



Greenman-Pedersen, Inc.

181 Ballardvale St.
Suite 202
Wilmington, MA 01887
978-570-2999

Beach Rd Reconstruction
Client MassDOT
Subject Tisbury - Beach Road

Location in Massachusetts

Proj. No. MAX-2011041.13 Design Parameters
Date 11/15/2016 10 Year Storm
Calc. by JAT 12 in Min. Pipe Size
Check by JFO Project File: 607411
2 (1-Boston, 2-Barnstable, 3-Worcester, 4-Springfield, 5-Pittsfield)
Manning's roughness coefficient 0.013

paved C= 0.9
unpaved C= 0.3

Manning's roughness coefficient (DIP) 0.011

Rainfall Data is For Barnstable

LOCATION OF STRUCTURES		DISCHARGE										PIPE DATA								VERTICAL CONTROL			
UPPER DMH.CBCI	LOWER DMH/CBCI	TIME OF		COMB.	DRAINAGE AREA			C x A		RAIN-	DES.	DIAM.	n	SLOPE	LENGTH	FULL	FULL	PEAK FLOW		PIPE INVERT		RIM ELEVATION &	
LOCATION	LOCATION	CONCENTRATION, T _C		RUNOFF	IN ACRES		FALL			DISCH.	OF	VEL.						CONDITIONS	ELEVATION	DEPTH OF COVER			
FROM	TO	PIPE	TOTAL, T _C	C	paved	unpaved	TOTAL	INC	TOTAL	i	Q	in		in/in	ft	cfs	ft/s	VELOCITY	d/D	UPPER	LOWER	UPPER	DEPTH OF
STATION	STATION	FLOW TIME	(min. = 5)		area	area	ACRES			in/HR	cfs							ft/s	d/D	END	END	RIM	PIPE COVER
CB 109	DMH 110		5.00	0.90	0.15		0.150	0.14	0.14	5.30	0.72	10	0.011	0.005	17	1.830	3.4	3.13	0.43	0.24	0.16	2.67	1.60
CBCI 112	DMH 110		5.00	0.90	0.16		0.160	0.14	0.14	5.30	0.76	10	0.011	0.005	22	1.830	3.4	3.20	0.45	0.15	0.04	2.58	1.60
DMH 110	DMH 111	0.11	5.11					0.00	0.28	5.30	1.48	10	0.011	0.004	94	1.637	3.0	3.39	0.74	0.04	-0.34	2.64	1.77
CB 105	DMH 111		5.00	0.90	0.06		0.060	0.05	0.05	5.30	0.29	10	0.011	0.033	3	4.702	8.6	4.63	0.16	-0.24	-0.34	1.98	1.39
CB 108	DMH 111		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	10	0.011	0.004	23	1.637	3.0	2.10	0.25	-0.25	-0.34	1.99	1.41
DMH 111	DMH 104	0.46	5.58						0.38	5.30	2.00	12	0.011	0.004	35	2.662	3.4	3.71	0.64	-0.34	-0.48	2.06	1.40
CBCI 106	DMH 104		5.00	0.90	0.1		0.100	0.09	0.09	5.30	0.48	10	0.011	0.035	4	4.843	8.9	5.62	0.21	-0.34	-0.48	1.91	1.42
CB 107	DMH 104		5.00	0.90	0.1		0.100	0.09	0.09	5.30	0.48	10	0.011	0.007	23	2.113	3.9	3.11	0.32	-0.34	-0.49	1.91	1.42
DMH 104	DMH 103	0.16	5.73						0.56	5.30	2.96	14	0.011	0.004	245	4.016	3.8	4.09	0.63	-0.48	-1.46	2.02	1.33
DMH 103	EX DMH 2	1.00	6.73						0.56	5.20	2.90	15	0.013	0.004	41	4.084	3.3	3.61	0.62	-1.46	-1.62	2.62	2.83
CB 102	EX DMH 2		5.00	0.90	0.06		0.060	0.05	0.05	5.30	0.29	12	0.013	0.010	15	3.562	4.5	2.72	0.19	-0.88	-1.03	2.39	2.27
CBCI 101	EX DMH 1		5.00	0.90	0.07		0.070	0.06	0.06	5.30	0.33	12	0.013	0.010	12	3.562	4.5	2.79	0.20	-1.10	-1.22	2.28	2.38
EX DMH 2	EX DMH 1	0.19	6.92					0.00	0.61	5.20	3.18	15	0.013	0.005	13	4.566	3.7	4.01	0.61	-1.69	-1.76	2.50	2.94
																					Unknown		
EX DMH 1	OUT	0.05	6.98					0.00	0.68	5.20	3.51	24	0.013	0.005	Unknown	15.991	5.1	4.02	0.31	-1.37	Unknown	2.23	1.60
														Unknown									



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LOCATION OF STRUCTURES		DISCHARGE										PIPE DATA								VERTICAL CONTROL			
UPPER DMH.CBCI LOCATION	LOWER DMH/CBCI LOCATION	TIME OF CONCENTRATION, T _C PERIOD IN MINUTES		COMB. RUNOFF COEFF. C	DRAINAGE AREA IN ACRES			C x A		RAIN- FALL INTEN. i in/HR	DES. DISCH. Q cfs	DIAM. OF PIPE in	n VALUE	SLOPE OF PIPE in/in	LENGTH OF PIPE ft	FULL CAP. cfs	FULL VEL. ft/s	PEAK FLOW CONDITIONS		PIPE INVERT ELEVATION		RIM ELEVATION & DEPTH OF COVER	
		PIPE FLOW TIME	TOTAL, T _C (min. = 5)		paved area ACRES	unpaved area ACRES	TOTAL AREA ACRES											INC	TOTAL	VELOCITY ft/s	d/D	UPPER END	LOWER END
CB 211	DMH 210		5.00	0.90	0.03		0.030	0.03	0.03	5.30	0.14	10	0.011	0.005	26	1.830	3.4	1.94	0.18	1.62	1.49	4.04	1.59
DMH 210	DMH 209	0.22	5.22					0.00	0.03	5.30	0.14	10	0.011	0.005	130	1.830	3.4	1.94	0.18	1.49	0.84	3.97	1.65
CB 212	DMH 209		5.00	0.90	0.11		0.110	0.10	0.10	5.30	0.52	10	0.011	0.010	5	2.588	4.7	3.68	0.30	0.93	0.88	3.18	1.42
DMH 209	DMH 207	1.12	6.34						0.13	5.20	0.66	10	0.011	0.004	69	1.637	3.0	2.80	0.43	0.84	0.56	3.45	1.78
CB 208	DMH 207		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	10	0.011	0.004	8	1.637	3.0	2.10	0.25	0.59	0.56	2.84	1.42
DMH 207	DMH 204	0.41	6.75					0.00	0.17	5.20	0.89	10	0.011	0.004	29	1.637	3.0	3.05	0.52	0.56	0.44	3.18	1.79
CB 205	DMH 204		5.00	0.90	0.11		0.110	0.10	0.10	5.30	0.52	10	0.011	0.005	14	1.830	3.4	2.87	0.36	0.52	0.45	2.77	1.42
CB 202	DMH 204		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	10	0.011	0.010	14	2.588	4.7	2.92	0.20	0.59	0.45	3.81	2.39
DMH 204	DMH 213	0.16	6.91					0.00	0.32	5.20	1.64	10	0.011	0.004	77	1.637	3.0	3.42	0.82	0.44	0.13	3.14	1.87
CB 203	DMH 213		5.00	0.90	0.09		0.090	0.08	0.08	5.30	0.43	10	0.011	0.085	4	7.547	13.8	7.43	0.16	0.58	0.24	3.00	1.59
CB 201	DMH 213		5.00	0.90	0.11		0.110	0.10	0.10	5.30	0.52	10	0.011	0.011	47	2.715	5.0	3.79	0.29	0.76	0.24	3.19	1.60
DMH 213	DMH 214	0.38	7.29					0.00	0.50	4.90	2.43	12	0.011	0.004	71	2.662	3.4	3.83	0.74	0.13	-0.15	3.16	2.03



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UPPER DMH.CBCI	LOWER DMH/CBCI	TIME OF		COMB.	DRAINAGE AREA			C x A		RAIN-	DES.	DIAM.	n	SLOPE	LENGTH	FULL	FULL	PEAK FLOW		PIPE INVERT		RIM ELEVATION &	
LOCATION	LOCATION	CONCENTRATION, T _C	PERIOD IN MINUTES	RUNOFF	IN ACRES		FALL			DISCH.	OF	INTEN.											
FROM	TO	PIPE	TOTAL, T _C	C	paved	unpaved	TOTAL	INC	TOTAL	i	Q	in		in/in	ft	cfs	ft/s	VELOCITY	d/D	UPPER	LOWER	UPPER	DEPTH OF
STATION	STATION	FLOW TIME	(min. = 5)		area	area	AREA			in/HR	cfs	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s	ft/s
CB 323	DMH 322		5.00	0.77	0.07	0.02	0.090	0.07	0.07	5.30	0.37	10	0.011	0.010	17	2.588	4.7	3.33	0.25	0.74	0.57	3.16	1.59
CB 324	DMH 322		5.00	0.90	0.12		0.120	0.11	0.11	5.30	0.57	10	0.011	0.010	13	2.588	4.7	3.75	0.31	0.74	0.61	3.16	1.59
DMH 322	DMH 319	0.09	5.09					0.00	0.18	5.30	0.94	10	0.011	0.005	40	1.830	3.4	3.36	0.50	0.57	0.37	3.34	1.94
CB 320	DMH 319		5.00	0.75	0.03	0.01	0.040	0.03	0.03	5.30	0.16	10	0.011	0.010	17	2.588	4.7	2.55	0.16	0.64	0.47	3.24	1.77
CB 321	DMH 319		5.00	0.90	0.06		0.060	0.05	0.05	5.30	0.29	10	0.011	0.010	11	2.588	4.7	3.08	0.22	0.58	0.47	3.24	1.83
DMH 319	DMH 317	0.20	5.28						0.26	5.30	1.38	10	0.011	0.005	136	1.830	3.4	3.67	0.64	0.37	-0.31	3.44	2.24
DMH 317	DMH 314	0.62	5.90						0.26	5.30	1.38	12	0.013	0.005	147	2.518	3.2	3.26	0.52	-0.31	-1.05	3.61	2.92
CB 315	DMH 314		5.00	0.84	0.06	0.007	0.067	0.06	0.06	5.30	0.30	10	0.011	0.010	15	2.588	4.7	3.08	0.22	-0.87	-1.02	2.25	2.29
CB 316	DMH 314		5.00	0.90	0.11		0.110	0.10	0.10	5.30	0.52	10	0.011	0.010	9	2.588	4.7	3.68	0.30	-0.84	-0.93	2.25	2.26
DMH 314	DMH 309	0.75	6.65					0.00	0.42	5.20	2.16	12	0.013	0.005	117	2.518	3.2	3.60	0.71	-1.04	-1.63	2.34	2.38
CB 310	DMH 309		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	10	0.011	0.010	14	2.588	4.7	2.92	0.20	-1.37	-1.51	1.69	2.23
CBCI 311	DMH 309		5.00	0.90	0.09		0.090	0.08	0.13	5.30	0.67	10	0.011	0.010	6	2.588	4.7	3.94	0.34	-1.37	-1.43	1.69	2.23
DMH 309	DMH 306	0.54	7.19					0.00	0.59	4.90	2.88	15	0.013	0.005	26	4.566	3.7	3.92	0.57	-1.63	-1.76	1.86	2.24
CB 307	DMH 306		5.00	0.90	0.02		0.020	0.02	0.02	5.30	0.10	10	0.011	0.010	14	2.588	4.7	2.24	0.13	-1.33	-1.47	1.81	2.31
CB 308	DMH 306		5.00	0.90	0.13		0.130	0.12	0.12	5.30	0.62	10	0.011	0.010	9	2.588	4.7	3.88	0.33	-1.29	-1.38	1.77	2.23
DMH 306	DMH 304	0.11	7.31					0.00	0.72	4.90	3.54	15	0.013	0.005	41	4.566	3.7	4.11	0.66	-1.76	-1.97	1.98	2.49
CB 305	DMH 304		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	12	0.013	0.010	13	3.562	4.5	2.53	0.17	-1.83	-1.96	2.07	2.90
DMH 304	CIT 301	0.17	7.47					0.00	0.77	4.90	3.76	15	0.013	0.007	14	5.206	4.2	4.60	0.62	-1.96	-2.05	2.21	2.92

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UPPER DMH.CBCI	LOWER DMH/CBCI	TIME OF		COMB.	DRAINAGE AREA			C x A		RAIN-	DES.	DIAM.	n	SLOPE	LENGTH	FULL	FULL	PEAK FLOW		PIPE INVERT		RIM ELEVATION &	
LOCATION	LOCATION	CONCENTRATION, T _C		RUNOFF	IN ACRES					FALL	DISCH.	OF		OF PIPE	OF PIPE	CAP.	VEL.	CONDITIONS	ELEVATION				
FROM	TO	PIPE	TOTAL, T _C		paved	unpaved	TOTAL	INC	TOTAL	i	Q	in		in/in	ft	cfs	ft/s	VELOCITY	d/D	UPPER	LOWER	UPPER	DEPTH OF
STATION	STATION	FLOW TIME	(min. = 5)	C	area	area	ACRES			in/HR	cfs							ft/s		END	END	RIM	PIPE COVER
CB 303	DMH 302		5.00	0.90	0.22		0.220	0.20	0.20	5.30	1.05	12	0.013	0.010	30	3.562	4.5	3.94	0.37	-1.07	-1.37	2.93	3.00
DMH 302	CIT 301	0.13	5.13					0.00	0.20	5.30	1.05	12	0.013	0.010	113	3.562	4.5	3.94	0.37	-1.16	-2.29	3.37	3.53
CIT 301	OUTFALL	0.05	7.52					0.00	0.97	4.90	4.73	15	0.013	0.006	200	5.002	4.1	4.63	0.77	-2.05	Unknown	2.38	3.18
												EXIST		Unknown									



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LOCATION	LOCATION	CONCENTRATION, T _C		RUNOFF	IN ACRES					FALL	DISCH.	OF		OF PIPE	OF PIPE	CAP.	VEL.	CONDITIONS	ELEVATION				
FROM	TO	PIPE	TOTAL, T _C	COEFF.	paved	unpaved	TOTAL	INC	TOTAL	i	Q	in		in/in	ft	cfs	ft/s	VELOCITY	d/D	UPPER	LOWER	UPPER	DEPTH OF
STATION	STATION	FLOW TIME	(min. = 5)	C	area	area	AREA			in/HR	cfs							ft/s	d/D	END	END	RIM	PIPE COVER
CB 403	CIT 401		5.00	0.90	0.04		0.040	0.04	0.04	5.30	0.19	12	0.013	0.010	11	3.562	4.5	2.34	0.15	0.91	0.80	4.04	2.13
CBCI 404	CIT 402		5.00	0.90	0.05		0.050	0.05	0.05	5.30	0.24	10	0.011	0.005	32	1.830	3.4	2.30	0.24	1.18	1.02	4.15	2.14
CIT 402	CIT 401	0.23	5.23					0.00	0.08	5.30	0.43	12	0.013	0.003	30	1.816	2.3	1.89	0.33	1.02	0.94	3.96	1.94
												Exist		Exist						Exist			