PLANS AND SPECIFICATIONS FOR IMPROVEMENT OF MOUNT HOPE ROAD

THESIS FOR DEGREE OF B. S.

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PLANS AND SPECIFICATIONS FOR IMPROVEMENT OF MOUNT HOPE ROAD

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by

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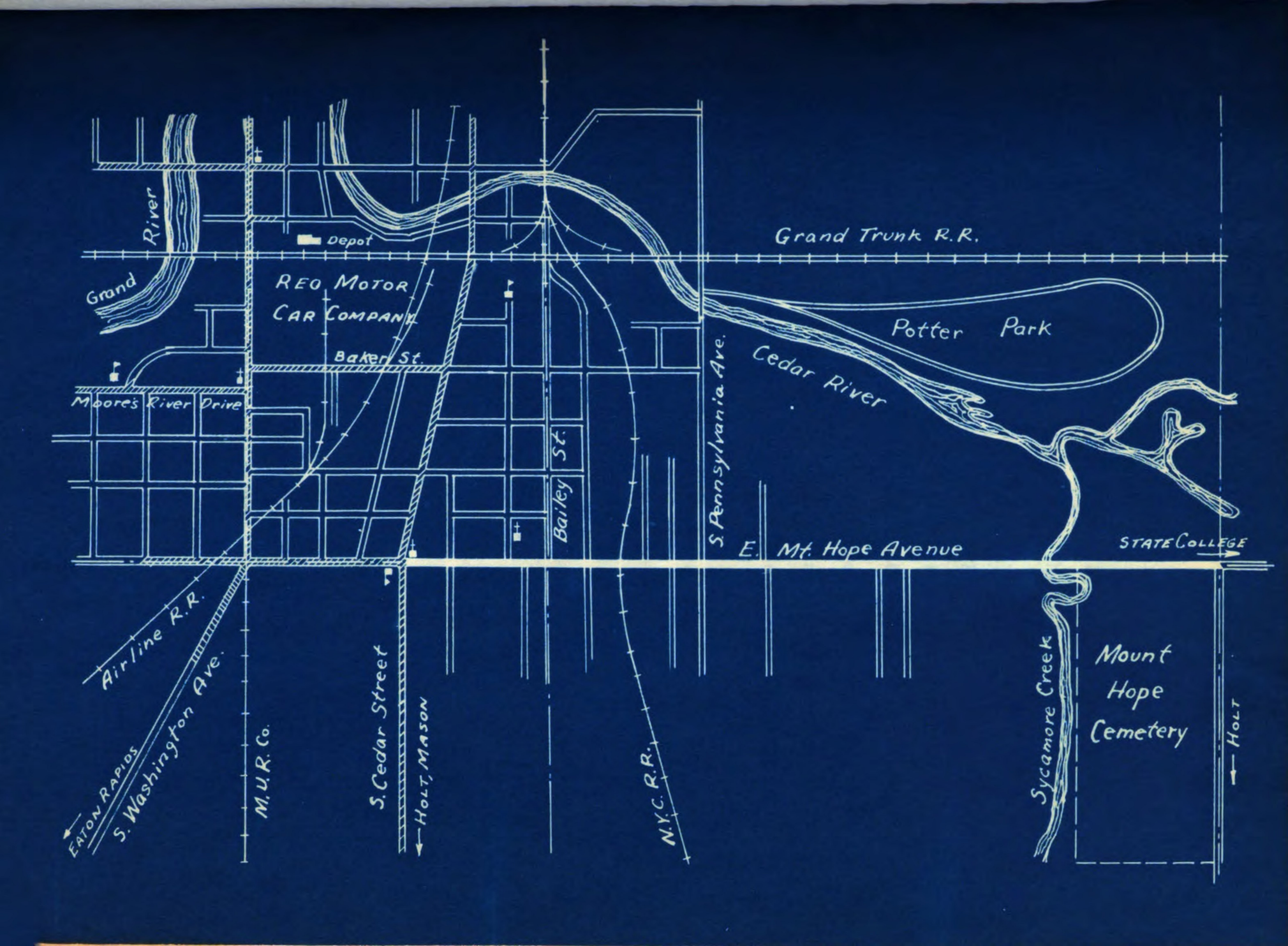
INTRODUCTION

A pavement is very much needed at the present time on E. Mt. Hope Avenue. It is the only through thoroughfare South of Michigan Avenue, which extends East and West. It is used daily by funeral processions on their way to the Mt. Hope Cemetery. The district is built up and subdivisions and new homes extend from Cedar Street to Sycamore Creek.

Beyond the end of the proposed pavement, houses are quite numerous, both on the road toward Okemos and the road toward Holt. Another use to which the road can be put to use is as another means of agression to the Michigan State College. After a football game or some such event, the trunk line highway is very congested. People desiring to go into Lansing by the South would find this a pleasing drive and one which would take them to M-29 going to Charlotte if they desired to go west on W. Mt. Hope Avenue.

Furthermore, and what is most important, most of the residents along the proposed pavement desired a pavement and expressed wonder that it had not been done before. The public opinion was easily seen to be all for a pavement.

A survey was made, accordingly, and plans were drawn to the best of our ability for a pavement which would best serve the public, which would have a pleasing appearance, and which conforms closely to City of Lansing and State Highway Department specifications.


Grand River
Depot
Grand Trunk R.R.
REO MOTOR CAR COMPANY
Baker St.
Moore's River Drive
Bailey St.
S. Pennsylvania Ave.
Potter Park
Cedar River
E. Mt. Hope Avenue
STATE COLLEGE
Airline R.R.
S. Washington Ave.
EATON RAPIDS
M.U.R. Co.
S. Cedar Street
HOLT, MASON
N.Y.C. R.R.
Sycamore Creek
Mount Hope Cemetery
HOLT

CROSS-SECTION

This particular cross-section chosen conforms very closely with the standard for the City of Lansing asphalt pavement. Their section for asphalt is a 6" base course of concrete and a 2½" top course of asphalt. The 8" thickness of pavement conforms with the state highway thickness standard for the edges and is one inch thicker at the center than the highway standard. As there is no steel, this thickness will be needed to produce a good safe pavement. The curbs, of course, are placed after the 27' width of pavement is laid.

Estimates of earthwork were made for the dirt graded to a smooth slope to the sidewalk or other embankment.where there is no sidewalk. This grading, or trimming, is to be done at any time after the concrete has hardened. The dirt which has been thrown upon the concrete to cure it must be cleaned off and may be used for grading or carted away.

Concrete to be used shall be of 1:2:4 mixture and shall be of a consistency to have a slump of not more than 2" nor less than 1".

Twice as much sand shall be used in curb than is used in pavement, but cement shall be in same proportion. In other words a 1:3:3 mixture.

New specifications of highway department also specify coarse aggregate shall all pass a 1" opening.

TRAVERSE

No witnesses were taken to Station C ± 00 but the point was lined in as follows:

Dug up section corner monument at intersection of Bailey Street and Mt. Hope Avenue. This is buried about 9" and is easily found. An iron stake on the east line of the lot having the large house on S. Side of road at Station 12 was on the property line and by measuring 33' out on center of Mt. Hope was easily measured off in digging for the monument.

The stores on the N.W. corner of Cedar and Mt. Hope are exactly 31' from the center line of Mt. Hope. Measured out 31' at right angles with the center line and held a rod on the point. Set up instrument on the monument and sighted rod. Lined in the rod when held at the east edge of existing pavement at Cedar Street and Mt. Hope intersection. This is Station 0 ± 00.

Another point on the center line of the road is the half-section monument at Station 38 ± 83. This is buried only a scant 2". It is on the N. and S. line with west fence of lane going north. Witnesses are as follows:

30" Sycamore N. and E. 30.2 ft.

Horse block---- S.W. corner N.E. 44 ft.

10" Maple edge of sidewalk S.E. 31 ft.

By wiggling in at top of hill be Pennsylvania Avenue monuments at Bailey Street and also last named monument can be sighted. By setting a rod at the point of wiggling in and another at Station C ± 00, the instrument at Bailey Street monument the deflection angle can be measured. This is 0 08'

By setting the instrument at the point of wiggling in, again, and sighting in on ½-section monument a stake midway between fence lines, 33' from each at top of hill by cemetery was checked and no deflection was noted. Section monument at road intersection at N.E. corner of cemetery was hunted for, about 2 cu. yds. of earth being moved but it was not found. Undoubtedly it is lost. Midway between the fences was then taken as a point on the center line.

BENCH LEVELS

A bench mark from city engineer of Lansing was secured to tie system to City of Lansing datum.

This was:

Hydrant N.E. corner Mt. Hope and Pennsylvania Avenue, top of valve stem 160.90

From this a line of levels was run both ways from here to the end of the proposed pavement.

A list of bench marks obtained follows:

B.M.#1 Hydrant N.E. corner Mt. Hope and Pennsylvania Avenue,-----Elevation 160.90

B.M.#2 Hydrant N.E. corner Mt. Hope and Bailey Street Elevation 157.35

B.M.#3 Hydrant N.W. corner Mt. Hope and Cedar Street Elevation 143.09

B.M.#4 Hydrant West of Sycamore Bridge by swamp Elevation 127.79

B.M.#5 Nail in blaze near root of 24" ash, road intersection Mt. Hope and Holt Roads. Elevation 136.96

DRAINAGE

Surface water from Station 0 to 5 + 80 will drain into the storm water sewers on Cedar Street, which is paved and well drained. Station 12 is the highest point between Cedar Street and the N.Y.C.R.R. tracks but all water from Station 0 to 12 could not be drained to Cedar Street because the necessary grade would make Linval Street intersection too high. Therefore the grade was laid so as to drain the water from Station 5 + 80 to Station 9 + 34 into Linval Street which has a slope toward the river and curb and gutter to carry it. Water from Station 9 + 34 to 12 also drains into Linval Street. Water from Bailey Street to the tracks will drain to the R,R. Right of Way. Water from Station 24, near Pennsylvania Avenue, to Station 17 +34 will also drain to the R.R. Right of Way. A very slight amount of water from Mt. Hope will drain into Pennsylvania Avenue as the high point is only 100' or so west of the intersection. There is a series of negative grades from Pennsylvania Avenue to the bridge on Mt. Hope over the Sycamore Creek. No catch basins or storm sewer are necessary as all the water can be drained to the bridge and into the creek. Two large cast iron inlets set in the curb at the bridge will be needed and about 20' of 24" sewer tile for each outlet. The street intersections between Pennsylvania and the bridge will need to be made with curb straight across intersection and not a crowned section at curb line.

There is a section of 140' just East of the bridge which is level. There is not much difficulty caring for the drainage here. The ground is near river level on both sides of the road and two catch inlets on each end of the 140' stretch, sunk in about 3/4" from bottom of gutter will catch all the water. 10" tile, 12' long on each side will take care of the inlets near the vridge and 18" tile, 12' long will take care of the inlets at Station 51 + 50. Water between 59 + 50 and 51 + 50 will all drain into the four inlets just named.

The pavement is made to end level with the crown of the existing road just before the road intersection. This crown is two or three feet above the ditchs at both sides and the 18"iron culvert is needed to drain the right ditch water to the left side of the road and into a grove sloping toward the Cedar River. All water from Station 59 + 50 to the end will drain to the left ditch and down the slope just named.

CURBS

Curbs already exist at the Cedar Street intersection. All curbs for intersecting streets shall have a 15' radius with a few exceptions. Pennsylvania Avenue shall have a 20' radius curb. The curb at the entrance gate of the Cemetery at Station 54 shall follow the curbe of the sidewalks and fence which have a larger radius than 20'.

There are 35 driveways where curb will have to be broken. If property owner desires a cement drive from curb to sidewalk the contractor can arrange terms with proprietor for putting same in. If property owner does not desire such, curb will be merely brought down level with gutter for the width of the driveway. Besides these 33 driveways there are two filling station entrances and one double entrance to the cemetery. At these entrances curba can be dropped same as for private drives. The entrance at Cedar Street filling station is 40' long. The driveway at the filling station and store at Pennsylvania is 30' long Station 24 ± 11 to 24 ± 47. The driveway at the cemetery will be double, a triangular flower bed dividing. These extend, at curbline, from Station 53 ± 40 to 53 ± 84 and from Station 54 ± 14 to 54 ± 58. At this double drive at the cemetery it will be best to carry the curbs in as far as the gate.

LIST OF DRIVES

No.	Place	Station	Right or Left
1	Filling Station	0 ± 00 to 0 ± 40	Right
2	House	1 ± 24 to 1 ± 32	Left
3	"	1 ± 16 to 1 ± 25	Right
4	"	2 ± 22 to 2 ± 30	Left
5	"	5 ± 29 to 5 ± 37	"
6	"	6 ± 40 to 6 ± 55	"
7	"	6 ± 82 to 6 ± 92	"
8	"	7 ± 43.5 to 7 ± 51.5	"
9	"	8 ± 13 to 8 ± 21	"
10	"	8 ± 98 to 9 ± 06	Right
11	"	9 ± 37.5 to 9 ± 46.5	"
12	"	9 ± 85 to 9 ± 93	"
13	"	10 ± 00 to 10 ± 09	Left
14	"	10 ± 61 to 10 ± 69	"
15	"	10 ± 91.5 to 10 ± 99.5	"
16	"	11 ± 33 to 11 ± 41	"
17	"	12 ± 29 to 12 ± 37	Right
18	"	12 ± 88 to 12 ± 98	"
19	"	17 ± 93 to 18 ± 00	Left
20	"	22 ± 67 to 22 ± 76	Right
21	"	23 ± 70 to 23 ± 88	"
24	Filling Station	24 ±11 to 24 ± 47	Left
25	Green House	27 ± 13 to 27 ± 28	Right
26	Green House	27 ± 87 to 28 ± 00	"
27	House	31 ± 12 to 31 ± 22	"
28	Green House	31 ± 92 to 32 ± 02	"

29	Green House	33 ± 24.5 to 33 ± 32	Right
30	House	37 ± 82 to 37 ± 90	"
31	Shubel's	39 ± 54 to 39 ± 66	Left
32	House	40 ± 32 to 40 ± 42	Right
33	"	44 ± 84 to 44 ± 98	"
34	Cemetery Drive	53 ± 40 to 53 ± 84	"
35	Cemetery Drive	54 ± 14 to 54 ± 58	"
36	House	54 ± 36 to 54 ± 53	Left
37	House	55 ± 34 to 55 ± 69	"
38	Field Gate	57 ± 82 to 57 ± 92	"
39	Cemetery Gate	62 ± 66 to 62 ± 83	Right

GRADE SHEET

for

Left Ditch.

Station	Elevation	Fill	Cut
0	139.0		0.7
1	140.0		0.9
2	142.1		0.6
3	144.5		0.6
4	147.6		0.5
5	149.6		1.4
6	150.4		1.0
7	150.3		0.6
8	150.2		1.3
9	150.3		1.9
10	151.3		2.5
11	153.1		1.6
12	153.5		2.2
13	152.4		1.4
14	151.2		0.5
15	149.9		1.0
16	148.6		1.0
17	147.4		0.8
17+27.6	147.0		
17+32.6	146.8		
18	148.8		1.8
19	151.7		0.4
20	154.6		2.8
21	157.0		1.0

22	156.7		1.0
23	160.0		1.5
24	160.3		1.8
25	159.6		1.0
26	157.4		1.9
27	155.0		0.8
28	152.6		2.0
29	150.1		1.4
30	147.4		0.7
31	145.3	0.1	
32	142.8		0.5
33	140.8		0.8
34	139.4		0.1
35	139.6	0.3	
36	133.0	0.9	
37	137.4	0.2	
38	136.8		0.7
39	136.1		0.2
40	135.1		0.3
41	133.6		0.3
42	131.9		0.2
43	130.0		0.4
44	128.1		0.2
45	126.3	0.4	
46	124.7	0.5	
47	123.7		0.1
48	123.2		0.3
49	123.0		0.5

1 30	122.9		0.7
50 1 14	122.7		1.0
51	122.7		0.5
52	122.7		0.6
53	123.1		0.5
54	123.6		0.1
55	124.6		
56	126.1		0.5
57	128.2		1.2
58	130.8		1.1
59	132.7		0.8
60	132.9		0.6
61	131.4		0.8
62	129.2		0.1
63	127.5	0.8	
64	125.7		
1 40	125.2		

GRADE SHEET

for

CENTER LINE

Station	Elevation of Ground	Elevation of Grade	Fill	Cut
0	140.1	139.4		0.7
1	141.3	140.4		0.9
2	143.0	142.5		0.5
3	145.6	144.9		0.7
4	149.6	148.0		1.6
5	150.9-	150.0		0.9
6	151.3	150.8		0.5
7	151.2	150.7		0.5
8	151.4	150.6		0.8
9	152.1	150.7		1.4
10	153.5	151.7		1.8
11	154.7	153.5		1.2
12	155.2	153.9		1.3
13	153.8	152.9		0.9
14	152.2	151.6		0.6
15	150.9	150.3		0.6
16	149.9	149.0		0.9
17	148.5	147.8		0.7
+ 27.6	148.1	147.4		0.7
+ 32.6	147.9	147.2		0.7
18	149.6	149.2		0.4
19	152.1	152.1		
20	156.1	155.0		1.1
21	158.2	157.4		0.8

22	159.5	159.1		0.4
23	161.2	160.4		0.8
24	162.0	160.7		1.3
25	160.7	160.0		0.7
26	158.8	157.8		1.0
27	156.8	155.4		1.4
28	154.6	153.0		1.6
29	151.4	150.5		0.9
30	143.5	148.1		0.4
31	146.1	145.7		0.4
32	144.2	143.2		1.0
33	142.0	141.2		0.8
34	140.4	139.8		0.6
35	139.5	139.0		0.5
36	138.7	138.4		0.3
37	138.3	137.8		0.5
38	137.8	137.2		0.6
39	137.0	136.5		0.5
40	136.2	135.5		0.7
41	134.7	134.0		0.7
42	132.8	132.3		0.5
43	130.7	130.4		0.3
44	123.5	123.5		
45	126.4	126.7	0.3	
46	124.7	125.1	0.4	
47	124.0	124.1	0.1	
48	124.2	123.6		0.6
49	124.0	123.4		0.6

± 30	124.0	123.3		0.7
50 ± 14	123.8	123.1		0.7
51	123.2	123.1		0.1
52	123.3	123.1		0.2
53	123.8	123.5		0.3
54	124.3	124.0		0.3
55	125.0	125.0		
56	126.6	126.5		0.1
57	129.7	128.6		1.1
58	132.4	131.2		1.2
59	134.0	133.1		0.9
60	133.8	133.3		0.5
61	132.6	131.8		0.8
62	129.8	129.6		0.2
63	127.4	127.9	0.5	
64	126.5	126.1		0.4
± 40	126.3	125.6		0.7

GRADE SHEET

for

RIGHT DITCH

Station	Elevation	Fill	Cut
0	138.0	0.9	
1	140.0		1.1
2	142.1		0.2
3	144.5		0.7
4	147.6		0.6
5	149.6		1.0
6	150.4		0.5
7	150.3		0.6
8	150.2		0.9
9	150.3		1.6
10	151.3		2.0
11	153.1		1.4
12	153.5		1.4
13	152.4		1.3
14	151.2		0.6
15	149.9		0.9
16	148.6		1.2
17	147.4		1.1
± 27.6	147.0		
± 32.6	146.8		
18	148.8		0.8
19	151.7		0.2
20	154.6		1.6
21	157.0		1.2
22	158.7		0.9

23	160.0		1.2
24	160.3		1.9
25	159.6		1.2
26	157.4		1.4
27	155.0		1.9
28	152.6		1.9
29	150.1		1.6
30	147.4		1.0
31	145.3		0.5
32	142.8		1.2
33	140.8		0.8
34	139.4		0.7
35	138.6		0.5
36	138.0		0.3
37	137.4	014	
38	136.8		0.5
39	136.1		0.5
40	135.1		0.5
41	133.6		
42	131.9		0.4
43	130.0		0.5
44	128.1		0.8
45	126.3		0.8
46	124.7		0.4
47	123.7		0.1
48	123.2		0.5
49	123.0		0.6
± 30	122.9		1.0

50 ± 14	132.7		1.1
51	132.7		0.5
52	132.7		0.2
53	133.1		0.4
54	133.6		
55	134.6		0.1
56	136.1		0.1
57	133.2		1.7
58	130.8		3.7
59	132.7		5.9
60	132.9		3.8
61	131.4		3.0
62	129.2		0.5
63	127.5	0.8	
64	135.7		0.1
± 40	135.2		0.6

VOLUME SHEET

Station	End Area Cut	End Area Fill	Volume Cut	Volume Fill	Fill ± %
0	19.8				
			68.7	6.5	7.8
1	17.3	3.5			
			66.3	9.7	11.6
2	13.5	1.75			
			74.6	3.8	4.6
3	21.8	1.3			
			82.0	8.9	10.7
4	28.3	2.5			
			91.3	7.4	3.9
5	26.8	1.5			
			83.5	5.2	6.3
6	18.3	1.3			
			62.2	9.4	11.3
7	15.3	3.8			
			79.3	8.3	10.0
8	27.5	0.7			
			147.2		
9	52.0				
			213.2		
10	65.8				
			204.3		
11	44.5				
			165.7		
12	45.0				
			145.0		
13	33.3				
			93.3	5.6	6.7
14	19.8	3.0			
			73.3	5.6	6.7
15	19.8				
			93.3		
16	33.3				
			104.8	0.2	0.3
17	23.3	0.1			
			86.5	0.1	0.12
± 23	27.8				
± 33	29.5				
			67.5	5.0	6.0
18	25.0	4.0			
			59.3	33.9	40.7
19	7.0	14.3			
			116.7	28.9	34.7
20	56.0	1.3			
			175.0	5.2	6.2
21	38.5	1.5			
			119.4	2.8	3.4
22	26.0				
			109.3	6.5	7.8
23	33.0	3.5			
			156.5	6.5	7.8
24	51.5				
			156.5		

25		33.0			
26		46.0	2.0	146.3	3.7 4.4
27		52.0		181.5	3.7 4.4
28		62.5		212.0	
29		44.3		197.8	
30		22.5	9.3	123.7	17.2 20.6
31		13.2	12.8	75.4	23.7 28.4
32		36.8	0.3	101.9	25.2 30.2
33		33.0	5.5	109.3	11.7 14.0
34		21.0	10.0	100.0	23.7 34.4
35		16.5	15.5	69.4	47.2 56.6
36		12.5	21.5	53.7	68.5 82.3
37		5.0	20.5	38.4	77.8 93.5
38		22.0	9.5	50.0	55.6 66.8
39		19.7	10.5	77.2	37.0 44.4
40		17.5	6.0	63.9	30.6 36.7
41		14.0	4.0	58.3	18.5 22.2
42		9.3	5.5	43.2	17.6 21.1
43		13.2	5.7	41.7	20.7 24.8
44		9.3	10.3	41.7	30.6 36.7
45		0.0	19.0	17.2	55.2 66.2
46		0.5	28.7	0.9	83.3 106.0
47		0.0	9.0	0.9	69.8 83.8
48		16.7	5.3	30.9	26.5 31.8
49		20.0	3.0	63.0	15.4 18.5
50	30	22.5		23.6	1.7 2.0
50					
*	14	25.0			
				43.7	6.4 7.7

51	2.5	4.0	15.7	13.2	21.8
52	6.5	5.8	24.6	21.5	25.8
53	6.3	5.3	24.6	35.0	42.0
54	6.5	13.1	12.0	47.0	56.5
55	0.0	12.3	3.7	40.0	43.0
56	2.0	9.3	66.3	17.2	20.6
57	33.8		169.1		
58	57.5		229.4		
59	66.4		184.1		
60	33.0	1.8	122.2	3.3	4.0
61	33.0		70.0	16.1	19.3
62	4.8	8.7	8.9	77.4	93.0
63		41.8	1.9	104.4	125.3
64	1.0	14.6	20.4	51.3	61.6
± 40	10.0	13.1			

Station	Balanced Volumes Cut	Fill	Mass Ordinate +C -F	Overhaul yd.sta.
0			60.9	
	60.9			
1			115.6	
	54.7			
2			185.6	
	70.0			
3			256.9	
	71.3			
4			339.3	
	83.4			
5			416.5	
	77.2			
6			467.4	
	50.9			
7			536.7	
	69.3			
8			683.9	
	147.2			
9			902.1	
	218.2			
10			1106.4	
	204.3			
11			1272.1	
	165.7			
12			1417.1	
	145.0			
13			1508.7	
	91.6			
14			1576.3	
	67.6			
15			1674.6	
	98.3			
16			1779.1	
	104.5			
17			1805.5	
	26.4			
± 28				
± 33			1867.0	
	61.5			
18			1885.6	
	18.6			
19			1967.6	
	82.0			
20			2136.4	
	168.8			
21			2252.4	
	116.0			
22			2353.9	
	101.5			
23			2502.6	
	148.7			

24			2659.1	
	156.5			
25			2801.0	
	141.9			
26			2978.1	
	177.1			
27			3190.1	
	210.0			
28			3387.9	
	197.8			
29			3491.0	
	103.1			
30			3538.0	waste
	47.0			3604 yds.
31			3609.7	
	71.7			
32			3725.0	
	115.3			
33			3790.6	
	65.6			
34			3803.4	
	12.8			
35			3774.8	
		28.6		
36			3713.7	
		61.1		
37			3696.9	
		16.8		
38			3729.7	
	32.8			
39			3761.9	
	32.2			
40			3798.0	
	36.1			
41			3820.1	
	22.1			
42			3837.0	
	16.9			
43			3842.0	
	5.0			
44			3793.0	
		49.0		
45			3687.9	
		105.1		
46			3605.0	
		82.9		
47			3604.1	
		0.9		93.7 cu.yd.
48			3653.6	
	49.5			
49			3675.2	
	21.6			
± 30				
50				
± 14			3711.2	

	36.0			
51			3706.1	
		5.1		
52			3704.9	
		1.2		
53			3687.5	
		17.4		
54			3643.0	
		44.5		
55			3598.7	
		44.3		
56			3644.4	
	45.7			
57			3813.5	
	169.1			
58			4042.9	
	229.4			
59			4227.0	
	184.1			543 cu.yd.
60			4345.2	
	118.2			
61			4395.9	
	50.7			
62			4311.8	
		84.1		
63			4188.4	
		123.4		
64			4147.2	
		41.2		
± 40				


Pocket
has

Pocket
has