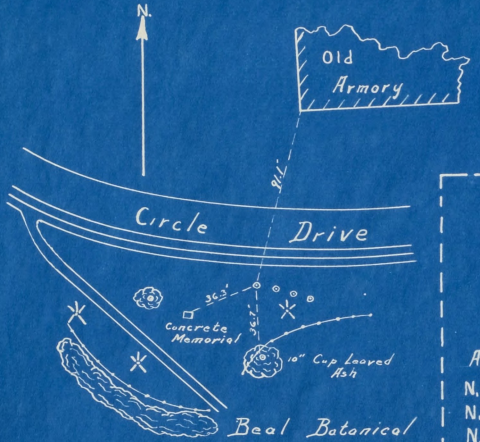
L, L_4 30.0425'

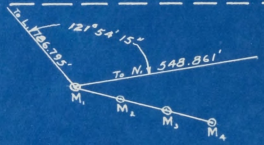
W. L. H.

Point Group "M" Sketch

Scale 1" = 50'

April, 1935

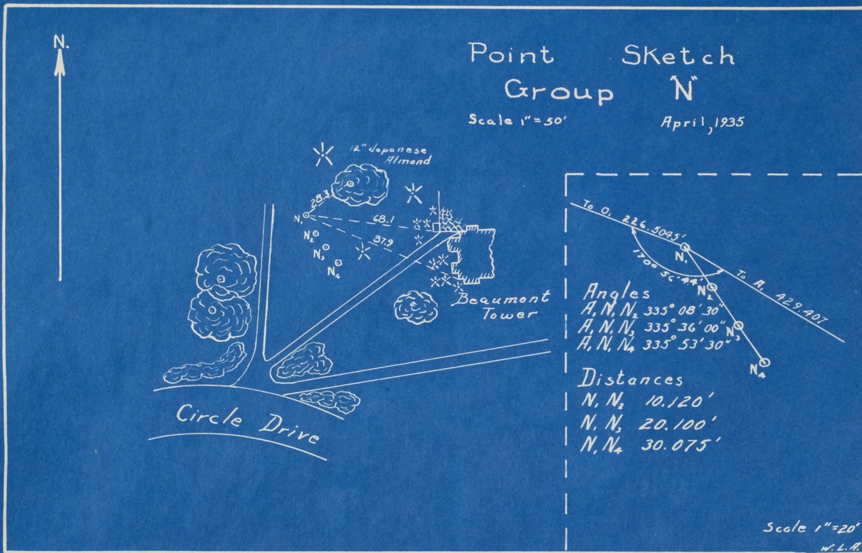




Angles		Distances	
N. M. M_2	29°05'00"	M, M_2	9.7695
N. M. M_3	24°11'30"	M, M_3	19.6735
N. M. M_4	24°11'30"	M, M_4	29.784

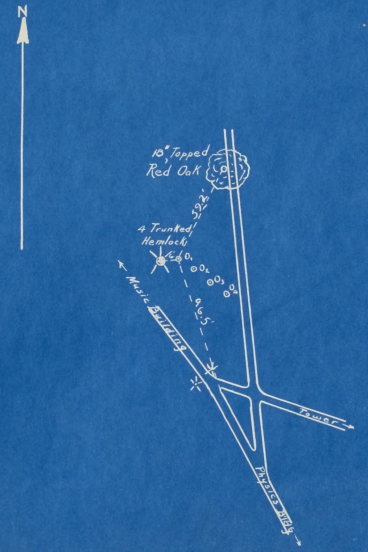
Scale 1" = 20'

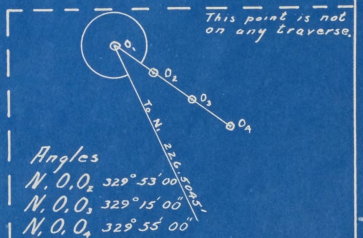
W. L. A.


N.
Point Sketch
Group "N"
Scale 1" = 50'
April, 1935
12" Japanese Almond
28.3
68.1
87.9
N1
N2
N3
N4
Beaumont Tower
Circle Drive
To O, 226.5045'
170° 56' 44"
To A, 429.407
Angles
A, N1 N2 335° 08' 30"
A, N1 N3 335° 36' 00"
A, N1 N4 335° 53' 30"
Distances
N1 N2 10.120'
N1 N3 20.100'
N1 N4 30.075'
Scale 1" = 20'
W. L. A.

Point Sketch
Group Ö

Scale 1" = 50' April, 1935





Angles

N. O. O_2 329° 53' 00"

N. O. O_3 329° 15' 00"

N. O. O_4 329° 55' 00"

Distances

O, O_2 9.921

O, O_3 19.809

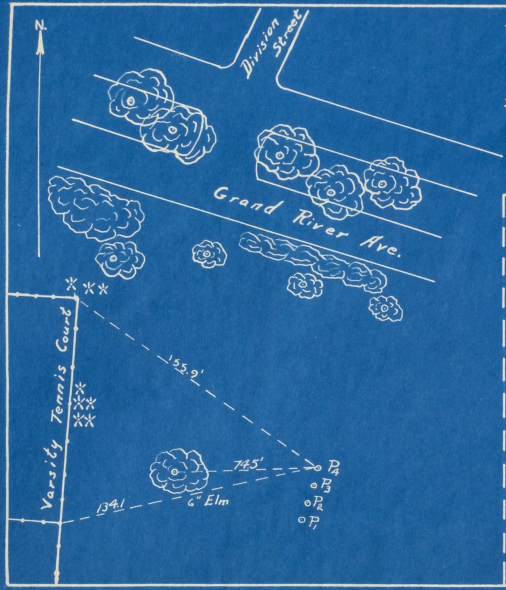
O, O_4 29.849

Scale 1" = 20'

W.L.A.

Point SKetch
Group "P"

Scale 1" = 50' April, 1935



Note:- This point is not included on any traverse.

Angles

G. P. P_2 188°35'00"
G. P. P_3 187°56'00"
G. P. P_4 187°58'00"

Distances

P_1P_2 9.985'
P_1P_3 19.876'
P_1P_4 30.051'

Scale 1" = 20'

W. L. A.

CONCLUSION

The contents of this book indicate how well we accomplished what we set out to do. The coordinates of all points from A-1 toPP-4 were determined to three decimal places. Our results are contained in tabular form here in and are also tabulated on the large map which is contained in the back pocket. Computations are shown in very elaborate form so that any subsequently discovered error may be readily located. Sketch maps of each point are bound in the volume. Original field notes are on file in Prof. Allens office.

So having accomplished our purpose we bring this volume to a close.

FINIS