

P.R. - Remer S.T.H.

Transit Book #2

DEITZGEN
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NEW YORK

ENGINEERS'
FIELD BOOK

No. 400

103

Chic

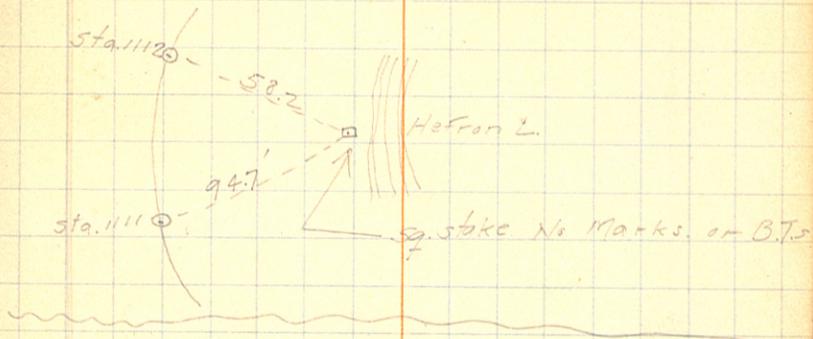
II

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39
40

F
to be
of road
exam
33.6 =

Found $n \frac{1}{4}$ sec. 16.
Found. sec. Cons sec. 8-9-16-17.

Tie to M.C. (?) on W. side Hebron L.



Meander Traverse of Part
of Woman L. Shore Line

starting at P.I. 1111+69'

Thence $S 87^{\circ} W$ 453' - 200'

" $N 86^{\circ} W$ - 400'

" $N 85^{\circ} W$ - 136'

" $N 69^{\circ} W$ - 33' to I.P. ~~Point~~

" $S 14^{\circ} W$ - 133'

Abandoned a/c Rocky shore &
High wind. Will attempt this
traverse by stadia from high
hills later.

~~M.C. on Beach in Woman L. Lake~~ M.C. Stake sets W.
approx 30' on Water
edge.

Line Location of Woman Lake shore line.

Inst. Δ stadia Traverse, Meander

OBJECT	Bearing	Interval	Y. A.
1	$N 42^{\circ} 15' E$	1.93	-2.25'
1	Sta. 2 $N 2^{\circ} 45' W$	6.16	
2	3 $N 39^{\circ} 30' E$	6.90	-6.07'
3	4 $N 60^{\circ} 30' W$	5.53	
4	Shoreline $N 13^{\circ} 30' E$	9.10	
	" " $N 13^{\circ} 45' E$	8.55	
	" " $N 12^{\circ} 15' E$	7.36	
	" " $N 13^{\circ} 00' E$	6.00	
	" " $N 11^{\circ} 45' E$	5.70	
	" " $N 8^{\circ} -30' E$	5.74	
	" " $N 10^{\circ} -00' E$	6.05	
	" " $N 11^{\circ} 15' E$	6.40	
	" " $N 6^{\circ} 15' E$	7.40	
	" " $N 4^{\circ} -00' E$	10.1	
	" " $N 2^{\circ} -15' W$	11.5	
	" " $N 11^{\circ} 00' W$	11.6	
	" " $N 10^{\circ} -00' W$	11.09	
	" " $N 2^{\circ} -30' W$	9.3	
	" " $N 7^{\circ} -15' W$	8.65	
	" " $N 9^{\circ} -30' W$	8.79	
	" " $N 12^{\circ} 15' W$	8.24	
	" " $N 22^{\circ} W$	7.98	
	" " $N 23^{\circ} 30' W$	6.10	
	" " $N 56^{\circ} 30' W$	4.20	
	" " $N 53^{\circ} 45' W$	2.10	

10.20
 1.54
 6.16
 7.1
 1.20
 4.65
 8.50
 8.1
 3.6
 5.74
 8.1
 2.05
 4.25
 5.2
 10.1
 13.00
 2.7
 7.5
 13.00
 9.25
 8.45

7.00
 1.47
 5.53
 13.50
 7.26
 13
 15.1
 16.5

Inst
A

	Object	Bear	Int.	V. L
4	Shoreline	N69°45'W	1.88	
	"	S66°30'W	3.70	
	"	S43°45'W	3.72	
	"	S42°30'W	1.60	
	"	S20°-15'W	1.01	
	"	S18°00'E	1.08	
	"	S48°38'E	2.90	
4	3	S60°30'E	5.53	
3	Shoreline	S84°-30'E	1.81	
	"	S88°-15'E	5.65	
	"	N88°-15'E	8.60	
	"	N84°-00'E	11.91	
3	5	N80°10'E	12.50	
6	5	N50°00'E	2.24	
	Shoreline	N60°45'E	3.95	
	"	N59°30'E	5.98	
	"	N55°30'E	1.80	
6	7	N47°20'E	10.87	2°06'
8	7	N32°30'W	4.01	
8	Shoreline	S31°30'E	1.70	
	"	N26°30'E	.47	
	"	N6°30'E	2.86	
8	" 9"	N5°00'E	4.91	
8	9			

Sta. 3 is on shore line

13.71
2.00

10.00	12.00
10.9	8.5
11.91	

7.00
5.09
4.91

12.09
06 Sta. 5 on shore line

Sta. 6 on shore line

13.71
2.11
16.29

Sta. 7 is on shore line

Sta. 8 is in lake

to
inf
to
20

INST.

	Object	Bearing	Int.	V. A
10	9	N 9° 40' E	4.43	
10	M. G. Seal	58° 00' W	3.15	
10	11	S 61° 40' E	3.04	45° 43'
12	11	S 87° 00' E	3.17	1° 12'
12	¹³ 1115+472	N 52° 00' E	3.16	4° 13'

Stations on shore line

Continuation of

Alignment From Book #1. 6

Sta A Bear

1155

1157

1186

1185

1154

1153

1152

+62' P.O.T.

+09 54°24' N 0°20' E

E=40

1181

1180

+20.7 P.O.T.

1179

1175

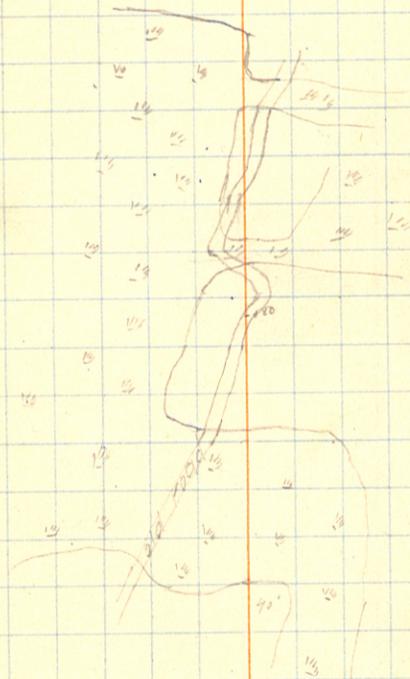
PT+65'

479

Start 720° R N54°30' E

Pt. of curve Sta. 1176 + 667

1176



Sta. Δ Bear. $E=30'$
 +655 $41^{\circ}15' L$ $N1^{\circ}30'E$

1209

1208

1207

1206

1205

1204

1203

1202

1201

1200

1199

1198

+555 Δ $41^{\circ}R$ $N54^{\circ}30'E$ $E=40'$

1197

1196

1195

1194

1193

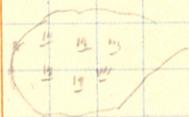
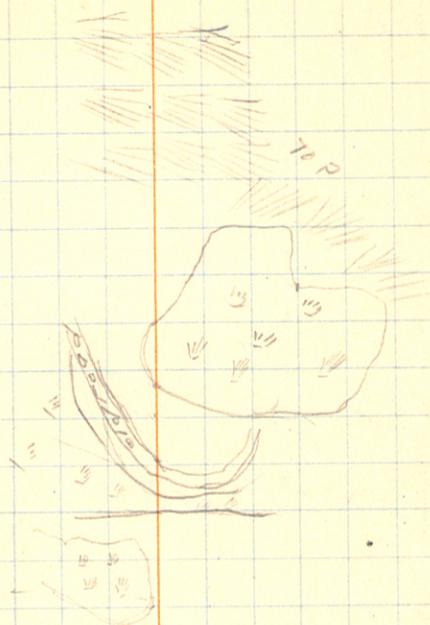
1192

1191

+97 \pm $13^{\circ}14' R$ $N13^{\circ}30'E$ $E=20'$

1190

1189



Sta. Δ Bear.

1230

1229

1228

1227

+ 60° 32°30' Δ N4°30'W

E-20

1226

1225

1224

1223

+ 75° 38°30' Δ N27°45' E

E-10

1222

1221

1220

1219

+ 42° 17°57' Δ N10°30'W

E-15

1218

1217

1216

1215

1214

1213

1212

1211

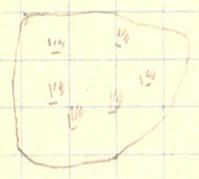
1210



to
of
13
80

Sta.	Δ	Bear
1252		
1251		
1250		
1249		
1248		
1247		
1246		
1245		
1244	P.O.T.	Iron wood & hulk
1243		
1242		
1241		
1240		
1239		
1238		
1212	P.O.T.	Birch hulk
1237		
1236		
1235		
1234		
1233		
1232		
1231		
1231	39°00' R	N34°-15' E

old road



tc
of
ra
80

Sta. Δ Bear.

1273

1272

+29² 4°-40' R N29°45' E Birch huk ^{E=10}

1271

1270

1269

1268

1267

1266

1265

1264

1263

1262

1261

1260

+70³ P.O.T.

Birch huk

1259

1258

1257

1256

1255

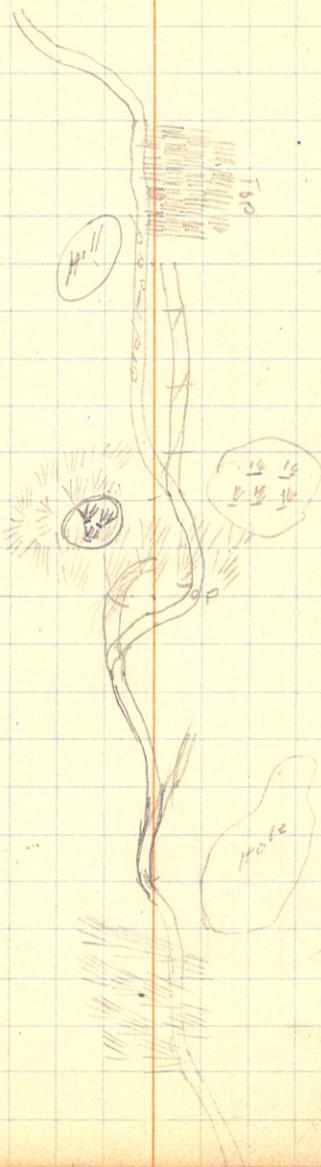
1254

+56² 9°30' L N24°45' E ^{E=20'}

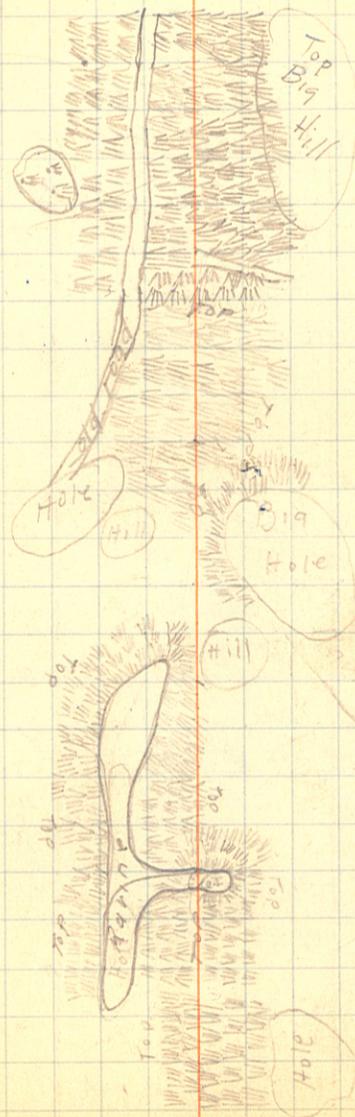
1253

→50←

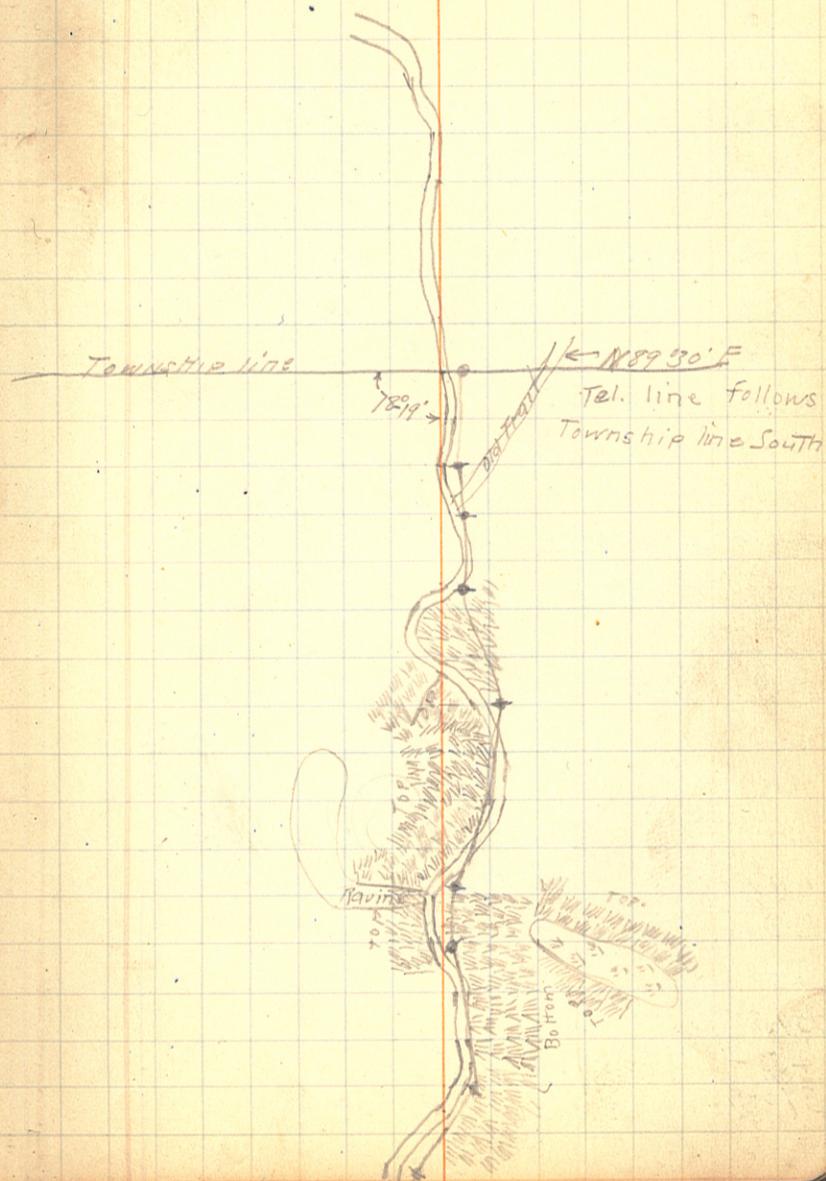
10



Sta.	A	Bearing	Notes
1292			
1291			
+382	30°40' L	N11°45' E	E=30 Pop. hub
1290			
1289			
1288			
1287			
+16.8	120°45' R	N41° 30' E	E=20 Birch hub
1286			
+282	33°30' R	N28°30' E	E=90 Pine hub
1285			
1284			
1283			
1282			
+544	34°15' L	N9°45' W	E=20 Birch hub
1281			
1280			
+7.169	F.O.T.		
1279			
1278			
1277			
1276			
1275			
1274			



Sta.	A	Beqr.	
1311			
1310			
1309	+35.3 = 37.0		$\Delta = 15^{\circ}50'$
+04 ²	15 ² 50' R	N28 ² 15' E	D = 6 ⁰
1308			T = 132.8
1307			R = 955
1306	+71.4		Lo = 263.9
+57 ²	P.O.T.	on Township line	
1305			
1304			
1303			
+78 ²	7250' R	N12 ² 15' E	E = 10
1302			
1301			
1300	P.O.T.		
1299			
+53 ²	P.O.T.		
1298			
1297			
1296			
1295			
+81 ²	6 ⁰ -15' L	N4 ² 30' E	E = 10
1294			
1293			



Sta	Δ	Bear	
1327			P.C. = 1323+06.9
1326			P.I. = 1324+00
1325	1324+10.3 = 1324+92.1		P.T. = 1324+79.3 = 1324+93.1
1324	N35°30'W		$\Delta = 50^\circ$
1323	+07.9 = P.C.		D = 29'
P.T. +49.1	22°02'		T = 93.1 = 92.1
1322	17°08'		hc = 172.4
+50	12°08'		R = 199.7 = 197.6
1321	7°08'		$\Delta 44^\circ 05' L$
+50	2°08'		D = 20'
P.C. 1320+28.7			PI 1321+45.2
+45.2	$\Delta 44^\circ 05' L$ ($44^\circ 08'$)		T 1+16.5
1321	O.P.O.T.		P.C. 1320+28.7
1320			Lc 2+20.4
+00.2	P.O.T.		P.T. 1322+49.1
1319			
1318			P.C. = 1311+12.4
1317			P.C. = 1313+54.2 = 1313+54.2
1316			R = 716.3
1315			T = 120.9
1314			
1313			
+33.2	19°16' L	N11°00' E	
B92			

1323+07.9
 1 72.4
 1324 79.3

1319+12.2 P.C

1321+00 = P.I

1322+87.2 = 87.8 = P.T

$\Delta = 7^\circ 30'$

D = 2°

T = 187.8

Lc = 375

R = 286.5

(spike)

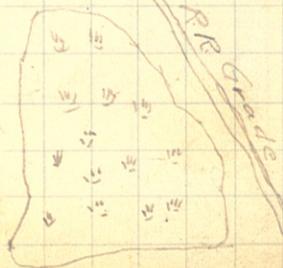
1312+33.3
 1311+12.4
 1 20.9



R.P.P.I.

3° Pop. S30°W 33.5
 T.P. S62°E 38.1

(B.H.)



1352 @ P.O.T. spike
 1351
 1350
 1349
 1348
 1347
 1346
 1345
 1344
 1343
 1342
 1341
 1340
 1339 +35 End
 1338
 1337
 1336
 +38°
 1335
 1334
 1333
 1332
 1331
 1330
 +44.5
 1329
 1328

@ Intx. H.L. Line sta. 976+40.1
 spike R.P.s stump N E 22.5
 T.P. S.E. 29.8'

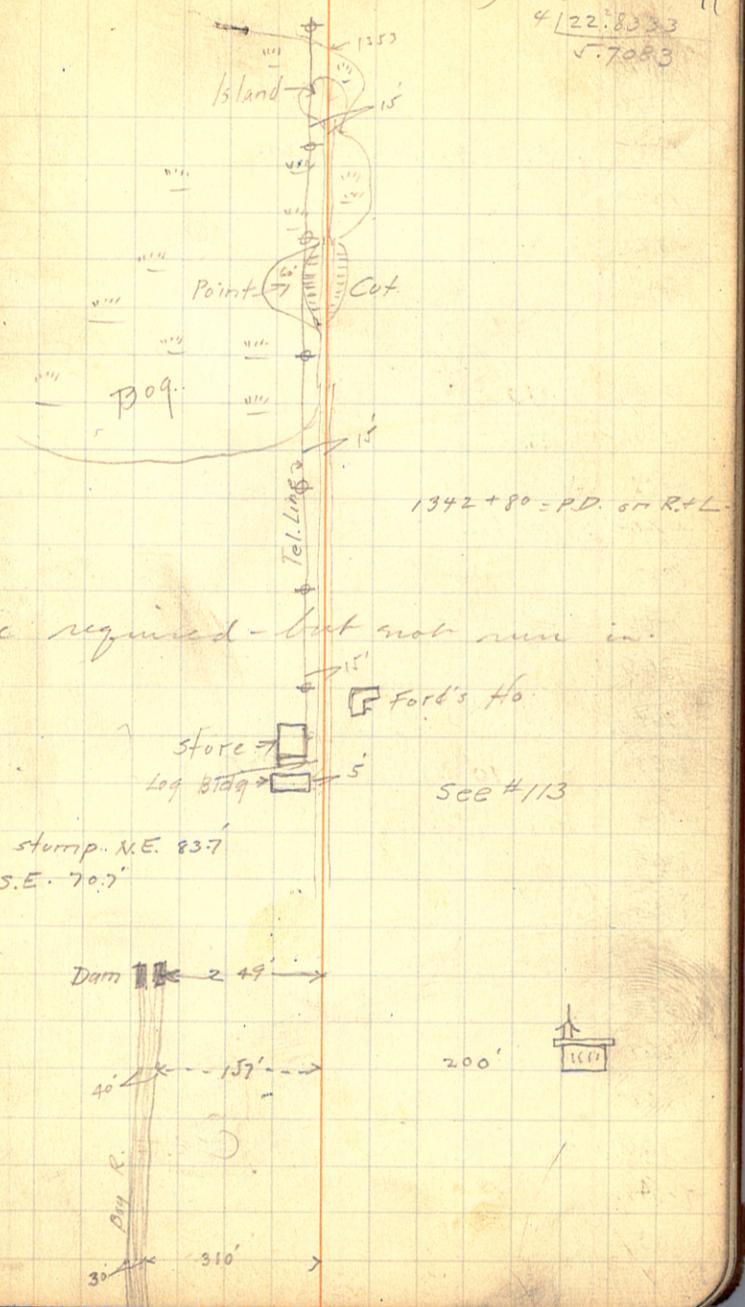
On abandoned line

$\Delta = 22^{\circ} 50' R.$
 $D = 4^{\circ}$
 $P.I. = 1335 + 38^{\circ}$
 $T = \frac{2 + 89.2}{}$
 $P.C. = 1332 + 48.8$
 $L_c = \frac{5 + 70.8}{}$
 $P.T. = 1338 + 19.6$

$\Delta = 22^{\circ} 50' R. \quad \eta 4^{\circ} 45' 6. \quad E = 30'$
 $\Delta = 38^{\circ} 36' R \quad P.C. = 1336 + 14$
 $D = 24^{\circ}$
 $T = 84.2 \quad P.I. = 1336 + 98.2$
 $R = 339 \quad P.T. = 1339 + 748$
 $L_c = 160.8 \quad = 1337 + 82.4$

$\Delta 17^{\circ} 25' R. \quad \eta 18^{\circ} 45' W.$

8333
 $\frac{4122.8333}{5.7083}$
 14



1342 + 80 = P.D. on R+L

curve required - but not run in.

see #113

R.P. stump N.E. 83.7
 F.P. S.E. 70.7

30) 575 (15)
 30
 275
 270

- 1376
- 1375
- 1374
- 1373
- 1372
- 1371
- 1370
- 1369
- 1368
- 1367
- 1366
- 1365
- 1364
- 1363
- 1362
- 1361
- 1360
- 1359
- 1358
- 1357
- 1356
- 1355
- 1354
- 1353

$\Delta 49^{\circ}20' L. \quad \eta 48^{\circ}15' W. \quad D = 29'$
 $E = 20'$

$\Delta 11^{\circ}46' L. \quad \eta 1^{\circ}15' E. \quad E = 5'$

$\Delta 8^{\circ}10' R. \quad E = 6' \quad \eta 12^{\circ}45' E.$

Wood Hub

spike

Δ sta. no. Marked on T.P. on Lt.

R.P. = Stamp N75³⁰E 26.8
 T.P. S37⁰W 50.0

Wood hub in side ditch



1392 34°27' ✓
 +50 27°12' ✓
 1391 19°57' ✓
 +50 12°42' ✓
 1390 5°27' ✓

PC.1389+624

+47.6 Δ 110°00' R. 7233°30' E.

1392

1391

1390

1389

1388

1387

1386

+76.3 Δ 28°10' L. 776°00' W.

1385

1384

+38.3 ○

1383

1382

1381

1380

1379 O.P.O.T.

Oak hub.

1378

1377

Δ 110°00' R.

D-29°

T=285.2

L=379.3

PI.1392+47.6

T=2+85.2

PC.1389+624

L=3+79.3

PT.1393+41.7

137
 29) 4260
 29
 136
 116
 200
 282.2
 285.2

147
 29) 8182.80
 29
 109.30
 58
 238
 232
 42
 58
 48
 29
 170
 174
 37931

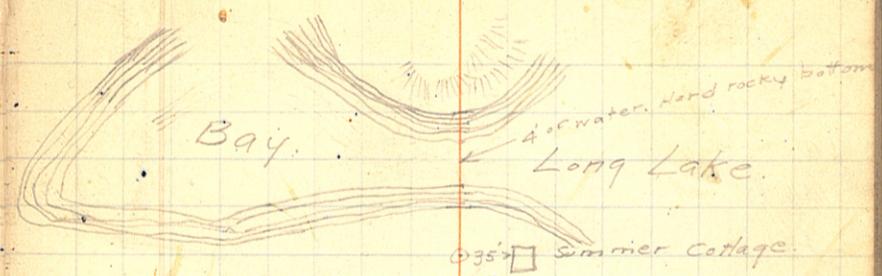


Draw from Lake.

Oak Hub. Near old Oak snag.



1410
 +56
 1409
 +63
 1408. $\Delta 40^{\circ}00' L.$ N. $47^{\circ}15' E.$
 1407
 1406
 1405
 +16.8 $\Delta 80^{\circ}00' R.$ E = $60'$ $71^{\circ}58' E.$
 1404
 1403
 1402
 1401
 +87.2 \odot P.O.T.
 1400
 1399
 1398
 +53.2 $\Delta 26^{\circ}20' L.$ E $20'$ $717^{\circ} E.$
 1397
 1396
 1395 P.D. on R.
 1394
 P.T. +41.7 $55^{\circ}00'$
 1393 $48^{\circ}57'$
 +50 $41^{\circ}42'$



1429

+76.3 $\Delta 22^{\circ}00' R. E 20'$ $7132^{\circ}30' E.$

1428

1427

1426

1425

1424

+44.2 O.P.O.T.

1423

+25.2 = should be +55.2

 $\Delta 54^{\circ}00' L. 7110^{\circ}30' E. E 40'$

1422

1421

1420 O.P.O.T. Ironwood Hub

1419

1418

1417

1416

1415

+28.3 $\Delta 27^{\circ}20' R. E 20'$ $7165^{\circ} E.$

1414

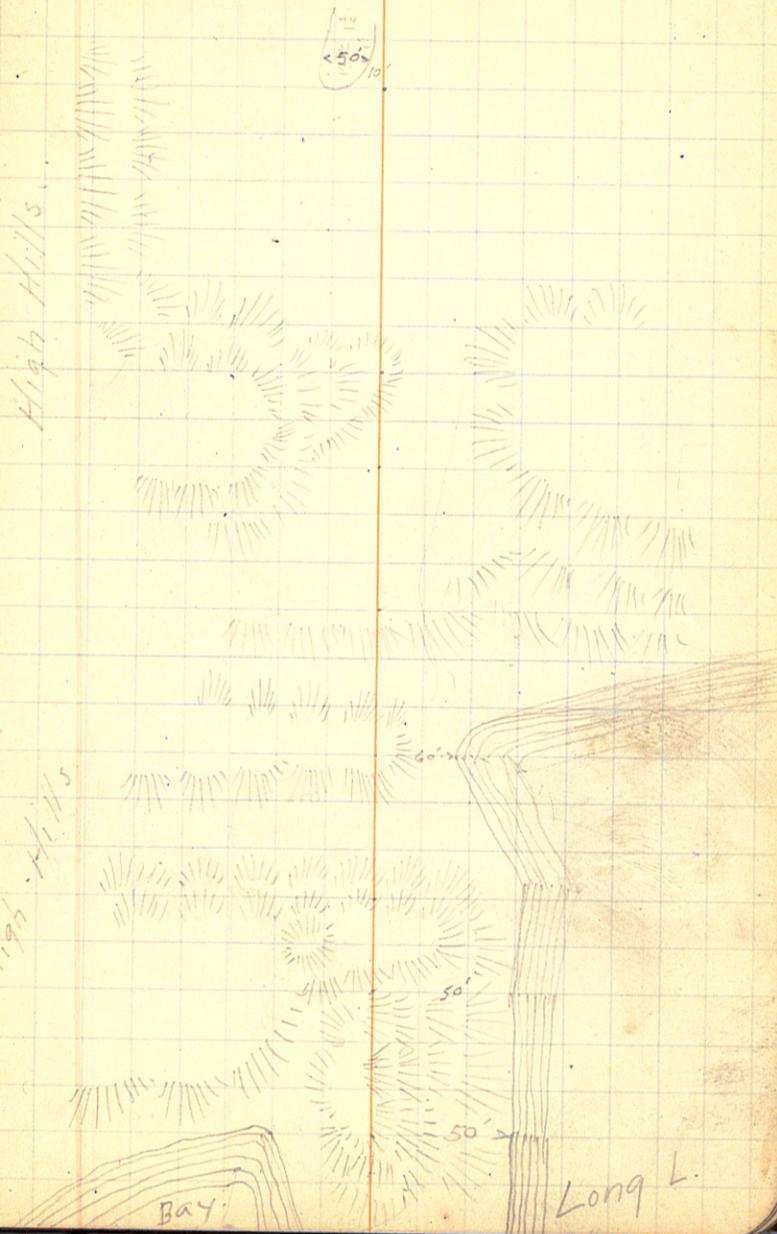
+01 O.P.O.T.

1413

1412

+52.9 $\Delta 10^{\circ}00' L. 7137^{\circ}30' E.$

1411



+59[±] Δ 42°00' L. 7145° E.

1448

1447

1446

1445

+66[±] Δ 68°40' R. 7188° E.

1444

1443

+24.9 O P.O.T.

1442

1441

1440

+86[±] Δ 23°50' R. 7118°30' E. E 2'

1439

+36

1438

1437

1436

1435

+66[±] O P.O.T.

1434

1433

+26[±] = should be +56[±]

Δ 38°00' L. E 30' 7115°15' W.

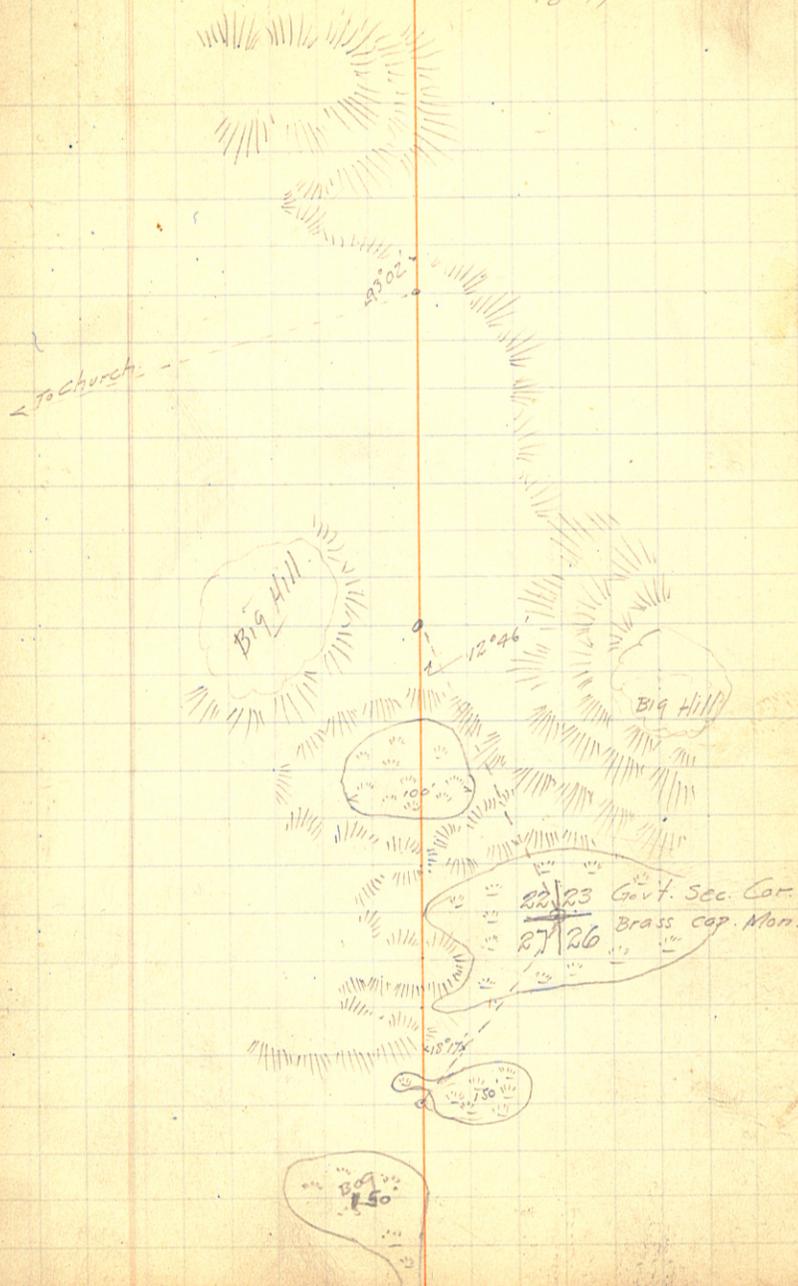
1432

1431

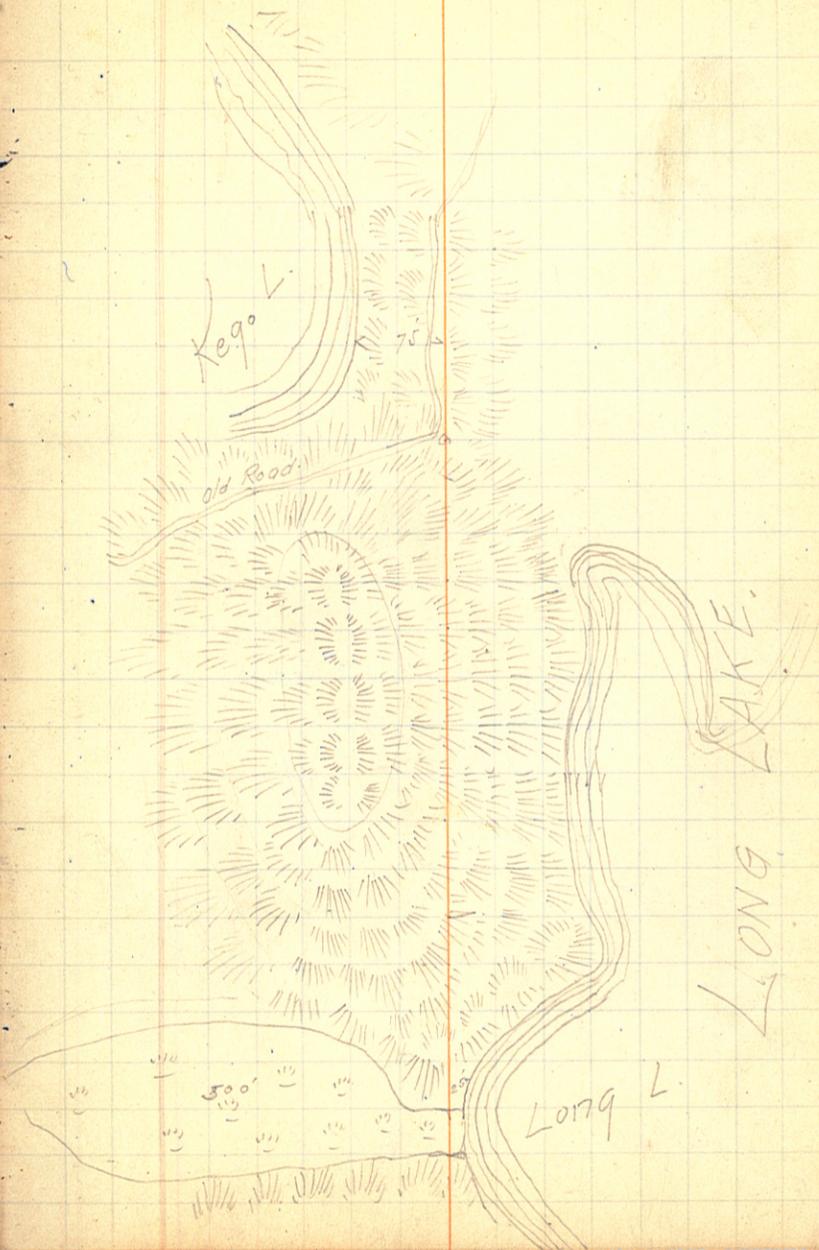
1430

38°00'
19°43'
18°17'

19

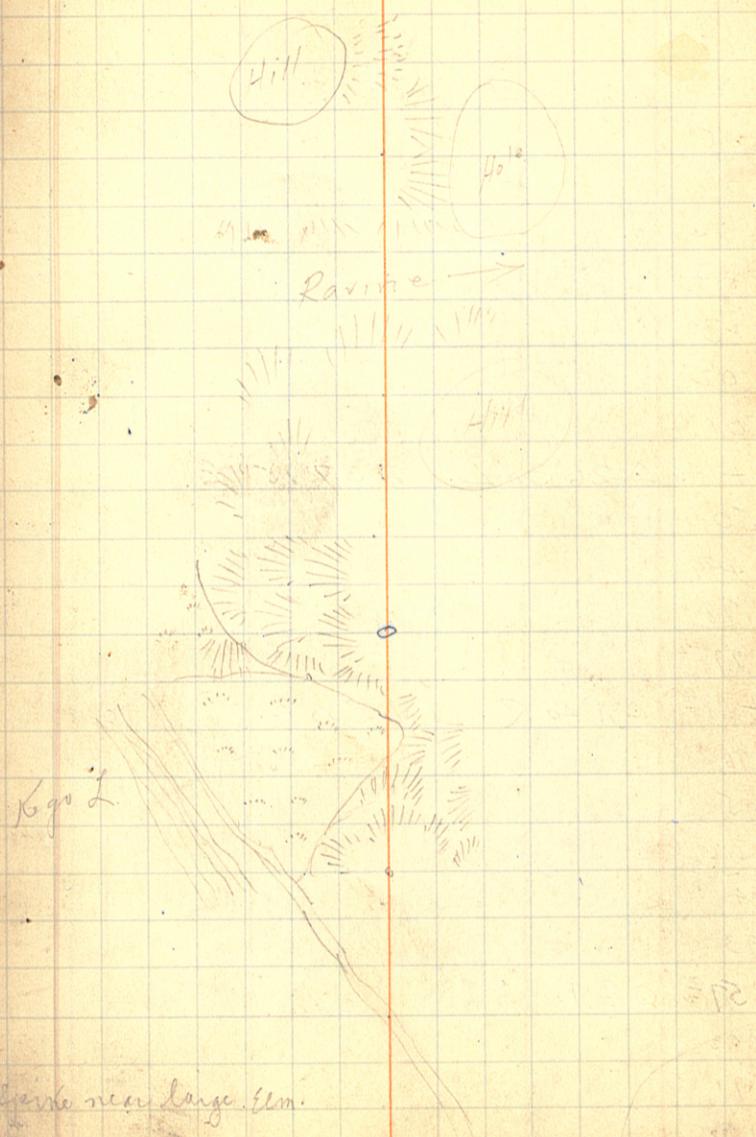


1469 O P.O.T.
 68
 67
 66
 65
 64
 63
 1462
 +00 E Δ 61°40' R 7184° E
 1461
 1460
 1459 O P.O.T.
 1458
 1457
 +22 E Δ 45°30' L 7122°30' E
 1456
 1455 O P.O.T.
 1454
 1453
 1452
 +73.7 Δ 22°25' R 7168° E
 1451
 +50
 1450
 1449

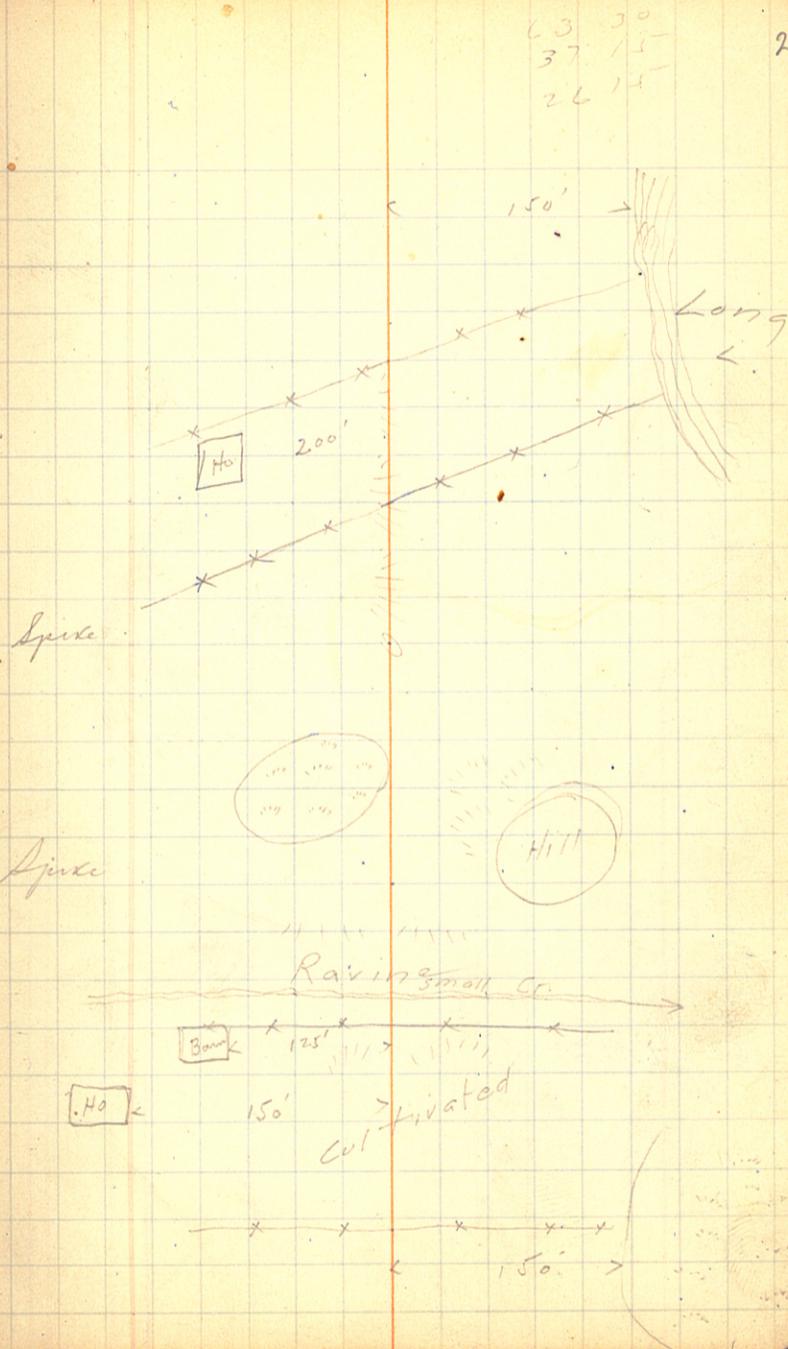


~~1488~~ ~~leave swamp~~
 1489
 +40 enter swamp
 88
 +76.4 O.P.O.T.
 87
 +06.7 $\Delta 18'40''$ R. $n 31^{\circ}45' E.$
 86
 85
 84
 83
 +15.2 $\Delta 21'30''$ L. $n 13^{\circ}15' E.$
 82
 81 O.P.O.T. spike
 80
 79
 +12.8 $\Delta 64'00''$ L. $n 34^{\circ}30' E.$
 78
 77
 76
 75
 +87.5 $\Delta 42'10''$ R. $S 81^{\circ} E.$
 74
 73
 72
 71
 +32 $\Delta 27'16''$ L. $n 52^{\circ}15' E.$
 1470

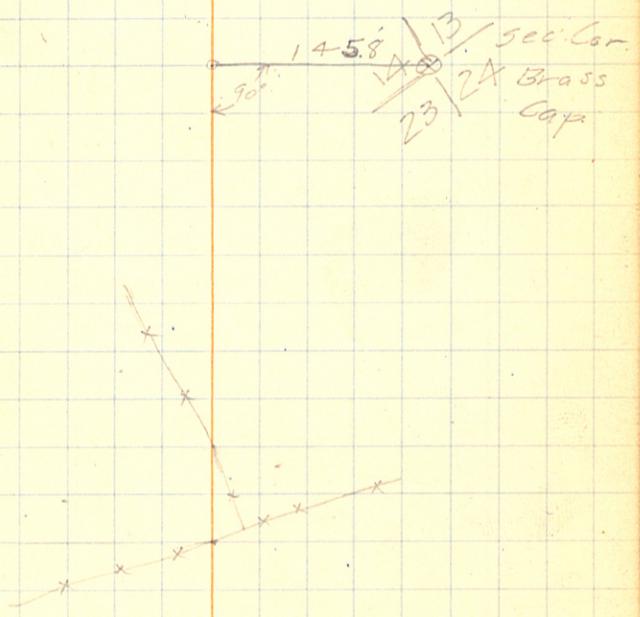
1490+08 leave swamp
 Ravine to big swamp
 21



07.
 06
 +342 $\Delta 15^{\circ}30' L. \quad N 22^{\circ} E$
 05
 +73
 04
 03
 +23
 02
 01
 +148 $\Delta 26^{\circ}30' L. \quad N 37^{\circ}15' E$
 1500
 1499
 98
 97
 +639 $\Delta 31^{\circ}40' R. \quad N 63^{\circ}30' E$
 96
 95
 +06
 94
 93
 +570 O.P.O.T. Spike.
 92
 91
 1490



27
 26
 25
 24
 23
 22
 +52.3 Δ 21°32' L. n 31° E.
 +23
 21
 20
 19
 18
 17
 16
 15
 +83
 14
 +28
 13
 +52° Δ 31°24' R. n 53° E.
 12
 11
 10
 09
 08



- 49
- 48
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- 32
- 31
- 30
- 29
- 28

⊙ POF $\Delta 0^{\circ} 05' L$.

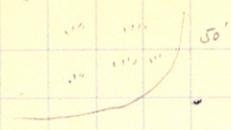
540'

+545 $\Delta 28^{\circ} 30' R$.

$\approx 50^{\circ} E$.

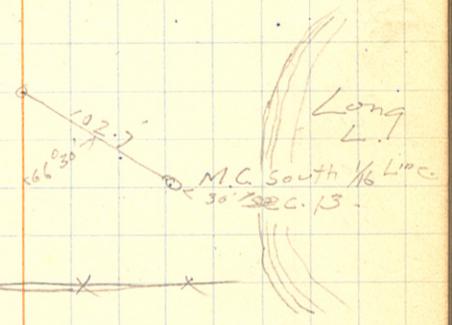
+86 $\Delta 9^{\circ} 47' L$.

$\approx 21^{\circ} 45' E$.



Small spike in to miss large tree. Tang to be straight
 - This will make this $\Delta 28^{\circ} 27' R$ instead of $28^{\circ} 30'$

Spike

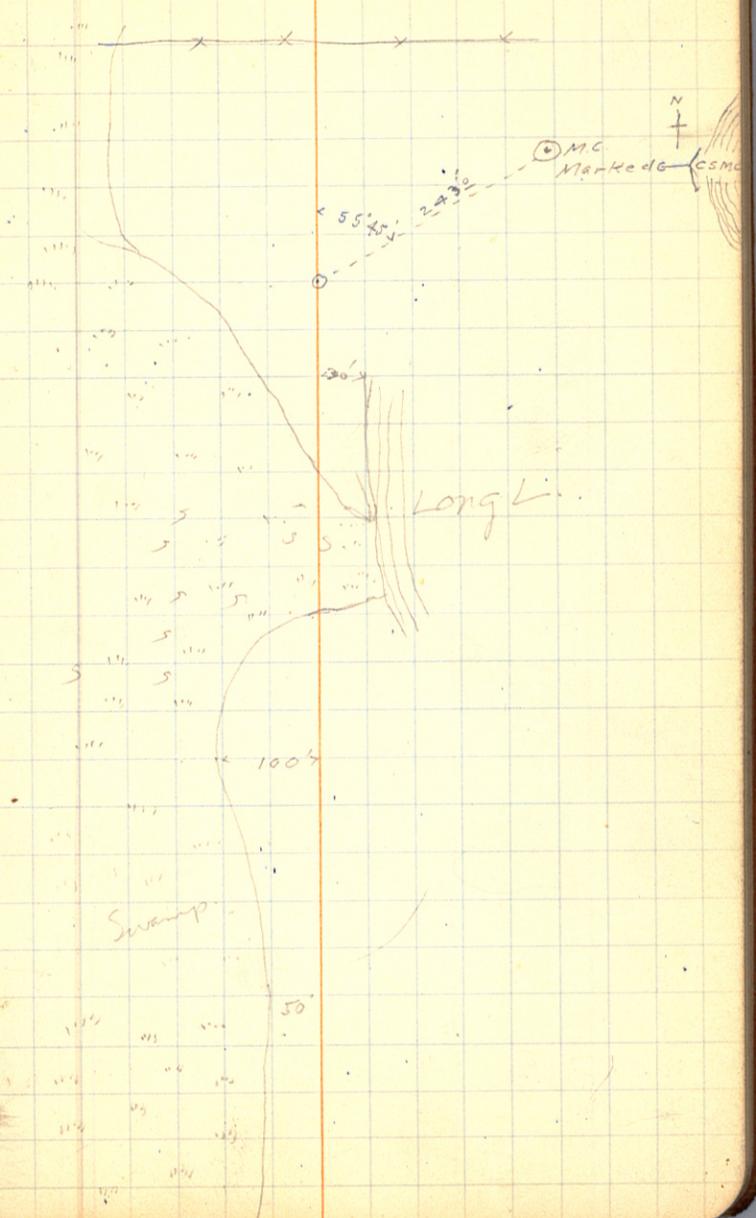


+75
 72
 71
 70
 69
 68
 67
 66
 65
 64
 63
 62
 61
 60
 59
 +368
 58
 57
 56
 55
 54
 53
 52
 51
 15.50

O.P.O.T.

$\Delta 23^{\circ}00' L.$ $n 74^{\circ} E.$

$\Delta 22^{\circ}15' R.$ $n 71^{\circ}45' E.$
 after cutting out the $0^{\circ}05' \Delta$
 this Δ will be $22^{\circ}13' R.$



91
90
89
+77' Δ 0°20' L
88
87
+29' Δ 41°25' R
86
85
84
+75'
83
+06' Δ 36°30' L
82
81
80
+51.9 O.P.T
79
78
77
76
75
+70.5 Δ 8°40' L
74
73

N 45° E

(This angle to be eliminated
on construction used to
follow cut out line which was
crooked.)

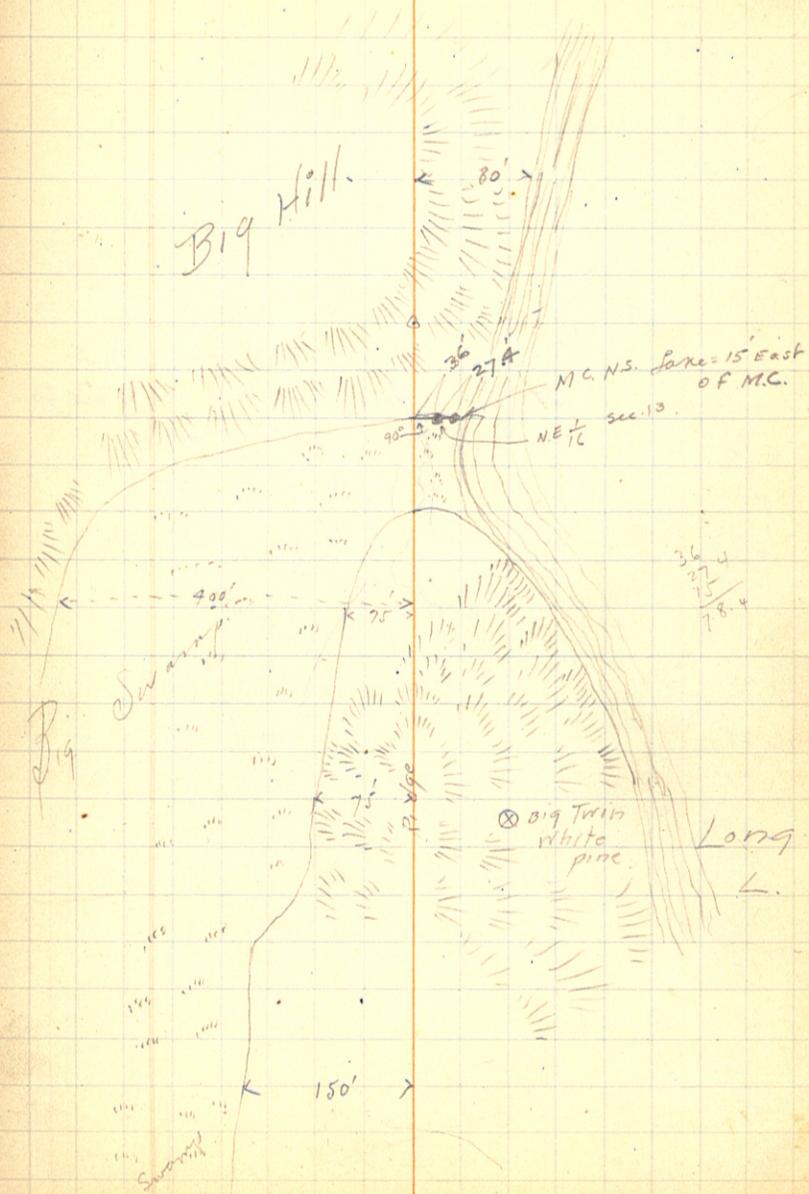
This makes this Δ 41°08' R.

N 45° 30' E

N 4° E

N 40° E

634
36
27.4



11
 16 10
 09
 08
 07
 06
 + 58.8
 05
 04
 + 20
 03
 + 266
 02
 01
 1600
 99
 + 66 1/2
 98
 97
 96
 95
 + 33 1/2
 94
 93
 92

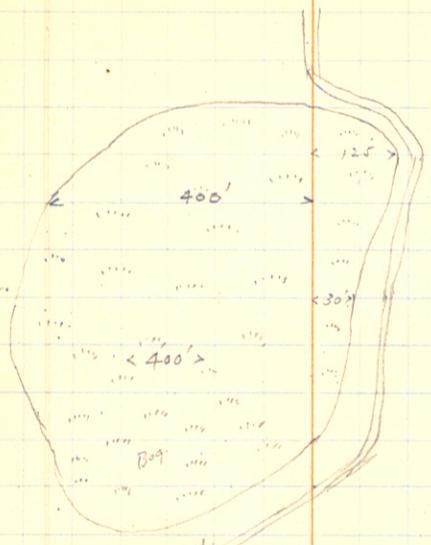
$\Delta 45^{\circ}00' L.$ Due North. on Approx
 ↑ This Δ changes to $45^{\circ}03' L.$ to hit
 Sec. Cor. 1 mile north + to $44^{\circ}54' L.$ to
 hit 1/4 Cor. 1/2 mile north

O P.O.T.

O P.O.T.

O P.O.T.

pic line.



Graded Road
 on S. Line of Sec. 12.



16.6
5.0
16.5

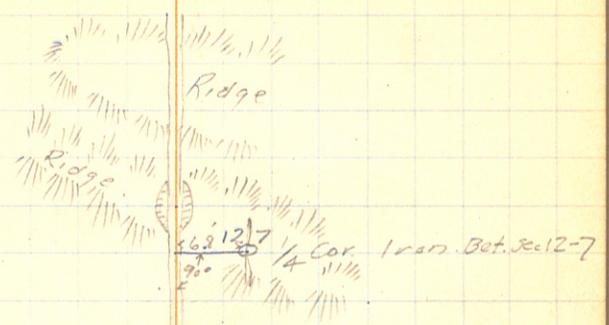
- 35
- 34
- 33
- 32
- 31
- +07
- 30
- 29
- 28
- 27
- 26
- 25
- 24
- 23
- 22
- 21
- 20
- 19
- 18
- 17
- 16
- 15
- 14
- 13
- 12

$\Delta 0^{\circ}22'R.$

spike of road.

© Pat.

spike center of road.



+ 35.2 \odot End Survey.

1656

55

54

53

52

51

50

49

+ 27.6 $\Delta 0^{\circ}43' L.$

48

47

46

45

44

43

42

41

1640

39

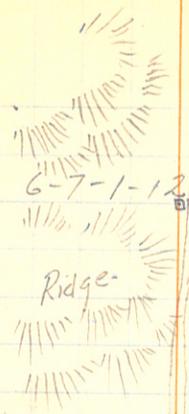
38

37

36

Hill.

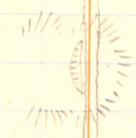
= Cor. Sec. 6-7-1-12.



Ridge.

Square stake on
W. side of road. Could
find no Iron Mon.

Spike



1334+10.6 X E. & W. 1/4 Line
 106.6 to Cor. & semitan. = 72°8'

	N.	E.	W.	
East	106.6		106.6	
N. 17°42' W	123.1	117.3	37.4	
		N	E	Co-ordinates
		117.3	69.2	69.2 117.3
N. 5°25' E	424.6	422.7	40.0	109.2 540.0
	150.7	150.0	14.2	123.4 690.0
	150.7	150.0	14.2	137.6 840.0

P.C. = 1311+12.4 Δ = 19°10' D = 8° W.
 P.I. = 1312+33.2 T = 120.9 R = 716.3'
 P.T. = 1313+52.0 = 1313+54.2 on Line

P.C. = 1319+12.2 Δ = 7°30' D = 2° R
 P.I. = 1321+00.0 T = 187.8 R = 286.5
 P.C. = 1322+87.2 = 1322+87.8

P.C. = 1323+^{07.9}067.9 Δ = 50° D = 29° W.
 P.I. = 1324+00 T = ^{92.1}93.7 R = ^{197.6}199.7
 P.T. = 1324+^{80.3}79.3 = 1324+^{92.1}93.7 W = 172.4

Alley 10'
 Block 300'
 Street 80'
 1/2 block + alley 150'
 Total 540'
 Outlot A 150'
 New Lot 150'
 840'

Longville - June 4, 1931

31

Rearrangement of Blocks 2, 3, 4 and
Part of Block 5, Plat of Longville

Outlet A contains part of Lot 2, and
E. all of Lots 3-4-5-6-7-8-9-10-11 in
N. 1 Block 4 and

Lots 22-23-24-25 and 26 in
N. 5 Block 5 and Second Street west of the
old grade:

Outlet B contains Lot 27 and that
part of Lots 1-2-3-4-5-6, Block 5
lying west of the old grade

W. 471 South Line Outlet B

Line Grade

840

690

540

0

1

2

B Line Location at Longville.

+98.3 $\Delta 38^{\circ}56'R.$ = Sta. 1336+34.2 Original Line.

1336

1335

1334

1333

1332

1331

1330

1329

1328

1327

1326

1325

1324 $\Delta 50^{\circ}00' L.$ $\Delta 33^{\circ}30' W.$

1323

+67

+49

1322

+83

+56

1321 $\Delta 7^{\circ}30'R.$

Top bank

Edge water

Edge water

Top bank

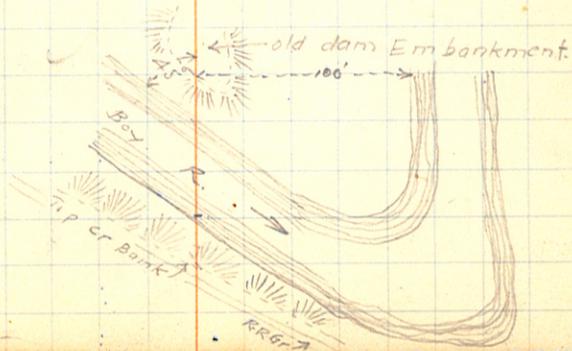
1337+78.5
1336+34.2
144.3

22+49
21+83
.6

1321+83
38°36'R. 22.09

1321+83
70
67

1336+34.2
1335+36.0
96.2



Connection H.L. Line with

P.R. - Remer Line.

686
15
532

971+71.5
+68.6
976+401

976+401 = $\Delta 84^{\circ}45' L$. = 1337+78.5 P.R.-R-Line.

468.6

971+71.5 HL $\Delta 30^{\circ}48' L$. East.

Falter stock $\left[\begin{array}{l} \leftarrow -32' \rightarrow 4+53.6 \\ \leftarrow -30' \rightarrow 4+18 \end{array} \right.$

Hotel $\rightarrow \left[\begin{array}{l} \leftarrow -22' \rightarrow 2+81 \\ \leftarrow -21' \rightarrow 2+20 \end{array} \right.$

$\Delta 47^{\circ} 20' L$
 $D = 17^{\circ} C. L.$
 $E = 51'$
 $T = 148.2$
 $P.I. = 1209 + 65.5$
 $T = 148.2$
 $P.C. = 1208 + 17.3$
 $L_c = 2 + 78.4$
 $P.T. = 1210 + 95.7$

$30 \overline{) 526.1}$
 $\underline{161}$
 150
 $17 \overline{) 2511.2}$
 $\underline{1309}$
 119
 131
 $\underline{119}$
 122
 119
 3
 2784.31
 $17 \overline{) 47.33333}$
 $\underline{34}$
 133
 $\underline{119}$
 140
 $\underline{136}$
 73
 $\underline{68}$
 59
 $\underline{51}$
 23
 17

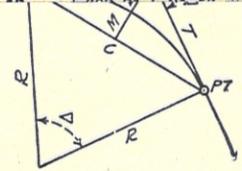
$20 \overline{) 2319.70}$
 $\underline{115.78}$
 20
 $\underline{119}$
 100
 $\underline{197}$
 180
 170
 $\underline{160}$

116.5

$4 \overline{) 1157.0}$ (289.2 50) 115.70
 $\underline{8}$
 35
 $\underline{32}$
 207
 $\underline{240}$
 170

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10'	58.34	.30	10'	560.11	27.31	10'	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60



CURVE FORMULAS

- Radius= $R = \frac{50}{\sin \frac{\Delta}{2}}$ (1) Degree of Curve= D and $\sin \frac{D}{2} = \frac{50}{R}$ (2)
- Tangent= $T = R \tan \frac{\Delta}{2}$ (3) Length of Curve= $L = 100 \frac{\Delta}{D}$ (4)
- Middle ordinate= $M = R(1 - \cos \frac{\Delta}{2})$ (5) $= R \text{vers} \frac{\Delta}{2}$ (6)
- External= $E = T \tan \frac{\Delta}{4}$ (7) $= R \div \cos \frac{\Delta}{2} - R$ (8) $= R \text{exsec} \frac{\Delta}{2}$ (9)
- Long Chord= $C = 2 R \sin \frac{\Delta}{2}$ (10) $\Delta =$ Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.—Sta. 161+60.35 to find Sta. of P. C. and P. T. $\Delta = 62^{\circ} 10'$ $D = 8^{\circ} 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{2} = 414.49$ ft. From Table V correction = .36 or $T = 414.85$ ft. P. C.—Sta. P. I.— $T = 157 + 45.50$. Also from (4) $L = 746.00$ and P. T.—Sta. P. C. + $L = 164 + 91.50$.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft. = 7.27 ft. Distance = 158—Sta. P. C. = 54.50, hence offset = 7.27 $(54.50 \div 100)^2 = 2.16$ ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2 \div (2 \times 688.26) = 2.16$ ft.

Deflections.—Deflection angle = $\frac{1}{2} D$ for 100 ft., $\frac{1}{4} D$ for 50 ft., etc. For c ft. = (in minutes) $.3 \times C \times D^2$ or = defl. for 1 ft. from Table III $\times C$. For Sta. 158 of above curve = $.3 \times 54.5 \times 8\frac{1}{2} = 136.2'$ or $2^{\circ} 16.2'$, or = $2.50 \times 54.5 = 136.2'$ from Table III. For Sta. 159 deflection angle = $2^{\circ} 16.2' + 8^{\circ} 20' \div 2 = 6^{\circ} 26.2'$, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 115.37. For from Table IV for 1° curve $E = 960.6$ for $8^{\circ} 20' = 960.6 \div 8\frac{1}{2} = 115.27$ and from Table V correction = .10 or $E = 115.37$. Or suppose $\Delta = 32^{\circ}$ and E is measured and found to be 42 ft. What is D ? From Table IV $E = 230.9$ and $\div 42 = 5.5$ or $D = 5^{\circ} 30'$.

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32	1643.0	230.9	42	2199.4	407.6	52	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	43	2257.0	428.5	53	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	44	2314.9	450.0	54	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	45	2373.3	472.1	55	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.3	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	46	2432.1	494.8	56	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	47	2491.3	518.2	57	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	48	2551.0	542.2	58	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	49	2611.2	566.9	59	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	50	2671.8	592.3	60	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

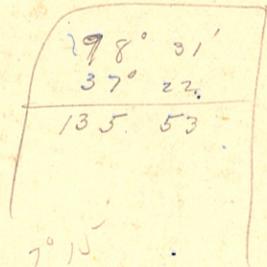
TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

23/4.9
7.8
23/9.7

2324.6
23/4.9
9.7 4.8

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
61°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1315.6	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62	3442.7	954.8	72	4162.8	1352.6	82	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63	3511.1	990.2	73	4239.7	1398.0	83	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64	3580.3	1026.6	74	4317.6	1444.6	84	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65	3650.2	1063.9	75	4396.5	1492.4	85	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66	3720.9	1102.2	76	4476.5	1541.4	86	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67	3792.4	1141.4	77	4557.6	1591.6	87	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68	3864.7	1181.6	78	4639.8	1643.0	88	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69	3937.9	1222.7	79	4723.2	1695.8	89	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70	4011.9	1265.0	80	4807.7	1749.9	90	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

11° 9' L
 45 15
 54 24



179 60
 135 53
 44 07

8.70
 35.56
 43.5
 42
 363

5280 / 133500
 10560
 6° 03' 27900
 26400

1000
 624
 376

41.7
 87
 2919
 3336
 36279

33.6
 8.7
 2632
 3088
 327.12
 300

5° 27'
 7° 15'
 12° 42'
 7° 15'
 19° 57'
 7° 15'
 26° 72'
 27° 12'
 7° 15'
 34° 27'
 7° 15'
 41° 42'
 7° 15'
 48° 57'
 6° 03'
 54° 60'

6.0
 17500
 174
 165
 29) 4807
 190
 174
 167
 140
 2

DISTANCES FROM CENTER OF ROADWAY FOR
 CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.
 For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	26.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.2	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be 41.9 + (20 - 16) * 2 or 2 ft. added to 41.9 = 43.9. For slopes of 1 on 1 see inside of front cover.