

2 November 1988

Ms. Vicki Huang
City Engineer's Office
City of Wichita, Kansas
455 N. Main - 7th Floor
Wichita, KS 67202

Re: Sunridge and Teal Brook Estates
Additions to Wichita, Kansas
Improvement Guarantees & Petitions

Dear Vicki:

On the 25th of October, we submitted construction cost estimates and maps for nine (9) segments of work identified as Items A through I.

Per your evaluation and recommendations, we have made the following minor adjustments to the plans and/or construction estimate for each of the 9 items, as follows:

- a. The cost estimates for all 9 items reflect a change in the Contract Administration percentage from 20% to 25%.
- b. There are no changes in the plan, in the quantities or construction totals for Items A, B, C, D and I, other than the change to 25% Contract Administration.
- c. Changes have been made in the plan, construction quantities and construction totals for Items E, F, G and H, as well as the change to 25% Contract Administration.

Additionally, we have prepared for your review, petitions for Items A through I.

As soon as these petitions are approved, we will obtain the appropriate signatures, project initiation fees and proof of ownership, as required.

I appreciate your patience and input in preparing these petitions.

If we may be of further assistance, please advise.

Sincerely,

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS


Don C. Moehring II

DCM:om

SUNRIDGE - TEAL BROOK ADD'NS - System 90

HYDROLOGY DATA COMPILATION

DRAINAGE CONCEPT

A. Initial Data

Use Rational Method - $Q = CIA$

1. Determine "C" Factors for Sub-Basins

<u>Node</u>	<u>Soil Type</u>	<u>Land Use</u>	<u>C₂</u>	<u>C₁₀₀</u>
97	B	Res., 2/5 Acre	0.37	0.55
96	B	"	0.37	0.55
95	B	"	0.37	0.55
94	B	"	0.37	0.55
93	B	"	0.37	0.55
92	B	"	0.37	0.55
91	B	"	0.37	0.55
90	(Outlet to Detention Pond #1)			

2. Determine T_c & I for Each Sub-Basin

<u>Node</u>	<u>T_c</u>	<u>I₂</u>	<u>I₁₀₀</u>
97	t ₀ =8.33 t _g =4.42 <u>T_c=12.75</u> Use 15	3.83	7.37
96	15	3.83	7.37
95	15	3.83	7.37
94	t ₀ =12.5 t _g = 2.2 <u>T_c=14.7</u> Use 15	3.83	7.37
93	t ₀ =13.33 t _g = 2.33 <u>T_c=15.66</u>	3.76	7.24
92	15	3.83	7.37
91	15	3.83	7.37
90	(Outlet to Detention Pond #1)		

3. - Determine Area, "A", of Sub-Basins Contributing to each Node

<u>Node</u>	<u>Area (Acres)</u>	
97	(N) 1.78 + 1.87 (E)	= 3.65
96	(N) 0.37 + 1.46 (E)	= 1.83
95	(E) 0.65 + 0.62 (W)	= 1.27
94	(E) 1.84 + 1.09 (W)	= 2.93
93	(N & W) 4.13	= 4.13
92	(E) 0.58 + 0.96 (N)	= 1.54
91	(W & N) 0.99	= 0.99
90	(Outlet to Detention Pond #1)	

4. - Determine Surface Contribution (Q₂) to Each Node

<u>Node</u>	<u>C₂</u>	<u>I₂</u>	<u>A</u>	<u>Q₂</u>
97	0.37	3.83	3.65	5.17
96	0.37	3.83	1.83	2.59
95	0.37	3.83	1.27	1.80
94	0.37	3.83	2.93	4.15
93	0.37	3.76	4.13	5.75
92	0.37	3.83	1.54	2.18
91	0.37	3.83	0.99	1.40
90	(Outlet)			

5. Determine Surface Contribution (Q_{100}) to Each Node

<u>Node</u>	<u>C_{100}</u>	<u>I_{100}</u>	<u>A</u>	<u>Q_{100}</u>
97	0.55	7.37	3.65	14.80
96	0.55	7.37	1.83	7.42
95	0.55	7.37	1.27	5.15
94	0.55	7.37	2.93	11.88
93	0.55	7.24	4.13	16.44
92	0.55	7.37	1.54	6.24
91	0.55	7.37	0.99	4.01
90	(Outlet to Detention Pond #1)			

6. Flood Routing/Inlet Sizing - 2 Year Design Storm

<u>Node</u>	<u>Inlet Condition</u>	<u>Inlet Length</u>	<u>Q_2 Approach</u>	<u>Q_2 Intercept</u>	<u>Q_2 By-Pass</u>	<u>By-Pass To Node</u>
97	Sump	5	5.17	5.17	0	-
96	Sump	5	2.59	2.59	0	-
95	Sump	5	1.80	1.80	0	-
94	Sump	5	4.15	4.15	0	-
93	Sump	5	5.75	5.75	0	-
92	Sump	5	2.18	2.18	0	-
91	Sump	5	1.40	1.40	0	-
90	(Outlet to Detention Pond #1)					

7. Flood Routing/Inlet Sizing - 100 Yr. Design Storm

<u>Node</u>	<u>Inlet Condition</u>	<u>Inlet Length</u>	<u>Q₁₀₀ Approach</u>	<u>Q₁₀₀ Intercept</u>	<u>Q₁₀₀ By-Pass</u>	<u>By-Pass To Node</u>
97	Sump	5	14.80	9.5	5.30	Pond #2
96	Sump	5	7.42	7.42	-	-
95	Sump	5	5.15	5.15	-	-
94	Sump	5	11.88	9.5	2.38	95 & Pond #1
93	Sump	10	16.44	16.44	0	-
92	Sump	5	6.24	6.24	0	-
91	Sump	5	4.01	4.01	0	-
90	(Outlet to Detention Pond #1)					

8. Street Flow Depths - 2 Yr. Design Storm

<u>Node</u>	<u>Q₂ Approach</u>	<u>Flow Distribution</u>	<u>Street Slope</u>	<u>Flow Depth</u>	<u>Allowable Depth</u>	<u>Comment</u>
97	5.17	49% (NW) = 2.53 51% (E) = 2.64	0.38 0.53	0.28 0.29	0.50 0.50	OK OK
96	2.59	20% (N) = 0.52 80% (E) = 2.07	0.38 0.53	0.16 0.25	0.50 0.50	OK OK
95	1.80	51% (E) = 0.92 49% (W) = 0.88	0.75 0.54	0.18 0.18	0.50 0.50	OK OK
94	4.15	63% (E) = 2.61 37% (W) = 1.54	0.75 0.65	0.26 0.22	0.50 0.50	OK OK
93	5.75	100% (N) = 5.75	0.36	0.41	0.50	OK
92	2.18	38% (E) = 0.83 62% (N) = 1.35	0.64 0.36	0.17 0.23	0.30 0.30	OK OK
91	1.40	100% = 1.40	0.44	0.23	0.30	OK
90	(Outlet to Detention Pond #1)					

SYSTEM 90

2 YEAR - FREQUENCY

INLET SIZE - CAPACITY

CONDUIT DATA

ΣQ_2 to Inlet	Inlet Length	Q_2 Intercept	Q_2 By-Pass	ΣQ_2 Pipe	Pipe Size	Velocity (fps)	Length	T.T.	T.T.+ T.C.
2.59	5	2.59	0	2.59	18"	1.47	40	.45	15.45
5.10	5	5.10	0	7.69	24"	2.45	100	.68	16.13
1.80	5	1.80	0	1.80	No Pipe -	Direct Discharge	to R.C.B.C.		
4.15	5	4.15	0	4.15	No Pipe -	Direct Discharge	to R.C.B.C.		
5.75	10	5.75	0	5.75	30"	1.17	60	.85	16.51
2.09	5	2.09	0	7.84	36"	1.11	225	3.38	19.89
1.22	5	1.22	0	9.06	36"	1.28	180	2.34	22.23

SYSTEM 90

100 YR. - FREQUENCY

N

INLET SIZE - CAPACITY

CONDUIT DATA

ΣQ_{100} to Inlet	Inlet Length	Q_{100} Intercept	Q_{100} By-Pass	ΣQ_{100} Pipe	Pipe Size	Velocity (fps)	Length	T.T.	T.T. + T.C.
7.42	5	7.42	0	7.42	18"	4.20	40	0.16	15.16
14.74	5	10.5	4.24 to Pond #2	17.92	24"	5.70	100	0.29	15.45
5.15	5	5.15	0	5.15	No Pipe -	Direct Discharge to	R.C.B.C.		
11.88	5	9.5	2.38 to Pond #1	9.5	No Pipe -	Direct Discharge to	Pond #1		
16.45	10	16.45	0	16.45	30"	3.35	60	0.30	15.96
6.09	5	6.09	0	22.54	36"	3.19	225	1.18	17.14
3.80	5	3.80	0	26.34	36"	3.73	180	0.80	17.94

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 90 (2 Yr. Frequency)

Structure 93 - Curb Inlet - Q_o only

$$Q_o = 5.75 \text{ cfs}; D_o = 30"; V_o = 1.17 \text{ fps}; V_o^2/2g = 0.0213$$

$$\text{To generate initial velocity, } H_v = V_o^2/2g = 0.02'$$

$$\text{Entrance loss into 24" pipe} = H_e = 0.5 \times V_o^2/2g = 0.1'$$

$$\text{Total Structure Loss} = 0.02 + 0.01 = 0.03'$$

Structure 92 - Curb Inlet + Upstream Flow

$$Q_u = 5.75 \text{ cfs}; V_u = 1.17 \text{ fps}; V_u^2/2g = 0.0213$$

$$Q_g = 2.09 \text{ cfs}$$

$$Q_o = 7.84 \text{ cfs}; V_o = 1.11 \text{ fps}; V_o^2/2g = 0.0191$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = 0.0191 - (0.7687 \times 0.0213)$$

$$H_u - H_o = 0.0191 - 0.0164 = 0.01'$$

Structure 91 - Curb Inlet + Lateral (45°) Flow

$$Q_u = 7.84 \text{ cfs}; V_u = 1.11 \text{ fps}; V_u^2/2g = 0.0191$$

$$Q_g = 1.22 \text{ cfs}$$

$$Q_o = 9.06 \text{ cfs}; V_o = 1.28 \text{ fps}; V_o^2/2g = 0.0254$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = 0.0254 - (0.8653 \times 0.0191) = 0.01'$$

$$\text{Turn Loss (45°)} = H_L = K(V_L^2/2g) = .465 \times 0.0191 = 0.01'$$

$$\text{Total Structure Loss} = 0.01' + 0.01' = 0.02'$$

Structure 96 - Curb Inlet - Q_o only

$$Q_o = 2.59 \text{ cfs}; D_o = 18"; V_o = 1.47 \text{ fps}; V_o^2/2g = 0.0336$$

$$\text{To generate initial velocity, } H_v = V_o^2/2g = 0.04'$$

$$\text{Entrance loss into 18" pipe} = H_e = 0.5 \times V_o^2/2g = 0.02'$$

$$\text{Total Structure Loss} = 0.04 + 0.02 = 0.06'$$

Structure 97 - Curb Inlet + Upstream Flow

$$Q_u = 2.59 \text{ cfs}; V_u = 1.47 \text{ fps}; V_u^2/2g = 0.0336$$

$$Q_g = 5.10 \text{ cfs}$$

$$Q_o = 7.69 \text{ cfs}; V_o = 2.45 \text{ fps}; V_o^2/2g = 0.0932$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = 0.0932 - (0.3368 \times 0.0336)$$

$$H_u - H_o = 0.0932 - 0.0113 = 0.08'$$

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 90 (100 Yr. Frequency)

Structure 93 - Curb Inlet - Q_o only

$$Q_o = 16.45 \text{ cfs}; D_o = 30"; V_o = 3.35 \text{ fps}; V_o^2/2g = .1743$$

$$\text{To generate initial velocity, } H_v = V_o^2/2g = 0.17'$$

$$\text{Entrance Loss into 30" pipe} = H_e = 0.5 V_o^2/2g = 0.09'$$

$$\text{Total Structure Loss} = 0.17' + 0.09' = 0.26'$$

Structure 92 - Curb Inlet + Upstream Flow

$$Q_u = 16.45 \text{ cfs}; V_u = 3.35 \text{ fps}; V_u^2/2g = .1743$$

$$Q_g = 6.09 \text{ cfs}; D_o = 36"$$

$$Q_o = 22.54 \text{ cfs}; V_o = 3.19 \text{ fps}; V_o^2/2g = .1580$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = .1580 - (0.7298 \times 0.1743)$$

$$H_u - H_o = .1580 - .1272 = 0.03'$$

Structure 91 - Curb Inlet + Lateral (45°) Flow

$$Q_u = 22.54 \text{ cfs}; V_u = 3.19 \text{ fps}; V_u^2/2g = .1580$$

$$Q_g = 3.80 \text{ cfs}$$

$$Q_o = 26.34 \text{ cfs}; V_o = 3.73 \text{ fps}; V_o^2/2g = .2160$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = .2160 - (.8557 \times .1580) = 0.08'$$

$$\text{Turn Loss (45°)} = H_L = K(V_L^2/2g) = .465 \times .1580 = 0.07'$$

$$\text{Total Structure Loss} = 0.08' + 0.07' = 0.15'$$

Structure 96 - Curb Inlet - Q_o only

$$Q_o = 7.42 \text{ cfs}; D_o = 18"; V_o = 4.20 \text{ fps}; V_o^2/2g = .2739$$

$$\text{To generate initial velocity, } H_v = V_o^2/2g = 0.27'$$

$$\text{Entrance Loss into 18" pipe} = H_e = 0.5 V_o^2/2g = 0.14'$$

$$\text{Total Structure Loss} = 0.27' + 0.14' = 0.41'$$

Structure 97 - Curb Inlet + Upstream Flow

$$Q_u = 7.42 \text{ cfs}; V_u = 4.20 \text{ fps}; V_u^2/2g = .2739$$

$$Q_g = 10.5 \text{ cfs}$$

$$Q_o = 17.92 \text{ cfs}; V_o = 5.70 \text{ fps}; V_o^2/2g = .5045$$

$$H_u - H_o = V_o^2/2g - Q_u/Q_o (V_u^2/2g)$$

$$H_u - H_o = .5045 - (0.4141 \times .2739)$$

$$H_u - H_o = .5045 - 0.1134 = 0.39'$$

