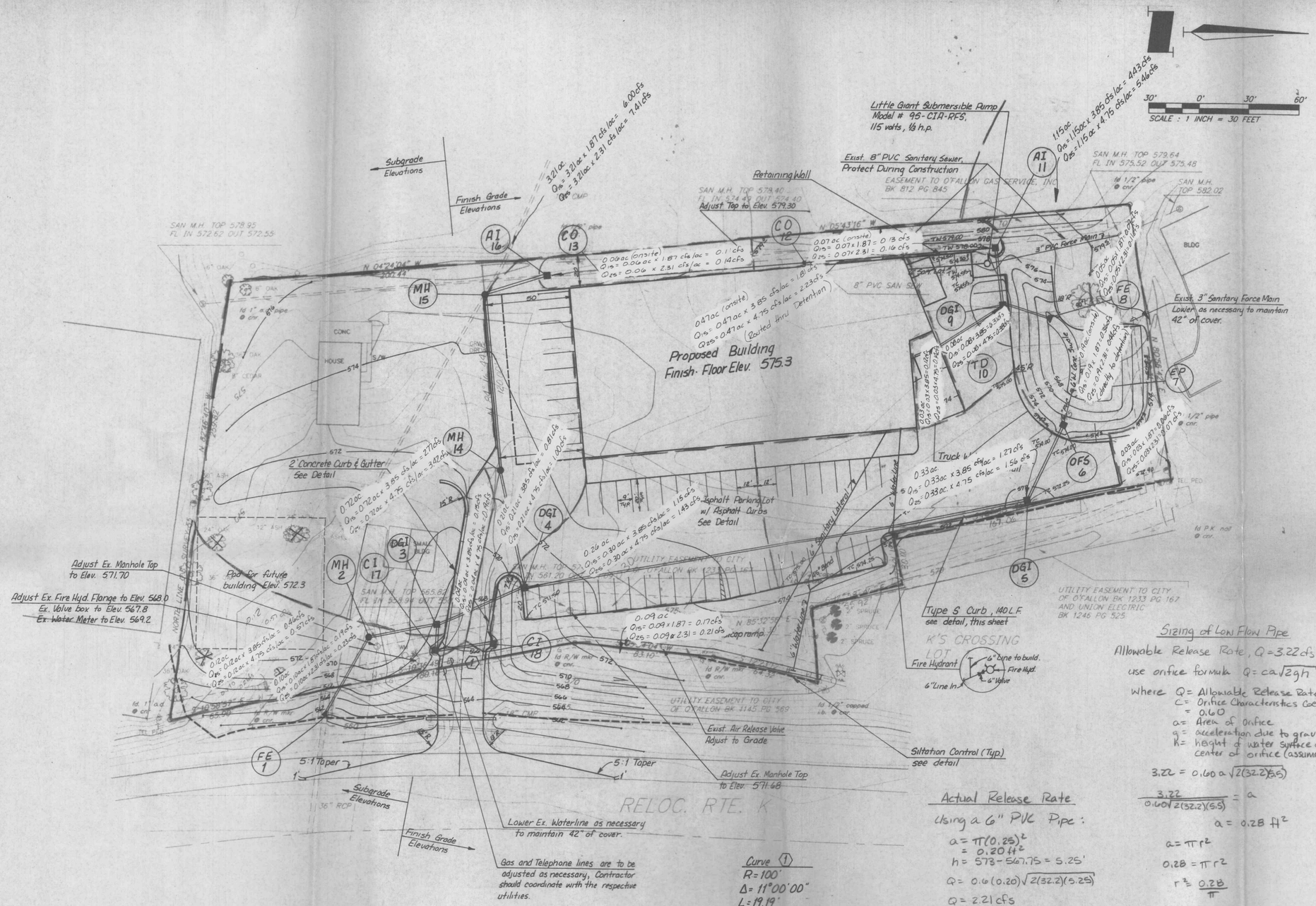

GBA
GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners
Kansas City, Mo. / Lenexa, Ks. / O'Fallon, Mo. / Ames, Ia. / Oklahoma City, Ok.

DATE:	3/19/92
DESIGN BY:	PLL/MCV
DRAWN BY:	MCV
PROJECT NO.:	9491
SHEET NO.	G 5
TOTAL SHEETS	6

DRAINAGE AREA MAP

REVISIONS	BY	DATE

Detention Calculations

Impervious Area = 2.894ac. - 0.54ac. (Greenspace)
= 2.354ac.

Runnoff Rate Factors; per O'Fallon Subdivision Ordinance

25yr - 30min Storm
Parks/Greenspace 2.31 cfs/ac.
Industrial/Commercial 4.75 cfs/ac

15yr - 30min Storm
Parks/Greenspace 1.87 cfs/ac
Industrial/Commercial 3.85 cfs/ac

Prior to Development Site is Parks/Greenspace

∴ 2.354ac x (4.75 - 2.31) cfs/ac = 5.74 cfs increase in flow for a 25yr. event.

Storage Required:

5.74 cfs x 30 min. x 60 sec/min = 10,332 cu ft

Actual Storage Capacity =

Post Development Flow to the Basin:

offsite 1	1.15ac	x 4.75 cfs/ac =	5.46 cfs
building	0.47 ac.	x 4.75 cfs/ac =	2.23 cfs
parking lot	0.11 ac.	x 4.75 cfs/ac =	0.52 cfs
greenspace	0.07 ac	x 2.31 cfs/ac =	0.16 cfs
basin	0.19 ac	x 2.31 cfs/ac =	0.44 cfs
			8.81 cfs

Post Development Flow Bypassing the Basin:

offsite	3.21 ac	x 2.31 cfs/ac =	7.41 cfs
greenspace	0.33 ac	x 2.31 cfs/ac =	0.76 cfs
parking lot	1.72 ac	x 4.75 cfs/ac =	8.71 cfs
			16.34 cfs

Allowable Release Rate: 2.894ac x 2.31 cfs/ac = 6.69 cfs
+ 1.15 ac x 4.75 cfs/ac = 5.46 cfs
+ 3.21 ac x 2.31 cfs/ac = 7.41 cfs
19.56 cfs

Allowable Release Rate From Detention:
19.56 cfs - 16.34 cfs = 3.22 cfs

Sizing of Low Flow Pipe

Allowable Release Rate, Q = 3.22 cfs

use orifice formula $Q = ca\sqrt{2gh}$

where Q = Allowable Release Rate
c = Orifice Characteristics Coef. = 0.60
a = Area of orifice
g = acceleration due to gravity
h = height of water surface above center of orifice (assume 5.5')

$3.22 = 0.60\, a\sqrt{2(32.2)(5.5)}$

$\frac{3.22}{0.60\sqrt{2(32.2)(5.5)}} = a$

$a = 0.28\ ft^2$

$a = \pi r^2$

$0.28 = \pi r^2$

$r^2 = \frac{0.28}{\pi}$

$r^2 = 0.091$

$r = 0.30'$

$d = 0.60'$

$d = 0.60' \times \frac{12''}{1'} = 7.23''$

∴ use 6" SDR 21 PVC Pipe

Actual Release Rate

Using a 6" PVC Pipe:

$a = \pi(0.25)^2 = 0.20\ ft^2$

$h = 578 - 567.75 = 5.25'$

$Q = 0.6(0.20)\sqrt{2(32.2)(5.25)}$

$Q = 2.21$ cfs

Actual Basin Storage Capacity

Storage Volume = 15,580 cu. ft.

STATE OF MISSOURI
PAUL L. LORTON
NUMBER PE-1995
REGISTERED PROFESSIONAL ENGINEER
4-7-92

THIS SHEET IS TO BE USED FOR DRAINAGE AREA PURPOSES ONLY, AND IS NOT TO BE USED FOR CONSTRUCTION

REVS-012491