SNYDER SUBDIVISION
A PROPOSED ADDITION TO THE CITY OF EAST LANSING

Thesis for the Degree of B. S.

MICHIGAN STATE COLLEGE
B. G. Omans – W. Reading

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Snyder Subdivision
A Proposed Addition to the
City of East Lansing

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Snyder Subdivision

A Proposed Addition to the City of East Lansing

Before starting on this thesis the two writers tried to map a plan of action to follow in completing this work.

It was decided to handle the problem by dividing it in the following manner:

1. Reconnaisance Survey
2. Location Survey
3. Topographical Survey
4. Street and Lot Layout
5. Street and Sidewalk Design
6. Storm and Sanitary Sewer Design
7. Water Supply
8. Engineer's Estimate of Cost of Project

Reconnaisance Survey

Several prospective parcels of land thought to be suitable for subdivision were looked at. The best of these were recorded as to location and owners. After consideration this parcel of land was selected as being the most likely site to subdivide.

It is owned by the Snyder Estate and is administered by Plummer Snyder, Lansing attorney. Hence the name Snyder Subdivision.

It was formerly the Inter-City Golf Course although it has not been used as such for a number of years. Bordering on the City of East Lansing on one side and Coolidge Road on another, it is readily accessible for development.

The piece of property is quite level, being at a higher elevation than properties to the South and West of it. Although it is clay and silt topsoil with water standing in several pockets, it is felt that drainage will be no problem.

The proximity of the East Lansing Pumping Station and Water Storage Tank assure adequate water pressures.

Location Survey

The Township of Lansing was contacted for the location of the property which was as follows:

N 50 acres of W half of SW quarter of Section 12.

Of this parcel the South 32.74 acres were subdivided.

The property is bordered by Coolidge Road on the West and Touraine Subdivision on the South. Dover and Touraine Streets terminate at the South property line.

The City Engineer and maps of the City of East Landing were consulted for location of existing utilities and the section corner common to Sections 11, 12, 13, 14. The city bench mark at the SE corner of Harvard and Coolidge Road was used in obtaining elevations. Exact location of this bench mark is shown in the field notes.

Topographical Survey

From a baseline along the edge of Coolidge Road a closed traverse was run staying approximately 300 feet inside the property lines. Interior angles were repeated six times and distances measured to the nearest thousandth of a foot.

The traverse was then closed by the use of latitudes and departures in conjunction with the transit rule. The error of closure being 0.306 feet and the accuracy 1/8725. (See field notes for computations on error and distribution of error.)

From this traverse the topographic features of the land were located by transit and stadia rod. The cross sections were also planned from this traverse as follows:

Along the South side line AC was measured off every hundred feet and staked. Along the West side AO perpendiculars were established at hundred foot intervals. At the intersections of this grid elevations were taken and at any other points deemed advisable to give accurate contours.

The Level Circuit was closed by checking back in on the City of East Lansing bench mark.

Street and Lot Layout

To be considered for addition to the City of East Lansing the lots must not be smaller than 5,000 square feet. Our development being suburban and wishing to make the lots as desirable as practicable, our lots have a minimum of 60 feet frontage and an average size of approximately 8,000 square feet.

There is enough variety in the size and frontage to relieve monotony and to give the buyer a selection to fit his needs.

Also for addition the street right-of-way must be 60 feet wide. This was provided for. An attempt was made to place the streets both as to utility and to give an attractive appearance to the whole design.

Street and Sidewalk Design

For addition to the City of East Lansing, streets must be 30 feet back to back of curb.

It is planned to lay the curb and gutter and put in a stabilized gravel road bed. After a period for consolidation the streets will be covered with a 3" layer of bituminous macadam.

The sidewalks, 5 feet wide and 4 inches thick, are to be of concrete. A typical cross-section of the 60 foot right-of-way is shown in detail with other plans.

Storm and Sanitary Sewer Design

Specifications for sewers in the City of East Lansing were obtained from the City Engineer and are as follows:

1. Catch basin type of inlet to be used
2. Combined sewer system required
3. Minimum cover of 7.5 feet required

The sewers were placed in an effort to utilize the natural slope of the ground although fairly deep ditches will be necessary to facilitate the velocity of flow. Our main outlet, even though a deep manhole is necessary, is much higher than the next manhole in the direction of flow and thus eliminates the need of a drop manhole.

Distances between manholes were limited to 400 feet except in two instances and in these cases there was no change of grade, direction or pipe size. All manholes were placed in the middle of the street to maintain equal ease of access from either side. Catch basins were placed at street intersections in such a manner that water would not gather at the crosswalks.

Complete rainfall data was obtained from the East Lansing Weather Bureau and a five year rainfall curve was plotted. The rainfall data was

converted to intensity of rainfall in inches per hour and these values plotted against time of duration of each storm.

The area was divided into smaller areas which would drain into each manhole. A ten minute inlet time was assumed for the areas served by each manhole. A value of 0.4 was used for the imperviousness coefficient as used in the formula Q=AIR. This is a common value for a built up residential district.

The velocity of flow was kept between 3 and 8 feet per second. In instances where there was a change in the size of pipe the elevation of the crown was kept the same. In each place there occurs a change in direction there is also a change in pipe size this taking care of head loss due to change in direction.

The point of concentration of the area is at manhole 12. Here it was deemed advisable to use a drop manhole to receive the two incoming lines.

Water Supply

Location of existing lines in bordering Touraine Subdivision were obtained from the City of East Lansing. An 8 inch line runs along Saginaw St. and 4 inch lines branch off this up Touraine St., Dover Pl., and Coolidge Rd. to the South edge of Snyder Subdivision.

The plan is to replace the 4 inch line up Coolidge Rd. and Touraine St. by an 8 inch line. Pressure on the 8 inch line will be about 65 psi, the pumping station and elevated storage being close to the subdivision.

Specifications of the City of East Lansing require that:

1. Feeders be not more than 3000 feet apart.
2. Supply lines to fire hydrants not less than 6 inches in residential districts.
3. 6inch cross mains not to exceed 600 feet.
4. Pressure on fire hydrants should not be less than 20 psi.

The following are the estimated pipe sizes to be used:

8 inch up Touraine St. and Coolidge Rd.

6 inch up Quimby and Whithall Avenues.

4 inch up Park Pl., Dover Pl. and Carr Ave.

No fire hydrant is on a dead end line thus giving a grid that should keep pressures more equal at different points.

The maximum demand on any line will be on Quimby Ave., with a 6 inch line, 1150 feet long. This line will serve 27 lots or at peak development 108 people.

Fire demand = $1{,}020\sqrt{0.108}\,(1 - 0.01\sqrt{0.108})$

= $334.4(0.9967)$

= 734 gal. per min.

Max. rate of Consumption = $\frac{100\,(2.50)\,108}{60}$

= 450 gal. per min.

Total requirement = 784 gal. per min.

Using the Hazen Williams Formula with a C for Cast Iron pipe of 100, the loss of head on a 6 inch ripe flowing at 748 gal. per min. is 70 feet per 1000 feet or 80.5 feet per 1150 feet.

Pressure drop is then = 0.433 (80.5) = 38 psi

Pressure is thus seen to be adequate, in fact a little high, but if the rest of this land is to be subdivided at some future date it will be possible to connect direct onto the eight inch mains and grid the entire plot.

Engineer's Estimate of Cost of Project

The Engineer's Estimate of the cost of the project was arrived at in the following manner:

36 Catch basins @ $100	$ 3600.00
1562' inlet @ $1.00	1562.00
360' of 10" V.C. sewer pipe @ $1.60	576.00
1080' " 15" " " " @ $2.50	2700.00
1125' " 18" " " " @ $3.00	3375.00
960' " 21" " " " @ $4.25	4080.00
360' " 24" " " " @ $5.00	1800.00
360' " 30" " " " @ $6.00	2160.00
1265' Manhole @ $1.41 plus 3' for those over 10' plus 3' for drop manhole	2407.50
1780' of 8" C.I. water pipe @ $2.90	5162.00
2289' " 6" " " " @ $2.00	4578.00
1969' " 4" " " " @ $1.80	3544.00
6 Fire hydrants 6" (3 hose) @ $150	900.00
6 Water Valves 6" @ $50	300.00
5 " " 4" @ $40	200.00
10114' Curb & Gutter @ $1.40	14159.00
5,214 sq.yds. Sidewalk 4" @ $1.33	6952.00
Grading	300.00
2087 cu.yds. Gravel @ $3.00	6261.00
16592 sq.yds. Bituminous paving @ $0.75	12444.00
Cost of Platting	2400.00
	$79,460.50

Legal Fees and Contingencies	10%	$ 7946.00
Total Estimates Cost		$ 87,406.50

With 123 lots this makes the average cost per lot for subdividing $710.62. Additional items such as the owners evaluation of his land, owners profit and sales commissions for selling lots should bring the price of each lot to around $1,000.

Unit costs were taken from "Seely's" Specifications and Costs. These are based on the Engineering News Record price index for Dec. 1943. Our costs were adjusted to current price index from the same source.

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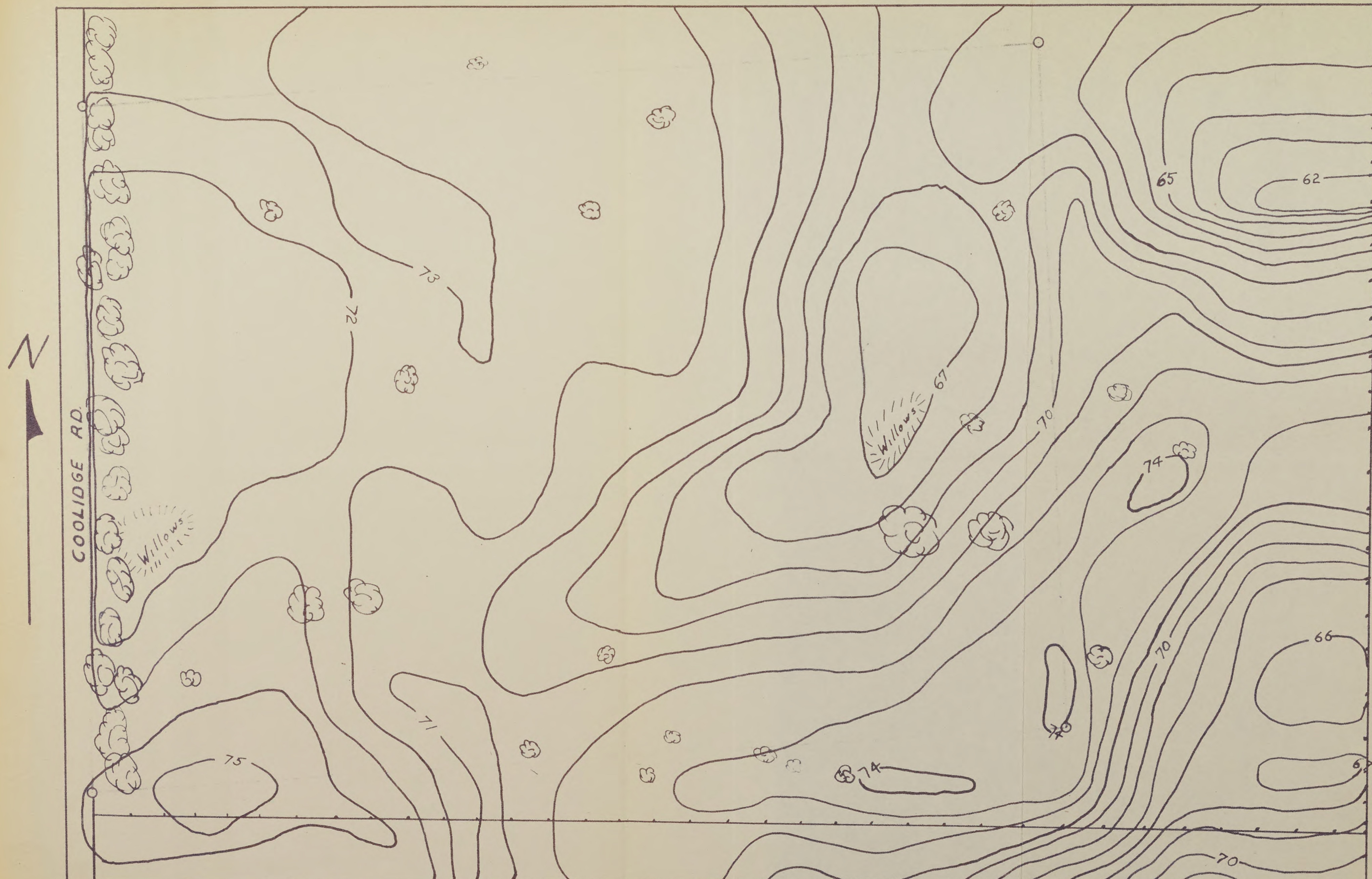


SNYDER SUBDIVISION	Topographic Map	Thesis CE 411 by B. Omans & W. Reading	Scale:- 1" = 100' Date:- 4/14/49

S 89° 51' 30" E

QUIMBY AVE.

PARK PLACE

DOVER PLACE

TOURAINE ST.

CARR AVE.

WHITHALL AVE.

N 0° 19' 15" W

COOLIDGE ROAD

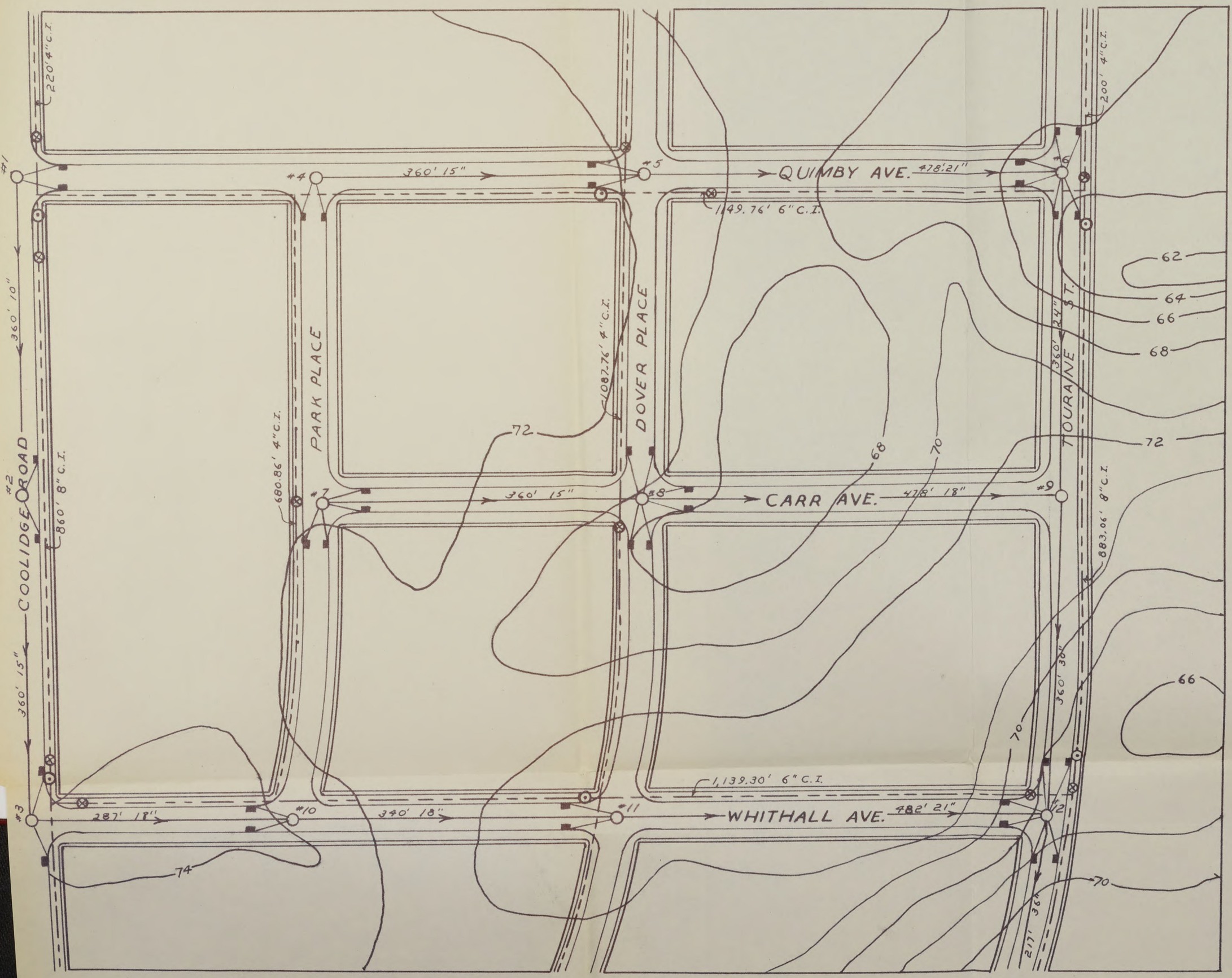
S 0° 23' 25" E

N 89° 51' 30" W

973'

Pt of beginning

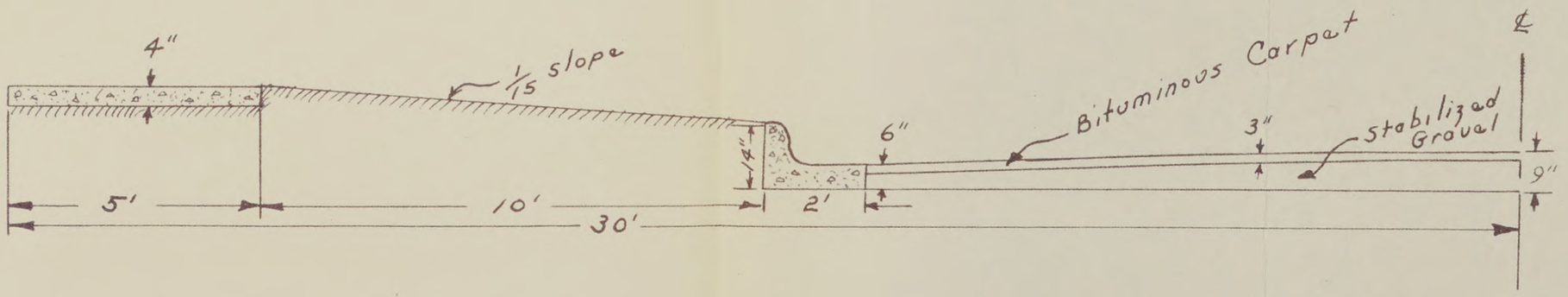
SNYDER SUBDIVISION	Subdivision Plan	Thesis CE 411 by B. Omans & W. Reading	Scale:- 1 = 100 Date:- 4/25/49



SNYDER SUBDIVISION	Water & Sewer	Thesis by CE 411 B. Omans & W. Reading	Scale:- 1 = 100 Date:- 5/2/49

DESIGN OF COMBINED SEWER SYSTEM
EAST LANSING, MICH.

line	location	from M.H.#	To M.H.#	Increment of area-acre	I	Equivalent area I-100% acres	Total area I-100% acres	Time of conc.	R - in/hr	Q - c.f.s.	Slope	Dia. of pipe-in	Velocity full ft/sec	Length	Time of flow - min	Capacity of Sewer - c.f.s	GROUND ELEV.		INVERT ELEV	
																	upper end	lower end	upper end	lower end
1	Coolidge	1	2	.76	.4	.30	.30	10	4.4	1.47	.006	10	3	360	2	1.5	873.2	871.5	865.70	863.54
2	"	2	3	1.09	.4	.44	.74	12	4.7	3.5	.005	15	3.6	360	1.7	5.0	871.5	873.5	863.12	861.32
3	Whithall	3	10	1.91	.4	.76	1.50	13.7	4.0	6.0	.005	18	4.1	287	1.2	7.3	873.5	874.0	861.07	959.64
4	Quimby	4	5	1.66	.4	.66	.66	10	4.9	3.34	.007	15	3.9	360	1.5	5.5	873.0	872.0	865.50	862.98
5	"	5	6	4.02	.4	1.61	2.27	11.5	4.6	10.4	.007	21	5.9	478	1.45	13.5	872.0	867.0	862.48	859.12
6	Touraine	6	9	5.00	.4	2.00	4.27	1295	4.3	18.40	.008	24	6.6	360	.90	21.0	867.0	871.5	858.87	855.99
7	Carr	7	8	1.75	.4	.70	.70	10	4.9	3.43	.007	15	4.0	360	1.9	5.5	872.0	872.0	862.10	859.58
8	"	8	9	2.94	.4	1.18	1.88	11.9	4.6	8.65	.007	18	5.3	478	1.5	9.5	872.0	871.5	859.33	855.99
9	Touraine	9	12	4.69	.4	1.87	8.02	13.4	4.1	33.8	.007	30	7.4	360	.9	37	871.5	871.0	854.99	852.47
10	Whithall	10	11	1.90	.4	.76	2.26	14.9	3.8	8.6	.006	18	4.9	340	1.15	9.0	874.0	872.0	859.64	957.60
11	"	11	12	2.89	.4	1.16	3.42	16.05	3.7	12.6	.005	21	5.7	422	1.3	14.0	872.0	871.0	857.35	855.24
12	Touraine	12	out	5.20	.4	2.08	13.52	15.0	3.7	50.0		36	7.0			65.0	871.0		851.97	

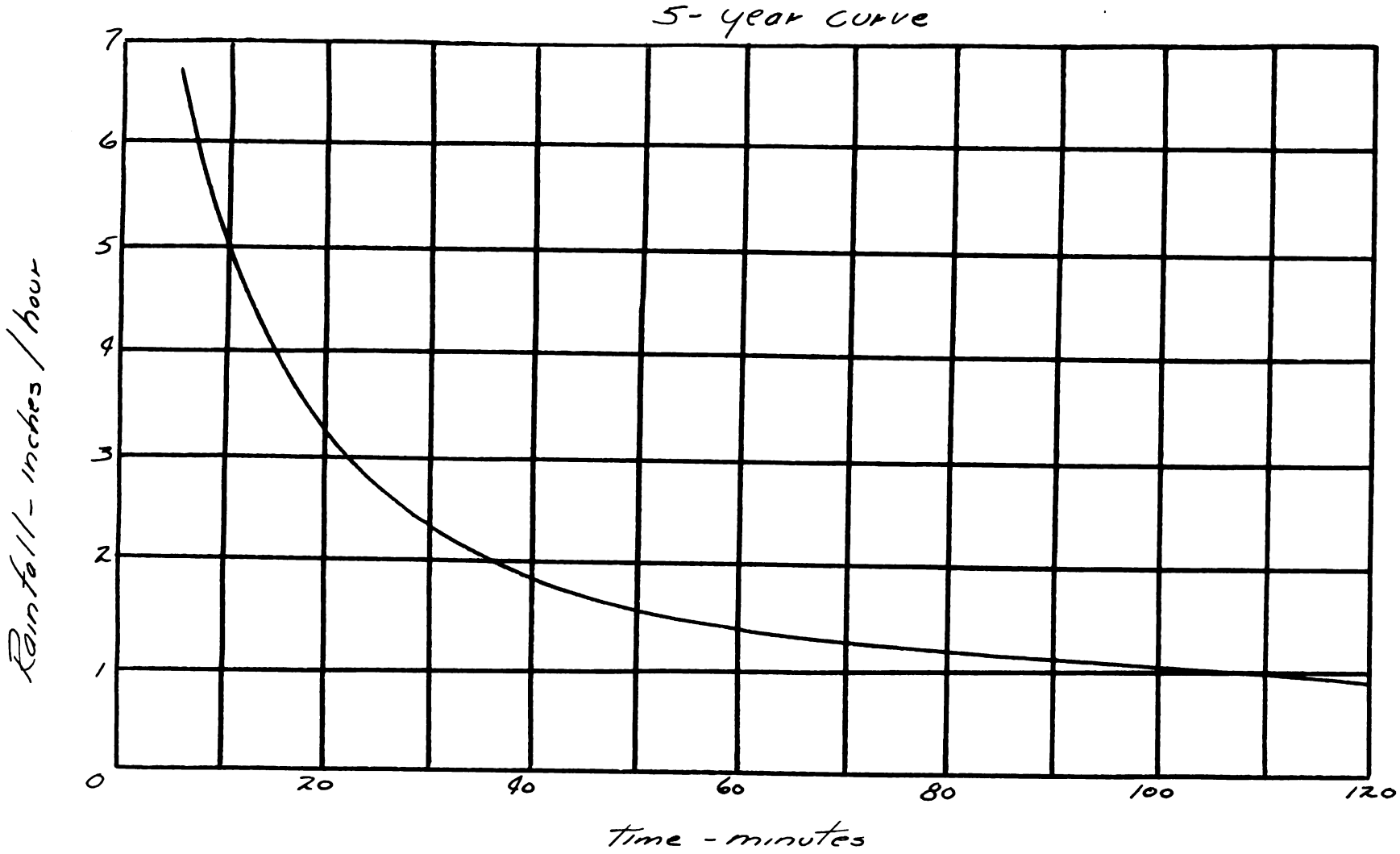


STREET CROSS-SECTION

SNYDER SUBDIVISION

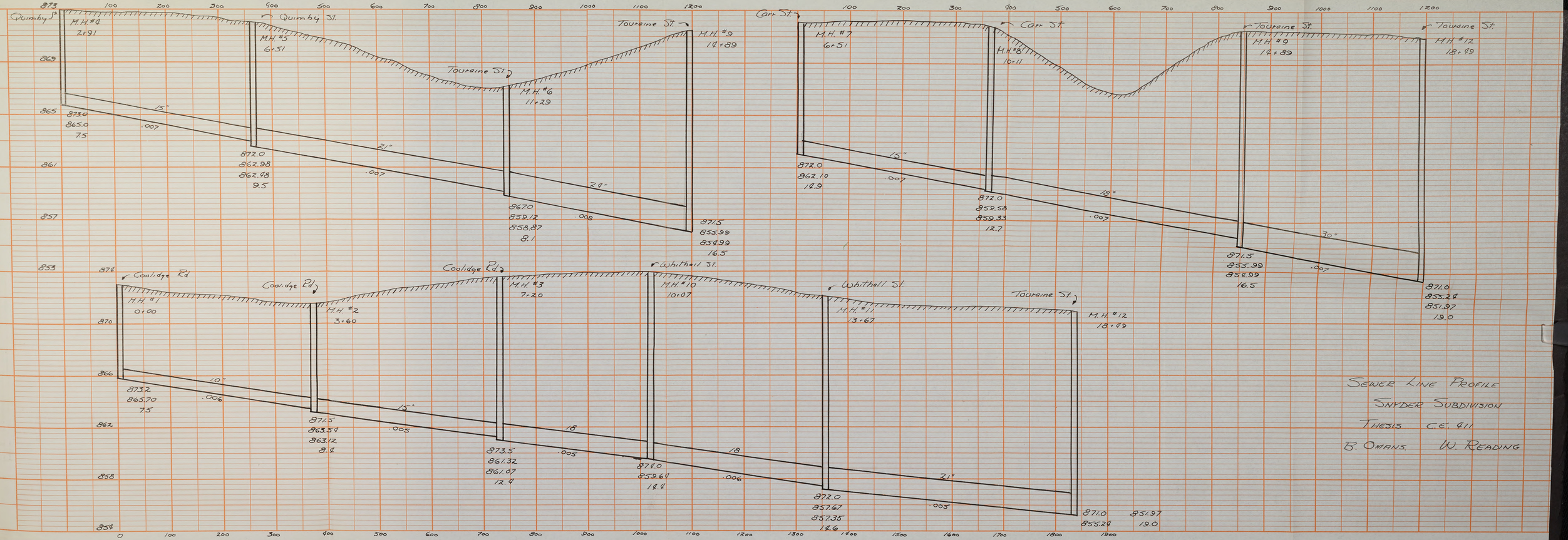
B. Omons & W. Reading Thesis

Date :- 5/6/49 Scale :- 1" = 3'



RAINFALL INTENSITY CURVE

EAST LANSING, MICH.



SEWER LINE PROFILE

SNYDER SUBDIVISION

THESIS C.E. 411

B. OMANS W. READING

PLATE 1-PLAN-PROFILE B. R. R. STANDARD

ROOM USE ONLY.