

MEMO

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This memorandum is a report of an investigation of major storm overflows from the intersection of Bekemeyer and Pine Grove in Golden Hills Fifth Addition in the City of Wichita.

1. Purpose of Study

The Developer and the Contractor have both raised a question as to the necessity of the flume shown on the plans. Although not yet constructed, conditions in the field are such that it will not function as an overflow device until the crest just south of the intersection of Cindy and Pine Grove is overtopped. As such, a relief flow route already exists to the south, and the flume would be redundant. Before recommending its deletion, it was felt that a review of the drainage scheme for the entire basin was in order.

II. History

Drainage in the vicinity of 119th St. West and Central has been studied in several separate reports by Professional Engineering Consultants from 1985 to present. The natural terrain is very flat, and prior to development the only drainage channels were the roadside ditches of Central and 119th St. West. In the undeveloped condition, substantial ponding would occur before runoff could concentrate in the ditch system.

As platting and development has occurred, several studies have been undertaken:

1. Drainage Plan and Supporting Calculations for Golden Hills Addition, June 7, 1985.

2. Design Computations and Drainage Plan for Bay Country, April 27, 1987 (2 volumes).

Memorandum
Page 2

3. Drainage Plan and Supporting Calculations for Golden Hills Fourth Addition, May 22, 1987. This plan originally had thirty acres draining southwest to the intersection of 119th and W. Central. This plan was revised July 24, 1987, to split the plat into both 4th and 5th Additions, and to direct as much drainage as possible away from the intersection.
 4. Design computations, Golden Hills Fifth Addition Phase I Streets and Storm Water Sewer, PEC Project No. 32-87555-1 & 2-1310, February 1988.
 5. Drainage Documentation Submittal for 119th Street West: Maple to Central and Central: 119th Street West to M154, April 1988.
- A review of the various reports determined that the 19 acres draining to the sump at the intersection of Bekemeyer and Pine Grove was not considered in the design of the 119th/Central intersection improvement. The assumption was made that for major storms, this area would drain through the flume to 119th Street West and thence north in street right-of-way to Cowkin Creek approximately one-half mile north. The Bay Country Addition Drainage Plan made similar assumptions. All other reports indicate that once this flow entered 119th St. West, it would flow south to the intersection of 119th and Central. From the quite limited survey information currently available, it appears that direction of major flow to the south is much more likely to occur at such time 119th Street West is improved to arterial standards.

III. Investigation

As stated previously, the 119th/Central improvement did not consider the 19 acre area concentrating at Bekemeyer and Pine Grove. An investigation was made to determine: a) the feasibility of directing major storm flows south and west via Pine Grove and Pine Street rights-of-way to 119th Street; b) once routed to 119th, the feasibility of routing this flow from 119th and Pine, via 119th Street West and Central Avenue street rights-of-way, to the inlet at Pond No. 6 in Bay Country.

To this end, 100-year major storm flows were determined for the affected areas with the following assumptions:

- 1) The times of concentration of major and minor storms are the same. This assumption introduces some conservatism into the analysis since gutter flow velocities are in the range of 1 to 2 feet per second while pipe flow velocities range up to 5 feet per second or more.
- 2) Under major storm conditions, flows carried in the pipe will not exceed the minor storm design capacity. This assumption also introduces conservatism since under the higher head conditions due to the ponding normally associated with major storms, additional flows can be carried in storm sewers.

- 3) Runoff coefficients in the Rational Formula are constant under major and minor storm conditions.

For each basin, the major storm was computed from the previously calculated minor storms using the ratio of rainfall intensities for time of concentration.

Once flow rates were determined, the flows were routed through the street system. Due to the flat terrain, the drainage pattern in the area is a series of several sumps or ponding areas interconnected by storm water sewers. For the Pine Grove/Bekemeyer basin, the storm water sewer actually flows north. However, in major storm conditions, water will flow by topping crests and spilling into adjacent basins. Crests are designed to decrease in elevation proceeding from the headwaters toward the outlet.

Capacity of the street right-of-way was computed by the Modified Manning's formula for triangular channels: $Q = (0.56 Z d^{8/3} S^{1/2}) / n$. As each crest is overtopped, weir flow occurs initially. Eventually, sufficient head must be built up to convey the water down the street. Thus, the depth required to convey a given flow based on the street grade and typical section was determined at the point just downstream of the overtopped crest.

The residential streets are 35' back to back constructed with 3/8 in./ft. cross-slope and standard 6 5/8-inch curbs. It is assumed that 119th north of Central and Central west of 119th Street will be constructed as 49' back to back arterial streets with 3/8 in./ft. cross-slope and KDOT Std. Type 1 (6-inch) curb.

Once routed to Pond No. 6, an estimate of the impact on this lake was made. The outlet structure at this location is a 75 ft. long trapezoidal broad-crested weir. Ignoring any detention effect, an increase in discharge of 40 cfs will cause a rise in the maximum stage of 0.1 foot or less on Pond No. 6. In our opinion, this is a negligible rise. As the lakes downstream have increasing volumes, the increase in maximum stages will be even less. Thus no further analysis was made.

IV. Findings and Recommendations:

On the basis of this hydrological analysis, it was determined that the nineteen acres contributing to the Bekemeyer/Pine Grove intersection add an additional 40 cfs during the 100-year event which was not previously considered in the analysis and design of Bay Country or 119th and Central.

Memorandum
Page 4

It is feasible to eliminate the flume at Bekemeyer and Pine Grove and to route major storm flows via Pine Grove south, Pine west, 119th St. West south, and Central west to Pond #6 in Bay Country. To do so walk grades should desirably be as follows:

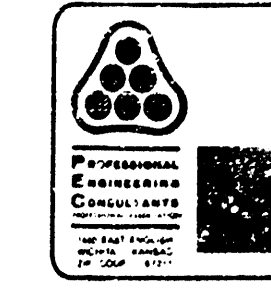
Pine Grove from Pine to Cindy: 0.55 ft. above top of curb
Cindy from 119th St. W. to a point 300 ft. east: 0.7 ft. above top of curb

119th St. W. from Central to a point 900 ft. north: 1.0 ft. above top of curb

Central from Bay Country pond to 119th St. W.: 1.0 ft. above top of curb

In summary, we recommend elimination of the flume at Bekemeyer and Pine Grove. We also recommend provision for walk grades of 1.0 ft. above top of curb along 119th St. West and Central Avenue as noted above.

MWB:cas



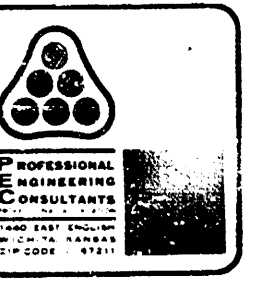
TO: Sedgwick County Bureau of Public Services
1250 South Seneca
Wichita, Kansas 67213-4198
ATTN: Mr. Jim Weber, Engineer
PROJECT: Gold Park West
DATE: 8/6/86
FROM: Charles S. Brown, P.E.
REFERENCE: Revised Drainage Plan

PLEASE ADVISE IMMEDIATELY OF ANY MISCONCEPTIONS OR OMISSIONS YOU BELIEVE TO BE CONTAINED HEREIN

Transmitted herewith are two copies of the revised Drainage Plan for Gold Park West Addition.

This plan has been revised by adding a temporary drainage easement for the south 400' of the subject property. This will allow surface drainage from the west to continue to flow across this property. When the property to the west develops, their internal drainage would be diverted to the existing storm sewer in 19th Street via storm sewer hook-up. Mr. Carson has granted storm sewer easement on Lot 14, Block 1, Westlink Village 16th to accommodate this future storm sewer hook-up.

CSB/ukm



Date: 2-10-88 Page 1 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

I. HYDROLOGY

Use Rational Method $Q = C \cdot I \cdot A$ Determine Q_{100}

Node	Hyd. Soil Cap.	Land Use	C_p	C_{100}
120	C	Res. 1/4 in.	0.55	0.73
119	C	"	0.55	0.73
118	C	"	0.55	0.73
117	C	"	0.55	0.73
116	C	"	0.55	0.73
115	C	"	0.55	0.73
114	C	"	0.55	0.73
113	C	"	0.55	0.73
112	C	"	0.55	0.73
111	C	"	0.55	0.73
110	C	"	0.55	0.73
109	C	"	0.55	0.73
108	C	"	0.55	0.73
107	C	"	0.55	0.73
106	C	"	0.55	0.73
105	C	"	0.55	0.73

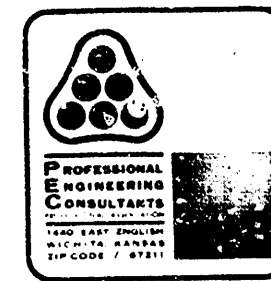
104 M.H.
103 Headwall



Date: 2-10-88 Page 2 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Determine I_{100}

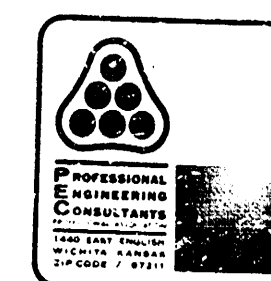
Node	I_{100}	I_{100}	I_{100}
120	15	3.83	7.37
119	15	3.83	7.37
118	15	3.83	7.37
117	15	3.83	7.37
116	15	3.83	7.37
115	15	3.83	7.37
114	15	3.83	7.37
113	15	3.83	7.37
112	15	3.83	7.37
111	15	3.83	7.37
110	15	3.83	7.37
109	15	3.83	7.37
108	15	3.83	7.37
107	15	3.83	7.37
106	15	3.83	7.37
105	15	3.83	7.37
104	M.H.		
103	M.H.		
102	M.H.		
101	M.H.		
100	Headwall		



Date: 2-10-88 Page 3 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Determine Q_{100}

Node	Planimeter Units	Area SF	Area Ac.
120	1556	255,360	5.86
119	156	24,800	0.57
118	242	150,720	3.44
117	264	154,240	3.54
116	560	89,600	2.06
115	540	86,400	1.98
114	130	24,000	0.55
113	858	137,280	3.15
112	734	120,640	2.77
111	234	37,440	0.86
110	1220	189,200	4.40
109	624	104,640	2.40
108	421	67,360	1.55
107	517	82,720	1.90
106	414	66,240	1.52
105	320	52,400	1.20
104	M.H.		
103	M.H.		
102	M.H.		
101	M.H.		
100	Headwall		



Date: 2-10-88 Page 4 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Determine Q_{100}

Node	C_p	I_{100}	A	Q_{100}
120	0.55	3.83	5.86	12.3
119	0.55	3.83	0.57	1.2
118	0.55	3.83	3.46	7.3
117	0.55	3.83	3.54	7.5
116	0.55	3.83	2.06	4.3
115	0.55	3.83	1.98	4.2
114	0.55	3.83	0.55	1.2
113	0.55	3.83	3.15	6.6
112	0.55	3.83	2.77	5.8
111	0.55	3.83	0.86	1.8
110	0.55	3.83	4.40	9.0
109	0.55	3.83	2.40	5.1
108	0.55	3.83	1.55	3.3
107	0.55	3.83	1.90	4.0
106	0.55	3.83	1.52	3.2
105	0.55	3.83	1.20	3.0
104	M.H.			
103	M.H.			
102	M.H.			
101	M.H.			
100	Headwall			



Date: 2-10-88 Page 5 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Determine Q_{100}

Node	C_p	I_{100}	A	Q_{100}
120	0.73	7.37	5.86	31.5
119	0.73	7.37	0.57	3.1
118	0.73	7.37	3.46	18.6
117	0.73	7.37	3.54	19.0
116	0.73	7.37	2.06	11.1
115	0.73	7.37	1.98	10.7
114	0.73	7.37	0.55	3.0
113	0.73	7.37	3.15	16.9
112	0.73	7.37	2.77	14.9
111	0.73	7.37	0.86	4.6
110	0.73	7.37	4.40	24.1
109	0.73	7.37	2.40	12.3
108	0.73	7.37	1.55	8.3
107	0.73	7.37	1.90	10.2
106	0.73	7.37	1.52	8.2
105	0.73	7.37	1.20	7.7
104	M.H.			
103	M.H.			
102	M.H.			
101	M.H.			
100	Headwall			



Date: 2-10-88 Page 6 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

II. INLET SIZING

Node	Q_{100}	Inlet Condition	G_{max} 5' Inlet	G_{max} 10' Inlet	Use Inlet
120	12.3	Sump	11 cfs	22 cfs	10'
119	1.2	Sump	"	"	5'
118	7.3	Sump	"	"	5'
117	7.5	Sump	"	"	5'
116	4.3	Sump	"	"	5'
115	4.2	Sump	"	"	5'
114	1.2	Sump	"	"	5'
113	6.6	Sump	"	"	5'
112	5.8	Sump	"	"	5'
111	1.8	Sump	"	"	5'
110	9.0	Sump	"	"	5'
109	5.1	Sump	"	"	5'
108	3.3	Sump	"	"	5'
107	4.0	Sump	"	"	5'
106	3.2	Sump	"	"	5'
105	3.0	Sump	"	"	5'
104	M.H.				
103	M.H.				
102	M.H.				
101	M.H.				
100	Headwall				



Date: 2-10-88 Page 7 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

III. STREET FLOW - 2 YR

Node	Q_{100}	Distribution	Street slope	d	d _{max}	Comment
120	12.3	95% (E) 5% (S)	11.7 0.6	0.32 0.18	0.55 0.55	OK OK
119	1.2	50% (N) 50% (S)	0.6 0.6	0.32 0.18	0.55 0.55	OK OK
118	7.3	95% (E) 5% (N)	6.9 0.4	0.32 0.15	0.55 0.55	OK OK
117	7.5	95% (E) 5% (S)	7.1 0.4	0.32 0.15	0.55 0.55	OK OK
116	4.3	80% (N) 20% (S)	3.4 0.9	0.32 0.20	0.55 0.55	OK OK
115	4.2	80% (N) 20% (S)	3.4 0.9	0.32 0.19	0.55 0.55	OK OK
114	1.2	50% (N) 50% (S)	0.6 0.6	0.32 0.18	0.55 0.55	OK OK
113	6.6	95% (E) 5% (N)	6.3 0.3	0.32 0.13	0.55 0.55	OK OK
112	5.8	95% (E) 5% (S)	5.5 0.3	0.32 0.13	0.55 0.55	OK OK
111	1.8	45% (N) 55% (S)	1.2 0.6	0.32 0.18	0.55 0.55	OK OK
110	9.0	50% (N) 50% (E)	4.5 4.5	0.32 0.32	0.55 0.55	OK OK
109	5.1	50% (N) 50% (S)	2.5 2.5	0.32 0.25	0.55 0.55	OK OK
108	3.3	50% (N) 50% (S)	2.5 2.5	0.32 0.25	0.55 0.55	OK OK
107	4.0	50% (N) 50% (S)	2.5 2.5	0.32 0.25	0.55 0.55	OK OK
106	3.2	50% (N) 50% (S)	2.5 2.5	0.32 0.25	0.55 0.55	OK OK
105	3.0	50% (N) 50% (S)	2.5 2.5	0.32 0.25	0.55 0.55	OK OK
104	M.H.					
103	M.H.					
102	M.H.					
101	M.H.					
100	Headwall					



Date: 2-10-88 Page 7A of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Node	Q_{100}	Distribution	Street slope	d	d _{max}	Comment
107	4.0	100% (S)	4.0	0.32	0.55	OK
106	3.2	50% (N) 50% (S)	1.6 1.6	0.32 0.32	0.55 0.55	OK OK
105	3.0	30% (N) 70% (W)	2.7 0.3	0.32 0.13	0.55 0.55	OK OK
104						
103		Man holes				
102						
101						
100		Headwall				



Date: 2-10-88 Page 8 of 13
Project: Golden Hills 5th Addition
Item: Revised Drainage Calc's

Location	Contributing Areas	Q_{100}	Q_{100}
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