PROPOSED PINECREST SUBDIVISION II

Thesis for the Degree of B. S.

MICHIGAN STATE COLLEGE

S. Kessler — E. W. Malkowitz Jr.

1949

SUPPLEMENTARY MATERIAL IN BACK OF BOOK

Proposed Pinecrest Subdivision II

A Thesis Submitted to

The Faculty of

MICHIGAN STATE COLLEGE

of

AGRICULTURE AND APPLIED SCIENCE

by

S. Kessler E. W. Malkewitz Jr.

Candidates for the Degree of

Bachelor of Science

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The purpose of this thesis is to broaden the authors knowledge of the methods of surveying and the procedure in making and planning a subdivision. The problems encountered in the various phases of this project may be considered as representative of those met in practice today.

The project was divided into the following phases:

1. Research and Field Survey
2. Traverse Survey
3. Topographical Survey
4. Design of Subdivision
5. Design of Streets and Sewers
6. Cost Estimate

Research and Field Survey

A search of likely land led the authors to a farm on the west side of Harrison Avenue between Saginaw Road and Lake Lansing Road. Permission was granted by the owner, Dr. Ward Giltner, and also the tenant, Phillip Narveson, for use of the land. Learning that of the farm of 120 acres, the South forty was already subdivided and called "Pinecrest". The middle forty was the logical part to use. A description of the property was obtained at the Ingham County Register of Deeds Office at Mason. The description read: The N.E.$\frac{1}{4}$, of the N.W.$\frac{1}{4}$, of Sec. 12, T4N, R2W, Lansing Township, Ingham County. Also the details of the roads intersecting the South boundary of the traverse were obtained. More field work showed undesirable lowland on the N.W. corner and not surveyable in the time allowed. The area was thus limited and the description changed to read a portion of the N.E.$\frac{1}{4}$.

The problem faced seems quite typical of those met in the field today. The plat must connect with the streets already located and still get an economical breakdown of the land.

Traverse Survey

The center of Sec. 12 was located as the nearest reference point. Proceed West, 33 feet; thence North, 1319.5 feet to the Point of Beginning. Thence S.89°30'W., 1283.5 feet; thence North, 660.0 feet; thence N.89°30'E., 600.0 feet; thence North, 550.0 feet; thence N.89°30'E., 682.9 feet; thence South, 1210.7 feet to the point of beginning.

Computation Of Lats & Deps

Line	Bearing	Distance	Latitude		Departure	
			N +	S −	E +	S −
AB	S 89°30W	1283.5'		11.2'		1283.5'
BC	North	660.0'	660.0'			
CD	N89°30'E	600.0'	5.2'		600.0'	
DE	North	550.0'	550.0'			
EF	N89°30'E	682.9'	6.0'		682.9'	
FA	South	1210.7		1210.7'		
		4987.1'	1221.2'	1221.9'	1282.9'	1283.5'
				1221.2'		1282.9'
				0.7'		0.6'

Total Error

$\sqrt{.7^2+.6^2}$

0.92'

Error Of Closure

$\frac{0.92}{4987.1} = \frac{1}{5400}$

Correlation or Test of Hypothesis

Name	Boarding	Distance	Deviation		Deviation	
			$x+$	$x-$	$y+$	$y-$
AA	2 km	15151		15151		15832
BB	4 km	2 km	0.022			
CC	3 km	3 km	0.022		0.002	
DD	4 km	3 km	0.022			
EE	3 km	4 km	0.022			
FF	2 km	3 km	0.022		0.002	
GG	4 km	2 km	0.022			
			0.132	15151	0.004	15832

$$\frac{0.132}{15151} = \frac{1}{114864}$$

$$\frac{0.004}{15832} = \frac{1}{3958}$$

Correlation of Distance

$$\frac{1}{3958} \times \frac{1}{114864} = \frac{1}{454,691,712}$$

$$0.0000000022$$

Topographical Survey

A bench mark was established on the high spot of a two-and-one-half foot boulder located along the ditch line in Harrison Avenue 15 feet East and 754 feet North of the Point of Beginning.

A grid system of 50 foot intervals was patterned by stationing stakes North and West along the boundaries. With the exception of the southwest portion which was stationed eastward from this West Side across the open terrain to the farm residence. The stations were extended across the field and elevations were taken at their intersections. Turning Points and Bench Marks were added about the field for convenience.

Two Bench Marks were obtained from the Michigan State Highway Department Field Office as used on the M-78 Road Project.

B.M. 20 Elev. 852.96	B.M. 21 Elev. 852.64
N.W. Root of 12" Elm	S.E. Root of 14" Hickory
42' Lt. of Sta. 112 01	169' Lt. of Sta. 120 55

These Bench Marks were checked against each other and the level was carried to the Stone Bench Mark. This Bench Mark was established as being 850.49 feet above Sea Level. The level was then carried back to B.M. 20 as a check.

Design of Subdivision

This design of the lots is made necessary by the streets entering from the South and the boundary of Harrison Avenue on the East. The distance of the subdivision from town makes it well adapted to the use of suburbanites. There is a need for a lot with size sufficient for a home garden, and/or a little space for lawn and leisure. The lot just under a half acre is the solution presented.

The adjustment of the angle in Sherwood Avenue by increasing the angle from S.24°34'30"E. to S.28°28'00"E. will bring it in line with the proposed right-of-way. This will be a small change in alignment and should not be displeasing.

There is a total of 28.10 acres in the subdivision. Of this total 6.28 acres is dedicated to the use of the public or 22.4 per cent.

The plat was made according to instructions obtained from the "Plat Manual of Township, Village, and City Plats", issued by Vernon J. Brown, Auditor General, State of Michigan.

Design of Streets and Sewers

The nature of the ground makes it desirable to remove the crown of some of the hills and fill in the low areas. This was kept in mind in the layout of the road elevations. Balancing of cuts and fills was not attempted, but future filling in of the low area in the Northwest would improve the layout of the whole subdivision.

The Right-Of-Way is 66 feet. The road is to be 36 feet wide back to back of the curbs. The sidewalk is to be 5 feet wide and one foot inside the Right-Of-Way for convenience in construction. The remaining 9 feet on each side will be the parkway and will be devoted to carrying the various utilities; water, electricity, and telephone lines.

The direction of the slopes in the subdivision made it difficult to collect the water and sewage in one spot. The natural collecting areas are on opposite sides of the plat. Further investigations as to splitting the direction of flow might be helpful. These would alleviate the deep cuts of the present plans in placing the sewers.

The following specifications were used in design.

Sanitary Sewers

100 gal./cap./day as average amount of sewage

Maximum flow 250% of average

6 persons/lot due to large lots

Infiltration 50,000 gal./day/mile of sewer

Minimum velocity 2 ft./sec.

$$V = \frac{1.486\ R^{\frac{2}{3}}\ S^{\frac{1}{2}}}{n}$$

n = 0.013

R = Wetted Perimeter

S = Slope

Minimum diameter of pipe 8"

Minimum depth of placing 6'

The 8" minimum diameter of pipe controls through out, and due to the low volume of sewage it will be necessary to provide flushing and cleaning at periodic intervals.

Storm Sewers

A 20 year rainfall record for East Lansing was obtained and design was based on the 10 year curve (see data)

Runoff Coefficient was computed for typical lot (see data)

Minimum velocity $2\frac{1}{2}$ ft./sec.

Use same formula in computation of velocity

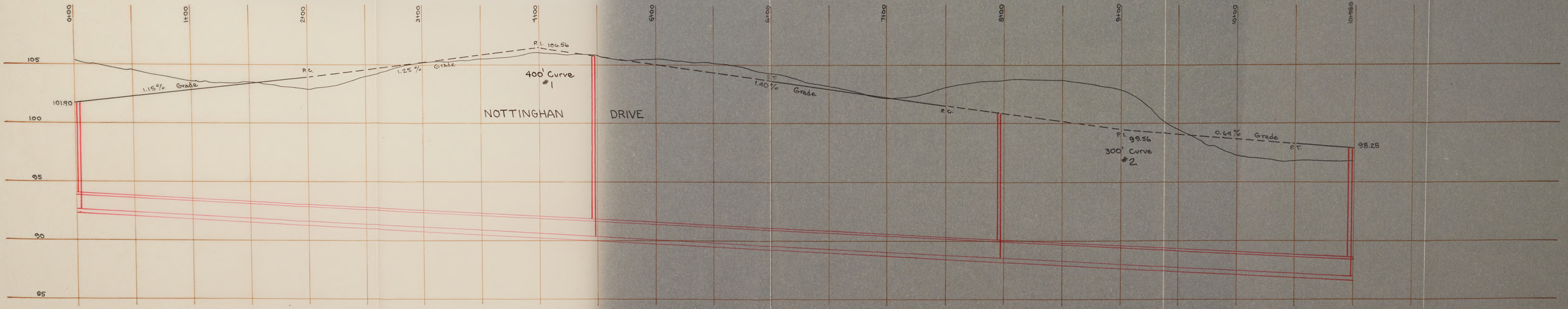
Minimum diameter 12"

Minimum depth of placing 7'

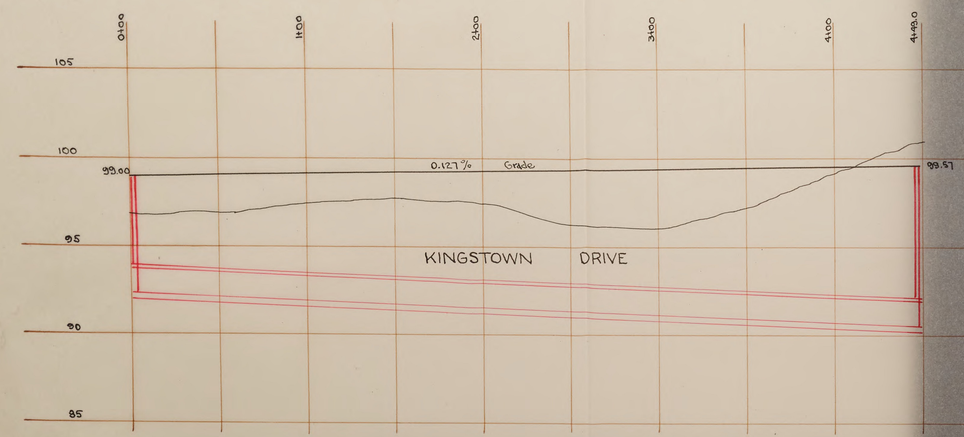
It was attempted to keep the Storm Sewer below the Sanitary Sewer to facilitate permanence in planning and the additional slope needed by the Sanitary Sewer to maintain minimum velocity allows the use of smaller pipe in the Storm Sewer which is more economical to use than the additional excavation cost needed.

Streets and Sidewalks

Materials and Construction Methods will be specified by the Ingham County Road Commissioner.


0+00
1+00
2+00
3+00
4+00
105
100
95
90
85
101.90
1.15% Grade
P.C.
1.25% Grade
P.I. 106.56
400' Curve #1
NOTTINGHAN DRIVE

5+00
6+00
7+00
8+00
9+00
10+00
10+98.8
P.C.
1.40% Grade
P.I. 99.56
300' Curve #2
0.69% Grade
P.T.
98.28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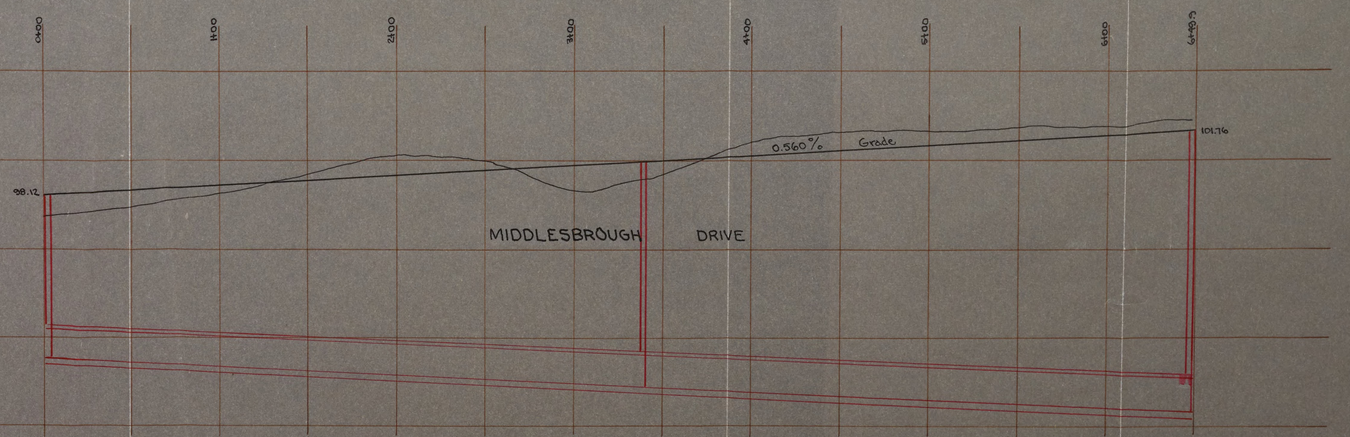
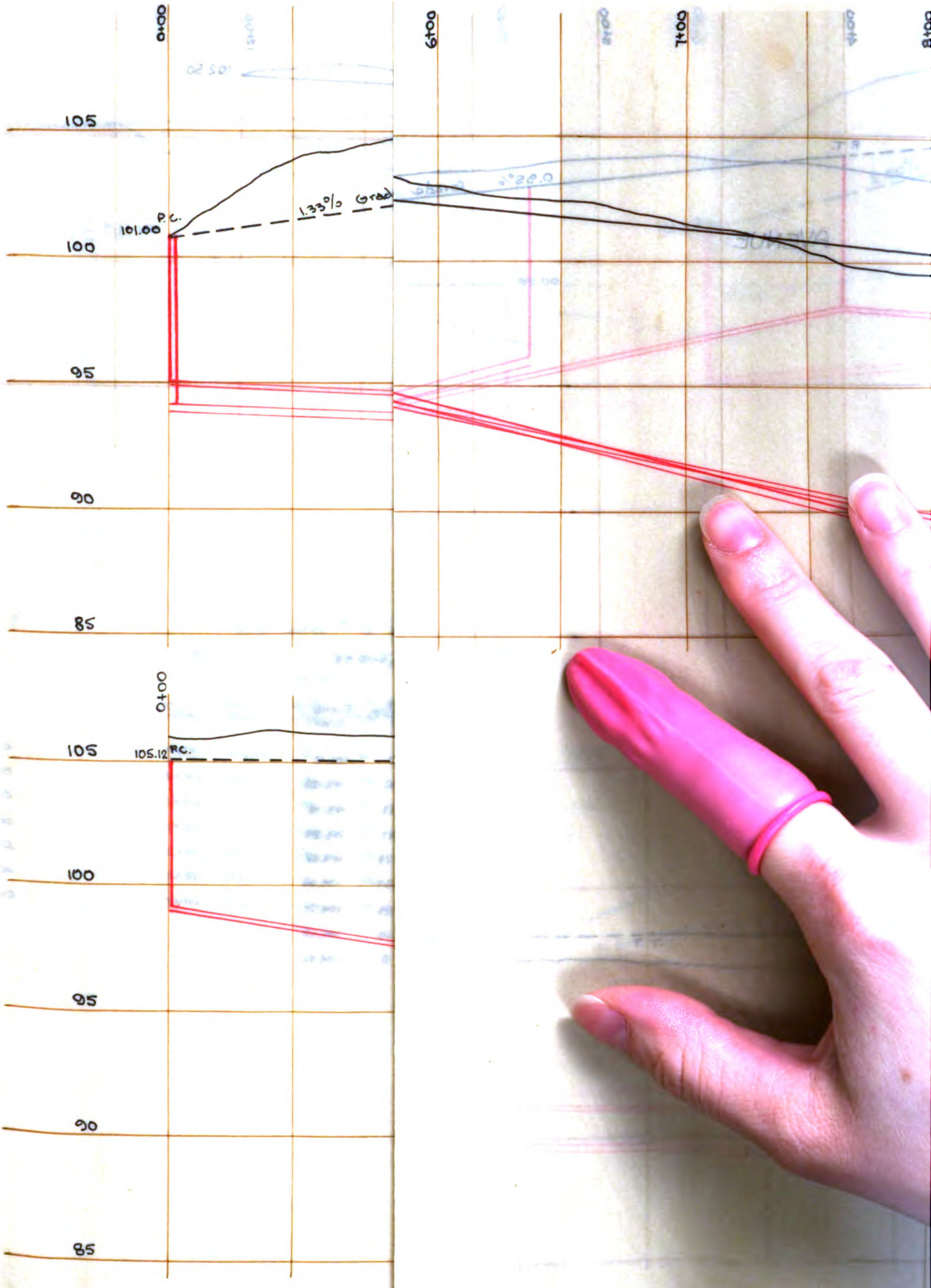
1+00
2+00
3+00
4+00
4+49.0
105
100
95
90
85
99.00
0.127% Grade
99.57
KINGSTOWN DRIVE

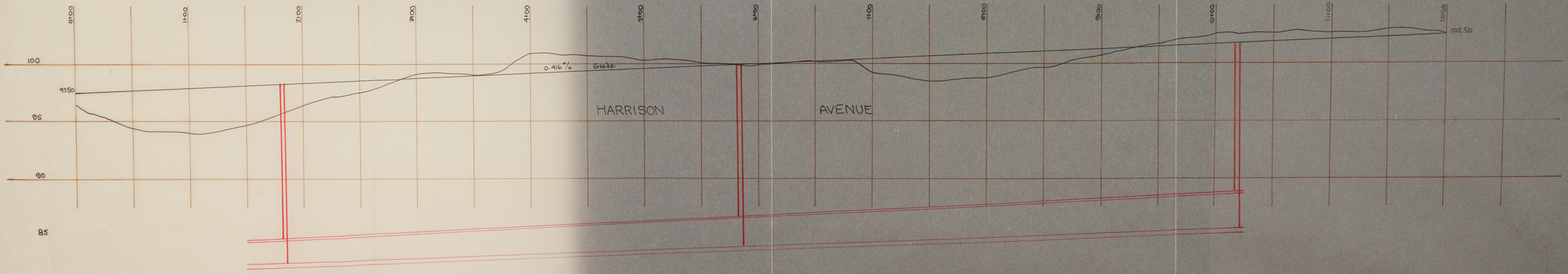

0+00
1+00
2+00
3+00
4+00
5+00
6+00
6+80.5
98.12
0.560% Grade
101.76
MIDDLESBROUGH DRIVE

1400
1600
102
100
98
96
94
1400
1600
102
100
98
96
94


6+00
7+00
105
100
95
90
85
101.00 P.C.
1.33% Grade
0+00
105
105.12 P.C.
100
95
90
85

0+00
1+00
2+00
102
100
98
96
94
GILCREST
P.C. 101.00
1.33% Grade
P.I. 103.00
300' Curve
#3

0+00
1+00
2+00
102
100
98
96
94
P.C. 101.12
P.I. 102.12
5.00%
300' Curve
#2



400' Curve #1

$g_1 = +1.15$ $g_2 = -1.40$ $e = 1.278$

Sta.	Grade Elev.	$(x/y)^2$	$(x/y)^2 e$	Curve Elev.
2+00	104.25	0	0	104.25
2+50	104.83	.06	.08	104.75
3+00	105.40	.25	.32	105.08
3+50	105.98	.56	.72	105.26
4+00	106.56	1.0	1.28	105.28
4+89.9	105.86	.56	.72	105.14
4+50	105.86	.56	.72	105.14
5+00	105.14	.25	.32	104.82
5+50	104.46	.06	.08	104.38
6+00	103.76	0	0	103.76

300' Curve #2

$g_1 = -1.40$ $g_2 = -0.69$ $e = -0.285$

Sta.	Grade Elev.	$(x/y)^2$	$(x/y)^2 e$	Curve Elev.
7+50	101.66	0	0	101.66
7+91.0	101.08	.08	.02	101.11
8+00	100.96	.11	.03	100.99
8+50	100.24	.49	.13	100.38
9+00	99.56	1.0	.28	99.85
9+50	99.24	.49	.13	99.37
10+00	98.72	.11	.03	98.75
10+50	98.40	0	0	98.40

300' Curve #3

$g_1 = 1.33$ $g_2 = -1.33$ $e = 1.000$

Sta.	Grade Elev.	$(x/y)^2$	$(y/y)^2 e$	Curve Elev.
0+00	101.00	0	0	101.00
0+50	101.67	.11	.11	101.56
1+00	102.33	.44	.44	101.89
1+50	103.00	1.0	1.0	102.00
1+86.0	102.52	.58	.58	101.94
2+00	102.33	.44	.44	101.88
2+50	101.67	.11	.11	101.56
3+00	101.00	0	0	101.00

300' Curve #4

$g_1 = -1.33$ $g_2 = 0.00$ $e = -0.500$

Sta.	Grade Elev.	$(x/y)^2$	$(y/y)^2 e$	Curve Elev.
3+00	101.00	0	0	101.00
3+50	100.33	.11	.06	100.39
4+00	99.67	.44	.22	99.89
4+50	99.00	1.0	.50	99.50
5+00	99.00	.44	.22	99.22
5+50	99.00	.11	.06	99.06
6+00	99.00	0	0	99.00

300' Curve #5

$g_1 = 0.00$ $g_2 = -2.80$ $e = 0.750$

Sta.	Grade Elev.	$(x/y)^2$	$(y/y)^2 e$	Curve Elev.
0+00	105.12	0	0	105.12
0+50	105.12	.11	.08	105.04
1+00	105.12	.44	.33	104.79
1+50	105.12	1.0	.75	104.37
2+00	104.12	.44	.33	103.79
2+50	103.12	.11	.08	103.04
3+00	102.12	0	0	102.12

400' Curve #6

$g_1 = -2.00$ $g_2 = 0.00$ $e = -1.000$

Sta.	Grade Elev.	$(x/y)^2$	$(y/y)^2 e$	Curve Elev.
3+00	102.12	0	0	102.12
3+50	101.12	.04	.04	101.18
4+00	100.12	.25	.25	100.37
4+50	99.12	.56	.56	99.68
4+56.5	99.00	.62	.62	99.87
5+00	98.12	1.0	1.0	99.12
5+50	98.12	.56	.56	98.68
6+00	98.12	.25	.25	98.37
6+50	98.12	.06	.06	98.18
7+00	98.12	0	0	98.12

400' Curve #7

$g_1 = 2.50$ $g_2 = -0.95$ $e = 1.726$

Sta.	Grade Elev.	$(x/y)^2$	$(y/y)^2 \cdot e$	Curve Elev.
0+00	101.11	0	0	101.11
0+50	102.36	.06	.10	102.26
1+00	103.61	.25	.43	103.18
1+50	104.86	.56	.97	103.89
2+00	106.11	1.0	1.73	104.38
2+50	105.63	.56	.97	104.66
3+00	105.16	.25	.43	104.73
3+50	104.68	.06	.10	104.58
4+00	104.21	0	0	104.21

Sta.	Elev. Grade	y_c (ft)	Elev. Crown
0+00	103.76	0	103.76
2+50	104.76	.08	104.38
2+00	105.14	.25	104.82
4+50	105.86	.25	105.14
4+89	105.86	.25	105.14
4+00	106.26	1.28	105.28
3+50	105.98	.25	105.28
3+00	105.40	.25	105.28
2+50	104.83	.08	104.75
2+00	104.25	0	104.25

$G = 1.518$

$g_1 = +1.18$ $\quad g_2 = -1.40$

400' Curve #1

Sta.	Elev. Grade	y_c (ft)	Elev. Crown
2+00	101.66	0	101.66
1+50	100.33	.11	100.44
1+00	99.67	.44	100.11
0+50	99.00	1.0	100.00
0+00	99.00	.44	99.67
0+50	99.00	.11	99.33
1+00	99.00	0	99.00

$G = 1.33$

$g_1 = -0.50$ $\quad g_2 = +1.33$

300' Curve #4

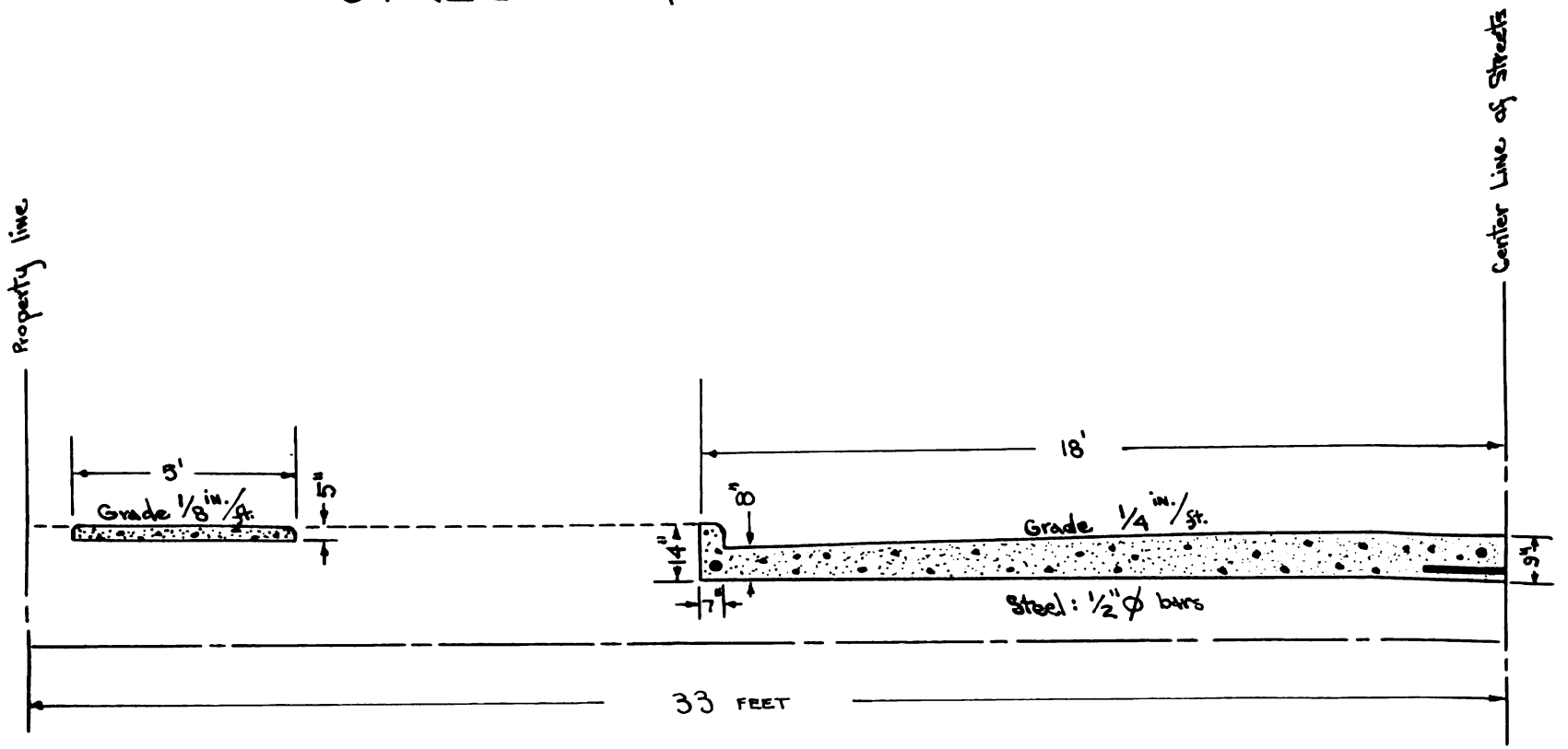
Sta.	Elev. Grade	y_c (ft)	Elev. Crown
1+50	101.66	0	101.66
1+00	101.09	.08	101.01
0+50	100.52	.11	100.63
0+00	100.00	.25	100.25
9+50	99.48	.25	99.73
9+00	98.95	.25	99.20
8+50	98.40	.08	98.48
8+00	98.00	0	98.00

$G = -0.585$

$g_1 = -1.40$ $\quad g_2 = +1.40$

800' Curve #2

STREETS & SIDEWALKS



STREETS & SIDEWALKS

STREETS & SIDEWALKS

Design of Sanitary Sewer System

Line No.	On Street	From Manhole	To Manhole	Length of Line	Number of Lots Served	Increment of Population	Total Population	Average Sewage	Maximum Sewage	Increment of Infiltration	Total Infiltration	Maximum Flow	Line No.
1	Gilcrest Ave	1	2	186	2	12	12	.00191	.00478	.00272	.00272	.0075	1
2	Nottingham Dr.	2	4	449	4	24	36	.00572	.0143	.00857	.00929	.0242	2
3	" "	4	7	342	2	12	48	.00763	.0191	.00350	.01429	.0334	3
4	Darlington Ave.	8	7	400	8	48	48	.00763	.0191	.00586	.00586	.0250	4
5	Nottingham Dr.	7	10	341	3	18	114	.0181	.0452	.00500	.02515	.0702	5
6	Gilcrest Ave.	2	3	4565	8	48	48	.00763	.0191	.00687	.00687	.0258	6
7	Kingstown Dr.	3	5	449	0	0	48	.00763	.0191	.00857	.01324	.0323	7
8	Sherwood Ave	4	5	4585	8	48	48	.00763	.0191	.00687	.00687	.0258	8
9	" "	5	6	3817	3	18	114	.0181	.0452	.00457	.02748	.0697	9
10	Middlesbrough Dr.	6	9	342	3	18	132	.0210	.0525	.00500	.02948	.0820	10
11	Darlington Ave	8	9	372	6	36	36	.00572	.0143	.00544	.00544	.0197	11
12	Middlesbrough Dr.	9	12	341	3	18	188	.0295	.0738	.00500	.03992	.1137	12
13	Harrison Ave.	12	11	372	3	18	204	.0324	.0809	.00544	.04536	.1263	13
14	" "	11	10	400	4	24	228	.0363	.0907	.00586	.05122	.1419	14

Design of Power System Lab

Line No.	Name of Station	From Number	To Number	Length of Line	Number of Circuits Served	Increment to Population	Total Population	Average Power	Maximum Power	Increment in Installation	Total Installation	Maximum Flow	Line No.
1	Chandrapur Sub Station	1	5	180	5	15	15	0.0120	0.0150	0.0015	0.0525	0.0172	1
2	Nagpur Distribution	5	4	240	4	45	30	0.0240	0.0300	0.0045	0.0750	0.0345	2
3	Wardha Substation	4	7	345	5	15	45	0.0360	0.0450	0.0015	0.1125	0.0360	3
4	Amravati Sub Station	7	8	405	8	45	45	0.0360	0.0450	0.0045	0.1125	0.0405	4
5	Akola Distribution	8	2	315	5	15	15	0.0120	0.0150	0.0015	0.0375	0.0135	5
6	Yavatmal Sub Station	2	3	270	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	6
7	Washim Distribution	3	6	210	3	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	7
8	Buldhana Sub Station	6	9	285	8	45	45	0.0360	0.0450	0.0045	0.1125	0.0405	8
9	Jalgaon Distribution	9	10	360	8	45	90	0.0720	0.0900	0.0045	0.2250	0.0810	9
10	Dhule Sub Station	10	11	420	8	45	135	0.1080	0.1350	0.0045	0.3375	0.1215	10
11	Nashik Distribution	11	12	375	8	45	180	0.1440	0.1800	0.0045	0.4500	0.1620	11
12	Thane Sub Station	12	13	300	6	30	210	0.1680	0.2100	0.0030	0.5250	0.1890	12
13	Mumbai Distribution	13	14	255	5	15	225	0.1800	0.2250	0.0015	0.5625	0.2025	13
14	Raigad Sub Station	14	15	195	4	15	240	0.1920	0.2400	0.0015	0.6000	0.2160	14
15	Ratnagiri Distribution	15	16	225	5	15	255	0.2040	0.2550	0.0015	0.6375	0.2295	15
16	Sindhudurg Sub Station	16	17	270	6	30	285	0.2280	0.2850	0.0030	0.7125	0.2565	16
17	Kolhapur Distribution	17	18	300	7	45	330	0.2640	0.3300	0.0045	0.8250	0.2970	17
18	Sangli Sub Station	18	19	330	8	45	375	0.3000	0.3750	0.0045	0.9375	0.3375	18
19	Solapur Distribution	19	20	360	8	45	420	0.3360	0.4200	0.0045	1.0500	0.3780	19
20	Osmanabad Sub Station	20	21	390	8	45	465	0.3720	0.4650	0.0045	1.1625	0.4185	20
21	Latur Distribution	21	22	420	8	45	510	0.4080	0.5100	0.0045	1.2750	0.4590	21
22	Beed Sub Station	22	23	450	8	45	555	0.4440	0.5550	0.0045	1.3875	0.4995	22
23	Aurangabad Distribution	23	24	480	8	45	600	0.4800	0.6000	0.0045	1.5000	0.5400	23
24	Jalna Sub Station	24	25	510	8	45	645	0.5160	0.6450	0.0045	1.6125	0.5805	24

Design Of Sanitary Sewer System

Line No	On Street	From Manhole	To Manhole	Length Ft.	Quantity cfs	Ground Elevation		Diameter in.	Slope ft/ft	Fall ft.	Velocity ft/sec	Capacity cfs	Invert Elevation		Cut To Line	
						Upper Manhole	Lower Manhole						Upper Manhole	Lower Manhole	Upper Manhole	Lower Manhole
1	Gilcrest Ave	1	2	186	.0075	101.00	101.56	8"	.0050	.9	2.3	.83	95.00	9407	6.00	7.49
2	Nottingham Dr	2	4	449	.0242	101.56	105.12	8"	"	2.25	2.3	"	94.07	91.82	7.49	6.30
3	" "	4	7	342	.0334	105.12	101.11	8	"	1.71	2.3	"	91.82	90.11	6.30	11.00
4	Darlington Ave.	8	7	400	.0250	104.21	101.11	8	.0078	3.10	2.9	1.10	98.21	95.11	6.00	6.00
5	Nottingham Dr.	7	10	341	.0702	101.11	98.28	8	.0050	1.71	2.3	.83	90.11	88.40	11.00	9.88
6	Gilcrest Ave	2	3	456.5	.0258	101.56	99.00	8	.0040	1.82	2.0	.75	95.56	93.74	6.00	5.26
7	Kingstown Dr	3	5	449	.0323	99.00	99.57	8	"	1.80	2.0	"	93.74	91.94	5.26	7.63
8	Sherwood Ave	4	5	456.5	.0258	105.12	99.57	8	.0157	7.18	4.3	1.60	99.12	91.94	6.00	7.63
9	" "	5	6	381.7	.0697	99.57	98.12	8	.0040	1.52	2.0	.75	91.94	90.42	7.63	7.72
10	Middlesbrough Dr	6	9	342	.0820	98.12	100.03	8	"	1.37	2.0	"	90.42	89.05	7.72	10.98
11	Darlington Ave	8	9	372	.0197	104.27	100.03	8	.0246	9.16	5.6	2.00	98.21	89.05	6.00	10.98
12	Middlesbrough Dr	9	12	342	.1137	100.03	101.76	8	.0040	1.36	2.0	.75	89.05	87.69	10.98	14.07
13	Harrison Ave	12	11	372	.1263	101.76	99.94	8	"	1.48	2.0	"	87.69	86.21	14.07	13.73
14	" "	11	10	400	.1419	99.94	98.28	8	"	1.60	2.0	"	86.21	84.61	13.73	13.67

Design of Spiral Staircase System

S.No	Name of Steel	Mark	No. of Members	Length of one member (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kg)	Remarks
1	Circular Ring	R1	16	3.142	50.272	2.466	123.971	
2	Vertical Rod	V1	32	1.200	38.400	0.888	34.099	
3	"	V2	32	1.200	38.400	0.888	34.099	
4	Horizontal Tie	H1	8	0.600	4.800	0.222	1.066	
5	Diagonal Brace	D1	8	1.131	9.048	0.522	4.723	
6	Base Plate	BP	1	0.450	0.450	15.700	7.065	
7	Anchor Bolt	AB	4	0.300	1.200	0.617	0.740	
8	Nut & Washer	NW	4	0.050	0.200	0.350	0.070	
9	Handrail Pipe	HP	1	3.142	3.142	2.466	7.748	
10	Step Plate	SP	16	0.300	4.800	1.884	9.043	
11	Concrete Fill	CF	1	0.450	0.450	2400.000	1080.000	kg
12	Weld Filler	WF	1	0.500	0.500	7.850	3.925	
13	Paint Coating	PC	1	12.000	12.000	0.150	1.800	
14	Misc. Fasteners	MF	1	0.500	0.500	7.850	3.925	
15	Safety Chain	SC	2	1.500	3.000	0.500	1.500	
16	Warning Plate	WP	1	0.200	0.200	1.200	0.240	

RAINFALL DATA

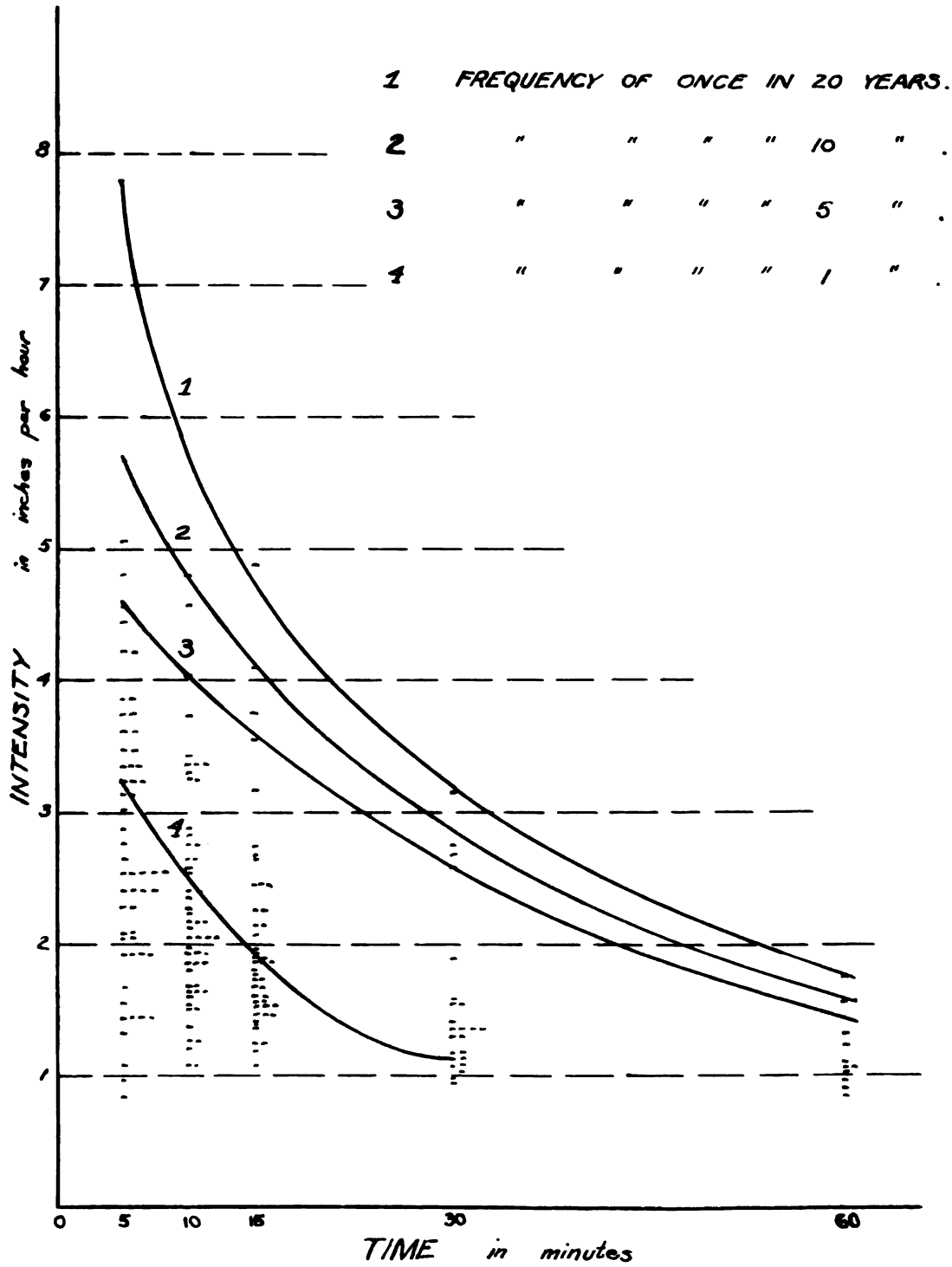
DATE	TIME IN MINUTES									
	5		10		15		30		60	
	Amount in.	Rate in./hr.	Amount in	Rate in./hr.	Amount in.	Rate in./hr.	Amount in.	Rate in./hr.	Amount in.	Rate in./hr.
1920 Mar.	0.23	2.76	0.39	2.34	0.47	1.88				
July	0.16	1.92	0.31	1.86	0.38	1.42	0.57	1.14	1.07	1.07
Sept.	0.28	3.36	0.42	2.52	0.53	2.12				
1921 June	0.28	3.36	0.40	2.40	0.43	1.72				
"	0.13	1.56	0.21	1.26	0.31	1.24	0.53	1.06		
"	0.27	3.24	0.44	2.64	0.44	1.76				
July	0.14	1.68	0.27	1.62	0.47	1.88	0.65	1.30		
"	0.40	4.80	0.76	4.56						
Aug.	0.66	7.92	0.90	5.40						
"	0.12	1.44	0.23	1.38	0.34	1.36				
"	0.11	1.32	0.37	2.22	0.43	1.72	0.59	1.18		
1922 Apr.	0.12	1.44	0.20	1.20	0.27	1.08				
"	0.21	2.52	0.31	1.86	0.35	1.40				
July	0.35	4.20	0.55	3.30	0.67	2.68				
Aug.	0.28	3.36	0.54	3.24	0.61	2.44				
1923 July	0.20	2.40	0.28	1.68	1.02	4.08	1.43	2.86	2.06	2.06
Sept.	0.21	2.52	0.35	2.10	0.42	1.68				
1924 June	0.24	2.88	0.46	2.76						
"	0.07	0.84	0.32	1.92	0.40	1.60	0.58	1.16	1.10	1.10
Aug.	0.20	2.40	0.36	2.16	0.45	1.80				
1925 July	0.16	1.92	0.27	2.22	0.36	1.44	0.68	1.36		
1926 June	0.25	3.00	0.38	2.88	0.48	1.92				
Sept.	0.26	3.72								
1927 Apr.	0.19	2.28	0.36	2.16	0.45	1.80				
May	0.17	2.08	0.32	1.92	0.38	1.52				
July	0.20	2.40	0.31	1.86	0.37	1.48				
Sept.	0.21	2.52	0.34	2.04						
1928 May	0.17	2.08	0.33	1.98	0.39	1.56				
July	0.16	1.92	0.28	1.68	0.40	1.60				
Aug.	0.26	3.12	0.36	2.16	0.39	1.56	0.68	1.36		
Oct.	0.29	3.48								
1929 July	0.31	3.72	0.56	3.36	0.62	2.48				
1931 Apr.	0.21	2.52	0.32	1.92	0.49	1.96	0.67	1.34		
June	0.30	3.60	0.40	2.40	0.47	1.88				
July	0.27	3.24	0.44	2.64						
Oct.	0.20	2.40	0.34	2.04	0.38	1.52				
Dec.	0.38	4.56	0.56	3.36	0.66	2.64				
1932 May	0.31	3.72	0.61	3.66	0.68	2.72				
Aug	0.09	1.08	0.18	1.08	0.56	2.24	0.77	1.54	1.23	1.23
1933 June.	0.12	1.44	0.34	2.04	0.89	3.56	1.29	2.58		
1934 July	0.19	2.28	0.38	2.28	0.61	2.44	0.81	1.62	1.31	1.31
1935 July	0.32	3.84	0.62	3.72	0.79	3.16	0.95	1.90	0.98	0.98
Aug.	0.17	2.04	0.25	1.50	0.31	1.24	0.48	0.96		
1936 Apr.	0.30	3.60	0.44	2.64	0.57	2.28	0.65	1.30		
June	0.16	1.92	0.21	1.26	0.27	1.08	0.50	1.00	0.84	0.84
Aug.	0.21	2.52	0.25	1.50	0.31	1.24	0.56	1.12		
Sept.	0.35	4.20	0.54	3.24	0.66	2.64	1.00	2.00	1.09	1.09
"	0.42	5.04	0.57	3.42	0.60	2.40	0.84	1.68	1.04	1.04
1937 June	0.37	4.44	0.67	4.02	0.93	3.72	1.34	2.86	1.56	1.56
July	0.22	2.63	0.36	2.16	0.37	1.48				
Aug.	0.47	5.64	0.80	4.80	1.22	4.88	1.37	2.74	1.75	1.75
1938 Aug.	0.29	3.48	0.43	2.58	0.45	1.80				
"	0.17	2.04	0.27	1.62	0.38	1.52	0.70	1.40	0.90	0.90
1939 June	0.27	3.23	0.46	2.76	0.52	2.08	0.63	1.26		
July	0.32	3.84	0.47	2.82	0.50	2.00	0.52	1.04		
Oct.	0.16	1.92	0.30	1.80	0.41	1.64	0.68	1.36		

Design of Sanitary Sewer System

RAINFALL DATA

DATE	5			10			15			30			60		
	Rate in./hr.	Amount in.		Rate in./hr.	Amount in.		Rate in./hr.	Amount in.		Rate in./hr.	Amount in.		Rate in./hr.	Amount in.	
1920	6.48	0.54		5.34	0.89		4.32	1.08		2.88	1.44		1.62	1.62	
1921	7.56	0.63		6.24	1.04		5.04	1.26		3.36	1.68		1.89	1.89	
1922	8.28	0.69		6.84	1.14		5.52	1.38		3.72	1.86		2.07	2.07	
1923	6.12	0.51		5.04	0.84		4.08	1.02		2.76	1.38		1.56	1.56	
1924	7.32	0.61		6.00	1.00		4.80	1.20		3.24	1.62		1.80	1.80	
1925	6.84	0.57		5.64	0.94		4.56	1.14		3.12	1.56		1.74	1.74	
1926	7.68	0.64		6.36	1.06		5.16	1.29		3.48	1.74		1.98	1.98	
1927	6.72	0.56		5.52	0.92		4.44	1.11		2.88	1.44		1.56	1.56	
1928	7.08	0.59		5.88	0.98		4.80	1.20		3.24	1.62		1.80	1.80	
1929	7.44	0.62		6.12	1.02		4.92	1.23		3.36	1.68		1.86	1.86	

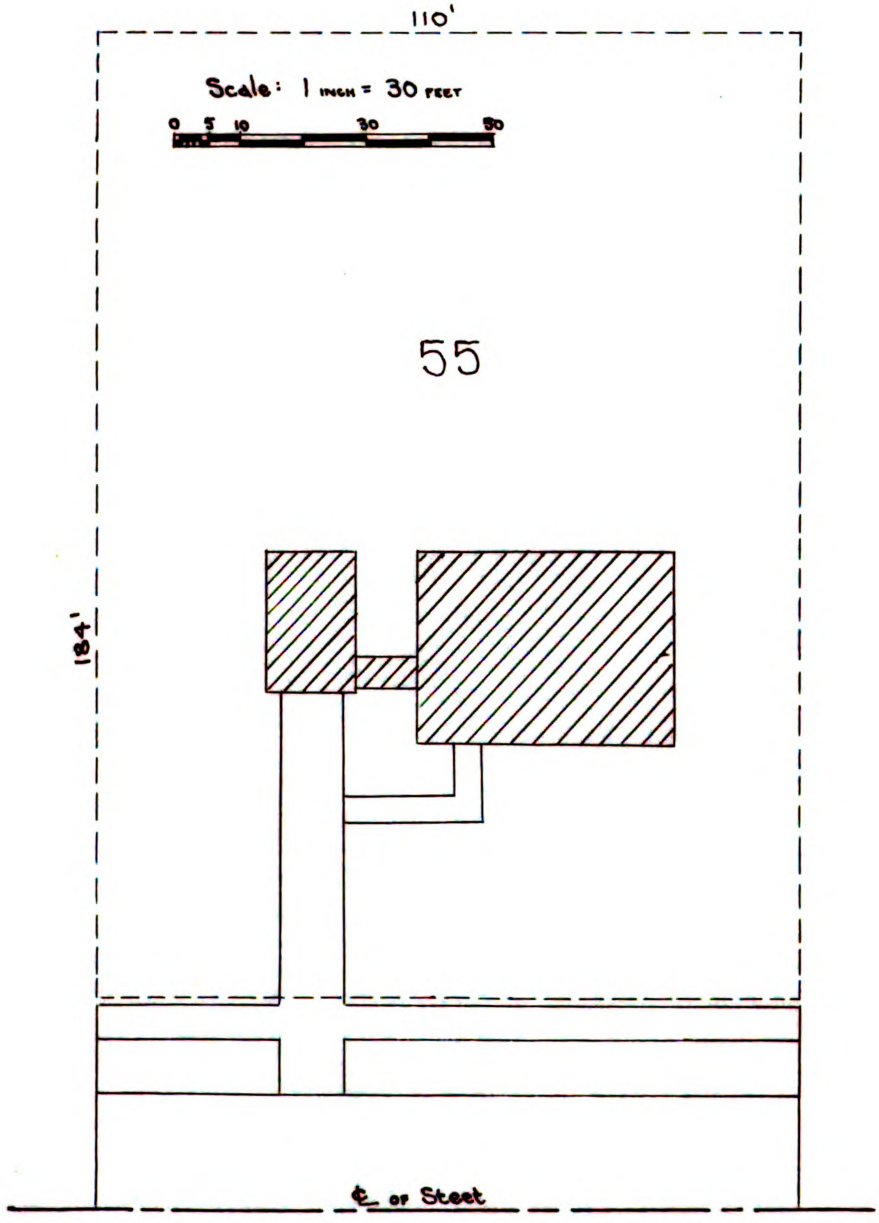
RAINFALL INTENSITY CURVES



RAINFALL INTENSITY CURVES

TYPICAL LOT FOR COMPUTING RUNOFF COEFFICIENT

Part	Area	Fraction of Total	Coefficient	Combined
Pavements	2,610 sq ft	0.129	0.80	0.103
Sidewalks	592	0.029	0.50	0.014
Roofing	1,558	0.077	0.85	0.067
Lawn	15,480	0.775	0.15	0.116
	20,240 sq ft	1.000		0.300 Total coefficient



TYPICAL LOT FOR COMPUTING RUNOFF COEFFICIENT

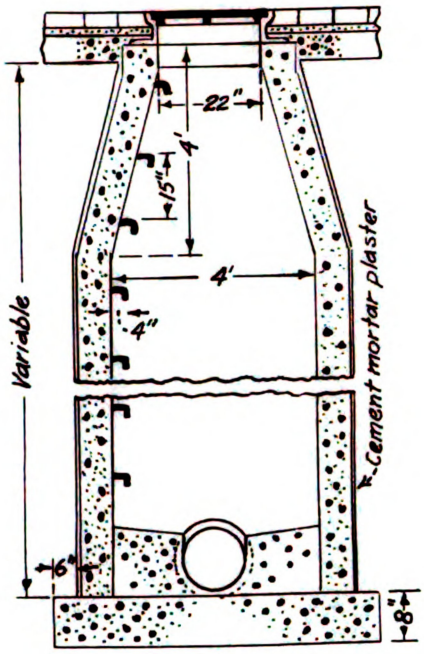
Part	Area	Fraction of Total	Coefficient	Combined
Pavements	2,610 sq ft	0.129	0.80	0.103
Sidewalks	592	0.029	0.50	0.014
Roofing	1,558	0.077	0.85	0.067
Lawn	15,480	0.775	0.15	0.116
	20,240 sq ft	1.000		0.300 Total coefficient

Design Of Storm Sewer System

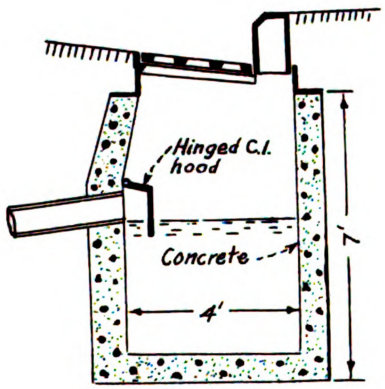
Line No	On Street	From Manhole	To Manhole	Increment Of Area Acres	Equivalent Area Incr. x.30	Total Equiv. Area	Time Concentration Min.	Rate of Rainfall in/hr.	Quantity c.f.s.	Slope ft/ft.	Diameter in.	Velocity ft/sec	Length ft.	Capacity c.f.s.	Ground Elevation Upper Manhole	Ground Elevation Lower Manhole	Invert Elevation Upper Manhole	Invert Elevation Lower Manhole	Cut To Line Upper Manhole	Cut To Line Lower Manhole	Line No
1	Gilcrest Ave	1	2	1.52	0.46	0.46	6.0	5.43	2.50	.0050	12	3.30	186	2.60	101.00	101.56	94.00	93.07	7.00	8.49	1
2	Nottingham Dr.	2	4	2.55	0.77	1.23	8.7	4.96	6.09	.0050	18	4.00	449	8.30	101.56	105.12	92.57	90.32	8.99	14.80	2
3	" "	4	7	None	—	1.23	11.2	4.56	5.60	.0050	18	3.80	342	8.30	105.12	101.11	90.32	88.61	14.80	12.50	3
4	" "	7	10	2.52	0.76	1.99	13.1	4.30	8.55	.0050	21	4.40	341	11.70	101.11	98.28	88.36	86.65	12.75	11.63	4
5	Kingstown Dr.	3	5	4.59	1.38	1.38	12	4.48	6.20	.0040	21	2.60	449	10.2	99.00	99.57	92.00	90.20	7.00	9.37	5
6	Sherwood Ave.	5	6	2.42	0.73	2.11	14.5	4.15	8.76	.0040	21	4.00	381.7	10.2	99.57	98.12	90.20	88.68	9.37	9.44	6
7	Middlesbrough Dr.	6	9	3.71	1.11	3.22	16.6	3.94	12.68	.0040	24	4.50	342	14.2	98.12	100.03	88.43	87.06	9.69	12.97	7
8	Darlington Ave	8	9	2.66	0.80	0.80	9.0	4.92	3.94	.0264	12	6.80	310	6.0	102.98	100.03	95.98	88.06	7.00	11.97	8
9	Middlesbrough Dr	9	12	3.42	1.03	5.05	18.5	3.72	18.90	.0040	27	5.15	341	19.5	100.03	101.76	86.81	85.45	13.22	16.31	9
10	Harrison Ave	12	11	None	—	5.05	20.4	3.55	17.90	.0040	27	5.10	372	19.5	101.76	99.94	85.45	83.97	16.31	15.97	10
11	" "	11	10	1.70	0.51	5.56	22.5	3.40	18.90	.0040	27	5.15	400	19.5	99.94	98.28	83.97	82.37	15.97	15.91	11
	Outlet			3.01	0.90	8.45	24.7	3.22	27.20						98.28						

Design Of Storm Sewer

Line No	On Street	From Manhole	To Manhole	Incremental Drainage Area Acres	Accumulated Drainage Area Acres	Runoff Coefficient C	Total Drainage Area Acres	Time of Concentration Min.	Rate of Rainfall In/Hr.	Capacity cfs.	Slope ft/ft	Diameter in	Velocity
1	Gilcrest Ave	1	2	1.52	0.46	0.30	0.46	6.0	5.43	2.50	.0050	12	3.
2	Nottingham Dr	2	4	2.55	0.77	1.23	8.7	4.86	6.09		.0050	18	4.
3	" "	4	7	None	—	1.23	11.2	4.56	5.60		.0050	18	3.
4	" "	7	10	2.52	0.76	1.29	13.1	4.30	8.52		.0050	24	4.
5	Kingstown Dr	3	5	4.59	1.38	1.38	15	4.48	.620		.0040	21	5.
6	Sherwood Ave.	5	8	2.42	0.73	2.11	17.2	4.42	8.78		.0040	21	4.
7	Middlesbrough Dr	6	9	3.71	1.11	3.22	20.4	4.26	13.96		.0040	24	4.
8	Darlington Ave	8	9	2.66	0.80	0.80	21.0	4.82	3.94		.0084	12	6.
9	Middlesbrough Dr	9	12	3.42	1.03	5.05	18.2	3.72	18.96		.0040	27	5.
10	Harrison Ave	10	11	None	—	5.05	20.4	3.65	12.90		.0040	27	4.
11	" "	11	12	1.79	0.54	8.58	22.2	3.60	16.30		.0040	27	5.
	Outlet			3.01	0.90	8.45	24.7	3.22	22.80				



TYPICAL MANHOLE



CATCH BASIN

TYPICAL MANHOLE

CATCH BASIN

Cost Estimate

A tentative schedule of costs to subdivide the land might include the following items.

Survey the boundary	$ 90.00
30 Monuments @ $5.00 ea.	150.00
Topographic Survey	232.00
57 Lots staked @ $10.00 ea.	570.00
Making Plat maps	75.00
Recording fee	4.00
	$1121.00

Further cost estimates have been omitted due to the lack of time. These might include investigations to the cost of:

Removing barn and farm house.

Leveling off the ground to smoother contours.

Building subgrades and roads.

Further drainage investigations.

Pinecrest Subdivision II

Topo Notes

Sta 0+00 to 6+60 Line BC

℄ Right 950'

Sta	+	HI	−	Elev	Sta
BM2	9.51	108.35		98.84	0+00
BM2	12.89	111.73		98.84	
					0+50
					1+00
					1+50
					2+00
					2+50

℄ 108.4 Right

108.35 111.73

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
10.2	3.1	2.5	2.4	2.9	6.1	8.6	9.6	9.1	7.7	5.4	3.5	3.1	3.0	2.0
98.2	99.3	100.9	101.0	100.5	100.3	99.8	98.8	99.3	100.7	103.0	104.9	105.3	105.4	104.7

950	900	850	800	750
15.4	14.5	13.5	11.2	8.4
96.7	97.2	98.2	100.5	103.3

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
9.3	2.3	6.3	5.9	4.3	5.3	2.4	7.7	8.2	5.9	4.3	3.1	3.2	3.1	2.2
99.1	101.1	102.1	102.5	101.1	103.1	101.0	100.7	100.2	102.5	104.1	105.3	105.2	105.3	104.5

950	900	850	800	750
15.9	15.4	14.0	11.7	9.2
95.8	96.3	97.7	100.0	102.5

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
5.3	4.2	4.4	4.9	3.2	3.6	4.9	6.7	6.9	4.4	2.5	2.5	2.3	2.6	2.0
103.1	104.2	104.0	103.5	105.2	104.8	103.5	102.0	101.8	104.0	105.9	105.9	106.1	105.8	104.7

950	900	850	800	750
14.6	15.2	12.9	10.4	8.5
97.1	96.5	98.8	101.3	103.4

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
2.3	1.8	1.9	1.9	2.0	3.2	4.2	6.1	5.8	4.7	2.7	2.4	2.4	2.6	6.7
106.1	106.6	106.5	106.5	106.4	105.2	104.2	102.3	102.6	104.2	105.7	106.0	106.0	105.8	101.0

950	900	850	800	750
9.9	12.9	10.5	8.4	7.8
101.8	98.8	101.2	103.3	103.9

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
1.8	2.7	3.1	3.3	4.0	5.0	5.8	5.0	5.4	3.9	2.8	2.6	2.4	2.8	6.1
106.6	105.7	105.3	105.1	104.4	103.4	102.6	103.4	103.0	104.5	105.6	105.8	106.0	105.9	101.6

950	900	850	800	750
6.8	8.5	8.4	7.3	6.6
104.9	103.2	103.3	104.4	105.1

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
2.2	5.1	5.2	5.6	7.2	7.5	7.6	5.1	5.0	4.3	3.6	2.9	2.3	2.3	6.0
106.2	103.3	103.2	102.8	101.2	100.9	100.6	103.3	103.4	104.1	104.8	105.5	106.1	106.1	101.7

950	900	850	800	750
5.4	6.4	8.5	6.1	5.3
106.3	105.3	103.2	105.6	105.8

℄ Right

108.35 111.73

Sta	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
3+00	5.7	7.8	7.2	8.7	11.4	10.1	9.0	6.9	5.5	4.7	4.0	2.9	2.6	2.5	6.8
	102.7	100.6	101.2	99.7	97.0	98.3	99.4	101.5	102.9	103.7	104.4	105.5	105.8	105.9	104.9
	950	900	850	800	750										
	4.0	6.2	5.9	5.7	6.1										
	107.7	105.5	105.8	106.0	105.6										
3+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	9.0	9.1	9.5	10.4	11.4	10.9	10.2	8.3	6.0	4.3	2.7	2.6	2.5	2.7	7.1
	99.4	99.3	98.9	98.0	97.0	97.5	98.2	100.1	102.4	104.1	105.7	105.8	105.9	105.7	104.6
	950	900	850	800	750										
	3.2	5.7	6.1	6.7	6.4										
	108.5	106.0	105.6	105.0	105.3										
4+00	0	W.S.	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	10.2	11.1	9.4	9.4	10.0	11.1	11.5	10.4	8.2	5.9	5.7	3.5	3.5	4.0	3.0	7.3
	98.2	97.3	99.0	99.0	98.4	97.3	96.8	98.0	100.2	102.5	103.0	104.9	104.9	104.4	105.1	104.4
	950	900	850	800	750										
	5.8	7.7	9.2	9.3	8.2										
	105.9	104.0	102.5	102.4	103.5										
4+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	6.7	7.7	8.8	10.0	11.2	10.2	10.1	8.0	6.6	5.8	5.1	5.2	6.0	7.6	7.9
	101.7	100.7	99.6	98.4	97.2	98.2	98.3	100.4	101.8	102.6	103.3	103.2	102.4	103.8	103.8
	950	900	850	800	750										
	8.2	10.7	12.3	9.9	8.6										
	103.5	101.0	99.4	101.8	103.1										
5+00	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	5.8	5.6	7.0	10.1	11.9	10.7	9.0	2.5	6.9	7.0	7.8	7.9	6.7	6.2	7.9
	102.6	102.8	101.4	98.3	96.5	97.7	99.4	100.9	101.5	101.4	100.6	100.5	101.7	103.2	103.8
	950	900	850	800	750										
	8.6	10.8	11.2	8.4	8.0										
	103.1	100.9	100.5	103.3	103.7										
5+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	4.5	4.2	6.8	9.4	11.1	9.6	7.5	6.7	7.6	9.2	9.5	9.2	7.2	6.1	8.7
	103.9	104.2	101.6	99.0	97.3	98.8	100.9	101.7	100.8	99.2	98.9	99.2	101.2	102.3	103.0
	950	900	850	800	750										
	9.1	9.2	9.0	7.6	7.8										
	102.6	102.5	102.7	104.	103.9										

Sta

6+00

6+50

℄ Right

103.35

111.73

	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
6+00	4.7	4.6	7.5	9.8	11.3	10.7	9.4	8.9	10.1	11.9	11.1	10.1	7.5	6.2	9.4
	103.8	103.8	100.9	98.6	97.1	97.7	99.0	99.5	98.3	96.5	97.3	98.3	100.9	102.2	102.3
	950	900	850	800	750										
	7.9	8.3	8.4	7.4	8.3										
	103.8	103.4	103.3	104.3	103.4										
6+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	7.9	9.4	10.4	12.1	12.7	11.5	11.3	11.6	11.7	12.9	13.0	11.2	9.3	7.0	11.3
	100.5	99.0	98.0	96.3	95.7	96.9	97.1	96.8	96.7	95.5	95.4	97.2	99.1	101.4	100.4
	950	900	850	800	750										
	8.3	8.7	8.8	9.7	11.0										
	103.4	103.0	102.9	102.0	100.7										

Copy

Pinecrest Subdivision II

Topo Notes

Sta 0+00 to 6+60 Line BC

℄ Right 950'

Sta	+	H.I.	−	Elev	Sta
BM2	9.51	108.35		98.84	0+00
BM2	12.89	111.73		98.84	
					0+50
					1+00
					1+50
					2+00
					2+50

℄ Right

108.35 | 111.73

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
10.2	9.1	7.5	2.4	2.9	8.1	8.6	9.6	9.1	7.7	5.4	3.5	3.1	3.0	7.0
98.2	99.3	100.9	101.0	100.5	100.3	99.8	98.8	99.3	99.7	103.0	104.9	105.3	105.4	104.7

950	900	850	800	750
15.4	14.5	13.5	11.2	8.4
96.3	97.2	98.2	100.5	103.3

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
9.3	7.3	6.3	5.9	4.3	5.3	7.4	2.7	8.2	5.9	4.3	3.1	3.2	3.1	7.2
99.1	101.1	102.1	102.5	104.1	103.1	101.0	100.7	100.2	102.5	104.1	105.3	105.2	105.3	104.5

950	900	850	800	750
15.9	15.4	14.0	11.7	9.2
95.8	96.3	97.7	100.0	102.5

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
5.3	4.2	4.4	4.9	3.2	3.6	4.9	6.4	6.9	4.4	2.5	2.5	2.3	2.6	2.0
103.1	104.2	104.0	103.5	105.2	104.8	103.5	102.0	101.5	104.0	105.9	105.9	106.1	105.8	104.7

950	900	850	800	750
14.6	15.2	12.9	10.4	8.5
97.1	96.5	98.8	101.3	103.2

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
2.3	1.8	1.9	1.9	2.0	3.2	4.2	6.1	5.8	4.7	2.7	2.4	2.4	2.6	1.7
106.1	106.6	106.5	106.5	106.4	105.2	104.2	102.3	102.6	104.2	105.7	106.0	106.0	105.8	106.5

950	900	850	800	750
2.9	12.9	10.5	8.4	2.6
101.8	98.8	101.1	103.3	103.9

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
1.8	2.7	3.1	3.3	4.0	5.0	5.6	5.0	5.4	3.9	2.8	2.6	2.4	2.6	6.1
106.6	105.7	105.3	105.1	104.4	103.4	102.8	103.4	103.0	104.5	105.6	105.8	106.0	105.8	105.6

950	900	850	800	750
6.8	8.5	8.4	7.3	6.6
104.9	103.2	103.3	104.4	105.1

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
2.2	5.1	5.2	5.6	7.2	7.5	7.6	5.1	5.0	4.3	3.6	2.9	2.3	2.3	6.0
106.2	103.3	103.2	102.8	101.2	100.9	100.8	103.3	103.4	104.1	104.8	105.5	106.1	106.1	105.7

950	900	850	800	750
5.4	6.4	8.5	8.1	5.9
106.3	105.3	103.2	105.6	105.8

℄ Right

108.35 | 111.73

Sta	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
3+00	5.7	7.8	7.2	8.7	11.4	10.1	9.0	6.9	5.5	4.7	4.0	2.9	2.6	2.5	6.8
	102.9	100.8	101.4	99.9	97.0	98.3	99.4	101.5	102.9	103.7	104.4	105.5	105.8	105.9	104.9
	950	900	850	800	750										
	4.0	6.2	5.9	5.7	6.1										
	107.7	105.5	105.8	106.0	105.6										
3+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	9.0	9.1	9.5	10.4	11.4	10.9	10.2	8.3	6.0	4.3	2.7	2.6	2.5	2.7	7.1
	99.4	99.3	98.9	98.0	97.0	97.5	98.2	100.1	102.4	104.1	105.7	105.8	105.9	105.7	104.6
	950	900	850	800	750										
	3.2	5.7	6.1	6.7	6.7										
	108.5	106.0	105.6	105.0	105.3										
4+00	0 WS	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	10.2	11.1	9.7	9.7	10.0	11.1	11.6	10.7	8.7	5.9	5.7	3.5	3.5	4.0	3.0	7.3
	98.4	97.5	99.0	99.0	98.7	97.3	96.8	98.0	100.0	102.5	103.0	104.9	104.9	104.4	105.4	104.4
	950	900	850	800	750										
	5.8	7.7	9.2	9.3	8.2										
	105.9	104.0	102.5	102.2	103.5										
4+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	6.7	7.7	8.8	10.0	11.2	10.7	10.1	8.8	6.8	5.8	5.1	5.2	6.0	7.6	7.9
	104.7	103.7	102.6	101.4	100.2	100.7	101.3	102.6	104.6	105.6	106.3	106.2	105.4	103.8	103.8
	950	900	850	800	750										
	8.2	10.7	12.3	9.9	8.6										
	103.5	101.0	99.4	101.8	103.1										
5+00	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	5.8	5.6	7.0	10.1	11.9	10.7	9.0	7.5	6.9	7.0	7.8	7.9	6.7	5.2	7.9
	102.6	102.8	101.4	98.3	96.5	97.7	99.4	100.9	101.5	101.4	100.6	100.5	101.7	103.2	103.8
	950	900	850	800	750										
	8.6	10.6	11.2	8.7	8.0										
	103.1	100.9	100.5	103.3	103.7										
5+50	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
	4.5	4.2	6.8	9.4	11.1	10.6	7.5	6.7	7.6	9.2	9.5	9.2	7.2	6.1	8.7
	103.9	104.2	101.6	99.0	97.3	98.8	100.9	101.7	100.8	99.2	98.9	99.2	101.2	102.3	103.0
	950	900	850	800	750										
	9.1	9.2	9.0	7.6	7.8										
	102.6	102.5	102.7	104.1	103.9										

℄ Right

108.35 111.73

Sta

6+00

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
4.7	4.6	7.5	9.8	11.3	10.7	9.4	8.9	10.1	11.9	11.1	10.1	7.5	6.2	2.4
103.7	103.8	100.9	98.6	97.1	97.7	99.0	99.5	98.3	96.5	97.3	98.3	100.9	102.3	103.3

950	900	850	800	750
7.9	8.3	6.4	7.4	8.3
103.8	103.4	103.3	104.3	103.4

6450

0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
7.9	9.4	10.4	12.1	12.7	11.5	11.3	11.6	11.7	12.9	13.0	11.2	9.3	7.0	4.3
100.5	99.0	98.0	96.3	95.7	96.3	97.1	96.8	96.7	95.5	95.4	97.2	99.1	101.4	100.4

950	900	850	800	750
9.3	8.7	8.6	9.7	11.0
103.4	103.9	102.9	102.0	100.7

Pinecrest Subdivision II

Topo Notes

Sta 0+00 to 6+60 Line FA

℄ Left 300'

Sta	+	HI	−	Elev	Sta
BM,	2.61	102.61		100.00	0+00
TP,	9.72	108.00	4.33	98.28	
					0+50
					1+00
					1+50
					2+00
					2+50
					3+00
					3+50
					4+00
BM,	7.65	107.65		100.00	4+50
					5+00
					5+50

Left ℄

108.00

300	250	200	150	100	50	0
12.9	12.7	12.6	12.9	13.0	12.6	11.5
95.1	95.3	95.4	95.1	95.0	95.4	96.5
300	250	200	150	100	50	0
11.5	11.4	9.9	10.6	12.5	13.0	13.5
96.5	96.6	98.1	97.4	95.5	95.0	94.5
300	250	200	150	100	50	0
10.4	8.7	8.0	10.7	12.9	14.3	14.2
97.6	99.3	100.0	97.3	95.1	93.7	93.8
300	250	200	150	100	50	0
6.4	6.0	5.5	2.9	1.0	13.5	13.3
101.6	102.0	102.5	100.1	97.0	94.5	94.7
300	250	200	150	100	50	0
3.1	3.3	4.5	8.3	10.9	11.5	11.6
104.9	104.7	103.5	99.1	97.1	96.5	96.4
300	250	200	150	100	50	0
0.8	1.2	3.6	5.2	9.1	9.8	10.6
107.2	106.8	104.4	102.8	98.9	98.2	97.4
300	250	200	150	100	50	0
-0.7	0.2	2.8	4.4	6.5	7.3	8.8
108.4	107.8	105.2	103.6	101.3	100.7	99.2
300	250	200	150	100	50	0
0.1	0.2	1.8	3.2	5.3	6.9	8.9
107.9	107.8	106.2	104.8	102.7	101.1	99.1
300	250	200	150	100	50	0
2.1	1.5	1.4	3.4	3.9	5.9	7.1
105.9	106.5	106.6	104.6	104.1	102.1	100.9
300	250	200	150	100	50	0
3.4	1.7	0.6	0.3	1.6	5.8	7.0
104.3	106.0	107.1	107.4	106.1	101.9	100.7
300	250	200	150	100	50	0
4.1	3.5	2.0	1.7	3.7	5.6	7.4
103.6	104.2	105.7	106.0	104.0	102.1	100.3
300	250	200	150	100	50	0
5.0	5.4	4.8	5.4	7.0	7.5	7.6
102.7	102.3	102.9	102.3	100.7	100.2	100.1

107.65

Sta.	+	HI	−	Elev	Sta.
					6+00
					6+50

Pinecrest Subdivision II

Topo Notes

Station 7+00 to 12+10.7 Line AF

℄ - Left 680'.

Sta	+	HI	−	Elev	Sta
BM1	6.54	106.54		100.00	7+00
Stone in ditch	Sta 7+54 Line AF R 15'				
TP1	6.96	105.91	7.09	99.45	7+50
BM2			7.07	98.84	8+00
Stake on S. side Fence East.	7+25 Line AF L 625'				
					8+50
					9+00
					9+50
					10+00
					10+50
					11+00
					11+50
					12+10.7

Left ℄

107.65

300	250	200	150	100	50	0
3.6	4.8	5.3	6.2	7.7	7.7	7.8
104.1	102.9	102.4	101.5	100.0	99.8	99.9
300	250	200	150	100	50	0
3.5	3.8	4.7	5.3	7.8	8.6	7.6
104.2	103.9	103.0	102.4	99.9	99.1	100.1

Left

105.91

680	650	600	550	500	450	400
2.9	6.5	6.0	6.3	5.3	3.1	2.1
98.0	97.4	99.9	99.6	100.6	102.9	103.8
680	650	600	550	500	450	400
8.6	8.1	6.8	5.3	4.8	2.9	2.5
97.3	97.8	99.1	100.6	101.1	103.0	103.7
680	650	600	550	500	450	400
8.8	8.5	7.4	5.4	4.6	3.0	2.9
97.1	97.4	98.5	100.5	101.3	102.9	103.0
680	650	600	550	500	450	400
9.4	8.9	8.0	5.9	5.1	4.1	3.5
96.5	97.0	97.9	100.0	100.8	101.8	102.4
680	650	600	550	500	450	400
9.9	9.1	8.2	6.9	5.9	7.1	6.7
96.0	96.8	97.7	99.0	100.0	98.8	99.2
680	650	600	550	500	450	400
9.8	9.1	8.5	7.5	5.7	6.2	7.9
96.1	96.8	97.4	98.4	100.2	99.7	98.0
680	650	600	550	500	450	400
9.6	9.3	8.5	7.7	6.3	5.0	6.8
96.3	96.6	97.4	98.2	99.6	100.9	99.1
680	650	600	550	500	450	400
9.0	9.1	8.4	7.9	7.0	5.6	5.4
96.9	96.8	97.3	98.0	98.9	100.3	100.5
680	650	600	550	500	450	400
8.8	8.8	8.3	8.2	8.1	6.9	5.5
97.1	97.1	97.6	97.7	97.8	99.0	100.4
680	650	600	550	500	450	400
8.4	8.7	8.4	8.5	8.6	8.4	7.1
97.3	97.2	97.5	97.4	97.3	97.5	98.8
680	650	600	550	500	450	400
8.4	8.6	8.2	8.0	9.1	9.6	8.6
97.5	97.3	97.7	96.9	96.8	96.3	97.3

106.54

350	300	250	200	150	100	50	0
2.9	2.3	2.4	2.5	3.5	5.9	8.1	7.8
102.6	104.2	104.1	104.0	103.0	99.6	98.4	98.7
350	300	250	200	150	100	50	0
3.6	2.9	2.8	3.0	3.1	5.1	7.5	8.1
102.9	103.6	103.7	103.5	103.4	101.7	99.0	98.4
350	300	250	200	150	100	50	0
4.5	3.7	3.6	3.6	3.3	4.8	6.7	7.8
102.0	103.8	103.9	103.9	103.2	101.7	99.8	98.7
350	300	250	200	150	100	50	0
6.0	3.9	3.7	3.5	3.6	4.4	5.5	7.1
100.5	103.6	103.8	103.0	103.9	102.1	101.9	99.4
350	300	250	200	150	100	50	0
7.6	4.9	4.4	3.9	3.9	4.3	5.1	5.8
98.9	101.6	102.1	102.6	102.6	102.7	101.4	100.7
350	300	250	200	150	100	50	0
8.9	6.3	5.1	4.6	4.3	4.5	4.4	4.8
97.6	100.2	101.4	101.9	102.2	102.0	102.1	101.7
350	300	250	200	150	100	50	0
6.6	7.2	5.3	4.7	4.6	4.4	4.4	4.1
97.9	99.3	101.7	101.8	101.9	102.1	102.1	102.4
350	300	250	200	150	100	50	0
8.1	6.9	5.4	4.8	4.8	4.8	4.8	3.8
98.4	99.6	101.1	101.7	101.7	101.7	101.7	102.7
350	300	250	200	150	100	50	0
7.4	5.7	5.1	4.6	4.7	5.0	4.5	3.9
99.1	100.8	101.4	101.9	101.9	101.5	102.0	102.6
350	300	250	200	150	100	50	0
7.2	5.3	4.9	4.2	4.5	4.4	4.2	3.6
99.3	101.2	101.6	101.3	102.0	102.1	102.3	102.9
350	300	250	200	150	100	50	0
8.0	5.6	5.1	4.4	4.3	4.5	4.2	3.9
98.5	100.9	101.4	102.1	102.2	102.0	102.3	102.6

Brd Ewing

F. W. MALKEWITZ

Pinecrest Subdivision II

Bench Mark Elevations

BM 20 & 21 MSHD Project M-78

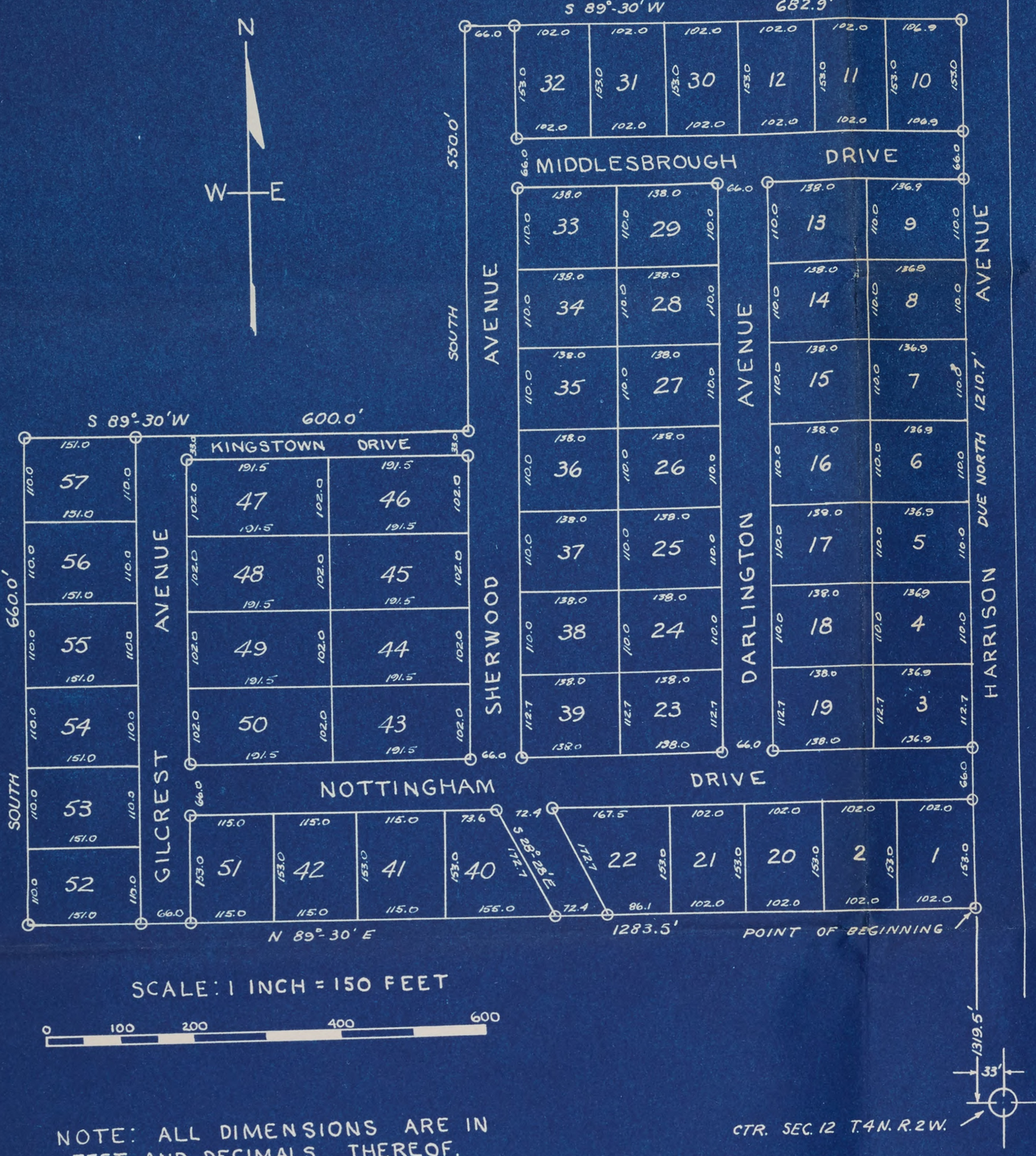
BM 20 Elev. 852.96
NW Root of 12" Elm
42' Lt. of Sta 112+01

BM 21 Elev. 852.64
SE Root of 14" Hickory
169' Lt. of Sta 120+55

Sta	+	H.I.	−	Elev
BM20	4.63	857.59		852.96
TP-1	5.57	859.93	3.23	854.36
BM21			7.29	852.64
BM20	7.87	860.83		852.96
TP1	2.95	856.42	7.36	853.47
TP2	3.92	859.48	0.86	855.56
TP3	7.61	862.67	4.42	855.06
TP4	3.34	864.05	1.96	860.71
TP5	2.31	861.03	5.33	858.72
TP6	1.81	851.36	11.48	849.55
TP7	4.33	853.10	2.59	848.77
BM1			2.61	850.49
BM1	3.02	853.51		850.49
TP1	3.04	851.81	4.74	848.77
TP2	11.24	860.82	2.23	849.58
TP3	6.16	865.17	1.81	859.01
TP4	1.46	859.09	7.54	857.63
TP5	3.09	857.98	4.20	854.89
TP6	3.26	861.14	0.10	857.88
BM20			8.18	852.96

PINECREST NO. 2

BEING A PART OF THE N.E. $\frac{1}{4}$ OF THE N.W. $\frac{1}{4}$ OF SEC. 12, T. 4 N., R. 2 W., LANSING TOWNSHIP, INGHAM COUNTY, MICHIGAN.



SCALE: 1 INCH = 150 FEET

0 100 200 400 600

NOTE: ALL DIMENSIONS ARE IN FEET AND DECIMALS THEREOF.

SURVEYOR'S CERTIFICATE

We hereby certify that the plat hereon delineated is a correct one and that permanent metal monuments consisting of bars not less than one-half inch in diameter and 48 inches in length, or shorter bars of not less than one-half inch in diameter lapped over each other at least 6 inches with an over-all length of not less than 48 inches, encased in a concrete cylinder at least 4 inches in diameter and 48 inches in depth have been placed at points marked thus (...O...) as thereon shown at all angles in the boundaries of the land platted, at all the intersections of streets, intersections of alleys, or of streets and alleys, and at the intersections of streets and alleys with the boundaries of the plat as shown on said plat.

Stephen Kessler
Stephen Kessler

Ernest W. Malkewitz Jr.
Ernest W. Malkewitz Jr. (Professional Engineer)

APPROVAL BY BOARD OF COUNTY ROAD COMMISSIONERS

This plat has been examined and was approved on the 26th day of May 1949 by the Ingham County Board of Road Commissioners.

Bill Smith (Chairman)
Bill Smith

Ray Moore (Member)
Ray Moore

John Doe (Member)
John Doe

DEDICATION

KNOW ALL MEN BY THESE PRESENTS, That we WARD GILTNER as proprietor, and MABEL A. GILTNER his wife, have caused the land embraced in the annexed plat to be surveyed, laid out and platted, to be known as "PINECREST NO. 2" being a Part of the N. E. 1/4 of the N. W. 1/4 of Section 12, T. 4 N., R. 2 W., Lansing Township, Ingham County, Michigan and that the streets and alleys as shown on said plat are hereby dedicated to the use of the public.

Signed and Sealed in the Presence of:

Malcolm H. Cooper (Witness)
Malcolm H. Cooper

Ward Giltner (L.S.)
Ward Giltner

Henry R. Jones (Witness)
Henry R. Jones

Mabel A. Giltner (L.S.)
Mabel A. Giltner

ACKNOWLEDGMENT

STATE OF MICHIGAN } ss.
County of Ingham }

On this 12th day of April 1949, before me, a Notary Public in and for said county, personally came the above named Ward Giltner and Mabel A. Giltner his wife, known to me to be the persons who executed the above dedication, and acknowledged the same to be their free act and deed.

Carl Brown
Carl Brown
Notary Public Ingham County
My Commission expires May 31, 1950

DESCRIPTION OF LAND PLATTED

The land embraced in the annexed plat of "PINECREST NO. 2" being a Part of the N. E. 1/4 of the N. W. 1/4 of Section 12, T. 4 N., R. 2 W., Lansing Township, Ingham County, Michigan

Is described as follows:

Beginning at a Point 33' W. and 1319.5' N. of the Center of Section 12, T. 4 N., R. 2 W., thence North 1210.7', thence S. 89°30' W. 682.9', thence South 550.0', thence S. 89°30' W. 600.0', thence South 660.0', thence N. 89°30' E. 1283.5' to the Point of Beginning.

MUNICIPAL APPROVAL

This plat was approved by the Township Board of the Township of Lansing at a meeting held April 18, 1949

Doris Bates
Doris Bates (Clerk)

APPROVAL BY COUNTY BOARD

This plat was approved on the 27th day of April 1949

Ethel L. Phillips
Ethel L. Phillips (County Register of Deeds)

C. Ross Hilliard
C. Ross Hilliard (County Clerk)

Lyle Austin
Lyle Austin (County Treasurer)

APPROVAL BY BOARD OF COUNTY AUDITORS

Approved by the Board of County Auditors of Ingham County, Michigan, this 3rd day of May 1949

Joe R. Brown
Joe R. Brown (Chairman)

Edward Small
Edward Small

COUNTY TREASURER'S CERTIFICATE

Office of County Treasurer Ingham County.

I hereby certify, that there are no tax liens or titles held by the State on the lands described hereon, and that there are no tax liens or titles held by individuals on said lands, for the five years preceding the 6th day of May 1949, and that the taxes for said period of five years are all paid, as shown by the records of this office,

Office of County Treasurer, Ingham

This certificate does not apply to taxes, if any, now in process of collection by township, city or village collecting officers.

Lyle Austin
Lyle Austin (County Treasurer)

Pocket has:
3 maps &
5 suppls.