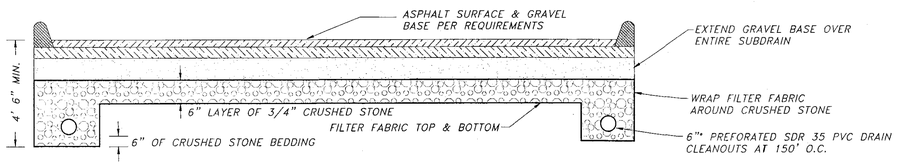
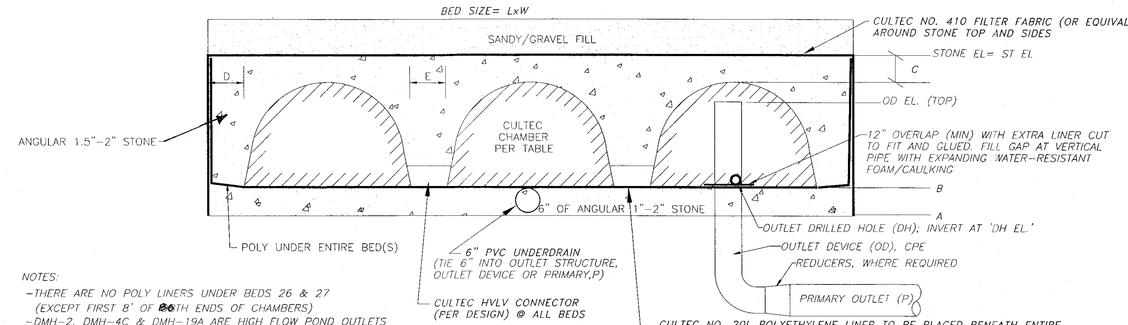
DRAINAGE STRUCTURE & PIPE TABLE

			PIPES IN				PIPES OUT			
STRUCTURE	RIM ELEV. ±	FROM	INV.IN	PIPE Ø	LENGTH	TO	INV.OUT	PIPE Ø	LENGTH	SLOPE	NOTES
DMH-1	351.0	DMH-2	346.25	15" CPE	33'	ON EX. 18"	346.00	N/A	N/A	N/A	Drop-over
		DD-2	346.25	12" RCP	83'						
DMH-2	351.0	CULTEC-BED-3	346.70		17'	DMH-1	346.48	15" CPE	33'	0.70%	Flat-Top W/Grate
DMH-3	352.7	CB-2	348.82	12" CPE	17'	DMH-3A	348.71	12" CPE	21'	1.00%	Flat-Top
		CB-28	348.82	12" CPE	35'						
		BIO-2	349.20	6" PVC	11'	Bio-Retention-2		6" PVC		varies	Use 90/45's to drop down
DMH-3A	352.7	DMH-3	348.50	12" CPE	21'	STORMFILTER	347.90	8" CPE	1.5'	1.00%	See Diversion Detail
		CB-1	348.81	12" CPE	5'	CULTEC BED-3	348.40	12" CPE			
DMH-4	359.3	DMH-5	354.81	12" CPE	79'	DMH-4A	354.51	15" CPE	25'	2.00%	Flat-Top
		CB-3	354.81	12" CPE	9'						
		CB-4	354.81	12" CPE	19'						
DMH-4A	362.2	DMH-4	354.01	15" CPE	25'	STORMFILTER	352.10	8" CPE	9'		
						CULTEC BED-4	352.60	15" CPE	42'		
DMH-4C	356.5	CULTEC-BED-4	348.10	12" CPE	9'	DD-1	348.00	12" CPE	32'	4.37%	Flat Top w/ 30" open Neenah 1897-A9-A Grate
DD-1	357.6	DMH-4C	346.60	12" CPE	32'	CULTEC BED-3	347.60	12" CPE	28'	0.35%	
DMH-5	367.3	DMH-6	362.22	12" CPE	72'	DMH-4	362.10	12" CPE	79'	9.22%	
		CB-5		12" CPE	7'						
		CB-6		12" CPE	7'						
DMH-6	375.0	DMH-7	370.60	12" CPE	94'	DMH-5	370.50	12" CPE	72'	11.50%	Flat Top
		CB-18	370.60	12" CPE	11'						
DMH-7	383.3	CB-7	378.90	12" CPE	15'	DMH-6	378.26	12" CPE	94'	8.15%	Flat Top
		CB-8	378.90	12" CPE	18'						
		CB-19	378.36	12" CPE	19'						
DMH-8	389.4	DMH-9	385.60	15" CPE	81'	HEADWALL	384.04	15" CPE	101'	3.00%	381.0 Inv at HW
		DMH-10	384.50	12" CPE	58'						Flat Top
DMH-9	398.0	SUBDRAIN	384.90	6" PVC	109'	DMH-8	390.46	15" CPE	81'	6.00%	
		HEADWALL	394.38	15" CPE	28'						
DMH-10	392.0	DMH-10A	387.00	12" CPE	76'	DMH-8	386.59	12" CPE	58'	3.60%	396.0 INV AT HW
		SUBDRAIN		6" PVC	253'						Flat Top
DMH-10A	398.5	HEADWALL	394.00	4"	30'	DMH-10	391.56	12" CPE	76'	6.00%	6" SUBDRAIN, 388.0 IN
		HEADWALL	395.50	10"	20'						Flat top
DMH-11	384.6	DMH-12	381.00	12" CPE	50'	STORMFILTER	380.80	8" CPE			395.0 & 398.0 AT HW'S
						CULTEC BED-7	381.30	12" CPE			Flat top
DMH-12	386.0	BIO BED-6	381.45	6" PVC	76'	DMH-11	381.35	12" CPE	50'	0.70%	Flat top
		CB-15	381.45	12" CPE	20'						
		CB-16		12" CPE	12'						
DMH-13	389.2	DMH-14	382.27	15" CPE	153'	HEADWALL	380.62	15" CPE	89'		
DMH-14	403.5					DMH-13	396.80	15" CPE	153'	9.50%	
DMH-15	390.0	BIO BED-8	387.00	6" PVC	29'	CB-14	385.63	12" CPE	99'	7.00%	Flat top
DMH-16	365.8	CB-11	361.60	12" CPE	22'	DMH-21	360.90	12" CPE	50'	1.00%	Flat-Top
		CB-12	361.60	12" CPE	26'						
DMH-17	357.7	DMH-19	352.18	12" CPE	55'	DMH-18	350.90	12" CPE	93'	4.00%	Flat top
		CB-20	353.26	12" CPE	16'						
		CB-21	353.26	12" CPE	7'						
DMH-18	351.6	DMH-17	347.18	12" CPE	93'	DD-2	347.01	12" CPE	28'	3.61%	Flat top
		CB-9	347.30	12" CPE	8'						
		CB-10	347.30	12" CPE	16'						
DD-2	352.0	DMH-18	346.00	12" CPE	28'	DMH-1	347.00	12" CPE	83'	0.90%	
DMH-19	362.0	CULTEC-BED-12	356.50	8" PVC	5'	DMH-17	352.77	12" CPE	55'	1.07%	
		UNDERDRAIN	356.00	6" PVC							
DMH-19A	362.0		359.60	6" PVC							Flat top
DMH-20	376.1	CB-30	373.11	8" CPE	70'	CULTEC-BED-26	370.50		7'	0.70%	6" TO BED-26, 370.5
						DMH-20A	373.00	8" CPE	21'	20.95%	Flat top
DMH-20A	373.9	DMH-20	368.60	8" CPE	21'	DMH-21	364.90	8" CPE	24'	10.00%	
DMH-21	365.0	DMH-20A	362.50	8" CPE	24'	CULTEC-BED-12	360.24	12" CPE	22'	2.75%	Flat top
		DMH-16	360.39	12" CPE	50'	STORM FILTER	359.74	8" CPE	3'	8.00%	
CB-1	352.0		N/A			DMH-3A	348.39	12" CPE	5'	1.00%	Flat top
CB-2	351.9		N/A			DMH-3	348.39	12" CPE	17'	1.00%	UNDERDRAIN CULTEC-12
CB-3	358.0		N/A			DMH-4	355.00	12" CPE	9'	2.11%	Flat top
CB-4	358.0		N/A			DMH-4	355.00	12" CPE	19'	1.00%	Flat-Top
CB-5	367.3		N/A			DMH-5	362.40	12" CPE	7'	2.57%	
CB-6	367.3	BIO-RET-5	362.50		60'	DMH-5	362.40	12" CPE	7'	2.57%	
CB-7	383.6		N/A			DMH-7	379.05	12" CPE	15'	1.00%	
CB-8	383.9		N/A			DMH-7	379.08	12" CPE	18'	1.00%	
CB-9	351.6		N/A			DMH-18	347.46	12" CPE	16'	1.00%	
CB-10	352.2		N/A			DMH-18	347.46	12" CPE	20'	0.80%	
CB-11	368.2		N/A			DMH-16	363.00	12" CPE	22'	6.36%	
CB-12	368.2		N/A			DMH-16	363.25	12" CPE	26'	6.34%	
CB-13	381.5	CB-14	378.29	12" CPE	31'	BIO-BED-9	378.19	12" CPE	26'		Flat-Top
CB-14	381.7	DMH-15	378.70	12" CPE	99'	CB-13	378.51	12" CPE	31'	0.70%	Flat-Top
CB-15	385.5		N/A			DMH-12	381.65	12" CPE	20'	1.00%	Flat-Top
CB-16	385.8	CB-17	381.66		5'	DMH-12	381.57	12" CPE	12'	1.00%	Flat-Top
CB-17	382.0		N/A			CB-16	381.76	12" CPE	5'	2.00%	Flat-Top
CB-18	376.0		N/A			DMH-6	370.71	12" CPE	11'	1.00%	
CB-19	382.1		N/A			DMH-7	378.55	12" CPE	19'	1.00%	Flat-Top
CB-20	359.1		N/A			DMH-17	353.90	12" CPE	16'	4.00%	
CB-21	357.8		N/A			DMH-17	353.68	12" CPE	7'	6.00%	
CB-22	370.9		N/A			CB6	365.30	4" PVC	60'	4.67%	4" FROM BIO-BED-5
CB-24	382.8	CB-25	378.80	12" CPE	132'	HEADWALL	376.83	12" CPE	127'	5.30%	
CB-25	393.5		N/A			CB-24	388.04	12" CPE	132'	7.00%	
CB-26	397.0		N/A			BIO-BED-6	394.00	12" CPE	47'	1.06%	Flat-Top
CB-28	357.6	BIO-BED-1	356.50	6" PVC	39'	DMH-3	349.06	12" CPE	35'	0.70%	
CB-30	377.8	BIO-BED-9	374.70	6" PVC	0'	DMH-20	373.60	8" CPE	70'	0.70%	Flat-top
BIO-RET-2	N/A		N/A			DMH-3	353.30	6" PVC	11'	0.70%	BED IN 6" STONE ENVEL.
BIO-RET-6	N/A		N/A			DMH-12	389.00	6" PVC	76'	9.93%	
BIO-RET-8	N/A		N/A			DMH-15	390.30	6" PVC	29'	11.00%	6" UNDERDRAIN



NOTE- DRAINAGE LAYER IS TO BE CONSTRUCTED FROM STATION 6+75 TO STATION 9+70

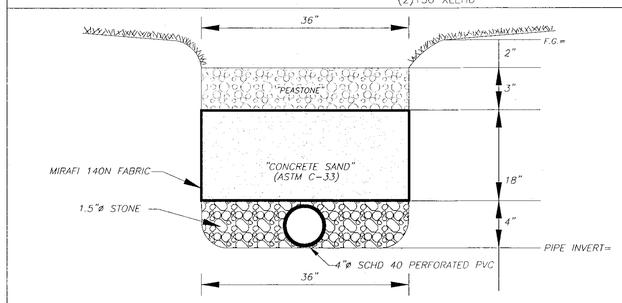
DRAINAGE LAYER DETAIL N.T.S.



NOTES:
- THERE ARE NO POLY LINERS UNDER BEDS 26 & 27 (EXCEPT FIRST 8' OF BOTH ENDS OF CHAMBERS)
- DMH-2, DMH-4C & DMH-19A ARE HIGH FLOW POND OUTLETS (WITH GRATE TOPS). SEE SHEET-7 TABLE FOR ELEVATIONS.
- PROVIDE INSPECTION PORTS (CAPPED PERF 6" ø PVC) AT BED-27. WRAP WITH FABRIC FROM STONE BOTTOM TO CAP AT FG.

CULTEC DETAILS

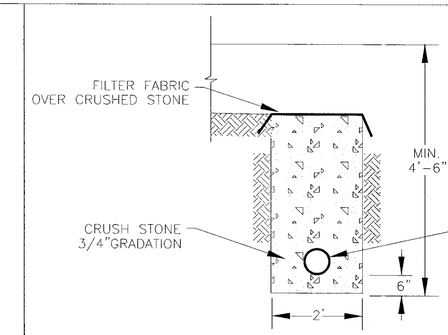
BED #	L'xW'	ROWS	CHAMBERS	A	B	C	ST EL.	D	E	P	OD	OD EL.	DH	DH EL
3	SEE PLAN	8	(64)R-V8HD	347.0	347.5	18"	351.7	3"	6"	15"	15"	349.5	(4)-2"	(2) 347.5,(2) 348.5
4	83.5'x39'	6	(60)R-V8HD	349.5	350.0	61"	356.8	6"	6"	6"	6"	351.0	(3)-2"	349.0
7	87.75'x14.5'	4	(4)150 XLSHD (24)150 XLIHD (4)150 XLEHD	379.8	380.3	6"	381.7	12"	6"	6"	6"	380.8	2"	380.3
12	47'x18'	3	(18)R-V8HD	359.0	359.5	6"	362.7	12"	6"	12"	8"	361.0	2"	359.5
26	34'x10'	(1)	(4)R-V8HD	370.2	370.5	3"	376.2	30"	N/A	N/A	(6" PERF. PIPE FROM DMH-20 AT EL. 370.5)			
27	94.5'x7'	2	(2)150 XLSHD (14)150 XLIHD (2)150 XLEHD	378.5	378.8	0"	378.8	6"	N/A	N/A	(6" PERF. PIPE FROM BED-7 AT EL. 378.8)			



SAND FILTER DETAIL NTS

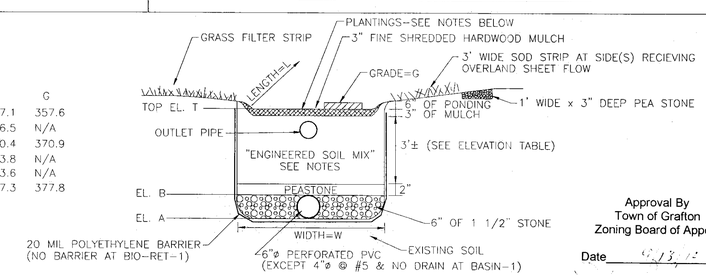
	F.G. EL=*	PIPE INVERT=	LENGTH
SAND FILTER-1	354.2-355.2 (SLOPING)	351.95-352.95	53'
SAND FILTER-2	400.8-401.8 (SLOPING)	398.55-399.55	81'

*SEE PLAN VIEW FOR GRADING



SUBDRAIN DETAIL NTS

BIO-BASIN#	L	W	A	B	ø OUTLET	T	G
1	70'	10'	353.7	354.2	6"-356.5	357.1	357.6
2	70'	10'	353.3	354.1	N/A	356.5	N/A
5	40'	12'	365.3	365.8	N/A	370.4	370.9
6	29'	14'	389.0	389.8	N/A	393.8	N/A
8	40'	12'	390.3	391.1	N/A	393.6	N/A
9	30'	10'	374.7	375.2	N/A	377.3	377.8



BIORETENTION AREA/RAIN GARDEN DETAIL

Approval By
Town of Grafton
Zoning Board of Appeals
Date 6/13/12

(Ref. Comprehensive Permit WDRD Bk.46010 pgs.1-37)

BIORETENTION AREA/RAIN GARDEN NOTES

-GENERAL NOTES
1. BIORETENTION AREA/RAIN GARDEN IS TO BE INSTALLED UPON COMPLETION OF SITE WORK.

-DESIGN NOTES
1. ENGINEERED SOIL MIX FOR BIORETENTION SHOULD BE A MIX OF 40% SAND, 30%-40% COMPOST, & 20%-30% TOPSOIL. THE SAND COMPONENT SHOULD BE GRAVELLY SAND THAT MEETS ASTM C-33 (WASHED CONCRETE SAND): 35% OR LESS OF TOTAL SAND MAY BE GRAVEL; 40-90% OF TOTAL SAND TO BE COARSE AND VERY COARSE SAND; NO GRAVEL OVER 3/4" ø NO GRAVEL IS SMALLER THAN 2MM IN DIAMETER, NO MORE THAN 2% OF TOTAL SAND MY PASS THROUGH A #200 SIEVE. THE TOPSOIL COMPONENT SHALL BE A SANDY LOAM. THE COMPOST COMPONENT MUST BE PROCESSSED FROM YARD WASTE IN ACCORDANCE WITH MASSDEP GUIDELINES. THE COMPOST MAY NOT INCLUDE BIOSOLIDS.
2. THE SOIL MUST BE MIXED UNIFORMLY WITH NO STONES, STUMPS, ROOTS OR SIMILAR OBJECTS LARGER THAN 2"ø. SOIL PH SHOULD GENERALLY BE BETWEEN 5.5-6.5, A RANGE THAT IS OPTIMAL FOR MICROBIAL ACTIVITY AND ADSORPTION OF NITROGEN, PHOSPHORUS, AND OTHER POLLUTANTS.
3. BIORETENTION AREA IS TO BE GRADED TO ALLOW A PONDING DEPTH OF 6" TO 8". THE " ENGINEERED SOIL MIX" SHALL BE COVERED WITH 3" OF FINE SHREDDED HARDWOOD MULCH.
4. THE PLANTINGS SHALL INCLUDE A MIX OF NATIVE HERBACEOUS PERRENIAL, SHRUBS, AND UNDERSTORY TREES THAT CAN TOLERATE INTERMITTENT PONDING, OCASSIONAL SALINE CONDITIONS (DUE TO ROAD SALT), AND EXTENDED DRY PERIODS. SEE TABLE-BA-1 SALT RESISTANT TREES AND SHRUBS
5. BIORETENTION CELLS REQUIRE PRETREATMENT OF STORM WATER BY A STONE OR PEA GRAVEL DIAPHRAGM AND A VEGETATED FILTER STRIP TO SLOW SHEET FLOW AND REMOVE SEDIMENT.

-CONSTRUCTION NOTES
1. DURING CONSTRUCTION, AVOID EXCESSIVELY COMPACTING AROUND THE BIORETENTION AREA AND ACCUMULATING SILT AROUND THE DRAIN FIELD. TO AVOID COMPACTION WORK FROM THE EDGE OF THE PROPOSED AREA.
2. PLACE PLANTING SOILS IN 1-FOOT TO 2-FOOT LIFTS AND COMPACT WITH MINIMAL PRESSSURE.

-MAINTENANCE NOTES
1. INSPECT SOIL & REPAIR ERODED AREAS MONTHLY, REMULCH AREAS AS NEEDED, REMOVE LITTER AND DEBRIS MONTHLY. REMOVE AND REPLACE DEAD VEGETATION TWICE PER YEAR (SPRING AND FALL). REMOVE INVASIVE SPECIES AS NEEDED. REPLACE MULCH EVERY TWO YEARS IN EARLY SPRING.
2. NEVER STORE SNOW ON BIORETENTION AREA. IF SNOW IS PILED ONTO CELLS, RUNOFF MAY BYPASS THE CELL AND RUNOFF INTO THE WETLANDS WITH OUT PRETREATMENT.

Rev: 8/1/12 for ZBA

GRAZ Engineering, LLC
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TEL.: (603) 585-6959 FAX: (603) 585-6960

PROVIDENCE ROAD COMMONS; 195 PROVIDENCE ROAD
40B SITE PLAN- DRAINAGE DETAILS

PREPARED FOR: PROVIDENCE ROAD COMMONS, LLC
43 CORTLAND WAY; GRAFTON, MASSACHUSETTS

Scale: AS NOTED
Drawn By: PFG
Date: OCTOBER 22, 2010
Revised: FEBRUARY 18, 2011
APRIL 5, 2011
MARCH 20, 2012

COMMONWEALTH OF MASSACHUSETTS REGISTERED PROFESSIONAL ENGINEER PAUL F. GRAZ No. 35306 CIVIL

DRAWING SET
SHEET 7 OF 12