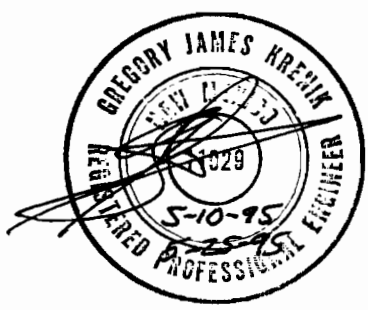
DRAINAGE CALCULATIONS
for
THE KNOLLS OF PARADISE HILLS
Lots 14-19, Block 44
Lots 27-31, Block 45

May 1995



MAY 25 1995

D. MARK GOODWIN & ASSOCIATES

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Congress Heights
SUBJECT Drainage
BY RM DATE 17 APR 95
CHECKED ____ DATE ____
SHEET 1 OF 6

Area In Subdivision

A = 2.6415 Acres = 0.0041 sq miles

Land Treatment

Type "A" = 0.0%

Type "B" = 28.70%

Type "C" = 28.71%

4.16 DU/Ac Type "D" = 42.59% 43.24%

Area In Congress

A = 0.2645 Acres = 0.0004 sq Miles

Land Treatment

Type "A" = 0.0%

Type "B" = 10.42%

Type "C" = 0.0%

Type "D" = 89.58%

AHYMO Results

Total Peak Q = 9.64 cfs @ 1.50 hrs

Total Peak V = 0.3245 Acre-Feet

Congress Ave
Q = 1.07 cfs @ 1.50 hrs
V = 0.039 Acre-Ft

Academy Road
Q = 8.57 cfs @ 1.50 hr
V = 0.2855 Acre-Ft

Pond Location, Sizing & Water Surface Elevation

- Location

Temporary or Permanent

Northeast Corner Lot 0 of Subdivision (See Attachments)

- Pond Sizing

Elev.	Area (ft²)	V (Acre-Ft)
91.00	3375	0.0852
92.00	4050	0.1033
93.00	4950	0.1240
94.00	5850	0.1446
95.00	6750	0.1653
96.00	7650	
	Total	0.6224

$Q_{capacity} > Q_{peak}$

0.6224 Acre-Ft > 0.4913 Acre-Ft

∴ Pond Contains Capacity For 100yr-10day Storm

For 100yr-10day Storm

$$V = 0.3245 + \left[\frac{(1.3820 * (367 - 220))}{12}\right] = 0.4913 = Q_{peak}$$

MAY - 3

Continued On Next Page

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Congress Heights
SUBJECT Drainage
BY RM DATE 17APR95
CHECKED ____ DATE ____
SHEET 2 OF 6

Pond Location, Sizing & Water Surface Elevation (continued)

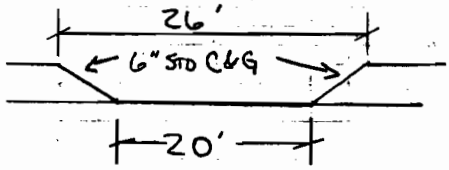
- Maximum Water Surface Elevation

Elev.	V (Acre-Ft)
95.00	0.4571
X	0.4913
96.00	0.6224

X = 95.20 (Indicated On Plan)

Inlet & Channel Design (Academy Road)

- Inlet Structure (Driveway Opening On Academy)



$Q = C L H^{3/2}$

$C = 2.9$ $L = 20'$ $H = 0.5'$

$Q = 2.9 * 20' * 0.5'$

$Q = 29$ cfs

$L = \frac{8.57}{2.9(0.5)^{3/2}}$

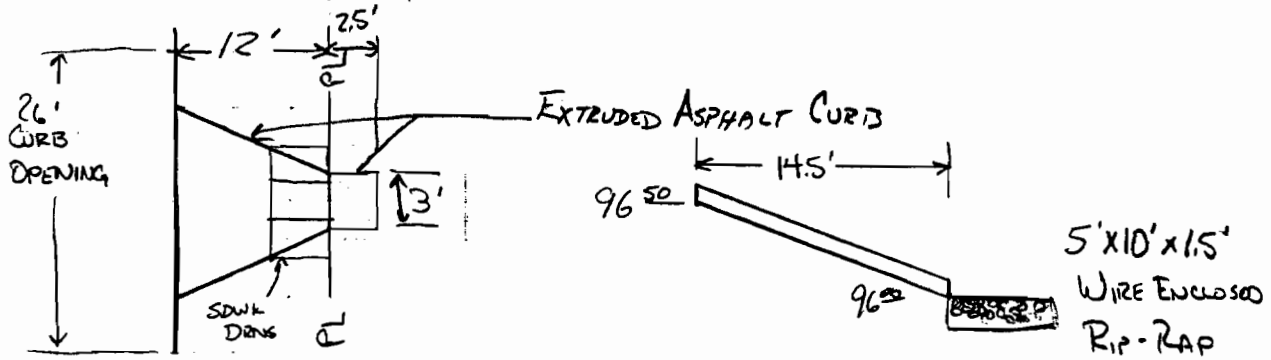
$= 8.36'$

$Q_{capacity} > Q_{peak}$

29 cfs > 8.57 cfs (From AHYMO Results Of Academy Road)

∴ Inlet Capacity Exceeds Developed 100 yr-6 hr Storm Runoff. For Academy

- Channel Design

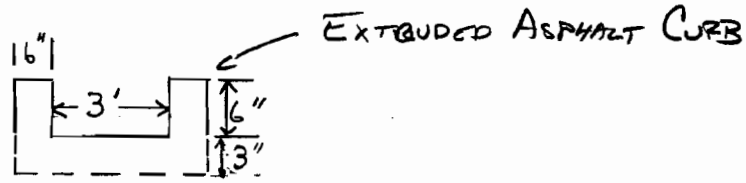


Continued On Next Page

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT CONGRESS HEIGHTS
SUBJECT DRAINAGE
BY RM DATE 17APR 95
CHECKED ____ DATE ____
SHEET 3 OF 6

INLET & CHANNEL DESIGN (CONTINUED)



$$Q = \frac{k}{n} A R_H^{2/3} S^{1/2}$$

$$= \frac{1.49}{0.016} (1.5)\left(\frac{1.5}{4}\right)^{2/3} (0.0345)^{1/2}$$

$Q = 13.50$ cfs CAPACITY OF ASPHALT CHANNEL

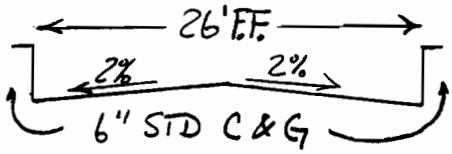
$Q_{CAPACITY} > Q_{PEAK}$

$13.50 cfs > 8.57 cfs$

∴ CHANNEL CONTAINS CAPACITY OF DEVELOPED STORM RUNOFF

STREET CAPACITY (ACADEMY ROAD)

Cross-section is not representative of the street. $S = 0.66\%$



$$Q = \frac{k}{n} A R_H^{2/3} S^{1/2}$$

$$= \frac{1.49}{0.016}(8.515)\left(\frac{8.515}{27}\right)^{2/3} (0.0066)^{1/2}$$

0.016
0.017

EGL

$Q = 29.90$ cfs CAPACITY $V = 29.9/8.515 = 3.51$ fps

$Q_{CAPACITY} > Q_{PEAK}$

$29.90 cfs > 8.57 cfs$

∴ STREET CAPACITY EXCEEDS DEVELOPED STORM RUN OFF

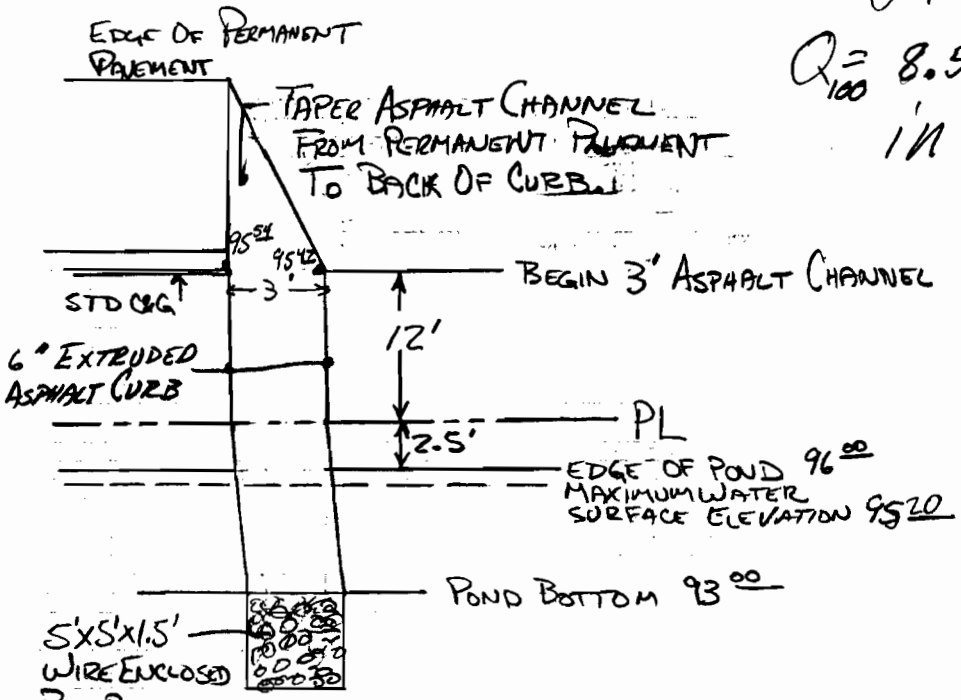
D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Congress Heights
SUBJECT Drainage
BY ZM DATE 18 Apr 25
CHECKED _____ DATE _____
SHEET 4 OF 6

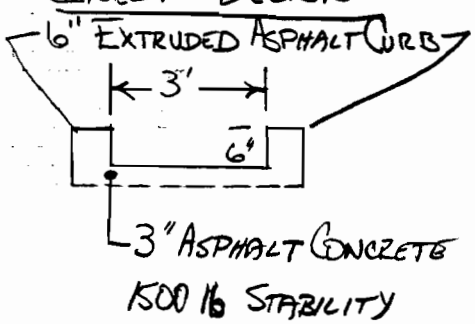
Inlet & Channel Design (Congress)

Check Capacity of Congress!

$Q_{100} = 8.57 + 1.07 = 9.64$ cfs in half section.



Inlet Design



$Q = c L H^{3/2}$

$C = 2.9$ $L = 3'$ $H = 0.5'$

$Q = 2.9(3')(.5)^{3/2}$

$Q = 3.08$ cfs

$Q_{Capacity} > Q_{Peak}$

3.08 cfs > 1.07 cfs (From AAMHO Results Congress Ave.)

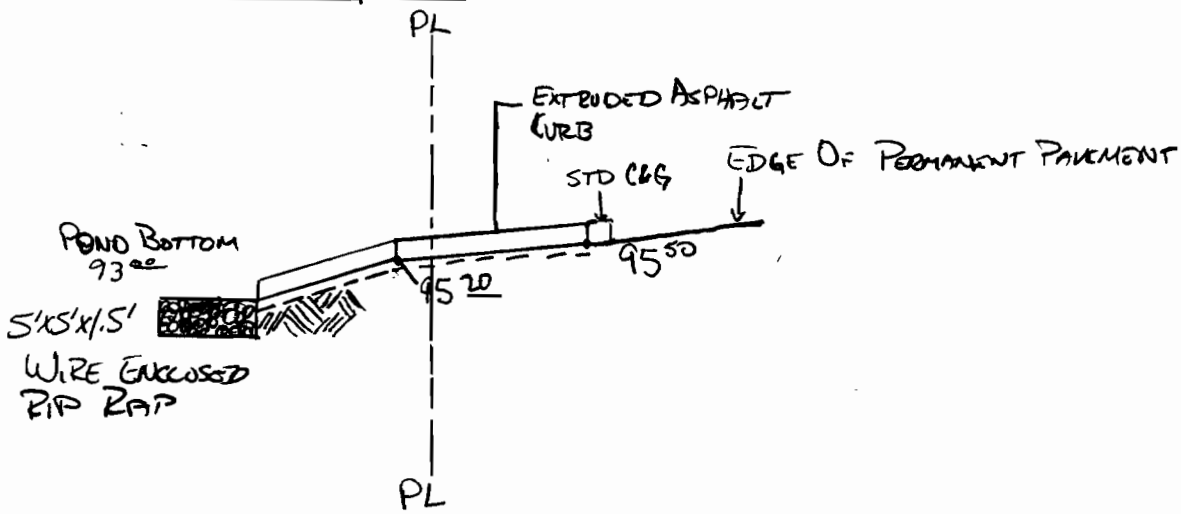
∴ Inlet Capacity Exceeds Developed Storm Runoff For Congress

Continued On Next Page

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT CONGRESS HEIGHTS
SUBJECT DRAINAGE
BY RM DATE 8 APR 95
CHECKED _____ DATE _____
SHEET 5 OF 6

- CHANNEL DESIGN



NOTE: MINIMUM SLOPE ON CHANNEL WILL BE FROM FLOWLINE ON CONGRESS TO MAXIMUM WATER SURFACE ELEVATION IN POND. WILL BE DETERMINED WITH CHANNEL FLOWING @ ½ CAPACITY

$$Q = \frac{k}{n} A R_H^{2/3} S^{1/2}$$

$$= \frac{1.49}{0.017}(0.75)\left(\frac{0.75}{3.5}\right)^{2/3}(0.0167)^{1/2}$$

$$Q = 3.23 \text{ cfs}$$

$Q_{CAPACITY} > Q_{PEAK}$

$3.23 \text{ cfs} > 1.07 \text{ cfs}$

∴ CHANNEL CONTAINS CAPACITY TO CONVEY 100YR-6HR STORM FROM CONGRESS TO POND

EMERGENCY SPILLWAY & CHANNEL

$Q = 9.64 \text{ cfs}$ $\quad Q = CLH^{3/2}$ $\quad H = 0.5$ $\quad C = 2.9$ $\quad Q = 9.64$

$L = Q / CH^{3/2}$

∴ EMERGENCY SPILLWAY OPENING 10' WILL CONVEY 100YR EVENT

$L = 9.64 / 2.9(0.5)^{3/2}$

$L = 9.40'$ CONSTRUCT OPENING TO 10'

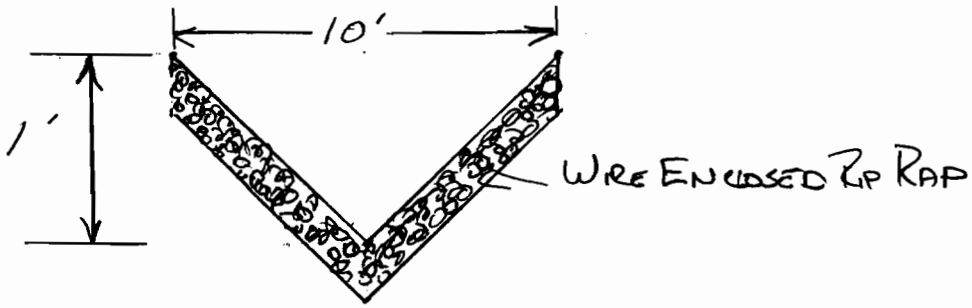
CONTINUED ON NEXT PAGE

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Congress Heights
SUBJECT Drainage
BY RWJ DATE 27 Apr 95
CHECKED _____ DATE _____
SHEET 6 OF 6

Emergency Spillway & Channel (Continued)

Channel Wire Enclosed Rip Rap V Shaped Channel



$$Q = \frac{k}{n} A R_H^{2/3} S^{1/2}$$

$$= \frac{1.49}{0.025} 5 \left(\frac{5}{10.2}\right)^{2/3} (0.11)^{1/2}$$

$Q = 61.45$ cfs Flowing @ Full Capacity > 18.52 cfs

∴ Emergency Spillway & Channel Contain Capacity For 100 yr - 6 HR Storm

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT The Knolls Of Pradise Hills
SUBJECT Drainage Re Calcs Selected Lots
BY RM DATE 13 Jun 95
CHECKED ____ DATE ____
SHEET 1 OF 2

Area In Subdivision (Academy Road)

No Changes In Land Treatments Or Area From AHYMO

$A = 2.6415$ Acres $Q_{PK} = 8.57$ cfs $V_{PK} = 0.2855$ Acre-Ft

- **Offsite Flows**

$A = 3.94284$ Acres $= 0.00616$ sq miles

Land Treatments

Type "A" = 100% Type "C" = 0.0 %

Type "B" = 0.0% Type "D" = 0.0 %

AHYMO Results

$Q_{PK} = 5.12$ cfs $V_{PK} = 0.1443$ Acre Feet

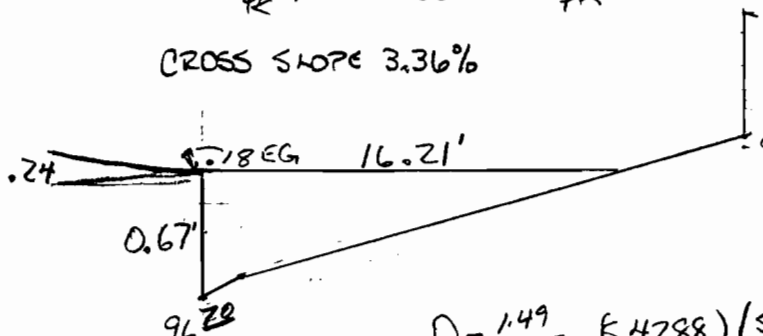
- **Addition Of Offsite Flows & Academy For Street Section**

AHYMO Results

$Q_{PK} = 13.58$ cfs $V_{PK} = 0.4298$ Acre Feet

* Section Taken @ South Western Side Of Curb Opening Prior To Entering Inlet

Cross Slope 3.36%



$Q = \frac{K}{n} A R_H^{2/3} S^{1/2}$

$K = 1.49$

$n = 0.016$

$S = 0.0061$

$EG = d + V^2/2g$

$= 0.67 + (3.41)^2/2g$

$EG = 0.85$

$V = Q/A = 3.41$ fps

$Q = \frac{1.49}{0.016}(5.4288)\left(\frac{5.4288}{16.8938}\right)^{2/3}(.0061)^{1/2}$

$Q = 18.52$ cfs > 13.58 cfs

∴ Street Section Contains Capacity For 100yr Event

E.G. Remains Within Right Of Way

4 Lots

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT The Knolls Of Paradise Hills
SUBJECT Drainage Re Calculations
BY RM DATE 13 Jan 95
CHECKED _____ DATE _____
SHEET 2 OF 2

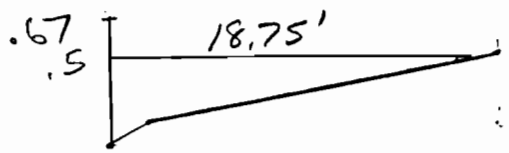
Congress

No Changes In Land Treatments Or Area

A = 0.2645 Acres

AHYMO Results

$Q_{PK} = 1.07$ cfs $\quad \forall_{PK} = 0.039$ Acre-Feet



Assume Flow Depth @ 0.5'

$\therefore Q = \frac{K}{n} A R_H^{2/3} S^{1/2}$

$K = 1.49$
$n = 0.016$
$S = 0.0350$ Min Slope On Congress

$Q = \frac{1.49}{0.016}(4.6875)\left(\frac{18.75}{19.25}\right)^{2/3}(.035)^{1/2}$

$Q = 31.85$ cfs $>>$ 1.07 cfs + 18.52 = 19.59 cfs

$\therefore$ Street Section Contains Capacity For 100yr Event On Congress. EG Will Not Be A Factor Due To The Amount Of Flow In Congress At This Point

Pond

No Change

$\forall_{PROVIDED} = 0.6224$ Ac. $\quad \forall_{OFFSITE} = 0.1443$ Acre-Feet

$+ \forall_{SUBDIVISION\ CONGRESS} = 0.4913$ Acre-Feet

$\forall_{ENTERING\ POND} = 0.63560$ Acre-Feet

Retained Volume @ Elev. 95^{20}

$\forall_{RT} = 0.4913$ Acre-Feet

$\therefore$ During 100yr Event Offsite Flows Will Discharge Through Emergency Spillway Elev. 95^{20}. The On Site Flow Will Be Retained.