MARIE CALLENDER'S

RESTAURANT AND BAKERY

DRAINAGE REPORT

JULY 1999
REVISED AUGUST 1999

Prepared for:

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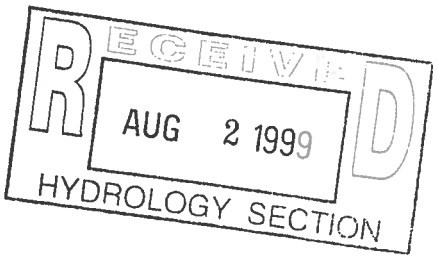

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I, George Nemeth, P.E., do hereby certify that this document was prepared by me, or under my direct supervision, and is true and correct to the best of my knowledge and belief and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.

George Nemeth, P.E.
New Mexico P.E. No. 12284

8-2-99
Date

INTRODUCTION

The Marie Callender's Restaurant project site is located on the west side of Coors Boulevard (NM 448) just north of Coors By Pass in the northwest section of Albuquerque, New Mexico. This site is located within the Special Assessment District (SAD) No. 223 on the Cottonwood Mall parcel. The site is zoned SU-1 and is designated C2A (Figure 1).

The drainage from this site discharges into the Cottonwood Mall storm sewer system. Design of the Mall storm sewer system accommodates free discharge from the fully developed out-parcels surrounding the Mall. Thus, storm water detention is not required.

DRAINAGE ANALYSIS

The drainage analysis of this site was completed using the "Developmental Process Manual: Section 22.2, Hydrology" and the "AHYMO Computer Program". The input parameters for the analysis were as follows; 100 year – 24 hour storm, type 2 rainfall, .05 hour time increments, time to peak = .1333 hours. The developed project site was analyzed using land treatment Type B and Type D. The proposed site development is composed of impervious and landscaped areas on nearly flat slopes.

The project site was divided into eight drainage zones (See sheet C-3 in the back pocket of this report). Zones 1, 4, and 8 discharge storm water sheet flow runoff directly offsite to nearby catch basins. Zones 2, 3, 5, 6, and 7 discharge storm water runoff directly to storm drains that convey the water to the nearby Cottonwood Mall storm sewer.

The following table shows the AHYMO calculated peak runoffs for each drainage basin for the 100 year – 24 hour storm. The AHYMO output file is included as Appendix A.

Basin	Runoff (cfs)
1	0.55
2	1.42
3	1.04
4	0.48
5	0.21
6	0.13
7	0.37
8	0.29

DRAIN PIPES

The following table gives the proposed pipe sizes, slopes, runoff rates, and pipe capacities. These were determined by the FlowMaster software as shown on the printouts included in Appendix B.

	Runoff	**Pipe Size**	**Pipe Slope**	**Manning's n**	**Pipe Capacity**
Zone	(cfs)	(in)	(ft/ft)		(cfs)
1	0.55	N/A	N/A	N/A	N/A
2	1.55*	12	0.008	0.024	1.73
3	3.17**	12	0.015	0.024	3.17***
4	0.48	N/A	N/A	N/A	N/A
5	0.21	6	0.020	0.018	0.57
6	0.13	6	0.027	0.018	0.67
7	0.37	6	0.040	0.018	0.81
8	0.29	N/A	N/A	N/A	N/A

* The runoff for Zone 2 is the sum of Zone 2 and Zone 6.

** The flow for Zone 3 is the sum of Zone 2, Zone 3, Zone 5, Zone 6, and Zone 7.

*** The pipe must operate as an orifice (pressure flow) to discharge 3.17 CFS. The available head on the orifice is 2.02 feet. The orifice equation: $Q=CA(2gh)^{0.5}$; with C=0.62, was used to calculate the pipe capacity. The required head on the orifice needed to discharge 3.17 cubic feet per second is 0.66 feet, which is less than the available 2.02 feet. Thus, this inlet will not surcharge.

By adding the flows for various zones to size a conveyance pipe, it is assumed that he time to peak for each drainage basin is the same. This will give the highest possible flow rates through the conveyance pipes, which is a conservative assumption.

The main conveyance pipes are proposed to be corrugated metal pipe (CMP). The pipes will be a minimum of 12" in diameter to avoid clogging of the pipe. A minimum 2.5 feet per second self cleaning velocity is provided in all pipe segments.

The 6" pipes are proposed to be High Density Polyethylene (HDPE) drain pipes. These pipes convey relatively small flows from the roof and surrounding landscaped areas to the 12" CMPs. The proposed drain inlets are shown in Appendix C, which is a product cut sheet from literature provided by the manufacturer.

REFERENCES

AMAFCA, January 1993, "Developmental Process Manual: Section 22.2, Hydrology"

AMAFCA, September 1993, "AHYMO Computer Program Users Manual"

Marie Callender's runoff calculations; land types and areas
used in AHYMO program; 7/6/99 by Ryan Paulk

DRAINAGE BASIN	TREATMENT TYPE	AREA (FT^2)	AREA (MILE^2)	PERCENT OF BASIN
1	B	2246	8.056E-05	34
	D	4396	1.577E-04	66
	TOTAL	6642	2.382E-04	
2	B	449	1.611E-05	3
	D	14051	5.040E-04	97
	TOTAL	14500	5.201E-04	
3	B	257	9.219E-06	2
	D	10339	3.709E-04	98
	TOTAL	10596	3.801E-04	
4	B	2270	8.143E-05	38
	D	3663	1.314E-04	62
	TOTAL	5933	2.128E-04	
5	D	2093	7.508E-05	100
			0.000E+00	
	TOTAL	2093	7.508E-05	
6	D	960	3.444E-05	63
	B	572	2.052E-05	37
	TOTAL	1532	5.495E-05	
7	D	2951	1.059E-04	70
	B	1265	4.536E-05	30
	TOTAL	4216	1.512E-04	
8	D	0	0.000E+00	0
	B	6096	2.187E-04	100
	TOTAL	6096	2.187E-04	
		TOTAL	**0.001851**	

	TOTALS Area	Percent
Type B land	**0.000621**	**34**
Type D land	**0.001230**	**66**
Total	**0.001851**	

pipe slope
Worksheet for Circular Channel

Project Description	
Project File	t:\projects\5060\eng\pipeslop.fm2
Worksheet	pipe slope
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.024	
Channel Slope	0.008000	ft/ft
Depth	12.0	in
Diameter	12.00	in

Results		
Discharge	1.73	cfs
Flow Area	0.79	ft^2
Wetted Perimeter	3.14	ft
Top Width	0.00	ft
Critical Depth	0.56	ft
Percent Full	100.00	
Critical Slope	0.022156	ft/ft
Velocity	2.20	ft/s
Velocity Head	0.08	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	1.86	cfs
Full Flow Capacity	1.73	cfs
Full Flow Slope	0.008000	ft/ft

lawn drains
Worksheet for Circular Channel

Project Description	
Project File	t:\projects\5060\eng\pipeslop.fm2
Worksheet	lawn drains
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.018	
Channel Slope	0.040000	ft/ft
Depth	0.50	ft
Diameter	6.00	in

Results		
Discharge	0.81	cfs
Flow Area	0.20	ft^2
Wetted Perimeter	1.57	ft
Top Width	0.15e-7	ft
Critical Depth	0.45	ft
Percent Full	100.00	
Critical Slope	0.035480	ft/ft
Velocity	4.13	ft/s
Velocity Head	0.26	ft
Specific Energy	0.76	ft
Froude Number	0.2e-3	
Maximum Discharge	0.87	cfs
Full Flow Capacity	0.81	cfs
Full Flow Slope	0.040000	ft/ft
Flow is subcritical.		

lawn drains
Worksheet for Circular Channel

Project Description	
Project File	t:\projects\5060\eng\pipeslop.fm2
Worksheet	lawn drains
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.018	
Channel Slope	0.027100	ft/ft
Depth	0.50	ft
Diameter	6.00	in

Results		
Discharge	0.67	cfs
Flow Area	0.20	ft²
Wetted Perimeter	1.57	ft
Top Width	0.15e-7	ft
Critical Depth	0.41	ft
Percent Full	100.00	
Critical Slope	0.026686	ft/ft
Velocity	3.40	ft/s
Velocity Head	0.18	ft
Specific Energy	0.68	ft
Froude Number	0.17e-3	
Maximum Discharge	0.72	cfs
Full Flow Capacity	0.67	cfs
Full Flow Slope	0.027100	ft/ft
Flow is subcritical.		

lawn drains
Worksheet for Circular Channel

Project Description	
Project File	t:\projects\5060\eng\pipeslop.fm2
Worksheet	lawn drains
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.018	
Channel Slope	0.020000	ft/ft
Depth	0.50	ft
Diameter	6.00	in

Results		
Discharge	0.57	cfs
Flow Area	0.20	ft^2
Wetted Perimeter	1.57	ft
Top Width	0.15e-7	ft
Critical Depth	0.39	ft
Percent Full	100.00	
Critical Slope	0.022594	ft/ft
Velocity	2.92	ft/s
Velocity Head	0.13	ft
Specific Energy	0.63	ft
Froude Number	0.14e-3	
Maximum Discharge	0.62	cfs
Full Flow Capacity	0.57	cfs
Full Flow Slope	0.020000	ft/ft
Flow is subcritical.		