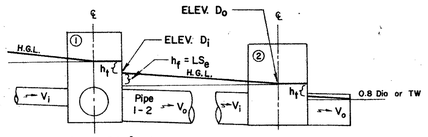
STORM DRAINAGE

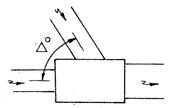
LOCATION: Stratford Woods - Revised Portions of Sections 5 and 6
Bland District; Prince George County, Virginia

DATE: 30 Jan. 84 CALC. MDB CHKD. _____ P.N. 8311-24

REV.



$h_i = 0.35\,(V_o^2/2G)$ — EXPANSION LOSS
$h_o = 0.25\,(V_o^2/2G)$ — CONTRACTION LOSS
$h_\Delta = K\,(V_o^2/2G)$ — BEND LOSS
$h_t = h_i + h_o + h_\Delta$ — TOTAL JUNCTION LOSS



90°	K = 0.70	40°	K = 0.38
80°	K = 0.66	30°	K = 0.28
70°	K = 0.61	25°	K = 0.22
60°	K = 0.55	20°	K = 0.16
50°	K = 0.47	15°	K = 0.10

THE ENERGY LOSS FOR THE INITIAL INLET OF A STORM SEWER SYSTEM IS 0.3 ($V_o^2/2G$).

WHEN MORE THAN ONE LINE ENTERS AN INLET DETERMINE LINE EXERTING GREATEST MOMENTUM (QV) FOR h_i

USE LINE WITH GREATEST "K" VALUE FOR DETERMINING h_o

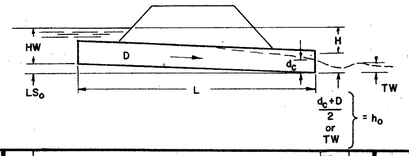
IF INLET SHAPING IS USED REDUCE "h_i" BY 50%

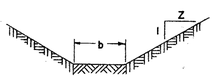
IF SURFACE INFLOW OCCURS INCREASE "h_i" BY 30%

BEGIN HYDRAULIC GRADE LINE AT PIPE OUTFALL USING 0.8 PIPE DIA. OR TW WHICHEVER IS GREATER.

* SPECIAL CONDITIONS REQUIRING USE OF CORRUGATED METAL PIPE.

	n
CONCRETE OR V.C.	0.013
PLAIN or FULLY COATED	0.024
PAVED INVERT (25%)	0.021
FIELD BOLTED	0.03
FULLY PAVED	0.013





n = 0.03 BARE EARTH
n = 0.05 GRASS or JUTE MESH
n = 0.015 PAVED
} PROTECTIVE LINING

$L_a = \frac{Q_a}{0.6(0.17+y)1.5}$

* CHECK SAG INLET SPREAD ON 0.1% SLOPE

STREET OR LOCATION	STRUCT. NO.	~~DROP INLET~~ TYPE		AREA NO.	ACRES	C	CA: CA	CA: Σ	CA: TRIB	CA: TOT.	OVER-LAND: L	OVER-LAND: So	OVER-LAND: Tc	CHANNEL: L	CHANNEL: So	CHANNEL: Tc	PIPE: Tc	TOTAL: Tc	I: 2 YR / 10 YR	Q cfs: Δ	Q cfs: Σ	Q cfs: CARRY-OVER Qc	Q cfs: TOTAL Q
Graded Swale above London Rd.	–	Line w/ Jute Mesh	D = 12"	–	1.29	0.33	0.43	0.43	1.77	2.20									3.0	6.6	6.6	–	6.6
																			4.1	9.0	9.0	–	9.0
4+00-2+50 Branchester Left Side	–	Earth Ditch	–	F-3	0.18	0.70	0.13	0.13	–	0.13						–		15	3.8	0.49	0.49	–	0.49
																			5.1	0.66	0.66	–	0.66
2+50-0+20 Branchester Left Side	–	Line w/ Jute Mesh	D = 8"	F-4	0.28	0.48	0.13	0.26	–	0.26								18	3.5	0.91	0.91	–	0.91
																			4.8	1.24	1.24	–	1.24
7+45-6+43 London Left Side	–	Earth Ditch	–	–	0.11	0.55	0.06	0.32	–	0.32								19	3.4	1.1	1.1	–	1.1
																			4.7	1.5	1.5	–	1.5
6+18-6+43 London Left Side	–	Earth Ditch	–	–	0.21	0.33	0.07	0.07	–	0.07	200'	6%	14	65'	1%	1	–	15	3.8	0.3	0.3	–	0.3
																			5.1	0.36	0.36	–	0.36
6+43; 45' Lt. 6+88; 45' Rt. London	6	18" Conc. Pipe	Cl. III	–	–	–	–	2.2	0.33	2.53						–		24	4.1	10.6	10.6	–	10.6
Outfall 'B' Right Side (Portions of Lots 8 & 9)	17	–	–	–	0.4	0.45	0.18	0.18	–	0.18								7 ↓					
Outfall 'B' Left Side (Portions of Lots 10 & 11)	17	Line w/ Jute Mesh	D = 15"	–	0.3	0.30	0.09	0.18	2.53	2.86						1		25	2.9	8.3	8.3	–	8.3
																			4.0	11.4	11.4	–	11.4
Outfall 'A' (along property boundary to N.W.C.)	18	St'd PG-5 Paved Ditch	D = 12"	–	0.45	0.30	0.13	2.99	–	2.99								26	2.8	8.4	8.4	–	8.4
																			3.9	11.7	11.7	–	11.7
3+60-3+20 Branchester Right Side	–	Earth Ditch	–	I-1 I-2	–	–	0.24	0.24	–	0.24	200'	6.3%	14	200'	2%	2	–	16	3.8	0.91	0.91	–	0.91
																			5.0	1.2	1.2	–	1.2
2+20-0+20 Branchester Right Side	–	Line w/ Jute Mesh	D = 8"	I-3	–	–	0.08	0.32	–	0.32								17	3.7	1.2	1.2	–	1.2
																			4.9	1.6	1.6	–	1.6
7+85-10+71.5 London Left Side	–	Jute Mesh to 8+50 (Plans)		I-4 I-5	–	–	0.35	0.67	–	0.67								19	3.4	2.3	2.3	–	2.3
																			4.6	3.1	3.1	–	3.1
11+00-12+50 Berkshire Left Side	–	Line w/ Jute Mesh	D = 8"	–	1.06	–	0.08	0.32	–	0.32	200'	2.7%	16	215'/186'	2.3%/3%	4	–	20	3.35	1.1	1.1	–	1.1
																			4.5	1.5	1.5	–	1.5
11+00-12+50 Berkshire Right Side	–	Earth Ditch	–	–	0.34	–	0.08	0.06	–	0.14							–	15	3.8	0.5	0.5	–	0.5
																			5.1	0.7	0.7	–	0.7
26+50-28+30 Old Iron Right Side	–	Earth Ditch	–	–	0.23	–	0.14	0.01	–	0.15							–	15	3.8	0.6	0.6	–	0.6
																			5.1	0.8	0.8	–	0.8
26+50-28+30 Old Iron Left Side	–	Earth Ditch	–	–	0.13	–	0.07	0.01	–	0.08							–	15	3.8	0.3	0.3	–	0.3
																			5.1	0.4	0.4	–	0.4

HYDRAULIC GRADE LINE

	JUNCTION LOSSES							PIPE BARREL LOSSES
V	0.35 x	$\frac{V_o^2}{2G}$	hi	I.3	50%	ELEV.		ELEV. D_o
QV	0.25 x	$\frac{V_o^2}{2G}$	ho					S_e
PIPE	Δ / K_Δ	$\frac{V_o^2}{2G}$	h_Δ					h_f
	int. 0.30 x	$\frac{V_o^2}{2G}$	ht					ELEV. D_i

PIPE: D	L	d_n	WATER SURFACE ELEV.	WATER SURFACE ELEV.	FULL FLOW Q_f
n	S_o	V_n	INV. IN	INV. OUT	V_f
18"	100'	1.0'	58.59	56.06	13
.013	1.5%	8.1	56.41	54.91	3.1

SIZE	CULVERT HEADWATER COMPUTATION: INLET CONTROL HW/D	HW	K_e	OUTLET CONTROL d_c	$\frac{d_c+D}{2}$	TW	h_o	H	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY
18"	1.45	2.18	0.2	1.3	1.4	1.1	1.4	1.25	1.5	1.15	2.18	7

CHANNEL TYPE	L	b / So	Z	V_a / n / V_a	n	V_2	d_2	V_{10} / V_{10}	d_{10} / d_{10}	WATER SURFACE ELEV. INV. IN	WATER SURFACE ELEV. INV. OUT
Vee	239'	0		2.5	.03	3.7	—	—	—	—	—
				4.0	.05	2.5	0.7	2.7	0.7		
	3.2%	6								64.0	56.41
Std.	–	0		2.5	.03	1.9	0.3	2.3	0.3	—	—
	2%	2.8								—	—
Std.	–	0		2.5	.03	2.9	—	—	—	—	—
	4%	2.8		4.0	.05	2.0	0.4	2.2	0.5	—	—
Std.	–	0		2.5	.03	1.8	0.5	1.9	0.5	—	—
	1%	2.8								—	56.41
Toe	–	0		2.5	.03	1.2	0.3	1.3	0.3	—	—
	1%	3								—	56.41
Trap.	120'	2'		2.5	.03	3.2	—	—	—	—	—
				4.0	.05	2.2	1.0	2.4	1.1		
	1.1%	2								54.90	53.60
Std. PG-5	182'	2'		2.5	.03	5.1	—	—	—	—	—
				4.0	.05	3.6	0.7	3.9	0.8		
	4%	2		—	.015	8.4	0.4	9.2	0.4	53.60	N.W.C.
Std.	150'	0		2.5	.03	2.2	0.4	2.4	0.4	—	—
	2%	2.8								—	—
Std.	200'	0		2.5	.03	3.1	—	—	—	—	—
				4.0	.05	2.1	0.4	2.3	0.5		
	4%	2.8								—	—
Std.	—	0		2.5	.03	3.8	—	—	—	—	—
				4.0	.05	2.6	0.6	2.8	0.6		
	4.4%	2.8								—	—
Std.	186'	0		2.5	.03	2.7	—	—	—	—	—
				4.0	.05	1.9	0.5	2.0	0.5		
	3%	2.8								—	—
Std.	186'	0		2.5	.03	2.2	0.3	2.4	0.3	—	—
	3%	2.8								—	—
Std.	–	0		2.5	.03	1.6	0.4	1.8	0.4	—	—
	1.2%	2.8								—	—
Std.	–	0		2.5	.03	1.4	0.3	1.5	0.3	—	—
	1.2%	2.8								—	—

SLOPE INLET Q_a/L_a	L_a	L/L_a	a/y	Q/Q_a	Q	Q_c	LOWPOINT INLET h	Q/L	H/h	H	S_p	REMARKS
												Place Std. EC-1, Type "A" @ Outlet (3.5' Cover)
												Paved Ditch 8+50-10+71.5 (See Road Plans for Section 6)

Office of County Planner
Prince George County, Va.
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SHEET 5 OF 7

6/20/75

24"