May 5, 1999

BOHANNAN-HUSTON, INC.
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Susan Calongne, P.E.
City/County Floodplain Administrator
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

Re: STONEBRIDGE SUBDIVISION
DRAINAGE REPORT AMENDMENT FOR INCLUSION OF SURGE PONDS
(DRB #98-351, Drainage File A12/D16, W.O.# 612981)

Dear Susan:

This letter report amends the previously approved drainage report for Stonebridge Subdivision. The existing report is amended to include the use of surge ponds and to expand the limits of the proposed development. The approved report and associated approved grading plan for phase 1 uses a pond to detain storm run-off and release at a reduced and non-erosive flow rate downstream to existing arroyos. The detention pond is approved as an interim improvement until downstream storm drain infrastructure is built by subsequent development.

This amendment allows for the use of surge ponds in concept, as a permanent improvement and as a part of the storm drain infrastructure. Two surge ponds are proposed, located within private parks. The surge ponds are to be privately owned and maintained by the Stonebridge Homeowners Association. Because of the private maintenance, low maintenance surge ponds are proposed versus standard detention ponds. The outfall storm drain system is to be a public storm drain.

The proposed surge pond concept works by back-flowing storm water into the pond through multiple inlets/outlets. Multiple inlets are proposed to reduce inlet flow rates and velocities. As the downstream storm drain capacity is exceeded, the hydraulic grade line increases until water begins to flow from the storm drain into the surge pond. The majority of the storm event volume passes by the pond in the storm system. Only in significant storm events does water surge and enter into the pond. During the 100 year event, the water reaches a depth of 2 ft. and a minimum volume of 2.58 acre-ft. After the peak flow occurs, the surge pond quickly drains, within a few hours.

Because the pond is filled by surging the storm drain system, inlets can be designed to function as outlets, also. The back pressure of the downstream storm drain is used to control water inflow and outflow, and therefore no outlet restrictions are required by mechanical means, as are required on detention ponds. Surge pond inlets can be larger than those used by detention ponds. Detention ponds have outlet structures which use weirs and orifices to restrict flow leaving the pond. These outlet structures are subject

40 YEARS

to clogging and require routine maintenance. The surge of flow into the surge pond tends to unclog any debris which may have logged in the storm drain inlet/outlet. This, combined with the large, less restrictive outlet structures, results in a maintenance-free design.

The minimum storm drain line size is 24". Placing restrictions in the storm drain manholes provides additional restriction and control of the surge pond inflow/outflow rate. Most of the required flow restriction is provided by the 24" storm drain lines, and therefore little adjustment is required. Orifice plates bolted to the downstream side of storm drain manholes provide any additional restriction in flow necessary.

The inherent design of the surge ponds makes the surge ponds self-cleaning and relatively maintenance-free. However, the proposed design includes overflow weirs that accommodate flows in excess of the design storm (100-year/6-hour) and operational failures. Overflow weir outfall discharges to public street rights-of-way. Street grades are designed such that any overflow would be conveyed to the Black's Arroyo via surface flow within the streets. The combined system, storm drains, ponds and street flows, has capacity to accept flow rates significantly larger than the 100 year design storm.

The attached exhibit shows storm drain flow rates, line sizes and pond volumes. The proposed modification to the drainage plan for Stonebridge includes installing two surge ponds. Pond 1 is located north of Phase I and is called Basin 1D. This pond stores 2.3 acre-feet of water at a depth of 1.9'. When it drains, it releases a maximum of 5.2 cfs. The second pond, Basin 3C2, is located to the east in Phase III. This pond stores 3.6 acre-feet of water at a depth of 2.8'. When it drains, it releases a maximum of 6.4 cfs. These two ponds are connected, so that the outflow of Pond 1 enters Pond 2 before being released. This combination of ponds reduces the flow at the outlet to the Black Arroyo from 488.6 cfs to 250.7 cfs. In addition, the outlet pipe required decreases from a 72" to a 48" after the ponds are installed. The outlet pipe is not the only one that can be reduced by the addition of the ponds. The following table illustrates the reduction in pipe diameter possible with the addition of the surge ponds.

BASIN	DIAMETER WITH POND	DIAMETER WITHOUT POND	PIPE LENGTH
1C	24"	30"	167.30'
2A1	24"	42"	201.47'
1D	24"	42"	977.44'
3C2	24"	48"	332.59'
3C1	24"	54"	627.57'
3D	48"	60"	545.81'
3D	48"	72"	56.12'

Attached with this letter/amendment are two exhibits, a drainage information sheet, and AHYMO printouts for your review and comment.

Please contact me so we can discuss this in more detail.

Sincerely,
Bohannan Huston, Inc.

Bradley L. Bingham

Bradley L. Bingham, P.E.
Community Development and Planning

BLB/am
Enclosures

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Normal Depth Analysis

24",3.24%,20cfs
Worksheet for Circular Channel

Project Description	
Project File	c:\flowma~1\stone.fm2
Worksheet	24",3.24%,20cfs
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.032400	ft/ft
Diameter	24.00	in
Discharge	20.00	ft^3/s

Results		
Depth	0.99	ft
Flow Area	1.55	ft^2
Wetted Perimeter	3.12	ft
Top Width	2.00	ft
Critical Depth	1.61	ft
Percent Full	49.48	%
Critical Slope	0.008120	ft/ft
Velocity	12.90	ft/s
Velocity Head	2.59	ft
Specific Energy	3.58	ft
Froude Number	2.58	
Maximum Discharge	43.80	ft^3/s
Full Flow Capacity	40.72	ft^3/s
Full Flow Slope	0.007817	ft/ft
Flow is supercritical.		

24",4.89%,20cfs
Worksheet for Circular Channel

Project Description	
Project File	c:\flowma~1\stone.fm2
Worksheet	24", 4.89%, 20cfs
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.048900	ft/ft
Diameter	24.00	in
Discharge	20.00	ft^3/s

Results		
Depth	0.88	ft
Flow Area	1.33	ft^2
Wetted Perimeter	2.90	ft
Top Width	1.99	ft
Critical Depth	1.61	ft
Percent Full	43.97	%
Critical Slope	0.008120	ft/ft
Velocity	15.03	ft/s
Velocity Head	3.51	ft
Specific Energy	4.39	ft
Froude Number	3.24	
Maximum Discharge	53.81	ft^3/s
Full Flow Capacity	50.02	ft^3/s
Full Flow Slope	0.007817	ft/ft
Flow is supercritical.		

pipe 1
Worksheet for Circular Channel

Project Description

Project File	c:\flowma~1\stone.fm2
Worksheet	24", 4.55%, 20cfs
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.013	
Channel Slope	0.045500	ft/ft
Diameter	24.00	in
Discharge	20.00	ft^3/s

Results

Depth	0.90	ft
Flow Area	1.37	ft^2
Wetted Perimeter	2.94	ft
Top Width	1.99	ft
Critical Depth	1.61	ft
Percent Full	44.88	%
Critical Slope	0.008120	ft/ft
Velocity	14.64	ft/s
Velocity Head	3.33	ft
Specific Energy	4.23	ft
Froude Number	3.11	
Maximum Discharge	51.91	ft^3/s
Full Flow Capacity	48.25	ft^3/s
Full Flow Slope	0.007817	ft/ft

Flow is supercritical.

18", 1%, 10 cfs
Worksheet for Circular Channel

Project Description	
Project File	c:\flowma~1\stone.fm2
Worksheet	18", 1%, 10cfs
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	18.00	in
Discharge	10.00	ft³/s

Results		
Depth	1.17	ft
Flow Area	1.48	ft²
Wetted Perimeter	3.25	ft
Top Width	1.24	ft
Critical Depth	1.22	ft
Percent Full	77.96	%
Critical Slope	0.009206	ft/ft
Velocity	6.77	ft/s
Velocity Head	0.71	ft
Specific Energy	1.88	ft
Froude Number	1.09	
Maximum Discharge	11.30	ft³/s
Full Flow Capacity	10.50	ft³/s
Full Flow Slope	0.009064	ft/ft
Flow is supercritical.		

30",2.37%,54.7cfs
Worksheet for Circular Channel

Project Description	
Project File	c:\flowma~1\stone.fm2
Worksheet	30",2.37%,54.7cfs
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.023700	ft/ft
Diameter	30.00	in
Discharge	54.70	ft³/s

Results		
Depth	1.80	ft
Flow Area	3.78	ft²
Wetted Perimeter	5.06	ft
Top Width	2.25	ft
Critical Depth	2.35	ft
Percent Full	71.89	%
Critical Slope	0.015372	ft/ft
Velocity	14.48	ft/s
Velocity Head	3.26	ft
Specific Energy	5.06	ft
Froude Number	1.97	
Maximum Discharge	67.92	ft³/s
Full Flow Capacity	63.14	ft³/s
Full Flow Slope	0.017787	ft/ft
Flow is supercritical.		

36",0.5%,43.3cfs
Worksheet for Circular Channel

Project Description		
Project File	c:\flowma~1\stone.fm2	
Worksheet	36",0.5%,43.3cfs	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	36.00	in
Discharge	43.30	ft^3/s

Results		
Depth	2.26	ft
Flow Area	5.72	ft^2
Wetted Perimeter	6.31	ft
Top Width	2.58	ft
Critical Depth	2.14	ft
Percent Full	75.45	%
Critical Slope	0.005701	ft/ft
Velocity	7.57	ft/s
Velocity Head	0.89	ft
Specific Energy	3.15	ft
Froude Number	0.90	
Maximum Discharge	50.73	ft^3/s
Full Flow Capacity	47.16	ft^3/s
Full Flow Slope	0.004215	ft/ft
Flow is subcritical.		

N

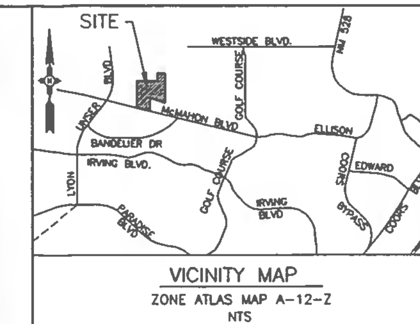
1"=200'

STONEBRIDGE SUBDIVISION
SURGE POND ANALYSIS

POND A	POND B
$Q_{100\ BYPASS}$= 27.0 CFS	$Q_{100\ BYPASS}$= 33.0 CFS
$Q_{100\ IN}$= 106.58 CFS	$Q_{100\ IN}$= 115.54 CFS
$Q_{100\ OUT}$= 5.21 CFS	$Q_{100\ OUT}$= 6.35 CFS
V_{100}= 2.58 AC FT	V_{100}= 3.97 AC FT
d_{100}= 1.91 FT	d_{100}= 2.83 FT
Q_2= 40.1 CFS	Q_2= 64.37 CFS

← ARROWS INDICATE PATH OF EMERGENCY OVERFLOW. (FLOW IN EXCESS OF STORM DRAIN SYSTEM CAPACITY)

EXHIBIT A



VICINITY MAP
ZONE ATLAS MAP A-12-Z
NTS

AS-BUILT INFORMATION
CONTRACTOR DATE
WORK STAKED BY DATE
INSPECTOR'S ACCEPTANCE BY DATE
FIELD VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE

MICRO-FILM INFORMATION
RECORDED BY DATE
NO.

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

No.	Date	REMARKS	By

REVISIONS

DESIGN

Designed By: BLB	DATE: 4/99
Drawn By: BLB	DATE: 4/99
Checked By: BLB	DATE: 4/99

Bohannan - Huston
Courtyard One 7500 JEFFERSON NE Albuquerque NEW MEXICO 87109
ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

McMAHON PROPERTIES
STORM DRAIN OPTION EXHIBIT
SURGE POND ANALYSIS

Design Review Committee	City Engineer Approval	Mo./Day/Yr.	Mo./Day/Yr.

Last Design Update

City Project No.	Zone Map No.	Sheet	Of
612981	A-12-Z	1	1

BHI JOB NO. 99267

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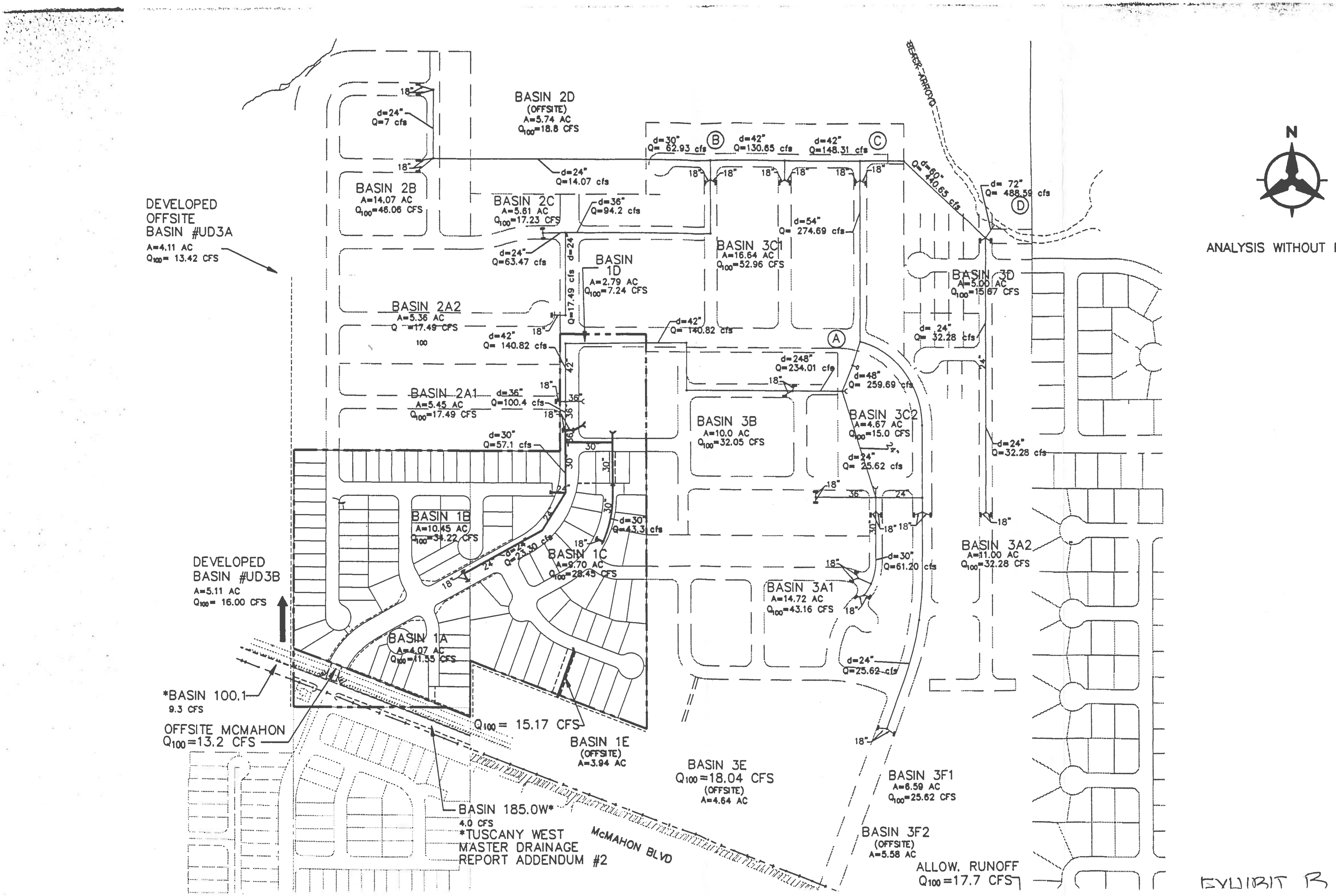
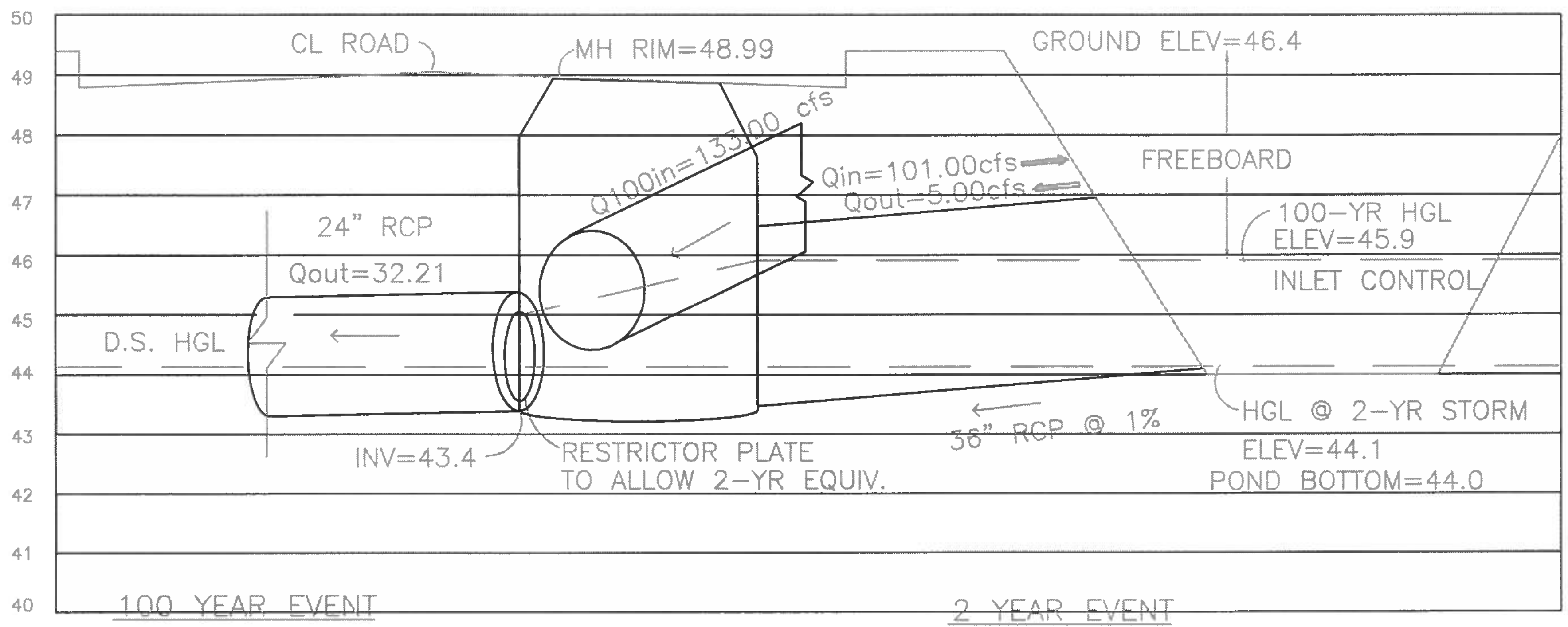
99267FDRN2.dwg 4/22/99



ANALYSIS WITHOUT PONDS

EXHIBIT B



100 YEAR EVENT

Q_{100} to System = 133 cfs
Q_{100} Surge to Pond = 101 cfs
Q_{100} By-Pass to Storm Drain = 32 cfs
100 YR MWSEL- 45.9
Volume 100 = 2.58 ac-ft.

2 YEAR EVENT

Q_2 to System = 60 cfs
Q_2 Surge to Pond = 28 cfs
Q_2 By-Pass to Storm Drain = 32 cfs
2 YR MWSECL- 44.1 (pond bottom 44.0)
Volume 2 YR = 0.15 ac-ft.

RESTRICTOR PLATE (INLET CONTROL)

h=1.2 V^2/2g = 6.18

Q=32.2 cfs

A=Q/(C(2gh)^.5)

A=2.69 ft^2

STONEBRIDGE
POND INLET/OUTLET
POND 1

MAY 3, 1999

EXHIBIT C

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ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

99267/CDP/DESIGN/POND_MH.DWG