DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

FOR
OAK CLIFF 3RD ADDITION
TO
WICHITA, KANSAS

OWNER-DEVELOPER:
INLAND INVESTMENT CO., INC.

PREPARED BY
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
ENGINEERS
WICHITA, KANSAS

AUGUST, 1984

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

FOR

OAK CLIFF 3RD ADDITION

TO

WICHITA, KANSAS

OWNER DEVELOPER:

INLAND INVESTMENT CO., INC.

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

ENGINEERS

WICHITA, KANSAS

AUGUST, 1984

STORM SEWERS

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

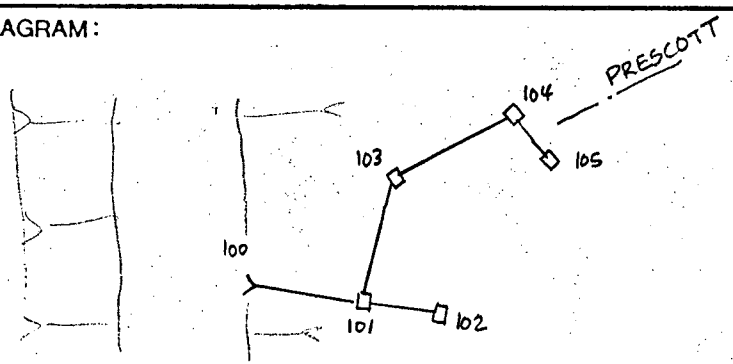
HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd Addition PROJECT NO. 36-83348

ITEM: Storm Sewer System 100 DATE: Aug 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:



TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I In./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft./sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
105	0.5	2.5	-	-	15	4.06	5.1	15	4.06	5.1	5.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
												15	0.6	4.2	35	0.1	15.1
104	0.5	0.5	-	-	15	4.06	1.0	15.1	4.05	1.0	6.1						
												15	0.9	5.0	160	0.5	15.6
103	0.5	0.5	-	-	15	4.06	1.0	15.6	4.00	1.0	7.1						
												18	0.4	3.9	240	1.0	16.6
102																	
102	0.5	2.4	-	-	15	4.06	4.9	15	4.06	4.9	4.9						
												15	0.6	4.2	35	0.1	15.1
101																	
101	0.5	2.3	-	-	15	4.06	4.7	15.6	4.00	4.6	16.5	21					
												24	0.5	5.0	150	0.5	16.1
100																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262 2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 200 DATE: Aug 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY: ____

SCHEMATIC DIAGRAM:

SYSTEM 200 ELIMINATED

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262 2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd Add'n PROJECT NO. 36-83348

ITEM: Storm Sewer System 300 DATE: Aug 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

SYSTEM 300 ELIMINATED

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

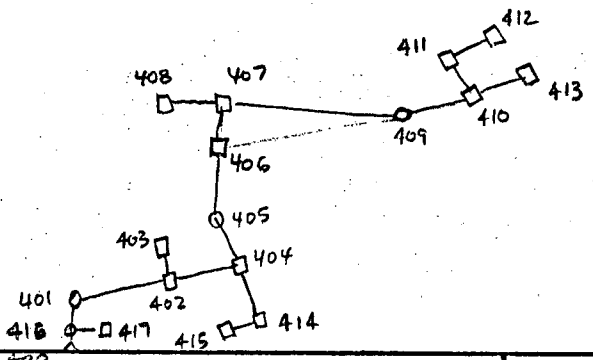
HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 400 DATE: Aug 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:



DWS > TC at 410-413

TRIBUTARY AREA

SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)
412	0.5	3.6	-	-	15	4.06	7.3
411	0.5	2.7	-	-	15	4.06	5.5
410							
413	0.5	2.8	-	-	15	4.06	5.7
410							
410	0.5	1.5	-	-	15	4.06	3.0
409	MH				-	-	
407							

HYDROLOGY SUMMATION

T_c (minutes) (9)	I In./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)
15	4.06	7.3	7.3
15.1	4.05	5.5	12.8
4.06	15	5.7	5.7
15.2	4.04	3.0	21.5

CONDUIT DATA

PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
15	1.2	5.8	40	0.1	15.1
18	1.4	7.0	35	0.1	15.2
15	0.8	5.4	40	0.1	15.1
27	0.5	5.2	90	0.3	15.5
27	0.5	5.2	300	1.0	16.5

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 400 (cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
408	0.5	2.5	-	-	15	4.06	5.1	15	4.06	5.1	5.1						
												15	0.6	4.2	70	0.3	15.3
407																	
407	0.5	2.8	-	-	15	4.06	5.7	16.5	3.91	5.5	31.9						
												30	0.55	6.2	80	0.2	16.7
406	0.5	0.7	-	-	15	4.06	1.4	16.7	3.89	1.4	33.3						
												30	0.65	7.0	320	0.8	17.5
405	MH																
												30	0.65	7.0	70'	0.2	17.7
404																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 400 (Cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I In./hr. (10)	Q (cfs) (11)	ΣQ (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
414	0.5	0.8	-	-	15.0	4.06	1.6	15	4.06	1.6	1.6						
												15	0.1	2	35	0.3	15.3
415	0.5	2.8	-	-	15	4.06	5.7	15.3	4.03	5.6	7.2						
												18	0.5	4.0	220	0.9	16.2
404																	
404	0.5	2.6	-	-	15	4.06	5.3	17.7	3.80	4.9	45.0						
												36	0.5	6.4	60	0.2	17.9
402																	
403	0.5	1.7	-	-	15	4.06	3.5	15	4.06	3.5	3.5						
												15	0.3	2.8	35	0.2	15.2
402																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 400 DATE: 8-15-84

RETURN PERIOD: _____ COMPUTATIONS BY: _____ REVISIONS BY: _____

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft./sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
402	0.5	0.9	-	-	15	4.06	1.8	17.9	3.79	1.7	49.9						
												42	0.25	5.2	180	0.6	18.5
401	MH																
												42	0.25	5.2	30	0.1	18.6
416																	
417	0.5	1.7	-	-	15	8.98	7.6	15	8.98	7.6	7.6						
												18	0.5	4.2	130	0.5	15.5
416																	
416	MH							18.6			56.9	42	0.34	6.0	120	0.3	18.9
400																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262 2691

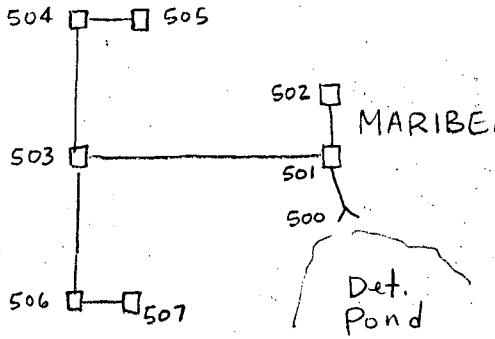
HYDROLOGY DATA SHEET

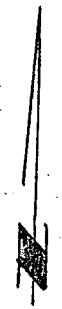
PROJECT: Oak Cliff PROJECT NO. 36-83348

ITEM: Storm Sewer System 500 DATE: Aug. 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:





O, K

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
507	0.5	0.9	-	-	15	4.06	1.8	15	4.06	1.8	1.8						
												15	.1	2.0	40	0.3	15.3
506	0.5	4.8	-	-	15	4.06	9.7	15.3	4.03	9.7	11.5						
												21	0.5	4.8	200	0.7	16.0
503																	
505	0.5	0.9	-	-	15	4.06	1.8	15	4.06	1.8	1.8						
												15	.1	2.0	40	0.3	15.3
504	0.5	4.0	-	-	15	4.06	8.1	15.3	4.03	8.1	9.9						
												18	0.85	5.6	220	0.7	16.0
503																	
503	0.5	1.0			15	4.06	2.0	16.0	3.96	2.0	23.2						
												27	0.55	5.8	290	0.8	16.8
501																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System No. 500 DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
502	0.5	0.6	-	-	15	4.06	1.2	15	4.06	1.2	1.2						
												15	.1	2	35	0.1	15.1
501																	
501	0.5	1.0	-	-	15	4.06	2.0	16.8	3.88	1.9	26.4						
												30"	0.42	5.5	80	0.2	17.0
500																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION

1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

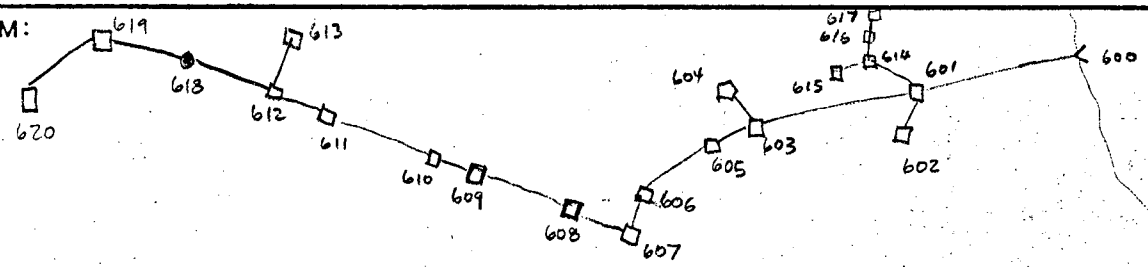
HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 600 DATE: Aug 15, 1984

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:



TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
620	0.5	2.2	-	-	15	4.06	4.5	15	4.06	4.5	4.5						
												15	0.5	3.7	100	0.5	15.5
619	0.5	3.9	-	-	15	4.06	7.9	15.5	4.01	7.8	12.3						
												21	0.55	5.0	180	0.6	16.1
618	MH																
												21	0.55	5.0	210	0.7	16.8
612																	
613	0.5	3.9	-	-	15	4.06	7.9	15	4.06	7.9	7.9						
												15	1.5	6.4	35	0.1	15.1
612																	
612	0.5	3.3	-	-	15	4.06	6.7	16.8	3.88	6.4	26.3						
												24	1.3	8.2	60	0.1	16.9
611	0.5	1.4	-	-	15	4.06	2.8	16.9	3.87	2.7	29.0						

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 600 (Cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
611																	
												27	0.85	7.2	210	0.5	17.4
610	0.5	1.7	-	-	15	4.06	3.5	17.4	3.85	3.3	32.3						
												30	0.6	6.3	60	0.2	17.6
609	0.5	2.2	-	-	15	4.06	4.5	17.6	3.81	4.2	36.5						
												30	0.8	7.4	230	0.5	18.1
608	0.5	1.8	-	-	15	4.06	3.7	18.1	3.77	3.4	39.9						
												36	0.38	5.7	60	0.2	18.3
607	0.5	1.7	-	-	15	4.06	3.5	18.3	3.76	3.3	43.2						
												36	0.44	6.3	35	0.1	18.4
606																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 600 (Cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft./sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
606	0.5	1.5	-	-	15	4.06	3.0	18.4	3.75	2.8	53.1						
												42	0.3	5.7	170	0.5	18.9
605	0.5	1.1	-	-	15	4.06	2.2	18.9	3.71	2.0	55.1						
												42	0.3	5.7	40	0.1	19.0
603																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262 2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 600 (Cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
604	0.5	0.6	-	-	15	4.06	1.2	15	4.06	1.2	1.2						
												15	.1	1.5	35	0.4	15.4
603																	
603	0.5	0.5	-	-	15	4.06	1.0	19.0	3.70	0.9	57.1						
												42	0.36	6.0	400	1.1	20.1
601																	
602	0.5	0.7	-	-	15	4.06	1.4	15	4.06	1.4	1.4						
												15	.1	1.5	30	0.3	15.3
601																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 600 (Cont'd) DATE: 8-15-84

RETURN PERIOD: 2 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in./hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
617	0.5	4.9	-	-	15	4.06	9.9	15	4.06	9.9	9.9						
												18	0.85	5.5	40	0.1	15.1
616	0.5	1.0	-	-	15	4.06	2.0	15.1	4.05	2.0	11.9						
												18	1.2	6.7	150	0.4	15.5
614																	
615	0.5	2.9	-	-	15	4.06	5.9	15	4.06	5.9	5.9						
												15	0.85	5.0	30	0.1	15.1
614																	
614	0.5	0.6			15	4.06	1.2	15.5	4.01	1.2	19.0						
601												24	0.8	6.3	100	0.3	15.8
601	0.5	1.2			15	4.06	2.4	20.1	3.62	2.2	77.6						
												48	0.3	6.0	200	0.5	20.6
600																	

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

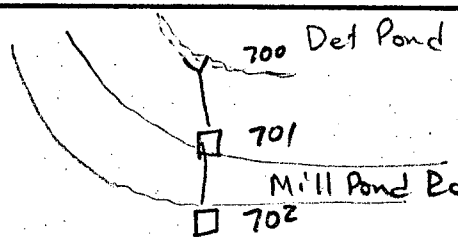
HYDROLOGY DATA SHEET

PROJECT: Oak Cliff 3rd PROJECT NO. 36-83348

ITEM: Storm Sewer System 700 DATE: 8-15-84

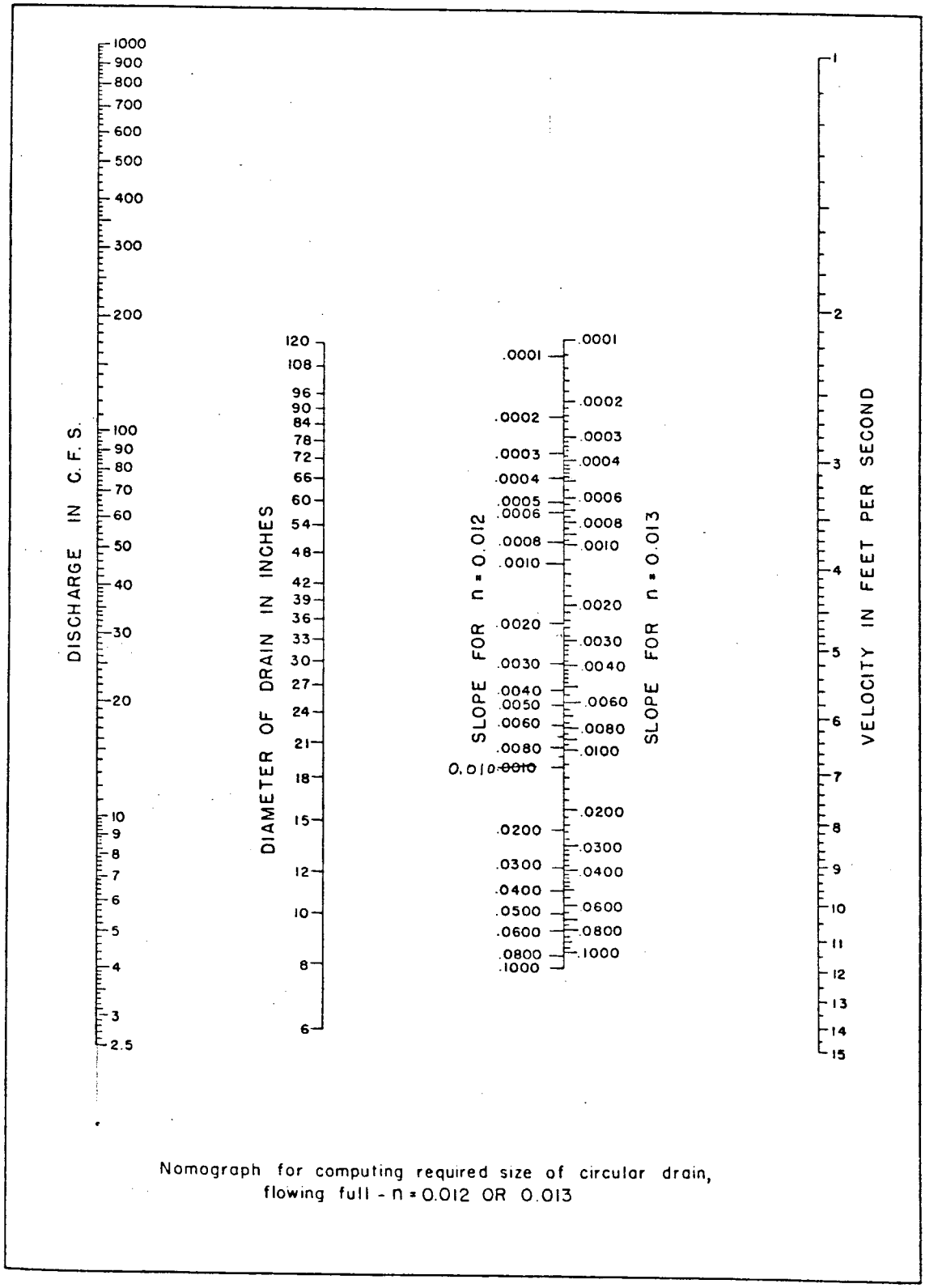
RETURN PERIOD: 100 COMPUTATIONS BY: CSB REVISIONS BY:

SCHEMATIC DIAGRAM:



0.4

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_o} (minutes) (6)	I_o in/hr. (7)	Q_o (cfs) (8)	T_c (minutes) (9)	I In./hr. (10)	Q (cfs) (11)	Σ Q (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
702	0.5	0.2	-	-	5	13.79	1.4	5	13.79	1.4	1.4						
												15	0.1	1.2	40	0.5	5.5
701	0.5	0.3	-	-	5	13.79	2.1	5	13.79	2.1	3.5						
												15	0.3	2.8	40	0.2	5.7
700																	



Nomograph for computing required size of circular drain, flowing full - n = 0.012 OR 0.013

FIGURE 9. Nomograph for computing required size of circular drain for n 0.012 or 0.013.

RAINFALL INTENSITY TABLE

for

SEDGWICK COUNTY KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40.

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.67	6.23	8.00	9.34	10.67	12.23	13.79
6	4.35	5.80	7.45	8.70	9.94	11.39	12.84
7	4.09	5.46	7.02	8.19	9.36	10.72	12.09
8	3.88	5.18	6.66	7.77	8.89	10.18	11.48
9	3.71	4.95	6.36	7.43	8.49	9.72	10.96
10	3.56	4.75	6.11	7.13	8.15	9.33	10.52
11	3.43	4.58	5.89	6.87	7.85	8.99	10.14
12	3.32	4.43	5.69	6.64	7.59	8.69	9.80
13	3.21	4.29	5.51	6.43	7.35	8.42	9.50
14	3.12	4.17	5.36	6.25	7.14	8.18	9.23
15	3.04	4.06	5.21	6.08	6.95	7.97	8.98
16	2.96	3.96	5.09	5.93	6.78	7.77	8.76
17	2.90	3.86	4.97	5.79	6.62	7.59	8.55
18	2.83	3.78	4.86	5.67	6.48	7.42	8.37
19	2.77	3.70	4.76	5.55	6.34	7.27	8.19
20	2.72	3.63	4.66	5.44	6.22	7.12	8.03
21	2.67	3.56	4.57	5.34	6.10	6.99	7.88
22	2.62	3.49	4.49	5.24	5.99	6.86	7.74
23	2.57	3.43	4.41	5.15	5.89	6.74	7.60
24	2.53	3.38	4.34	5.07	5.79	6.63	7.48
25	2.49	3.32	4.27	4.99	5.70	6.53	7.36
26	2.45	3.23	4.21	4.91	5.61	6.43	7.25
27	2.42	3.13	4.15	4.84	5.53	6.33	7.14
28	2.38	3.05	4.09	4.77	5.45	6.25	7.04
29	2.35	2.97	4.02	4.68	5.38	6.16	6.95
30	2.32	2.89	3.92	4.56	5.31	6.08	6.79
31	2.29	2.82	3.82	4.44	5.19	6.00	6.62
32	2.26	2.75	3.73	4.33	5.07	5.87	6.45
33	2.24	2.68	3.64	4.23	4.95	5.73	6.30
34	2.19	2.62	3.55	4.13	4.83	5.60	6.16
35	2.14	2.57	3.47	4.04	4.73	5.47	6.02
36	2.09	2.51	3.40	3.95	4.62	5.35	5.89
37	2.05	2.46	3.33	3.87	4.52	5.23	5.76
38	2.00	2.41	3.26	3.79	4.43	5.13	5.64
39	1.96	2.36	3.19	3.71	4.34	5.02	5.53
40	1.92	2.32	3.13	3.64	4.26	4.92	5.42
41	1.89	2.27	3.07	3.57	4.18	4.83	5.32
42	1.85	2.23	3.01	3.51	4.10	4.74	5.22
43	1.82	2.19	2.96	3.44	4.02	4.65	5.13
44	1.78	2.15	2.91	3.38	3.95	4.56	5.03
45	1.75	2.11	2.86	3.32	3.88	4.48	4.95

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.72	2.08	2.81	3.27	3.82	4.41	4.86
47	1.69	2.04	2.76	3.21	3.75	4.33	4.78
48	1.67	2.01	2.72	3.16	3.69	4.26	4.70
49	1.64	1.98	2.67	3.11	3.63	4.19	4.63
50	1.61	1.95	2.63	3.06	3.58	4.13	4.56
51	1.59	1.92	2.59	3.01	3.52	4.06	4.49
52	1.56	1.89	2.55	2.97	3.47	4.00	4.42
53	1.54	1.86	2.51	2.92	3.42	3.94	4.35
54	1.52	1.84	2.48	2.88	3.37	3.88	4.29
55	1.50	1.81	2.44	2.84	3.32	3.83	4.23
56	1.47	1.79	2.41	2.80	3.27	3.77	4.17
57	1.45	1.76	2.37	2.76	3.23	3.72	4.11
58	1.43	1.74	2.34	2.73	3.19	3.67	4.06
59	1.42	1.72	2.31	2.69	3.14	3.62	4.01
60	1.40	1.69	2.28	2.65	3.10	3.57	3.95
61	1.38	1.67	2.25	2.62	3.06	3.53	3.90
62	1.36	1.65	2.22	2.59	3.02	3.48	3.85
63	1.34	1.63	2.20	2.55	2.99	3.44	3.81
64	1.33	1.61	2.17	2.52	2.95	3.40	3.76
65	1.31	1.59	2.14	2.49	2.92	3.35	3.71
66	1.30	1.57	2.12	2.46	2.88	3.31	3.67
67	1.28	1.56	2.09	2.44	2.85	3.27	3.63
68	1.26	1.54	2.07	2.41	2.81	3.24	3.59
69	1.25	1.52	2.05	2.38	2.78	3.20	3.54
70	1.24	1.50	2.02	2.35	2.75	3.16	3.51
71	1.22	1.49	2.00	2.33	2.72	3.13	3.47
72	1.21	1.47	1.98	2.30	2.69	3.09	3.43
73	1.20	1.46	1.96	2.28	2.66	3.06	3.39
74	1.18	1.44	1.94	2.25	2.63	3.03	3.36
75	1.17	1.43	1.92	2.23	2.61	3.00	3.32
76	1.16	1.41	1.90	2.21	2.58	2.96	3.29
77	1.15	1.40	1.88	2.18	2.55	2.93	3.25
78	1.13	1.38	1.86	2.16	2.53	2.90	3.22
79	1.12	1.37	1.84	2.14	2.50	2.88	3.19
80	1.11	1.36	1.82	2.12	2.48	2.85	3.16
81	1.10	1.34	1.81	2.10	2.46	2.82	3.13
82	1.09	1.33	1.79	2.08	2.43	2.79	3.10
83	1.08	1.32	1.77	2.06	2.41	2.76	3.07
84	1.07	1.31	1.75	2.04	2.39	2.74	3.04
85	1.06	1.30	1.74	2.02	2.37	2.71	3.01
86	1.05	1.28	1.72	2.00	2.34	2.69	2.99
87	1.04	1.27	1.71	1.99	2.32	2.66	2.96
88	1.03	1.26	1.69	1.97	2.30	2.64	2.93
89	1.02	1.25	1.68	1.95	2.28	2.62	2.91
90	1.01	1.24	1.66	1.93	2.26	2.59	2.88

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30
121	0.80	0.99	1.32	1.54	1.80	2.05	2.29
122	0.80	0.98	1.31	1.53	1.78	2.04	2.27
123	0.79	0.97	1.30	1.52	1.77	2.03	2.26
124	0.79	0.97	1.30	1.51	1.76	2.01	2.24
125	0.78	0.96	1.29	1.50	1.75	2.00	2.23
126	0.78	0.96	1.28	1.49	1.74	1.99	2.22
127	0.77	0.95	1.27	1.48	1.73	1.98	2.20
128							
129							
130							
131							
132							
133							
134							
135							

INLET REQUIREMENTS

PROFESSIONAL ENGINEERING CONSULTANTS ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 1 of

Project Oak Cliff 3rd Addition

Item Inlet Sizing.

I. Determine Max. Q intercepted in sump condition.

Using Chart 1073.03, H = 10" h = 6"

H/h = 1.67 Q/L = 2.0

With City of Wichita Standard Type 1A Inlet,

L = 5

Q = 2 × L = 2 × 5 = 10 cfs.

II Inlets on Grade

50% of Q assumed to be intercepte

50% bypass to next downstream inlet

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 2 of

Project Oak Cliff 3rd Addition

Item Inlet Requirements

Node		Q_2	Inlet Condition	Req'd Inlet(s) Size
101		4.7 +0.5 (103) +0.5 (104) =5.7	Sump	1-COW Type 1A
102		4.9	Sump	1-COW Type 1A
103		1.0	On Grade	1-COW Type 1A
104		1.0	On Grade	1-COW Type 1A
105		5.1	Sump	1-COW Type 1A
401	MH		—	
402		1.8	Sump	1-COW Type 1A
403		3.5	Sump	1-COW Type 1A
404		5.3 +0.7 (406) = 5.7	Sump	1-COW Type 1A
405	MH		—	
406		1.4	On Grade	1-COW Type 1A
407		5.7	Sump	1-COW Type 1A
408		5.1	Sump	1-COW Type 1A
409	MH		—	
410		3.0	Sump	1-COW Type 1A
411		5.5	Sump	1-COW Type 1A
412		7.3	Sump	1-COW Type 1A
413		5.7	Sump	1-COW Type 1A
414		1.6	Sump	1-COW Type 1A
415		5.7	Sump	1-COW Type 1A

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 16 1984 Page 3 of

Project Oak Cliff 3rd Addition

Item Inlet Requirements

Node		Q_2	Inlet Condition	Req'd Inlet(s) Size
416	MH	/	-	
417	(Q_{100})	7.6	Sump	1 - COW Type 1A
501		2.0 + 0.9 (507) = 2.9	Sump	1 - COW Type 1A
502		1.2	Sump	1 - COW Type 1A
503		2.0 + (4.8) (506) = 6.8	Sump	1 - COW Type 1A
504		8.1	Sump	1 - COW Type 1A
505		1.8	Sump	1 - COW Type 1A
506		9.7	On Grade	1 - COW Type 1A
507		1.8	On Grade	1 - COW Type 1A
601		2.4	Sump.	1 - COW Type 1A
602		1.4 + 1.1 + 0.6 + 0.5 = 3.6 (614) (604)(603)	Sump	1 COW Type 1A
603		1.0	On Grade	1 COW Type 1A
604		1.2	On Grade	1 COW Type 1A
605		2.2	Sump	1 - COW Type 1A
606		3.0 + 4.0 (613) = 7.0	Sump	1 - COW Type 1A
607		3.5	Sump	1 - COW Type 1A
608		3.7 + 2.3 (609) = 6.0	Sump	1 - COW Type 1A
609		4.5	On Grade	1 - COW Type 1A
610		3.5 + 1.4 (611) = 4.9	Sump	1 - COW Type 1A
611		2.8	On Grade	1 - COW Type 1A

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 16, 1984 Page 4 of

Project Oak Cliff 3rd Addition

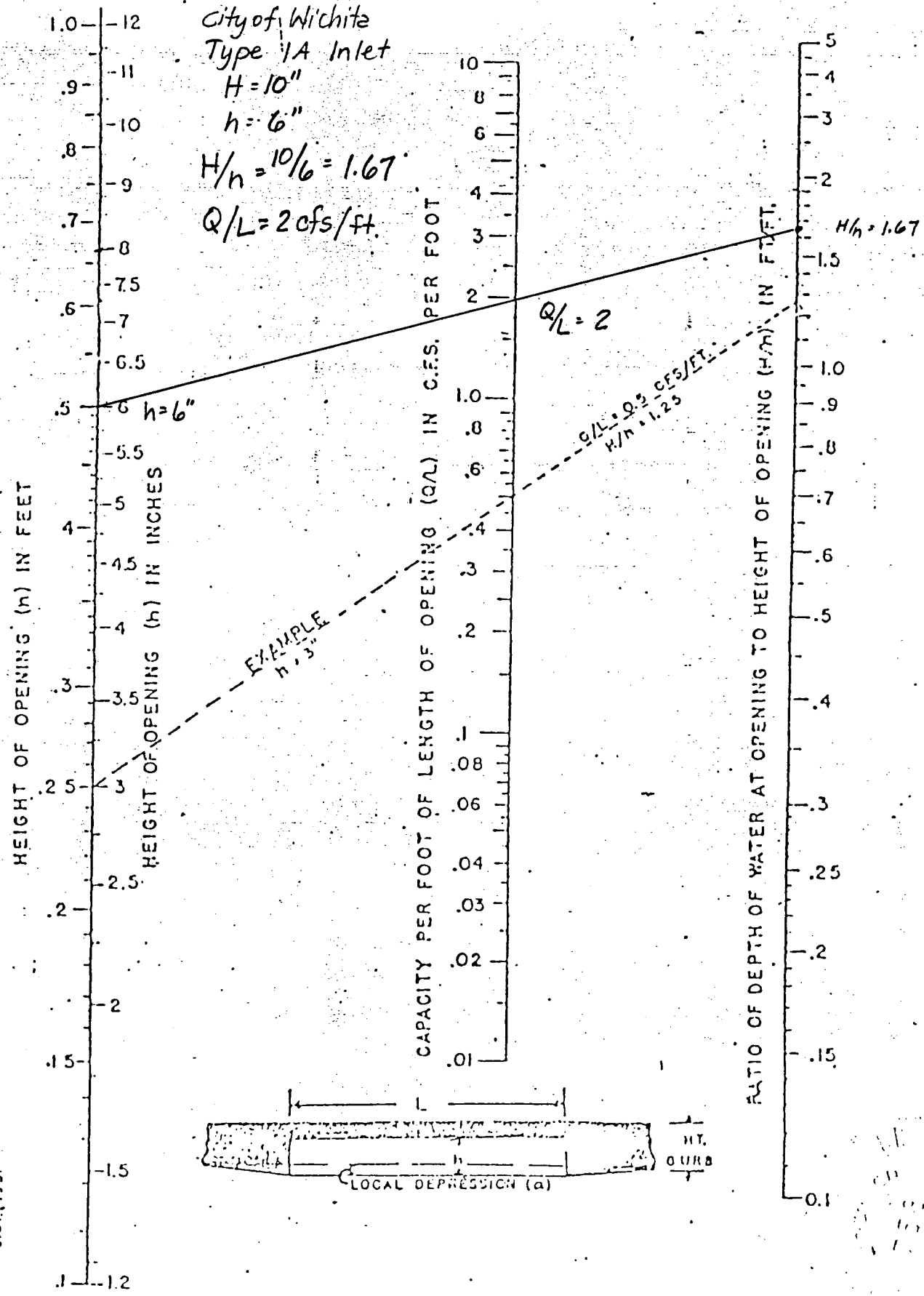
Item Inlet Requirements

Node		Q_2	Inlet Condition	Required Inlet(s)
612		6.7	Sump	1-COW Type 1A
613		7.9	On Grade	1-COW Type 1A
614		1.2 + 1.0 (616) = 2.2	On Grade	1-COW Type 1A
615		5.9	Sump	1-2'x4' Grate
616		2.0	On Grade	1-COW Type 1A
617		9.9	Sump	1-COW-Type 1A
618	MH		—	
619		7.9	Sump	1 COW Type 1A
620		4.5	Sump	1 COW Type 1A

SUMP CONDITION ONLY

1073.03

City of Wichita
Type 1A Inlet
H = 10"
h = 6"
H/h = 10/6 = 1.67
Q/L = 2 cfs/ft.



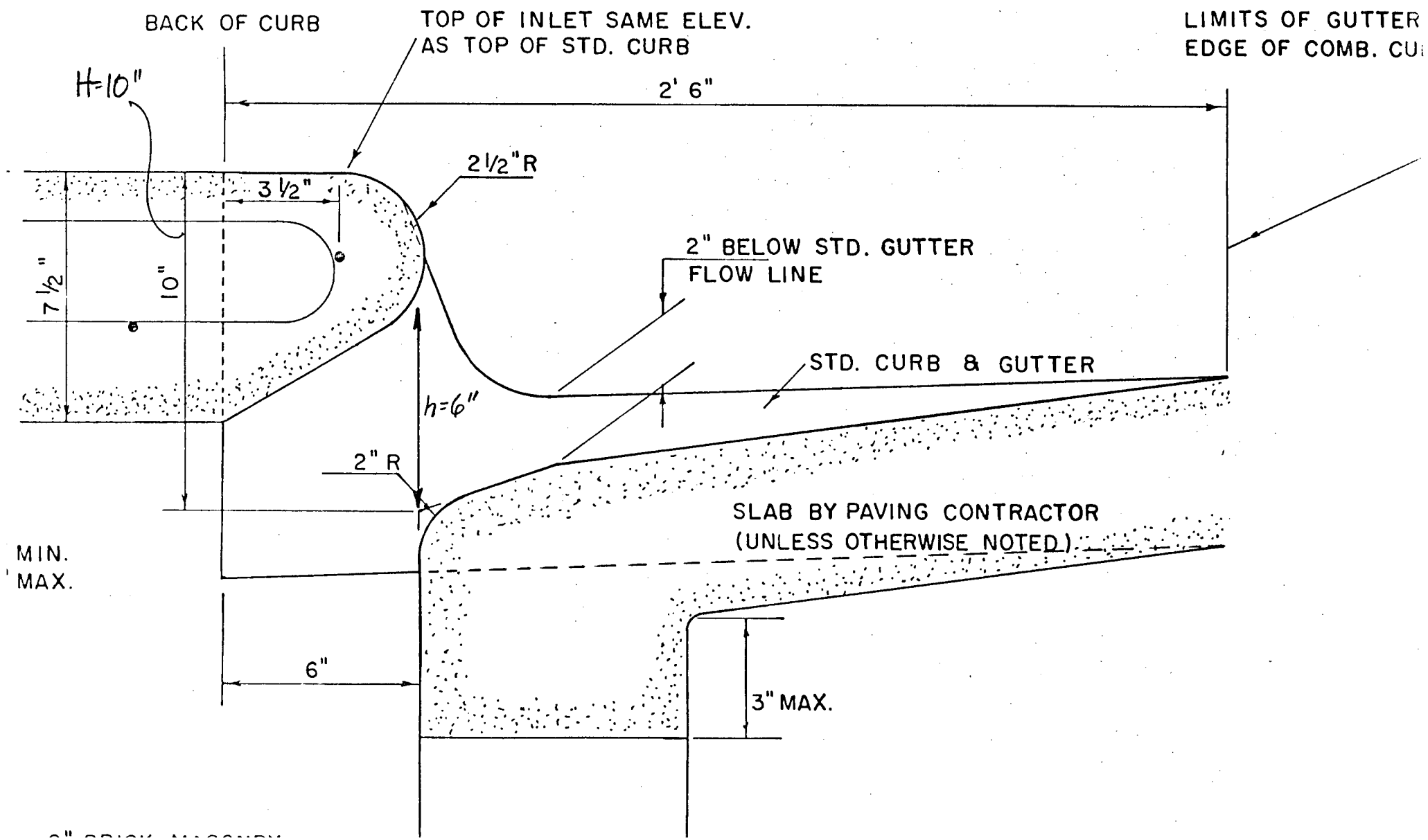
JAN., 1951

BUREAU OF PUBLIC ROADS
DIVISION TWO WASH., D. C.

NOMOGRAPH FOR CAPACITY OF CURB OPENING INLETS AT LOW POINTS

0.90 ±

SECTION B-B



STREET FLOW

PROFESSIONAL ENGINEERING CONSULTANTS
ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 19, 1984 Page 1 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 2 Year Storm

Check Flow in streets as it approaches inlets

Use Std. Curb

Use Flow in Triangular Channels (Graph Attached)

NODE		STREET SLOPE %	Q ALLOW (Top Curb)	Q_2 actual	Comment
101		0.5	16	5.7	OK
102		0.5	16	4.9	OK
103		0.85	21	1.0	OK
104		0.32	12	1.0	OK
105		0.32	12	5.1	OK
401	MH				
402		0.32	12	1.8	OK
403		0.44	14	3.5	OK
404		0.32	12	5.7	OK
405	MH				
406		0.5	18	1.4	OK
407		0.4	14	5.7	OK
408		0.4	14	5.1	OK
409	MH				
410		0.5	16	3.0	OK
411		0.4	14	5.5	OK
412		0.32	12	7.3	OK
413		0.32	12	5.7	OK

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 19 1984 Page 2 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 2 year storm

NODE		STREET SLOPE %	Q ALLOW (Top curb)	Q_2 actual	Commcut
414		0.32	12	1.6	OK
415		0.32	12	5.7	OK
416	MH				
417		0.5	16	7.6 (Q_{100})	OK
501		2.0	31	2.9	OK
502		2.0	31	1.2	OK
503		0.32	12	6.8	OK
504		1.0	22	8.1	OK
505		1.0	22	1.8	OK
506		0.5	16	9.7	OK
507		0.5	16	1.8	OK
601		1.0	22	2.4	OK
602		0.4	14	3.6	OK
603		0.85	21	1.0	OK
604		0.85	21	1.2	OK
605		0.85	21	2.2	OK
606		0.62	18	7.0	OK
607		0.32	12	3.5	OK
608		0.62	18	6.0	OK
609		0.32	12	4.5	OK

PROFESSIONAL ENGINEERING CONSULTANTS ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 19, 1984 Page 3 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 2 year storm

NODE		STREET SCOPE %	Q allow (Top Curb)	Q_2 actual	Comment
610		0.32	12	4.9	OK
611		0.32	12	2.8	OK
612		0.32	12	6.7	OK
613		0.75	19	7.9	OK
614		1.0	22	2.2	OK
615		Area Drain	-	5.9	Inlet Not Located on Street
616		0.62	18	2.0	OK
617		0.62	18	9.9	OK
618	MH				
619		0.32	12	7.9	OK
620		0.54	16	4.5	OK

NOTE: Q_2's listed include any bypass Q as determined in Section titled "Inlet Requirements".

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 20, 1984 Page 4 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 100 yr.

Check Street Flow during 100-yr. storm

Assume 2 yr storm in pipe

Street Flow = $Q_{100} - Q_2$

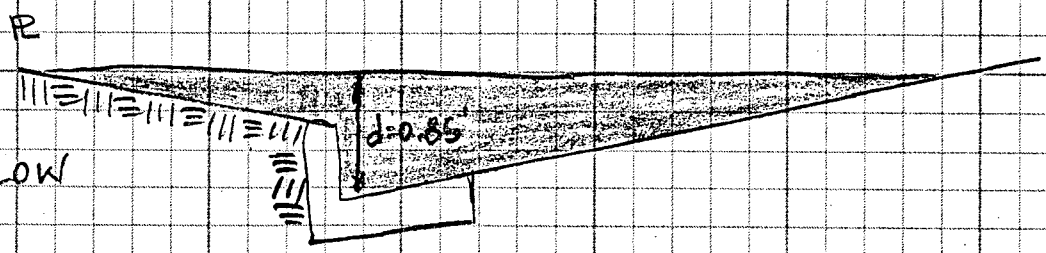
System 100

D.A = 8.2 Ac.
t_c = 16 min
I_{100} = 8.76
c = 0.5

$Q_{100} = 0.5 \times 8.76 \times 8.2$
= 36 cfs

Q_2 (from storm sewer calcs) = 16.5

$Q_{100} - Q_2 = 36 - 16.5 = 19.5$ cfs



APPROX. FLOW

Using $\frac{z}{n}$ = 2000 :

Street slope	Q allow.
0.32	40
0.5	50
0.75	60
1.00	70
2.00	100

PROFESSIONAL ENGINEERING CONSULTANTS
ASSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 20, 1984 Page 5 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 100 yr. storm.

System 100 OK

System 400

Check street flow on Prescott St.

Flow towards Node 405, southward

D.A. = Nodes 405 through 413
= 0.7 + 2.8 + 2.5 + 1.5 + 2.7 + 3.6 + 2.8
= 16.6

t_c = 18 min ±

I_{100} = 8.37

C = 0.5

Q_{100} = 0.5 × 8.37 × 16.6 = 69.5

Q_2 at this point
= 1.4 + 5.7 + 5.1 + 3.0 + 5.5 + 7.3 + 5.7
= 33.7

$Q_{100} - Q_2$ = 69.5 - 33.7 = 35.8 cfs

Q_{allow} on S = 0.44% = 50 cfs

Street Flow OK

Since this is the most critical location in this System Area, all of System 400 assumed OK

PROFESSIONAL ENGINEERING CONSULTANTS ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 20, 1984 Page 6 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 100 yr.

System 500

D. A. = 0.9 + 4.8 + 0.9 + 4.0 + 1.0 + 0.6 + 1.0
= 13.2 Ac.

t_c = 17 m
I_{100} = 8.55
C = 0.5

Q_{100} = 0.5 × 8.55 × 13.2 = 56.4 cfs

Q_2 (from storm sewer calcs) = 26.4

$Q_{100} - Q_2$ = 56.4 - 26.4 = 30 cfs

System 500 OK

System 600

(A) Check Flow in Reserve "I", between Lots 12 & 13, Block 11

D. A. = Nodes 606 through 613
+ 618 through 620

= 23.6 Ac.

t_c = 18 min
I_{100} = 8.37
C = 0.5

Q_{100} = 0.5 × 8.37 × 23.6 = 98.8 cfs

Q_2 (from storm sewer calcs) = 53.1

$Q_{100} - Q_2$ = 98.8 - 53.1 = 45.7 cfs

w/ Street slope = 0.5

Q_{allow} = 50 cfs

Point (A) OK

PROFESSIONAL GINEERING NSULTANTS
CSSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 20, 1984 Page 7 of 7

Project Oak Cliff 3rd Addition

Item Street Flow - 100 yr.

System 600 (cont'd) (B) Check Flow in Mill Pond
Flow towards NE & Node 602

D.A. = Nodes 602 through Node 613
" 618 " Node 620
= 23.6 Ac. + 1.1 + 0.6 + 0.5 + 0.7
= 26.5 Ac

t_c = 19 min

I_{100} = 8.19

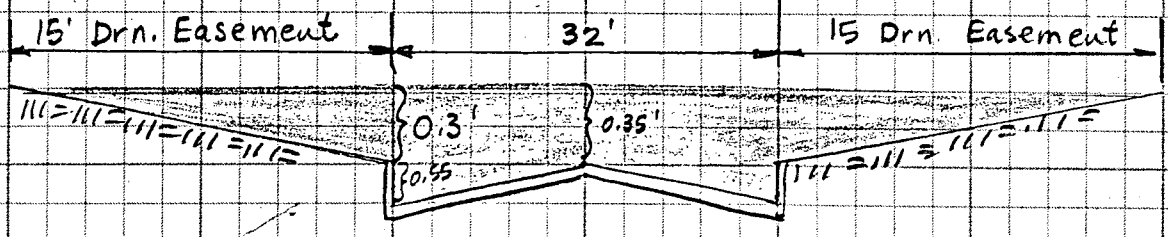
C = 0.5

Q_{100} = 0.5 × 8.19 × 26.5 = 108.5

Q_2 = 53.1 + 2.2 + 1.2 + 1.0 + 1.4 = 58.9

$Q_{100} - Q_2$ = 108.5 - 58.9 = 59.6 cfs

Using Detailed Section Below:



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

where $n = \frac{(32 \times 0.016) + (30 \times 0.025)}{62}$

= 0.020

$$= \frac{1.486}{0.020} \times 23.7 \times (0.3762)^{2/3} \times (0.0044)^{1/2}$$

$A = 2(\frac{1}{2} \times 15 \times 0.3) + 2(16 \times \frac{0.85 + 0.35}{2})$

$= 74.30 \times 23.7 \times 0.52112 \times 0.06633$

= 4.5 + 19.2 = 23.7

= 60.87 cfs

P = 63'

$R = A/P = 23.7/63 = 0.376$

S = 0.0044

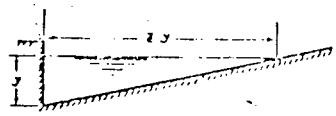
OK

n = ~~0.015~~ 0.016

~~n = 2.5~~ 1

Z/n = 2000

1072.03



EQUATION: $Q = 0.56\left(\frac{Z}{n}\right) S^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

Z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN: S = 0.03
Z = 24
n = .02
Z/n = 1200
y = 0.22

FIND: Q = 2.0 CFS

2461
2,000

RATIO Z/n

10000 9000 8000 7000 6000 5000 4000 3000 2000 1000 900 800 700 600 500 400 300 200 100 90 80 70 60 50 40 30 20 10

TURNING LINE

DISCHARGE (Q) IN CFS

100 70 50 30 20 10 7 5 3 2 1 .7 .5 .3 .2 .1 .07 .05 .03 .02 .01

SLOPE OF CHANNEL (S) IN FT./FT.

.10 .08 .07 .06 .05 .04 .03 .02 .01 .008 .007 .006 .005 .004 .003 .002 .001

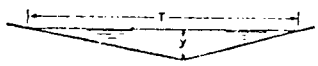
DEPTH AT CURB OR DEEPEST POINT (y) IN FT.

2.0 1.0 .90 .70 .60 .50 .40 .30 .20 .10 .08 .07 .06 .05 .04 .03 .02 .01

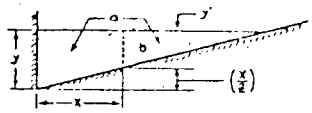
INSTRUCTIONS

1. CONNECT Z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

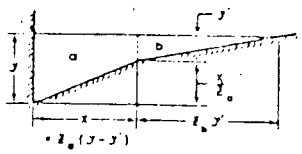
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $Z = \frac{T}{y}$



3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH X: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$



4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION - FOLLOW INSTRUCTION 3 TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO Z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$



JUN. 1950 (REV.)
MAY 1949

U. S. PUBLIC ROADS ADMINISTRATION
DIVISION TWO WASHINGTON, D. C.

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

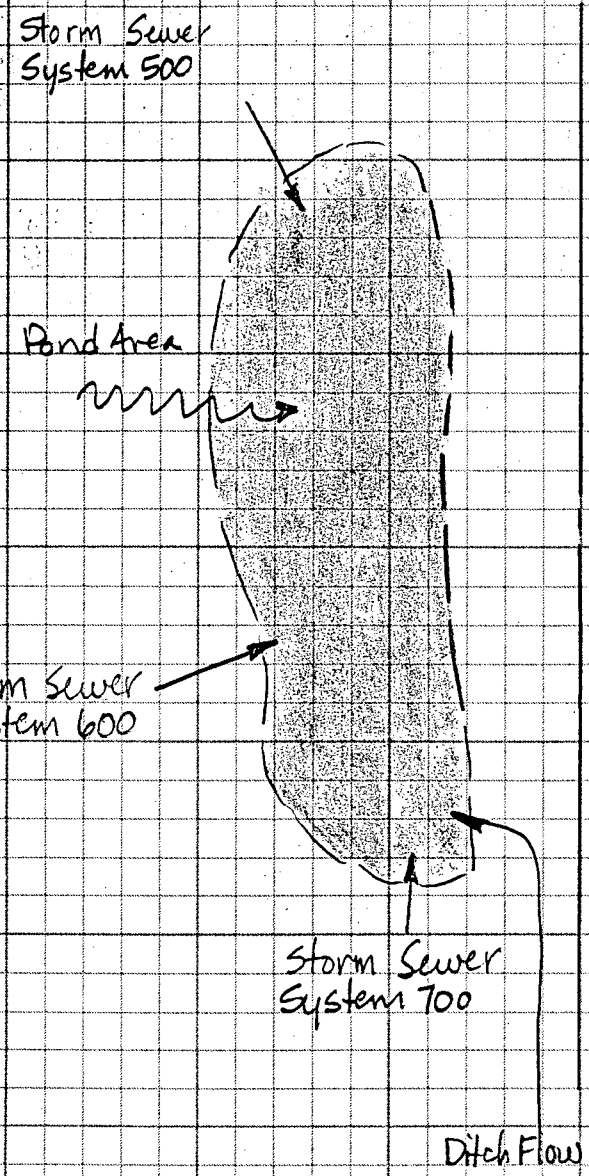
DETENTION POND

PROFESSIONAL ENGINEERING CONSULTANTS
NATIONAL ASSOCIATION
7440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 16, 1984 Page 1 of

Project Oak Cliff 3rd Add'n

Item Detention Pond

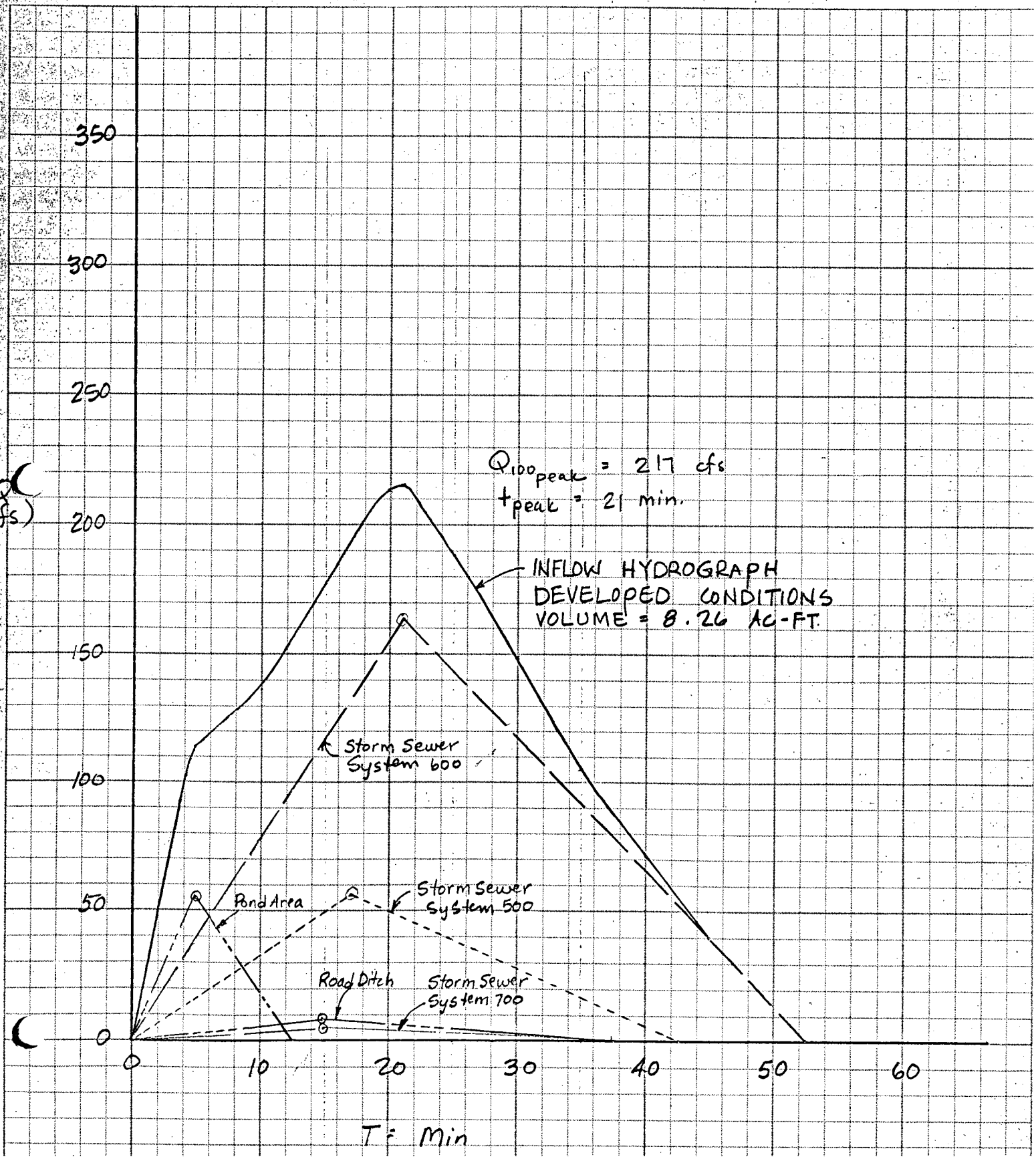


PROFESSIONAL ENGINEERING CONSULTANTS
NATIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 2 of

Project Oak Cliff 3rd Add'n

Item Detention Pond (Inflow Hydrograph)



PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 17, 1984 Page 3 of

Project Oak Cliff 3rd Addition

Item Detention Pond

Although there is no specific requirement for detention of storm water run-off, a retention-detention pond is planned along the east side of the property. For preliminary design, the pond will store the difference between the pre-developed & post-developed runoffs. The discharge will be the same as the pre-developed Q:

$Q_{100} = c I_{100} A$

$c = 0.3$

$A = 31$ Ac.

$t_c = \frac{1.8(1.1-c)\sqrt{D}}{\sqrt[3]{s}} = 61$ min.

$I_{100} = 3.90$ (D = 2000) (s = 1.2%)

$Q_{100} = 0.3 \times 3.90 \times 31$

$= 36$ cfs.

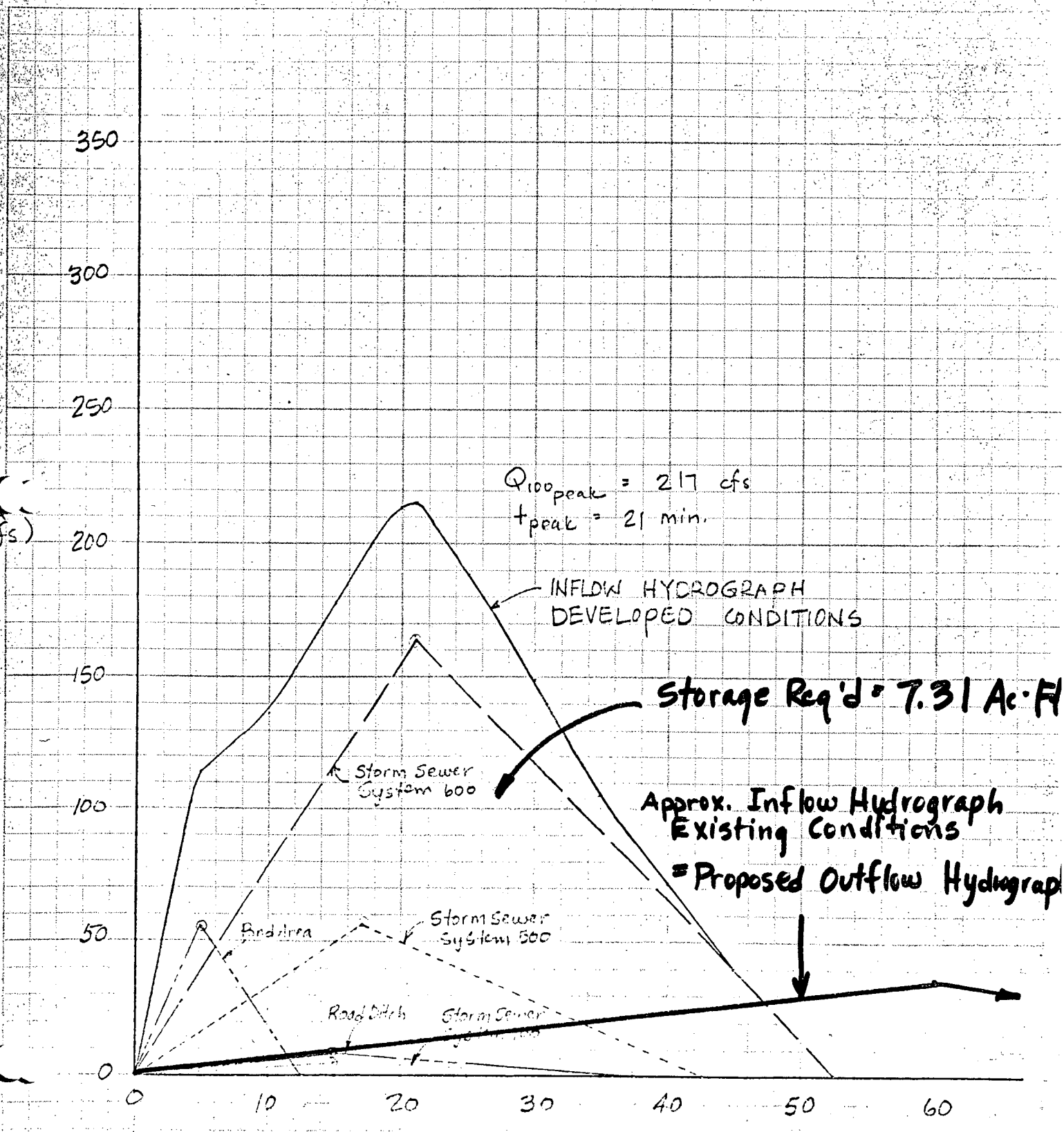
Storage Req'd = Ac-Ft. (See next sheet)

PROFESSIONAL ENGINEERING CONSULTANTS
NATIONAL ASSOCIATION
140 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1994 Page 2 of

Project Oak Cliff 3rd Add'n

Item Detention Pond (Inflow Hydrograph)



PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 17, 1984 Page 5 of

Project Oak Cliff

Item

With Static Pool @ 128.6 & Max DWS @ 133.2, water depth (flood) = 4.6'

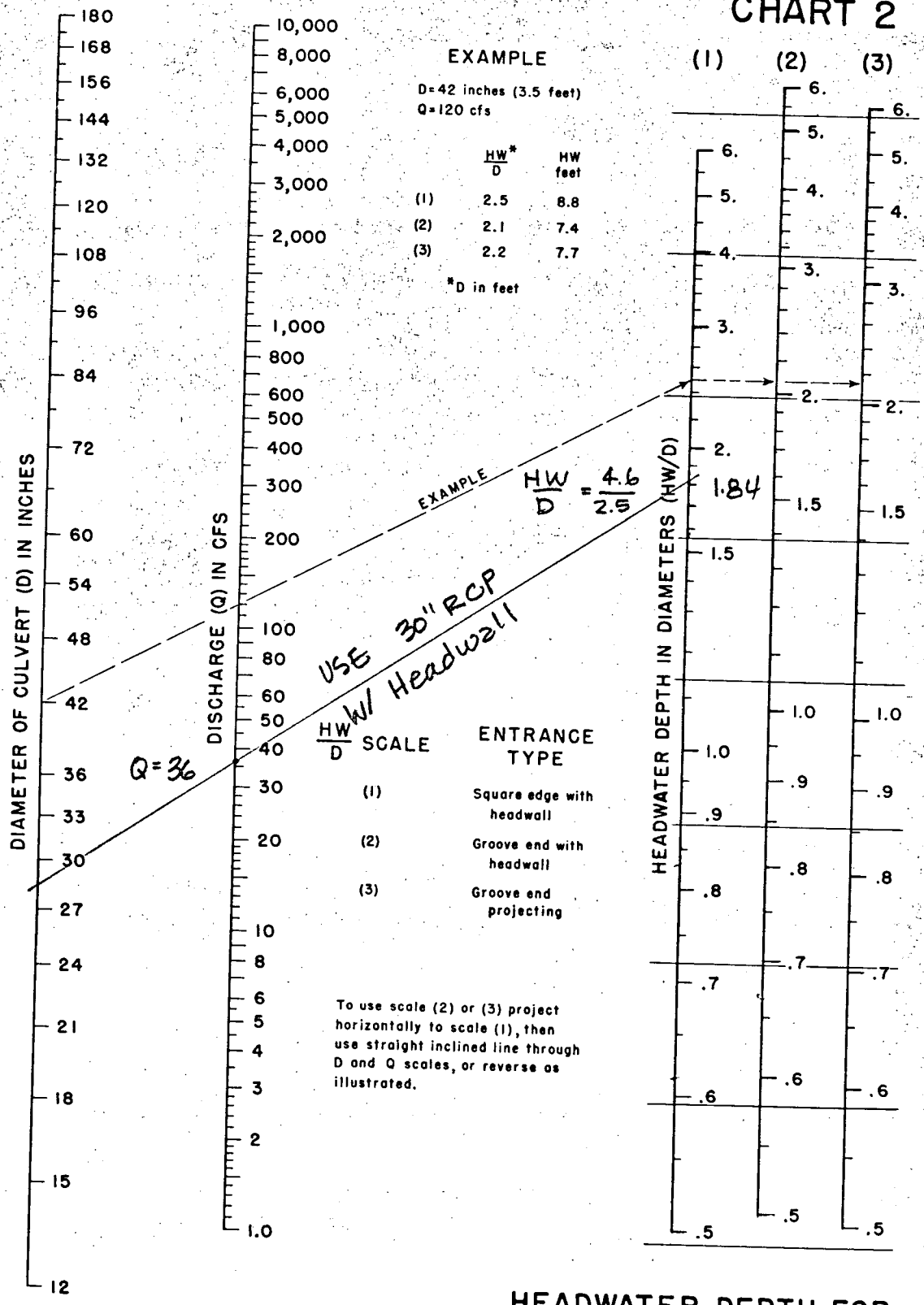
With 7.31 Ac-Ft Storage Required,

$$\text{Pond Size} = \frac{7.31 \text{ Ac-Ft}}{4.6'} = 1.6 \text{ Ac.}$$

Outlet pipe to be designed to discharge 36 cfs (undeveloped Q) @ 4.6' Head.

NOTE: More accurate design for the retention-detention pond (i.e. stage-storage, inflow-outflow hydrographs, etc.) should be performed when detailed pond configuration is determined.

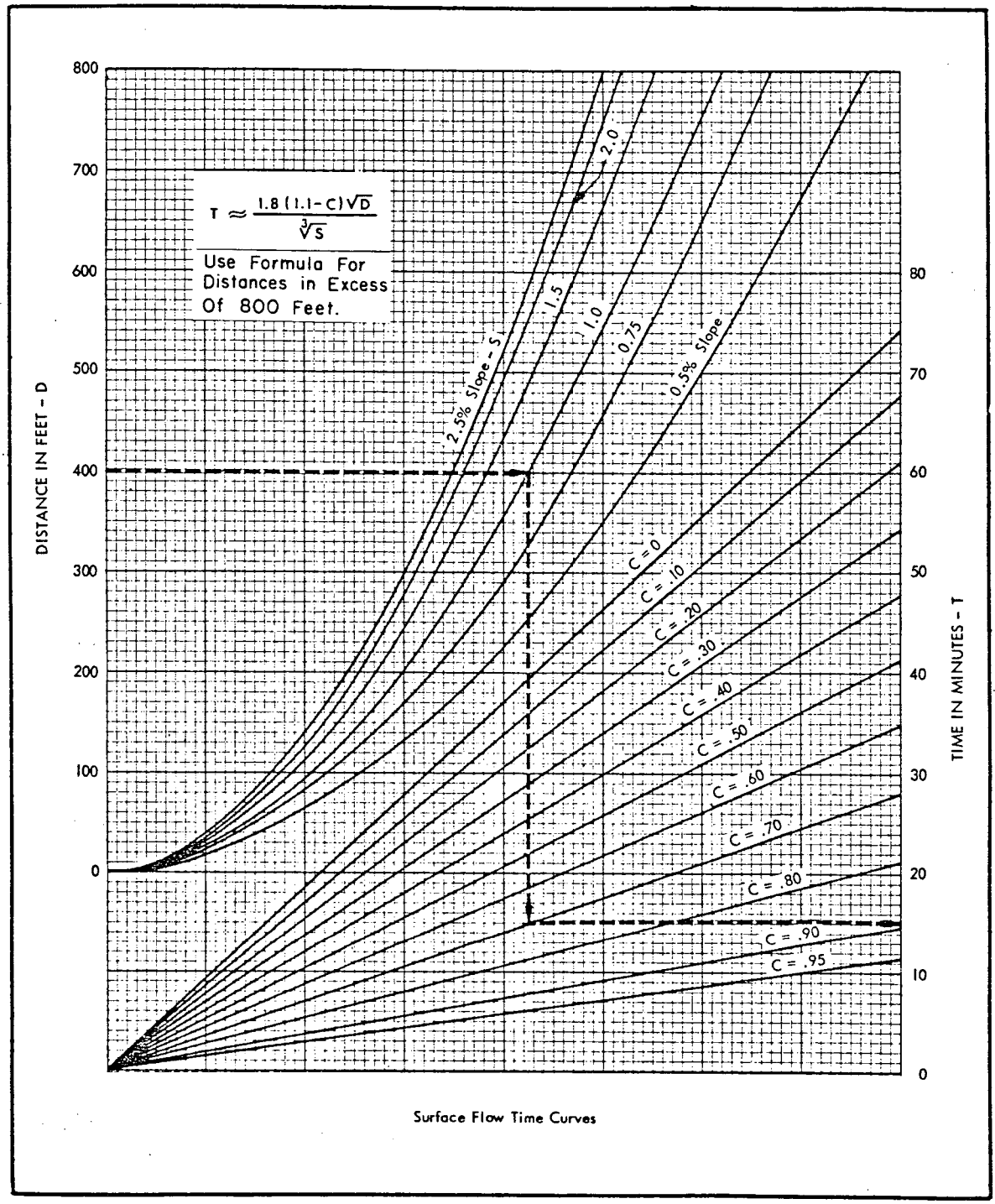
CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963



Surface Flow Time Curves

FIGURE 7. Surface flow time curves.

being investigated. In some instances the "inlet time" will be the time of concentration. Such is the case for an inlet at the upper end of a drainage line.

(1) Furthermore, a condition may exist where the "inlet time" to a structure along the line may exceed the time required for water falling on a more distant subarea to reach that

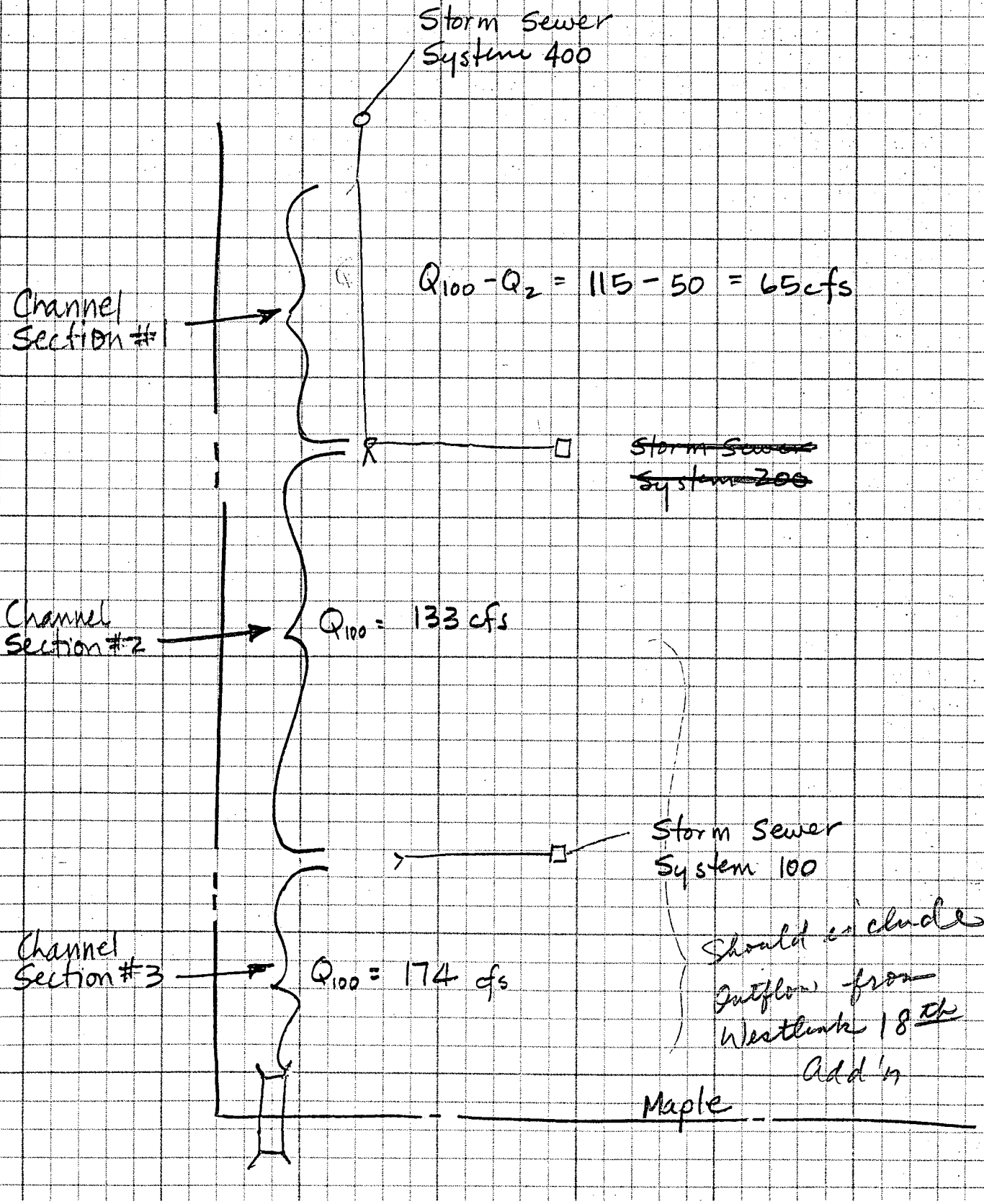
OPEN CHANNEL @ WEST FP

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 1 of 5

Project Oak Cliff 3rd Add'n

Item Open Channel @ west R



PROFESSIONAL ENGINEERING CONSULTANTS ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 2 of 5

Project Oak Cliff 3rd Add'n

Item Open Channel

Channel Section #1

Q_{100} = Storm Sewer System 400 (t_c = 18 min) + Area Adjacent to Channel (t_c = 15 min)

= (0.5 × 8.37 × 25.4 A.) + (0.4 × 8.98 × 2.4)

= 106.3 cfs + 8.6

= 115 cfs.

$Q_{100} - Q_2 = 115 - 50 = 65$ cfs

Channel Section #2

Q_{100} = 115 cfs + (Node #417) + Area Adjacent to Channel

= 115 cfs + 7.6 cfs + (0.4 × 8.98 × 2.9)

= 115 + 7.6 + 10.4

= 133 cfs

Channel Section #3

Q_{100} = 133 cfs + Storm Sewer System 100 (t_c = 16) + Area Adjacent to Channel

= 133 + (0.5 × 8.76 × 8.2) + (0.4 × 8.98 × 1.4)

= 133 + 35.9 + 5.0

= 174 cfs

PROFESSIONAL ENGINEERING CONSULTANTS
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 3 of 5

Project Oak Cliff 3rd Add'n

Item Open Channel @ West Pt

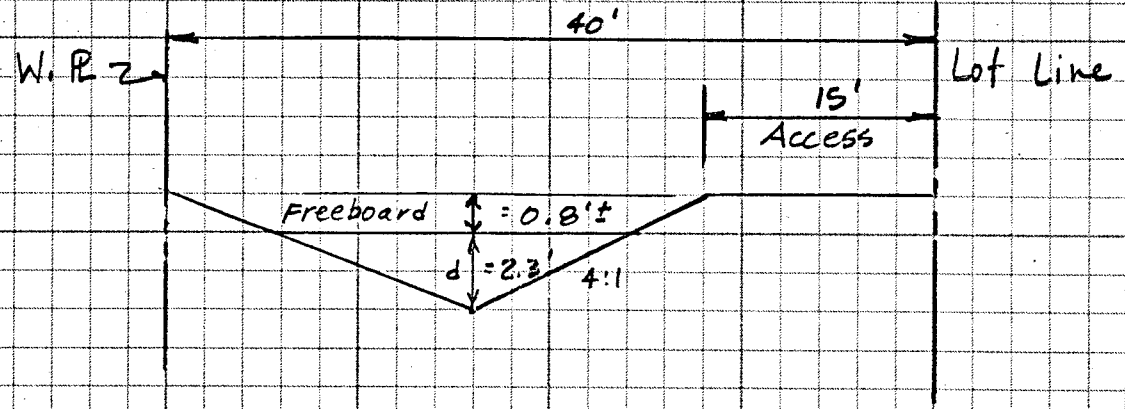
Channel Section No. 1

$Q = 65 cfs = \frac{1.486}{n} AR^{2/3} S^{1/2}$ $\quad n = 0.035$, $S = 0.005$

$AR^{2/3} = \frac{65 \times 0.035}{1.486 \times (0.005)^{1/2}}$

$= \frac{2.275}{0.10507}$

$= 21.65$



d	A	P	R	$R^{2/3}$	$AR^{2/3}$
2.0	16	16.49	0.97	0.979	15.67
2.2	19.36	18.14	1.07	1.044	20.21
2.3	21.16	18.97	1.12	1.076	22.76

USE $d = 2.3'$ Velocity = 3.07 OK.

PROFESSIONAL ENGINEERING CONSULTANTS
3440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug. 16, 1984 Page 4 of 5

Project Oak Cliff 3rd

Item Open Channel @ West R

Channel Section No. 2

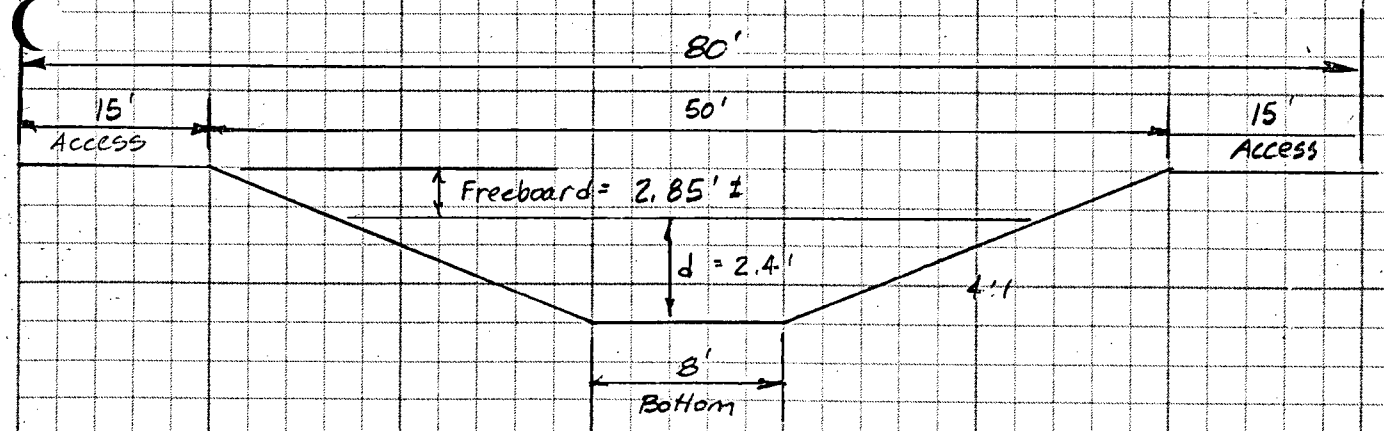
$Q_{100} = 133 cfs = \frac{1.486}{n} AR^{2/3} S^{1/2}$ $n = 0.035$, $S = 0.003$

$133 = \frac{1.486}{0.035} AR^{2/3} (0.003)^{1/2}$

$133 = 42.46 \; AR^{2/3} \; 0.05477$

$AR^{2/3} = \frac{133}{42.46 \times 0.05477}$

$= \frac{133}{2.32562} = 57.19$



d	A	P	R	$R^{2/3}$	$AR^{2/3}$
2.5	45.0	28.61	1.572	1.352	60.8
2.4	42.24	27.79	1.520	1.321	55.8

USE $d = 2.4'$ $V = 3.15$ OK

PROFESSIONAL GINEERING NSULTANTS
SIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date Aug 16, 1984 Page 5 of 5

Project Oak Cliff 3rd Add'n

Item Open Channel @ W. R

Channel Section #3

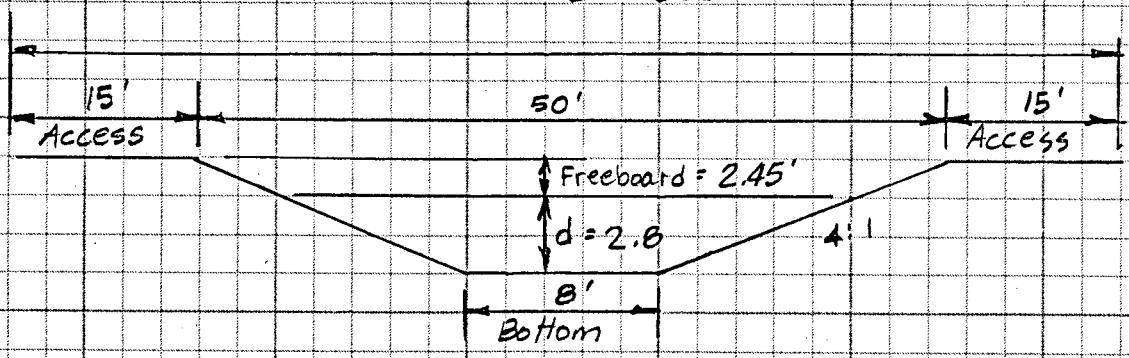
$Q = 174 \text{ cfs} = \frac{1.486}{n} AR^{2/3} S^{1/2}$ $\quad n = 0.035$, $S = 0.003$

$174 = \frac{1.486}{0.035} AR^{2/3} (0.003)^{1/2}$

$174 = 42.46\ AR^{2/3}\ 0.05477$

$AR^{2/3} = \frac{174}{42.46 \times 0.05477}$

$= \frac{174}{2.32562} = 74.82$



d	A	P	R	$R^{2/3}$	$AR^{2/3}$
2.8'	53.76	31.09	1.73	1.44	77.45
2.7'	50.76	30.26	1.677	1.41	71.65

USE d = 2.8' Velocity = 3.43 fps

DRAINAGE PLAN