

MACKENSACK - LONGVILLE

TRANSIT, No. 2

DIETZGEN
TRADE MARK

ENGINEERS'
FIELD BOOK

No. 400

139

632

631

630

629

628

627

+72° Δ 24°00' R. 739°45' E. Var 8°30'

626

625

624

623

622

621

+57

○

Pop. hub.

620

619

+31.2 Δ 20°00' R. 715°30' E.

618

617

616

615

614

613

+40.5 Δ 15°06' R. (14°47' R) 714°45' W. Var 8°30'

612

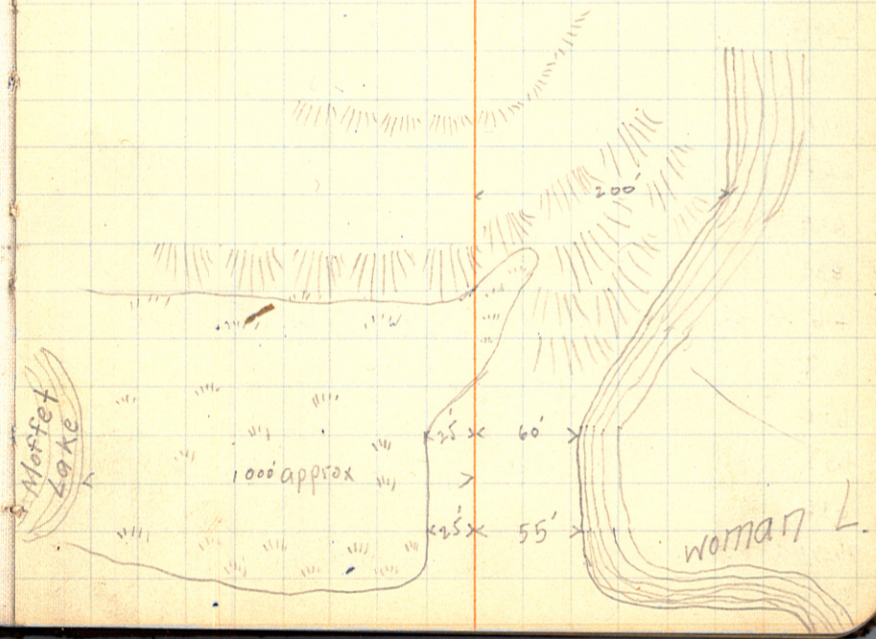
611

626+72
618+31.2
840.8

618+31.2
612+40.5
590.7

612+40.5
608+30.4
382.1

Equation 612+39.1 = 612+40.5
up line back.
after eliminating
2 small Δ back.
This stn. becomes 14°47' R



655
 654
 653
 652
 651
 650
 649
 648
 647
 646
 645
 644
 643
 +93.2
 642
 641
 640
 639
 638
 +62.4
 637
 636
 635
 634
 633
 +32.3

$\Delta 0^{\circ}08'R$. Eliminated Birch hub.

Basswood hub

Sta No. on 4" basswood to R.

646+0.0
 637+62.38
 638
 ← to eliminate the old ahead.

$\Delta 22^{\circ}20' L (22^{\circ}6' L)$ 749'5" E. Var. 8^{\circ}30'

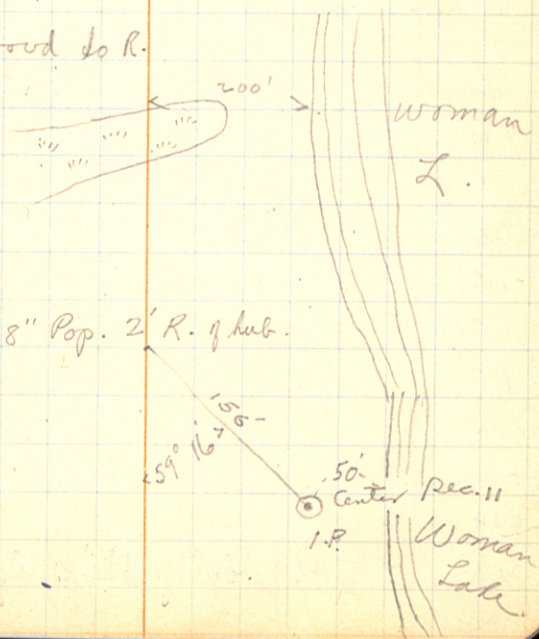
Sta No. on blazed 8" Pop. 2' R. of hub.

637+62.4
 632+32.3
 5 30

632+32.3
 626+12
 5 60.3

Pop hub

$\Delta 32^{\circ}16'R$



- 675
- 674
- 673
- 672
- 671
- 670
- 669
- 668
- 667
- +64
- 666
- +25
- 665
- 664
- 663
- 662
- 661
- 660
- 659
- 658
- 657
- +25
- 656
- +14.1

square hub on top of hill

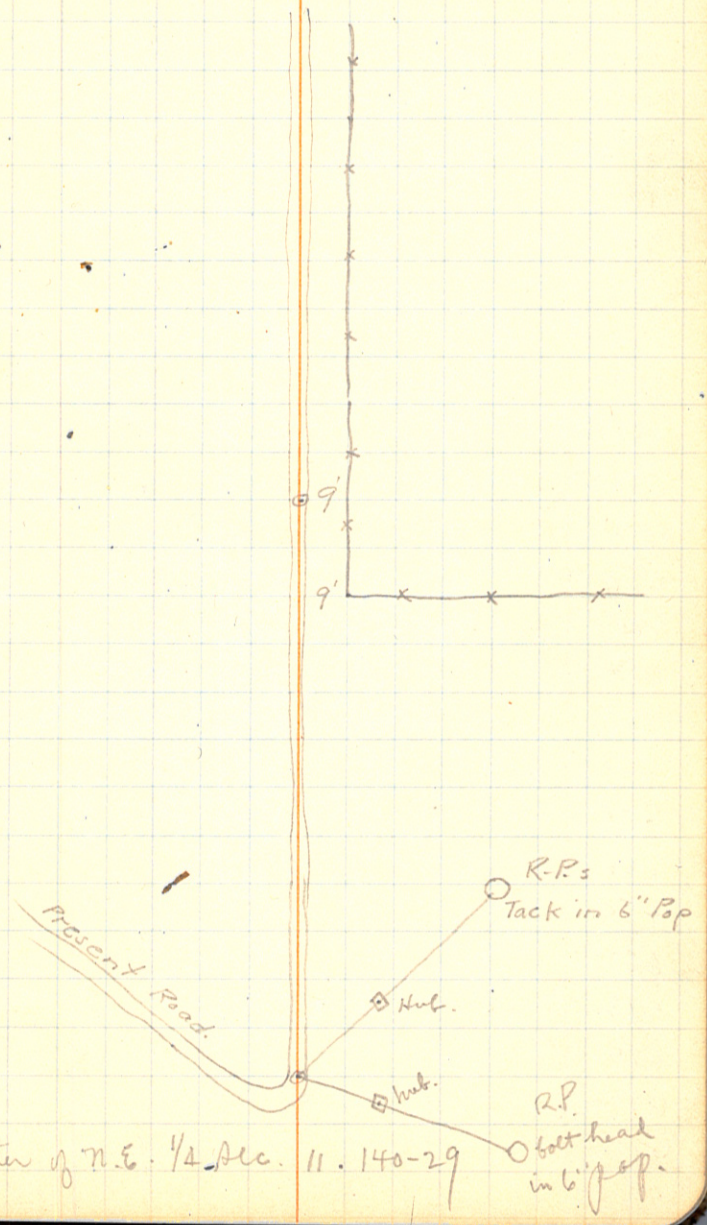
after eliminating the 08' back at 646.500.

$\Delta 50^{\circ}20' L (50^{\circ}16' L) 70^{\circ}30' W. Var 8^{\circ}30'$

656+25
637+62.4
18 62.6

I.M.

Center of n.e. 1/4 Sec. 11. 140-29



696

695

694

+55.2 \odot

693

692

691

690

689

688

+92.2 Δ 31°00' R.

687

686

685

684

683

682

+78

681

+59

680

+18 \odot

679

678

677

676

sq. hub

N 30°30' E Var 8°30'

687+92.2
656+25
31 672

681+78
679+18
260

sq. stake

679+18
656+25
22 93

56 25
50 7.0
6 05

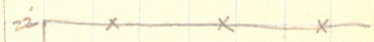
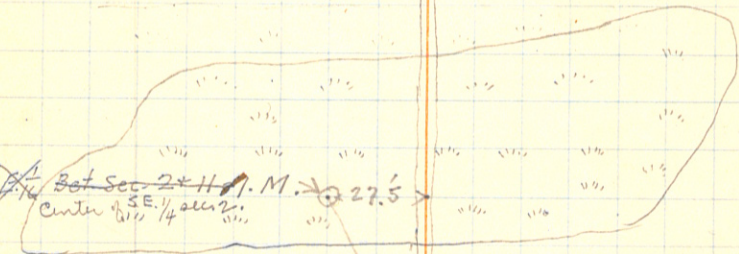
688
656
32.00

(5)

sq hub in side ditch → \odot

transverse
Hood's hub sets East of ours 1.85

Set Sec. 2 H.M. \rightarrow 27.5
Center $\frac{SE}{4}$ sec 2



P.O. La Valle

+40

716

+75

715

+74.3 ○

Birch hub

714

713

712

711 ○

W. Pine hub

710

709

708

707. ○

Pop hub

706

705

+12.3 ○

Bass wood Hub

704

703

702

+02.9 ○

Oak wood Hub

701

700

699

+50.

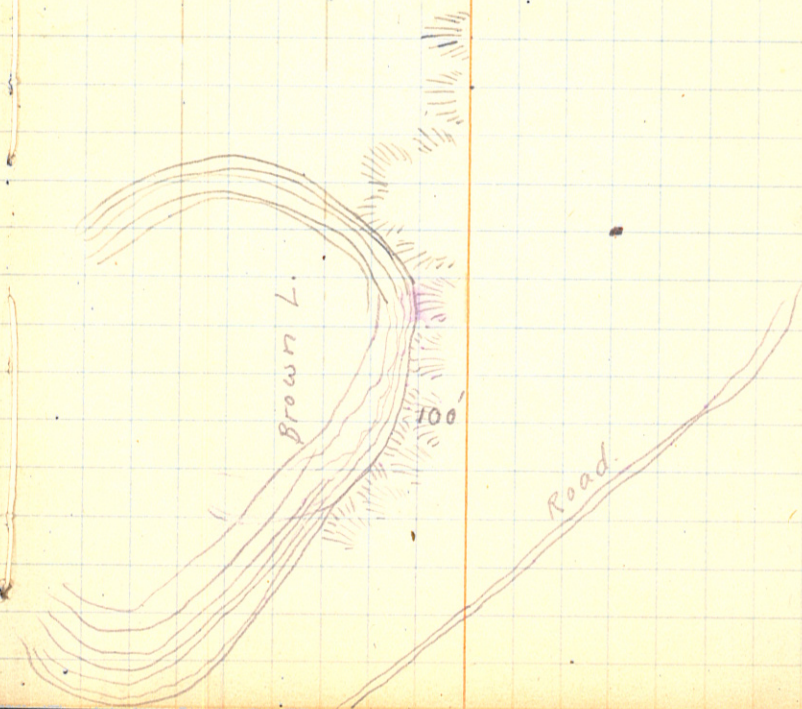
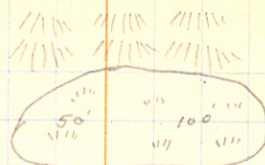
698

697

Leave swamp

enter swamp

} pot hole



+10.4 ○

Birch hub.

735

734

733

+55.6 ○

Pop hub.

732

+12.3 ○

sq. hub. 1' west of West wheel Track.

731

.730

+80

Leave swamp

729

+10

Enter swamp

728

+47 ○

Dry Pop hub.

727

726

+85

Leave bog

725

+25

Enter bog

724

723

722

721

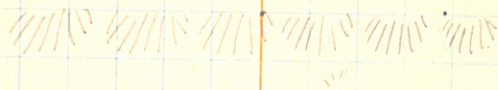
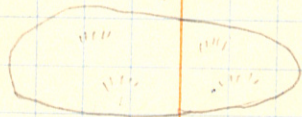
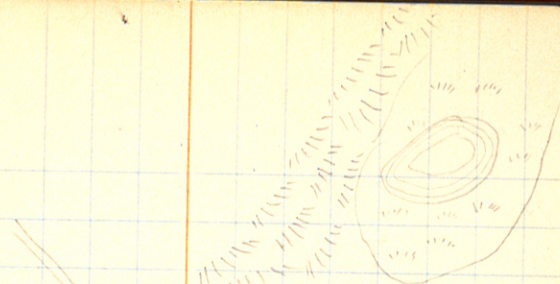
720 ○

Dry birch hub.

719

718

717



+39.8 ○
756

Birch Hub.

755

754

+86.4 ○

D. Pop. Hub.

753

752

On large Black stump.

751

750

+91.7 ○

G. Pop. Hub.

749

748

747

746

745

+09.4 ○

Dry Pop hub.

744

743

742

741

740

+41.2 ○

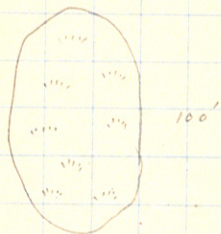
Jag Alder hub.

739

738

737

736



Sta. No. on 6" Pop. 2 1/2' Rt.

710 level swamp

779

778

777

776

775 ○ Alder Hub

774

773

772 ○ G. Birch Hub

771

770

769

+599 ○ D. pop hub.

768

767

766

765

+23° ○ D. Pop Hub.

764

763

762

761

760

759

758

757

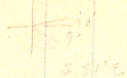
Enter swamp



791 + 73.8

71 89° 30' E

(10)



After setting Hub at 791+73.8 I went to see Cor. N.E. of 36 and set a course of $71^{\circ} 30' E$ at $71^{\circ} 30'$ and then turned an angle of $7^{\circ} 30'$ Rt. which gives me a bearing of $58^{\circ} E$. which I run to an Inter section with our line at sta. 791+60.4

+73.8 ○

In E of present Road.

791

790

791+73.8

789

+04.2 ○

Birch hub.

788

787

786

785

+50 approx

784

783

782

+34.9 ○

G. Birch hub.

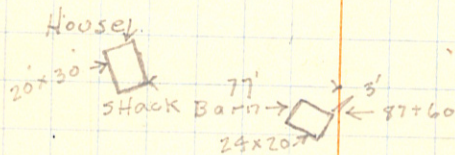
781

780

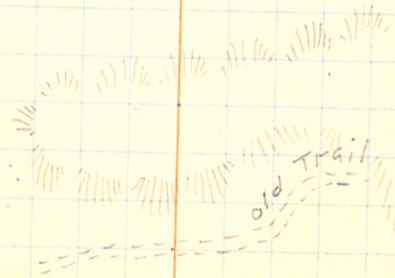
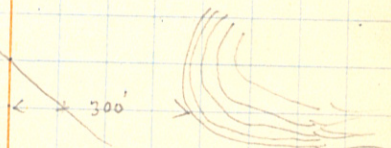
+60

+ 47.4 ○

Oak hub.

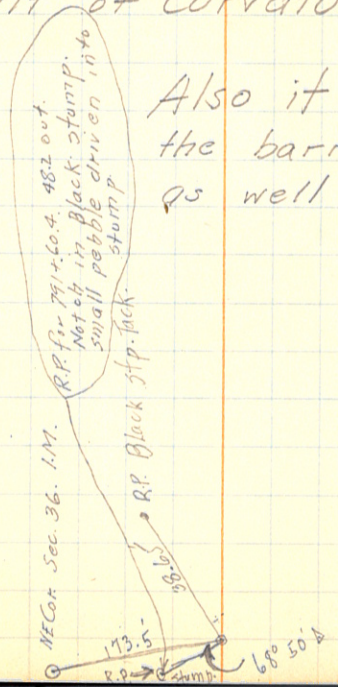


24x20



Note: In as much as this Line calls for a rather large Δ ($68^{\circ}50'$) at $791+60.4$ as well as the removal of this Farmers barn, I went back to sta. 784 where I set a hub and turned an Δ of $34^{\circ}25'R$. to intersect the 581° line from sec. cor. this line will give 2 curves as against the former lines. One, but both are lighter and the total amount of Curvature is the same.

Also it eliminates the barn's removal as well as a hill.

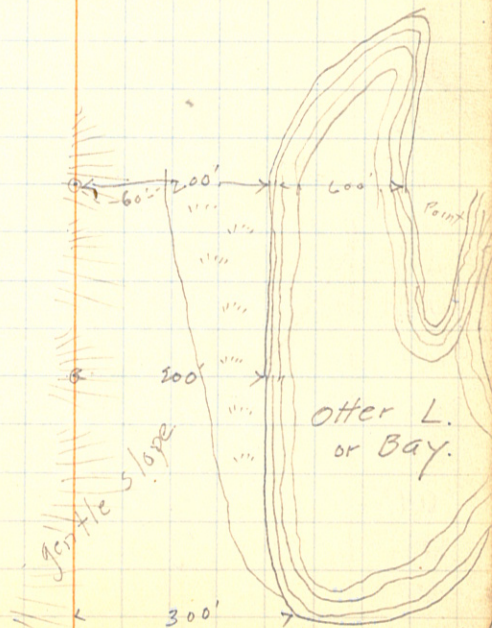
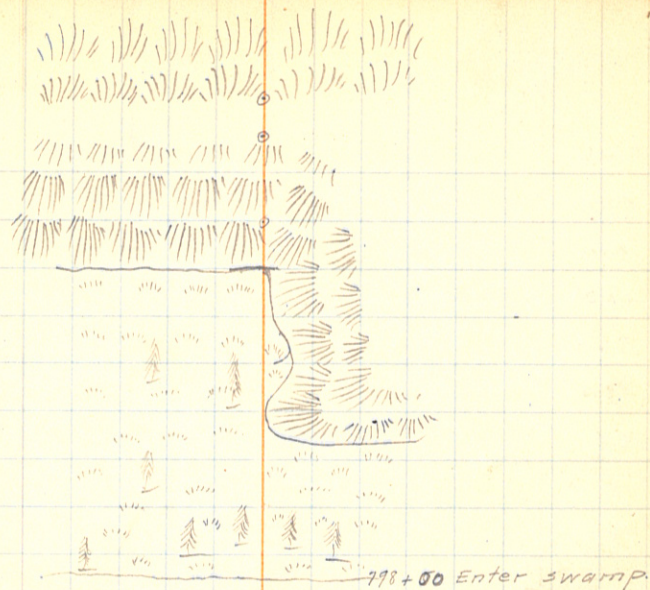


+7
79
79
78
+
78
78
78
+5
78
783
784
+34
781
780
+60
+4

791+60.4 $\Delta 68^{\circ}50'R$. Birch hub at edge of road. s. side
setting on Hub at sta. 791+60.4

+925	○	Birch hub	
806			
+846	○	Birch hub.	
805			
+397	○	Birch hub at foot of hill.	
804			
803			
802			
801			
800			
799			
798			
797			
+953	△	34°30' R. Pop Hub.	
796	○	Pop Hub.	
795			
794			
793			
792	○	Pop Hub.	
791			
790			
789			
+44	○	Pop hub	
788			
787			
786			
785			
784.	△	34°25' R. Basswood hub.	

$$\begin{array}{r}
 796 + 953 \\
 784 \\
 \hline
 12953
 \end{array}$$



826

825

824

+082 Δ 84°00' L. D. Birch hub

823

822

821

820

819

+76 Δ 60°00' R G. Birch hub.

818

817

+30

816

815

814

813

+90

+60

812

811

○

Pop hub.

810

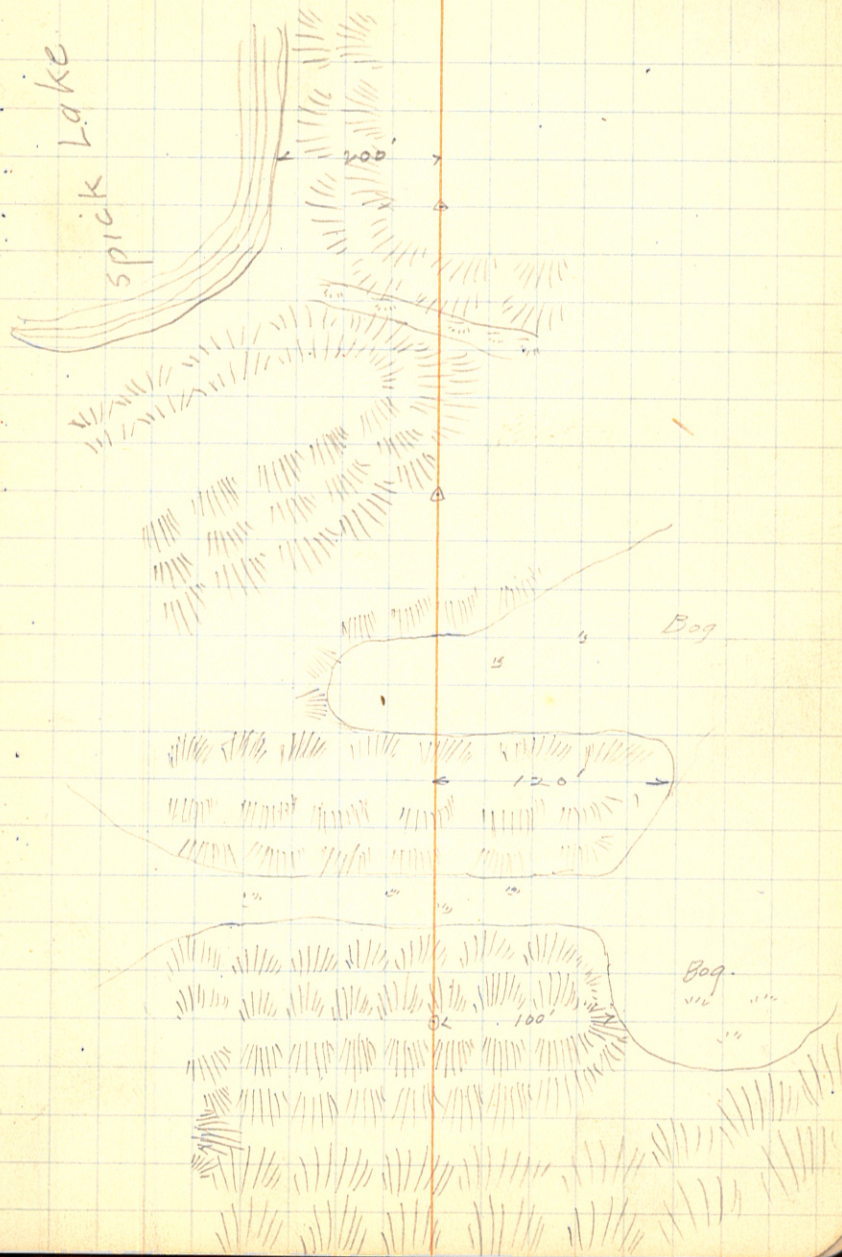
809

808

807

823+0 8.2
818+76
4 32.2

818+76
796+953
21 807



849

848

+73.9 0.

G Pop hub.

847

846

845

844

843

Birch hub

842

841

840

839

838

837

+90

836

835

+23.6 0

dry pop hub

834

833

+28.4 $\Delta 24^\circ R.$

832

831

830

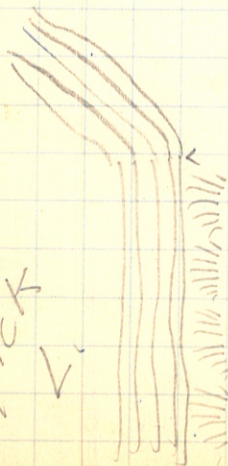
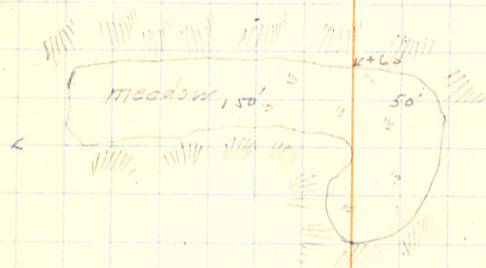
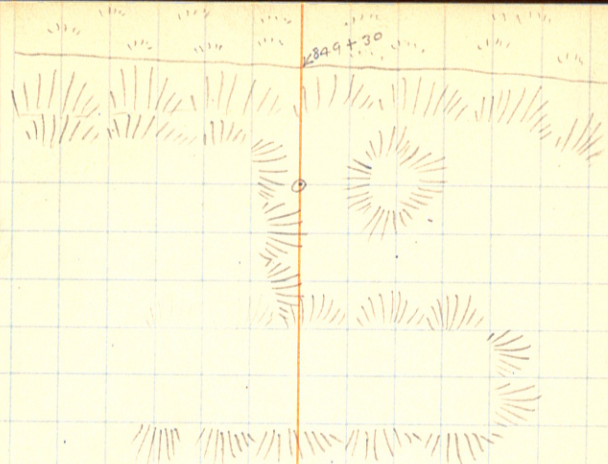
829

828

827

832+28.4
823+08.2
9 20.2

SPICK
L.



200'

Back on original
Line, $581^\circ E.$ Var $8^\circ 30'$

+411 ○

G. Birch Hub.

868

867

866

865

+85

864

+90

863

862

+453 ○

G. Pop hub.

861

860

859

858

857

856 ○

G. pop hub.

855

854

853

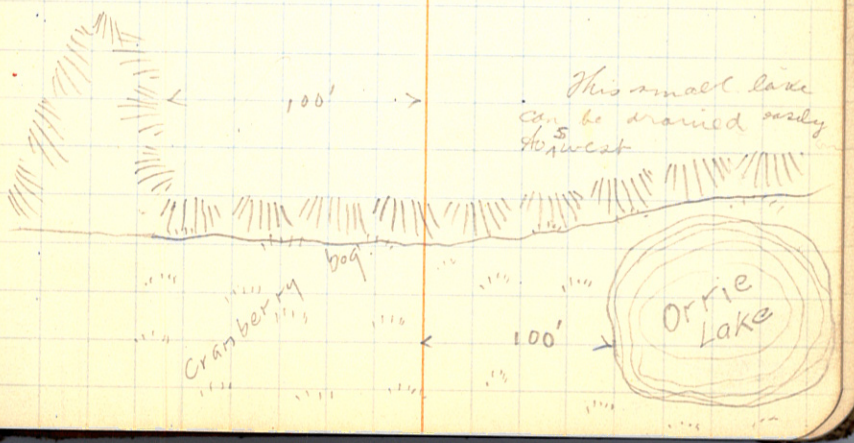
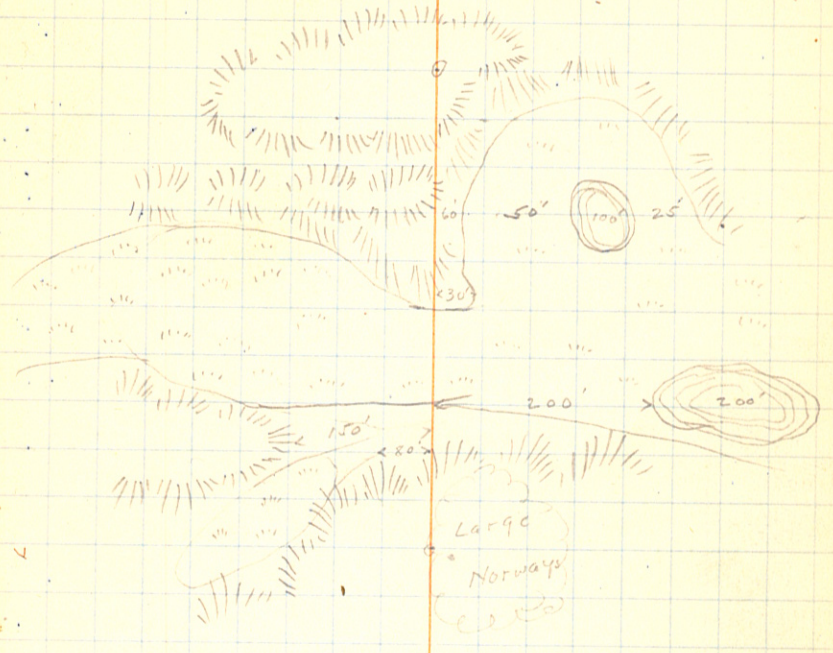
+80

852

851

850

leave meadow }
 } old lake
 } bottom
cut meadow



leave bog

888

887

886

885

+59.6 \odot G. Pop Hub.

884

883

882

881

+25.4 Δ 9°30' L. Due East Var 8°30'

880

+55

Leave meadow

879

880+25.4

832+28.4

47 97.0

878

+50

Enter meadow

877

876

875

+38.6 \odot

Bass wood Hub on Mound near clump of Birch.

874

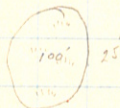
873

872

871

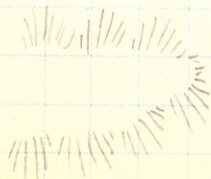
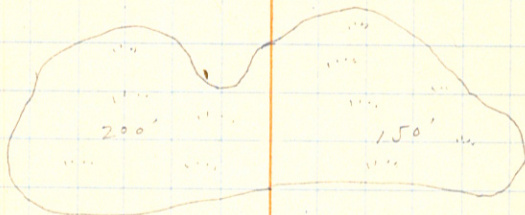
870

869



Old Road \rightarrow To Girl L. Bridge \rightarrow

Birch hub



+ 43.1 ○ Oak Hub

909

908

907

906

+ 33.4 ○ G. Pop Hub.

905

904

903

902

901

900

899

898

897

+ 87 ○ G Pop hub.

896

895

894

893

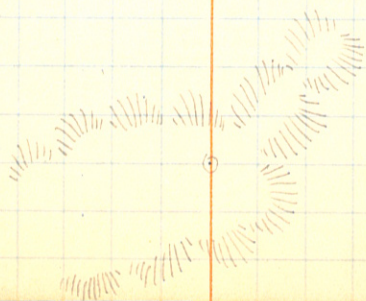
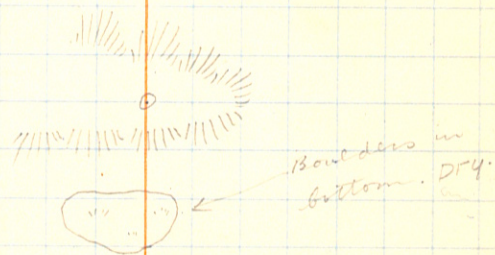
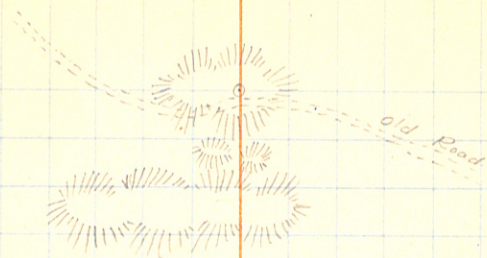
892

891

+ 08° ○ G. Birch hub.

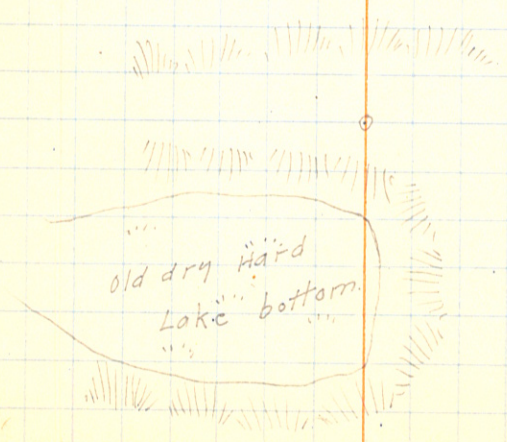
890

889



922
874
48

931
930
929
+22⁶ ○ Oak hub.
928
927
926
925
924
923
922
+38² ○ Oak hub.
921
920
919
918
+45.4 ○ Birch hub.
917
916
915
914
913
912
911
910



953

952

951

950 Δ 28°20'R.

Birch Hub.

949

948

947

946

945

$$\begin{array}{r} 950+000. \\ 944+17.9 \\ \hline 5 \quad 82.1 \end{array}$$

+17.9 Δ 2°45'R.

944

943

942

941

940

939

+50.6 \odot

G. Pop Hub.

938

937

936

935

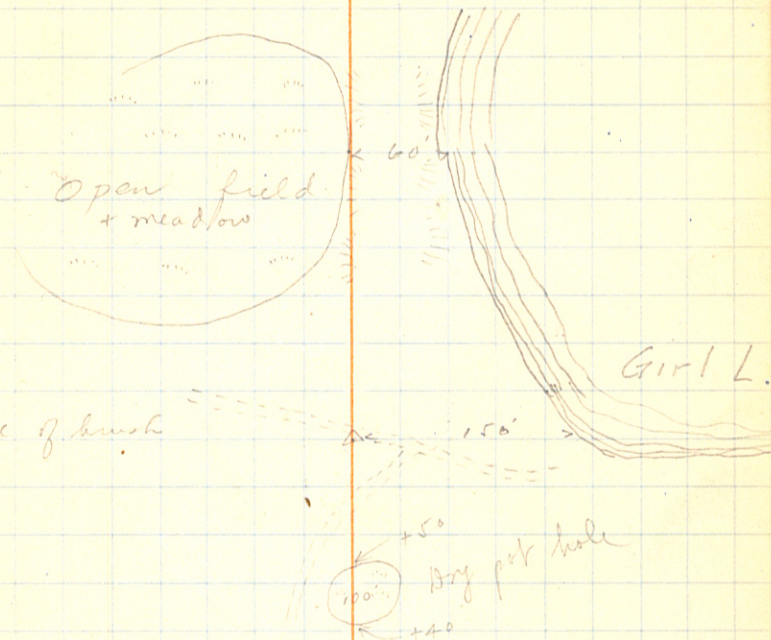
+17 \odot

dry birch hub. just west of fence.

934

933

932



From P.R.-L. Road
 1337+785 = O X H.L. Road Sta. 976+40.1
 R.P.S Stump N.E. 22.5
 T.P. S.E. 22.8

976+40.1
 971+71.5

 468.6

For Connection to Pine River
 Remer Survey - see Transit
 book for that survey
 End. of line.

+71.5 ○ Large Birch Hub.

971

970

969

968

967 Δ 11°52' L. Birch hub.

966

965

964

963

+41.9 Δ 11°46' R. Pop hub. 547°30' E Var 8°30'

962

961

960

959

958

957

956 ○ Birch hub.

955

954

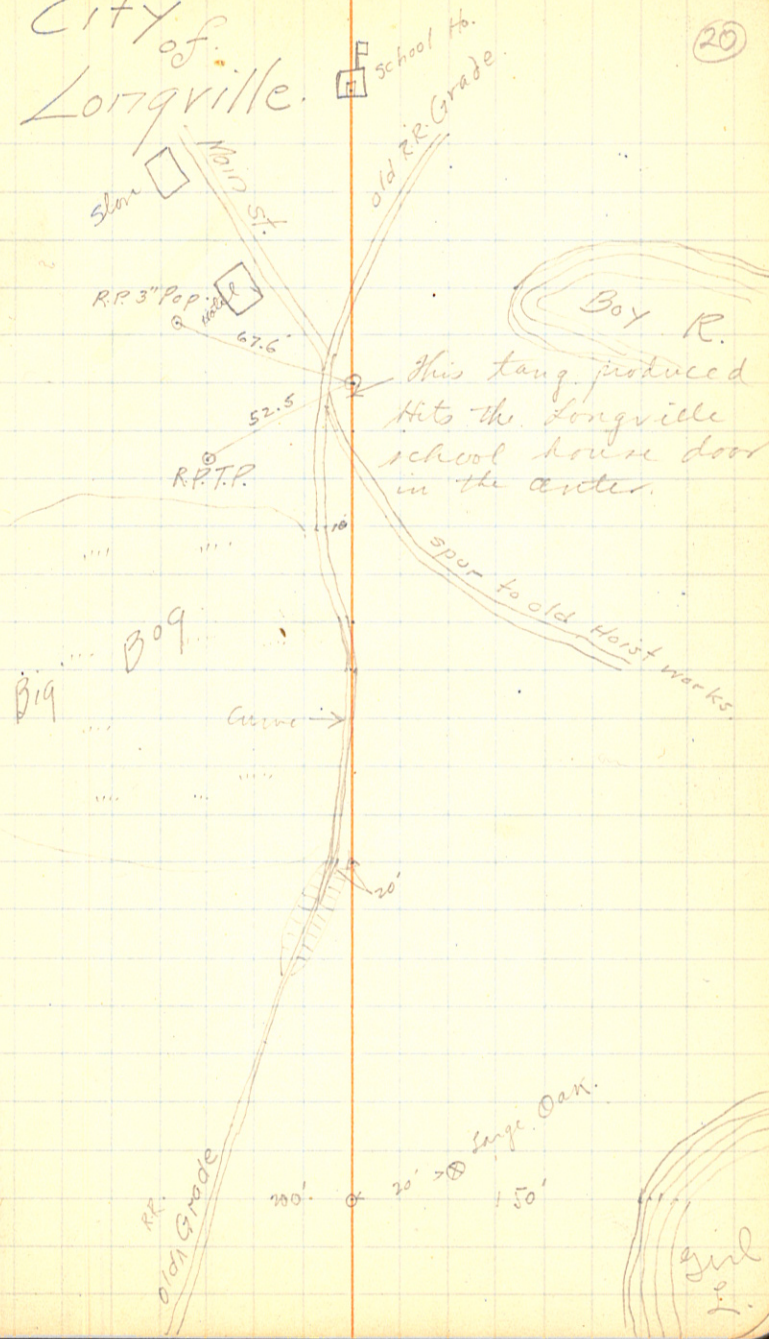
967+00.0
 962+41.9

 458.1

962+41.9
 950+00.0

 1241.9

City of
 Longville.



This tang. produced
 Hits the Longville
 school house door
 in the center.

spur to old Horst works

"B" Connection Line

to connect with old R.R. Grade
& Probable P.R.-Longville
Location.

Take wide sections from sta. 951+50 to top of
R.R. grade, making them the regular sections
at the beginning and widening it out to
200' on each side at grade. Go across grade
about 20' with sections on back long produced.
This is for topography for "Y" connecting
curves to old grade.

+69.6

⊙

sq. hub in center of R.R. Grade.

953

952

951

950

949

948

947

946

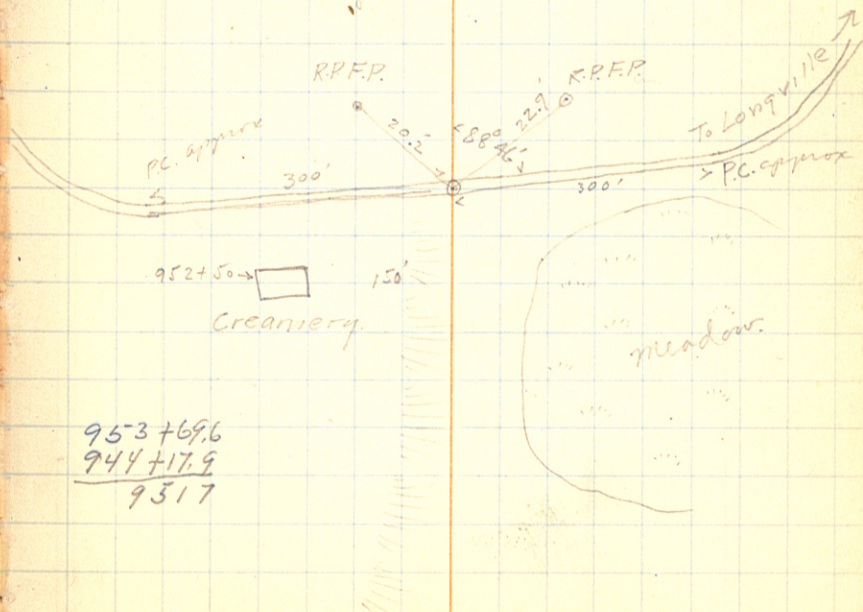
945

944+17.9 Δ 2597 L.

953+69.6

944+17.9

9517



953+69.6

944+17.9

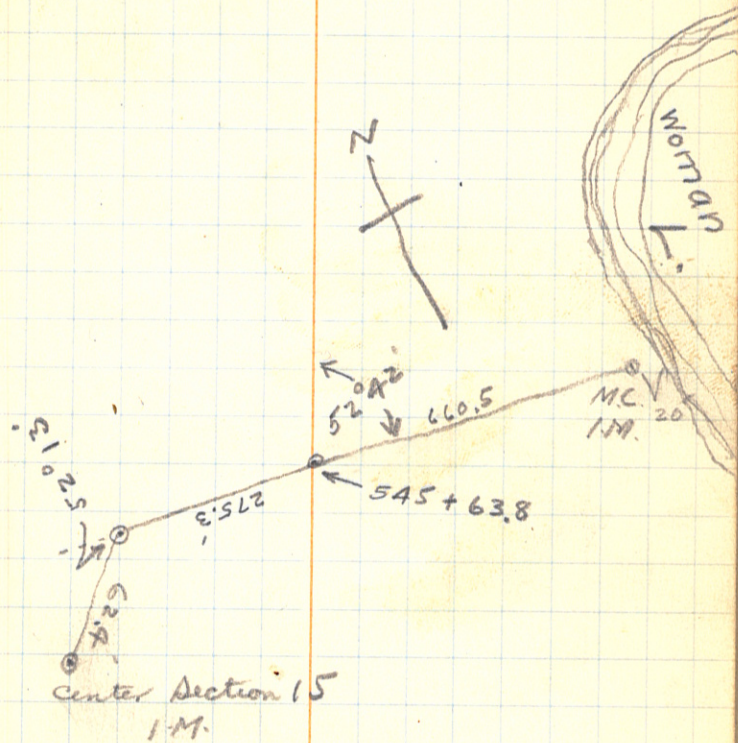
9517

Sounding 5.

Sta.	Peat	Muck	clay.	sand.	Total to Bottom	Kind of Bottom.
852	4'	8'			12'	Lake sand.
851	4'	16'	5'		25'	Clay & sand mixed.
850	3'	6'			9'	Lake sand.
797+50		3'			3'	sand.
799+25		3'	2'		5'	B. clay + sand mixed.
800		3'			3'	sand.
802		4'	1'		5'	B. clay + sand.
779		2'			2'	clay + sand.
778		4'			4'	clay + sand.
777		5'			5'	B. clay + some sand.
776		4'			4'	B. clay + sand.
681+25		7'			7'	Rock. (Boulder)
"		8'			8'	Gravel + Boulder.
681+80		8'	3 1/2'		12'	8' to thin hard pan - 6" hard pan - 3 1/2' soft clay - Gravel
682+25		8'	4'		12'	gravel bottom
Cur Lake Creek. 488+50					12'	10' boulder - 2' blue clay - gravel + sand ^{clay} bottom (a mixture)
"		8'	2'		10'	Muck is a white color, sort of a ^{clay} quick sand ^{so close}
485+25					4'	alternate layers of wash sand + muck. ^{clay} sand bottom
485+60		6'	4'		10'	pond bottom.
362+50						6' muck to blue clay and sand.
371+20						2' to Gravel

Section Tie at 545+63.8

(24)



545+63.8
543+89.4

174.4

<u>Course</u>									
Bearing Course	Length	Bearing	Cosine of bearing	Sine of Bearing	Lat.	+ Lat.	- Dep.	+ Dep.	
AB	1125	N 3° W	.99863	.05234		1123.46 ✓	58.88 ✓		
BC	1198	N 4° 45' W	.99657	.08281		1193.89 ✓	99.21 ?		
CD	394	N 2° 15' W	.99923	.03926		393.70 ✓	15.47 ✓		
DE	747	N 16° 30' E	.95882	.28402		716.24 ✓		212.16 ✓	
EF	597	N 14° 45' E	.96705	.25460		577.33 ✓		152.00 ✓	
FG	1012	N 44° 15' E	.71630	.69779		724.90 ✓		706.16 ✓	
GH	486	N 45° 30' E	.70091	.71325		340.64 ✓		346.64 ✓	
HI	430	N 53° 15' E	.59832	.80125		257.28 ✓		344.54 ✓	
IJ	630	N 51° 30' E	.62251	.78261		392.18 ✓		493.04 ✓	
JK	230	S 60° 30' E	.49242	.87036	113.26 ✓			200.18 ✓	
KL	214	S 77° 30' E	.21644	.97630	46.32 ✓			208.93 ✓	
LM	360	N 73° 30' E	.28402	.95882		102.25 ✓		345.18 ✓	
MN	81	N 6° 05' W	.99437	.10597		80.54 ✓	8.58 ✓		
						-159.58 ✓	8902.41 ?	-182.14 ^a	+3008.83 ✓

+L	+L
-D	+D
-L	-L
+D	+D

Lat.	Dep.
+ 5902.41	+ 3008.83
- 159.58	- 182.14
<u>+ 5742.83</u>	<u>+ 2826.69</u>

Length of Course = $2826.69 \div \sin 26^\circ 12' 25'' = 6400.75'$

∴ Lat of req'd Course = -5742.83
 Dep of " " = -2826.69
 ∴ Bearing of Course = S.W.
 Tang. of bearing = $2826.69 \div 5742.83 = .49221$
 Bearing = $S 26^\circ 12' 25'' W$, or reversed =
 $N 26^\circ 12' 25'' E$.

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
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66

133. 270
141 270
27 5.5
137.5

Ex 70 14/128 19 40 100° Ex 7 9'

CURVE FORMULAS

- Radius=R= $\frac{50}{\sin D/2}$ (1) Degree of Curve=D and $\sin \frac{D}{2} = \frac{50}{R}$ (2)
- Tangent=T=Rtan $\frac{\Delta}{2}$ (3) Length of Curve=L=100 $\frac{\Delta}{D}$ (4)
- Middle ordinate=M= R(1-cos $\frac{\Delta}{2}$) = Rvers $\frac{\Delta}{2}$ (5)
- External=E=Ttan $\frac{\Delta}{4}$ (7) = R \div cos $\frac{\Delta}{2}$ - R (8) = Rexsec $\frac{\Delta}{2}$ (9)
- Long Chord=C=2 R sin $\frac{\Delta}{2}$ (10) Δ =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 $\div 8\frac{1}{3}=414.49$ 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 x 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 x C x D² or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8 $\frac{1}{3}$ =136.2' or 2° 16.2', or=2.50 x 54.5=136.2' from Table III. For Sta. 159 deflection angle=2° 16.2' + 8° 20' \div 2=6° 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 $\frac{1}{3}$ =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= $5^\circ 30'$.

29
600
59
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	483.2	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.

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

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

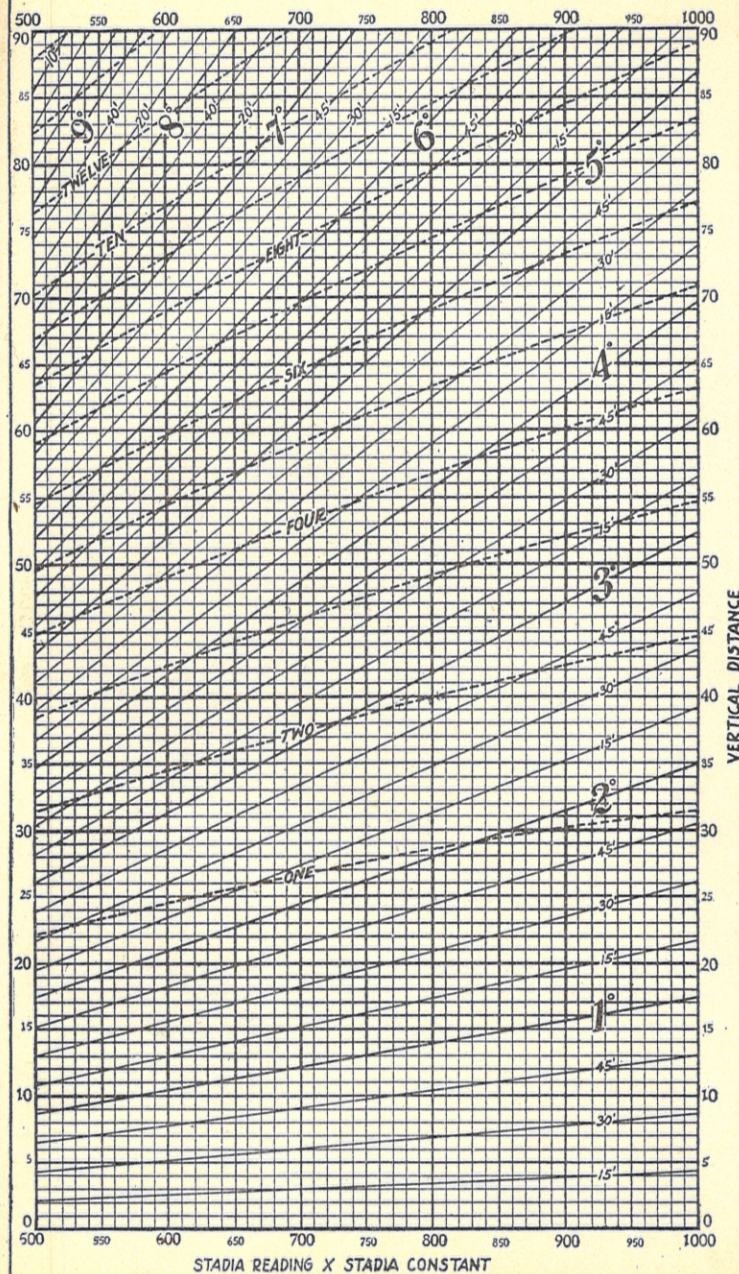
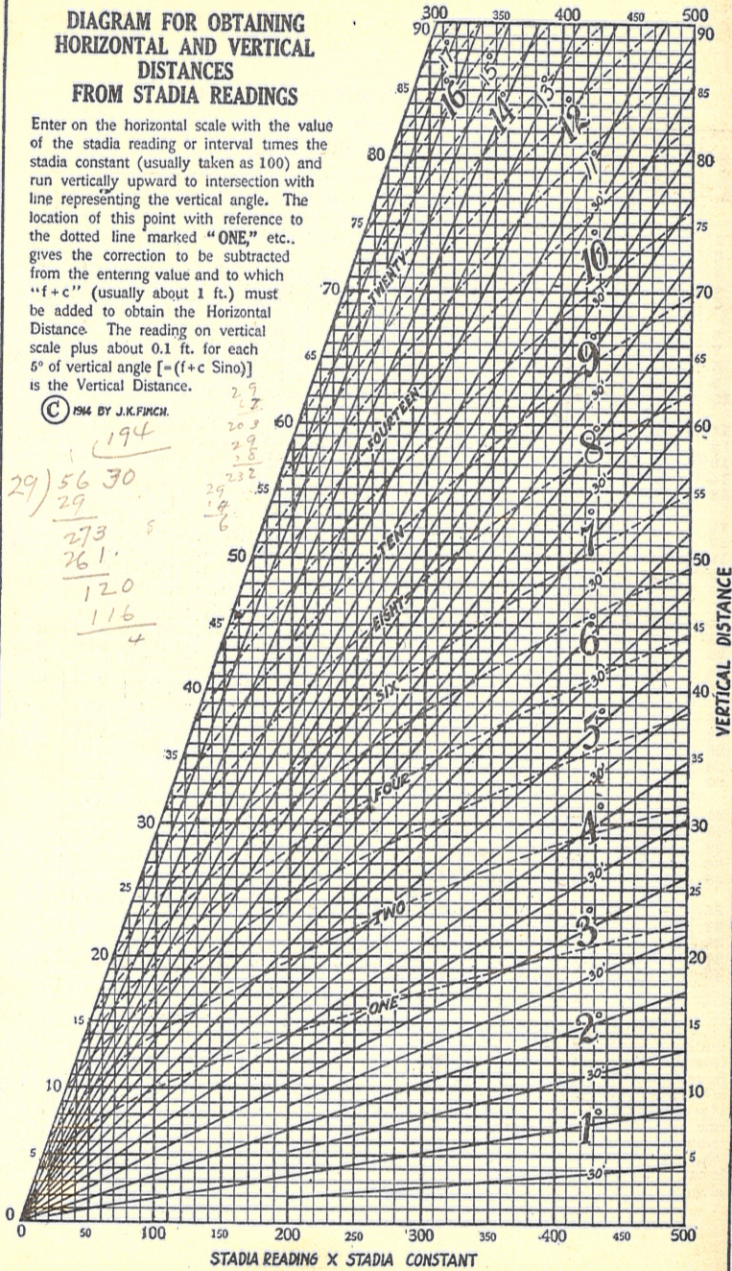
Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which "f+c" (usually about 1 ft.) must be added to obtain the Horizontal Distance. The reading on vertical scale plus about 0.1 ft. for each 5° of vertical angle $[(f+c) \sin \alpha]$ is the Vertical Distance.

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Handwritten calculations:

$$\begin{array}{r} 29 \overline{) 5630} \\ \underline{29} \\ 273 \\ \underline{261} \\ 120 \\ \underline{116} \\ 4 \end{array}$$

 194
 2.9
 2.7
 2.5
 2.3
 2.1
 1.9
 1.7
 1.5
 1.3
 1.1
 0.9
 0.7
 0.5



342.20
29) 9924.00

87
122
116
64
58
60
58
20

342.2
3.8
346.0

818476
1 14
819 90

432.2
.86603
12966
25932
25932
34576
3742981.66

P.I. = 823 + 76.0 40674
T = 3 + 46.0 366066
P.C. = 820 + 30.0
L.C. = 4 13.8 40674
P.T. = 824 + 43.8 162696

40674) 374.29816600
366066
82321
81348
97366
81348
160180
122022
391580

a = 920.24

823 + 08.2
9 + 20.2
832 + 28.4

a : c :: sin A : sin C

a : 432.2 :: .86603 : 40674

071056
0825
07227
81
18
5280

41379
29) 120.0000

29
232
29
11

40
L 21' 29"
5
43.8
8.7
3066
3504
381.06
36.
21

110
87
230
203
270
261

over line

14° 30'

7°

8.70
435.0
420
15

39° 09'
715
4624
715
53 39

(Horn)
26.6
54.0
(539.4
C.V.W.)

Horn hut near mail box.

53° 39'

6° 21'

59° 60'

60°

56.731 + 12.3

34° 07' 2°

515.9

8.542

14° 42' R.

24° 45' L.

Horn B

17° 24'

715

24° 39'

715

31° 54'

715

38° 69'

39° 09'

8.70
174.0
120
2054
715
9° 69'
10° 09'
715
17° 24'
715
24° 39'
715
31° 54'
715
38° 69'
39° 09'

97772.0
 5280
 44272
 42240
 21320
 791+60
 1 35
 790+25.4

68
 29) 1980
 174
 240
 232
 8

823 + 0.2
 818 + 76.0
 4 32.2
 1 14
 3 18.2

687
 29) 5159
 29
 225
 203
 229

180
 80
 96
 60
 156
 24

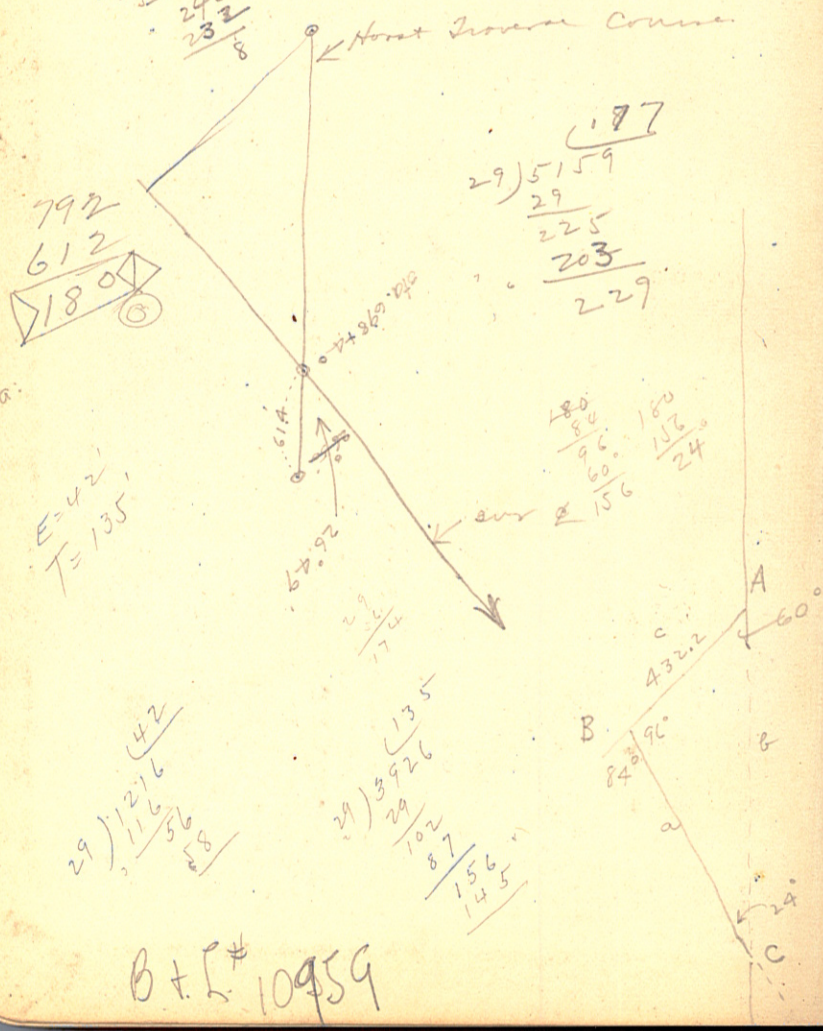
792
 612
 180

E=42
 T=135

42
 29) 1216
 116
 56
 58

135
 29) 3926
 29
 102
 87
 156
 145

B + L # 10959



DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1 1/2.
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	25.2	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	56.3	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.