

Menu of Solutions



Dry Pond



Wet Retention Pond



Bioretention Cell



Treatment Swale

Permeable Pavers



Gravel Pave Systems

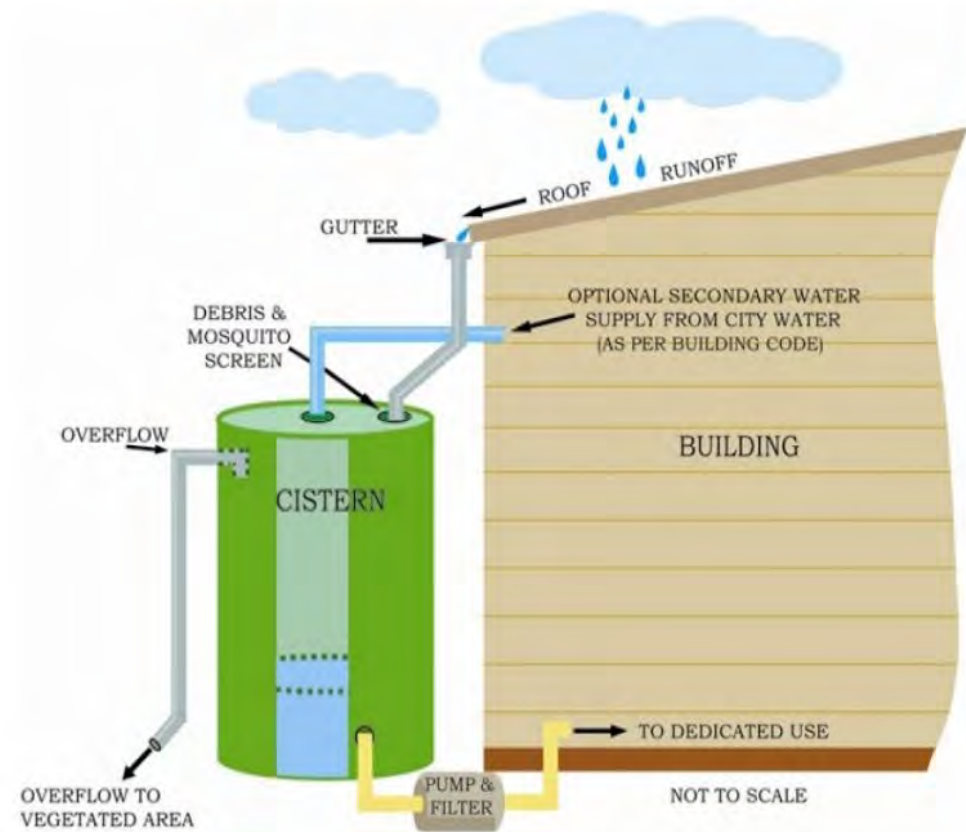


Permeable Concrete



Rainwater Harvesting (RWH)

Figure 1. Example RWH System (NCSU-BAE)



Solutions/Neighborhood

Neighborhood Flooding Focus Area = ~27 ac



Area 1 - Table 1 - Stormwater Control Measures and Costs										
Neighborhood	SCM Number	SCM Option	Street/Location	SCM Size (SF)	SCM Vol/SF	SCM Total Storage Vol (CF)	SCM \$/unit*	SCM Total Cost	SCM \$/CF	Notes
Ocean Pines	1-1A	Dry Detention (dry pond)	Ocean Pines Drive tennis court	5869	1.57	9220	\$10.00	\$58,693.97	\$6.37	
	1-1B	Removal of Pavement	Ocean Pines Drive tennis court	5869	0.50	2935	\$5.00	\$29,347.00	\$10.00	
	1-2	Permeable Pavers	Ocean Pines Drive parking	1707	0.80	1366	\$15.00	\$25,603.50	\$18.75	
Gulls Flight	1-3	Dry detention (1' swale)	Flight Drive	7029	0.50	3515	\$10.00	\$70,293.60	\$20.00	
Sound Sea Village	1-7	Dry Detention (dry pond)	116 & 118 Ocean Bay Blvd	4642	1.57	7292	\$10.00	\$46,420.10	\$6.37	Existing pond expansion
	1-4	Dry detention (1' swale)	Acorn Aak Ave	7205	0.50	3602	\$10.00	\$72,045.60	\$20.00	
	1-5	Dry detention (1' swale)	Sound Sea Ave	5647	0.50	2824	\$10.00	\$56,474.40	\$20.00	
Caffey's Inlet	1-6	Bioretention	Carrol Drive Cul-de-sac median island	935	2.90	2712	\$20.00	\$18,702.40	\$6.90	
		Permeable Pavers	Carrol Drive Cul-de-sac	4118	0.80	3295	\$15.00	\$61,773.15	\$18.75	
		Dry Detention (2' swale)	Carrol Drive Cul-de-sac	1632	1.00	1632	\$10.00	\$16,320.00	\$10.00	
	1-9	Bioretention	114 Carrol Drive Residence	3382	2.90	9808	\$20.00	\$67,640.00	\$6.90	
	1-8	Bioretention	Hillside Ct Cul-de-sac median island	935	2.90	2712	\$20.00	\$18,702.40	\$6.90	
		Dry detention (2' swale)	Hillside Ct	1344	1.00	1344	\$10.00	\$13,440.00	\$10.00	
		Dry detention (1' swale)	Hillside Ct	582	0.50	291	\$10.00	\$5,820.00	\$20.00	
		Permeable Pavers	Hillside Ct	3485	0.80	2788	\$15.00	\$52,268.55	\$18.75	
	1-10	Bioretention	Carrol Drive Cul-de-sac median island	935	2.90	2712	\$20.00	\$18,700.00	\$6.90	
		Permeable Pavers	Carrol Drive Cul-de-sac	3335	0.80	2668	\$15.00	\$50,019.15	\$18.75	
		Dry detention (1' swale)	Carrol Drive Cul-de-sac	776	0.50	388	\$10.00	\$7,757.40	\$20.00	

*Prices sourced from recent construction projects

Note: Area 1 neighborhood focus area = ~27 ac

Area 1 - Table 2 - Rainwater Harvesting and Costs										
Neighborhood	Approx. No. of Units	Rain Barrel Size (gal)	Rain Barrel Volume (CF)	No. of Rain Barrels Per Unit	Total Storage Vol Per Unit (CF)	Storage Provided Per Neighborhood (CF)	Price (4 Barrels w/ Gutters)	Total Neighborhood Cost	SCM \$/CF	Notes
Ocean Pines	34	50	7	4	27	909	\$10,000.00	\$340,000.00	\$374.00	
		125	17	4	67	2273	\$12,500.00	\$425,000.00	\$187.00	
Gulls Flight	19	50	7	4	27	508	\$10,000.00	\$190,000.00	\$374.00	
		125	17	4	67	1270	\$12,500.00	\$237,500.00	\$187.00	
Sound Sea Village	103	50	7	4	27	2754	\$10,000.00	\$1,030,000.00	\$374.00	
		125	17	4	67	6885	\$12,500.00	\$1,287,500.00	\$187.00	
Caffey's Inlet	44	50	7	4	27	1176	\$10,000.00	\$440,000.00	\$374.00	
		125	17	4	67	2941	\$12,500.00	\$550,000.00	\$187.00	

Area 1 - Table 3 - Boring Groundwater Elevation					
Neighborhood	B/HA Name*	FT Below Grade	Existing Grade (FT)	GW Elevation (FT)	Notes
Ocean Pines	B1-1	3.5	5	1.5	
	HA1-1	2.5	5	2.5	
Sound Sea Village	B1-2	4	5	1	
	HA1-2	2.5	5	2.5	

*B = Boring HA = Hand Auger

Neighborhood Flooding Focus Area = ~7 ac



Area 2 - Table 1 - Stormwater Control Measures and Costs										
Neighborhood	SCM Number	SCM Option	Street/Location	SCM Size (SF)	SCM Vol/SF	SCM Total Storage Vol (CF)	SCM \$/unit*	SCM Total Cost	SCM \$/CF	Notes
Poteskeet Village	2-7	Bioretention	Wampum Drive Cul-de-sac median island	935	2.90	2712	\$20.00	\$18,702.40	\$6.90	
		Permeable Pavers	Wampum Drive Cul-de-sac	3857	0.80	3085	\$15.00	\$57,852.60	\$18.75	
		Dry detention (1' swale)	Wampum Drive Cul-de-sac	230	0.50	115	\$10.00	\$2,295.00	\$20.00	
	2-8	Dry detention (2' swale)	Wampum Drive	4762	1.00	4762	\$10.00	\$47,622.00	\$10.00	
Schooner Ridge	2-1A	Dry Detention (dry pond)	0 Schooner Ridge Drive	6013	1.57	9446	\$10.00	\$60,134.30	\$6.37	
	2-6	Dry detention (dry pond)	169 Schooner Ridge Drive	7424	1.57	11662	\$10.00	\$74,240.00	\$6.37	
	2-1B	Permeable Pavers	0 Schooner Ridge Drive	6013	0.80	4811	\$15.00	\$90,201.45	\$18.75	
	2-2	Dry detention (1' swale)	Schooner Ridge Drive	2357	0.50	1178	\$10.00	\$23,565.60	\$20.00	
Duck Landing	2-4B	Dry Detention (dry pond)	Duck Landing Lane tennis court	7076	1.57	11114	\$10.00	\$70,756.57	\$6.37	
	2-4A	Removal of Pavement	Duck Landing Lane parking	2947	0.50	1473	\$5.00	\$14,734.30	\$10.00	
	2-5	Dry detention (2' swale)	Duck Landing Lane	1200	1.00	1200	\$10.00	\$12,000.00	\$10.00	
	2-3	Permeable Pavers	Duck Landing Lane parking	2947	0.80	2357	\$15.00	\$44,202.89	\$18.75	

*Prices sourced from recent construction projects

Note: Area 2 neighborhood focus area = ~7 ac

Area 2 - Table 2 - Rainwater Harvesting and Costs										
Neighborhood	Approx. No. of Units	Rain Barrel Size (gal)	Rain Barrel Volume (CF)	No. of Rain Barrels Per Unit	Total Storage Vol Per Unit (CF)	Storage Provided Per Neighborhood (CF)	Price (4 Barrels w/ Gutters)	Total Neighborhood Cost	SCM \$/CF	Notes
Poteskeet Village	45	50	7	4	27	1203	\$10,000.00	\$450,000.00	\$374.00	
		125	17	4	67	3008	\$12,500.00	\$562,500.00	\$187.00	
Schooner Ridge	101	50	7	4	27	2701	\$10,000.00	\$1,010,000.00	\$374.00	
		125	17	4	67	6751	\$12,500.00	\$1,262,500.00	\$187.00	
Duck Landing	51	50	7	4	27	1364	\$10,000.00	\$510,000.00	\$374.00	
		125	17	4	67	3409	\$12,500.00	\$637,500.00	\$187.00	

Area 2 - Table 3 - Boring Groundwater Elevation					
Neighborhood	B/HA Name*	FT Below Grade	Existing Grade (FT)	GW Elevation (FT)	Notes
Schooner Ridge	B2-1	4.5	8	3.5	
	HA2-1	2.5	7	4.5	
Duck Landing	B2-2	6.5	8	1.5	

*B = Boring HA = Hand Auger

Neighborhood Flooding Focus Area = ~24 ac

Ocean Dunes

Sea Pines

Four Seasons

EMERGENCY
WATER DISCHARGE
PLAN

SCM 3-8
1' SWALE
2' SWALE

SCM 3-1
PERMEABLE PAVERS

EMERGENCY
WATER DISCHARGE
PLAN

SCM 3-2
BIORETENTION

B3-2
Approx. 6" below existing grade.
Trace organics at 9.5' to 10'.

SCM 3-6
BIORETENTION
PERMEABLE PAVERS
1' SWALE

B3-1
Approx. 6" below existing grade.

SCM 3-3
BIORETENTION

SCM 3-7
2' SWALE

HA3-1
Approx. 3.8" below existing grade.

SCM 3-4
BIORETENTION

SCM 3-5
BIORETENTION

HURRICANE MATTHEW IMPACT AREA

**Teresa Ct / Duck Hunt Club
AREA #3**

Legend
● Boring
● Hand Auger w/
Infiltration
— Neighborhood Flooding Focus Area
— Parcel Lines



Area 3 - Table 1 - Stormwater Control Measures and Costs										
Neighborhood	SCM Number	SCM Option	Street/Location	SCM Size (SF)	SCM Vol/SF	SCM Total Storage Vol (CF)	SCM \$/unit*	SCM Total Cost	SCM \$/CF	Notes
Ocean Dunes	3-6	Bioretention	Teresa Court Cul-de-sac	935	2.90	2711.85	\$20.00	\$18,702.40	\$6.90	
		Permeable Pavers	Teresa Court Cul-de-sac	158	0.80	126.58	\$15.00	\$2,373.30	\$18.75	
		Dry detention (1' swale)	Teresa Court Cul-de-sac	1408	0.50	703.89	\$10.00	\$14,077.80	\$20.00	
	3-8	Dry detention (2' swale)	Christopher Drive	6672	1.00	6672.00	\$10.00	\$66,720.00	\$10.00	
		Dry detention (1' swale)	Christopher Drive	3197	0.50	1598.61	\$10.00	\$31,972.20	\$20.00	
Sea Pines	3-2	Bioretention	Scarborough Lane Cul-de-sac median	1808	2.90	5243.26	\$20.00	\$36,160.40	\$6.90	
	3-3	Bioretention	Scarborough Lane Cul-de-sac median	1808	2.90	5243.26	\$20.00	\$36,160.40	\$6.90	
	3-4	Bioretention	Scarborough Lane Cul-de-sac median	1808	2.90	5243.20	\$20.00	\$36,160.00	\$6.90	
	3-5	Bioretention	Scarborough Lane Cul-de-sac median	1808	2.90	5243.20	\$20.00	\$36,160.00	\$6.90	
	3-1	Permeable Pavers	Scarborough Lane Parking	1329	0.80	1063.48	\$15.00	\$19,940.25	\$18.75	
Four Seasons	3-7	Dry detention (2' swale)	Duck Hunt Club Lane	268	1.00	267.68	\$10.00	\$2,676.80	\$10.00	
		Dry detention (1' swale)	Duck Hunt Club Lane	268	0.50	134.00	\$10.00	\$2,680.00	\$20.00	

*Prices sourced from recent construction projects

Note: Area 3 neighborhood focus area = ~24 ac

Area 3 - Table 2 - Rainwater Harvesting and Costs										
Neighborhood	Approx. No. of Units	Rain Barrel Size (gal)	Rain Barrel Volume (CF)	No. of Rain Barrels Per Unit	Total Storage Vol Per Unit (CF)	Storage Provided Per Neighborhood (CF)	Price (4 Barrels w/ Gutters)	Total Neighborhood Cost	SCM \$/CF	Notes
Ocean Dunes	93	50	7	4	27	2487	\$10,000.00	\$930,000.00	\$374.00	
		125	17	4	67	6217	\$12,500.00	\$1,162,500.00	\$187.00	
Sea Pines	67	50	7	4	27	1791	\$10,000.00	\$670,000.00	\$374.00	
		125	17	4	67	4479	\$12,500.00	\$837,500.00	\$187.00	
Four Season	134	50	7	4	27	3583	\$10,000.00	\$1,340,000.00	\$374.00	
		125	17	4	67	8957	\$12,500.00	\$1,675,000.00	\$187.00	

Area 3 - Table 3 - Boring Groundwater Elevation					
Neighborhood	B/HA Name*	FT Below Grade	Existing Grade (FT)	GW Elevation (FT)	Notes
Sea Pines	B3-1	6	9	3	Trace organics at 9.5' to 10'
	B3-2	6	9	3	
Four Seasons	HA3-1	3.8	8	4.2	

*B = Boring HA = Hand Auger

Neighborhood Flooding Focus Area = ~14 ac

Duck Blind
Villas

Georgetown
Sands

Sand Dollar
Shores

Sea Hawk

SCM 4-9
BIORETENTION
PERMEABLE PAVERS
2' SWALE

SCM 4-1
PERMEABLE PAVERS

SCM 4-2A
BIORETENTION
SCM 4-2B
PERMEABLE PAVERS

SCM 4-3
PERMEABLE PAVERS

SCM 4-5
2' SWALES

SCM 4-7
1' SWALE

SCM 4-7
2' SWALE

SCM 4-4
BIORETENTION
AND
PERMEABLE PAVERS

SCM 4-6A
BIORETENTION
SCM 4-6B
PERMEABLE PAVERS

HA4-1
Approx. 3.8' below existing
grade.

SCM 4-8
DRY DETENTION

B4-2
Approx. 6' below existing
grade.

LP

LP

LP

Georgetown Sands AREA #4

Legend

- Boring
- Hand Auger w/ Infiltration
- Neighborhood Flooding Focus Area
- Parcel Lines

TOWN OF DUCK
NORTH CAROLINA

vhb
Village Home Builders

Area 4 - Table 1 - Stormwater Control Measures and Costs										
Neighborhood	SCM Number	SCM Option	Street/Location	SCM Size (SF)	SCM Vol/SF	SCM Total Storage Vol (CF)	SCM \$/unit*	SCM Total Cost	SCM \$/CF	Notes
Duck Blind Villas	4-1	Permeable Pavers	Plover Drive	10349	0.80	8279.18	\$15.00	\$155,234.54	\$18.75	
	4-9	Bioretention	Plover Drive Cul-de-sac median island	935	2.90	2711.50	\$20.00	\$18,700.00	\$6.90	
		Dry detention (2' swale)	Plover Drive Cul-de-sac	2080	1.00	2080.07	\$10.00	\$20,800.68	\$10.00	
		Permeable Pavers	Plover Drive Cul-de-sac	2343	0.80	1874.03	\$15.00	\$35,138.10	\$18.75	
Georgetown Sands	4-8	Dry detention (dry pond)	Georgetown Sands Road Condos	12962	1.57	20360.66	\$10.00	\$129,620.00	\$6.37	
	4-2A	Bioretention	Georgetown Sands Road Condos	1024	2.90	2969.60	\$20.00	\$20,480.00	\$6.90	
	4-6A	Bioretention	Georgetown Sands Road Condos	788	2.90	2286.33	\$20.00	\$15,767.80	\$6.90	
	4-4	Bioretention	Georgetown Sands Road Condos	2680	2.90	7772.00	\$20.00	\$53,600.00	\$6.90	
		Permeable Pavers	Georgetown Sands Road Condos	1361	0.80	1088.80	\$15.00	\$20,415.00	\$18.75	
	4-6B	Permeable Pavers	Georgetown Sands Road Condos	788	0.80	630.40	\$15.00	\$11,820.00	\$18.75	
	4-2B	Permeable Pavers	Georgetown Sands Road Condos	1024	0.80	819.20	\$15.00	\$15,360.00	\$18.75	
	4-3	Permeable Pavers	Georgetown Sands Road Condos	968	0.80	774.66	\$15.00	\$14,524.80	\$18.75	
Sand Dollar Shores	4-5	Dry detention (2' swale)	Sea Breeze Drive	15920	1.00	15920.16	\$10.00	\$159,201.60	\$10.00	
Sea Hawk	4-7	Dry detention (2' swale)	Seahawk Drive	350	1.00	350.00	\$10.00	\$3,500.00	\$10.00	
		Dry detention (1' swale)	Seahawk Drive	387	0.50	193.57	\$10.00	\$3,871.40	\$20.00	

*Prices sourced from recent construction projects

Note: Area 4 neighborhood focus area = ~14 ac

Area 4 - Table 2 - Rainwater Harvesting and Costs										
Neighborhood	Approx. No. of Units	Rain Barrel Size (gal)	Rain Barrel Volume (CF)	No. of Rain Barrels Per Unit	Total Storage Vol Per Unit (CF)	Storage Provided Per Neighborhood (CF)	Price (4 Barrels w/ Gutters)	Total Neighborhood Cost	SCM \$/CF	Notes
Duck Blind Villas	28	50	7	4	27	749	\$10,000.00	\$280,000.00	\$374.00	
		125	17	4	67	1872	\$12,500.00	\$350,000.00	\$187.00	
Georgetown Sands	51	50	7	4	27	1364	\$10,000.00	\$510,000.00	\$374.00	
		125	17	4	67	3409	\$12,500.00	\$637,500.00	\$187.00	
Sand Dollar Shores	44	50	7	4	27	1176	\$10,000.00	\$440,000.00	\$374.00	
		125	17	4	67	2941	\$12,500.00	\$550,000.00	\$187.00	
Sea Hawk	44	50	7	4	27	1176	\$10,000.00	\$440,000.00	\$374.00	
		125	17	4	67	2941	\$12,500.00	\$550,000.00	\$187.00	

Area 4 - Table 3 - Boring Groundwater Elevation					
Neighborhood	B/HA Name*	FT Below Grade	Existing Grade (FT)	GW Elevation (FT)	Notes
Georgetown Sands	B4-1	5	6	1	
	HA4-1	3.8	8	4.2	
Sea Hawk	B4-2	5	7	2	

*B = Boring HA = Hand Auger

Neighborhood Flooding Focus Area = ~8 ac

The Tides

Bias Shores

Ocean Crest

SCM 5-1A
PERMEABLE PAVERS
SCM 5-1B
REMOVAL OF PAVEMENT
SCM 5-1C
BIORETENTION

SCM 5-4
PERMEABLE PAVERS
2 SWALE
BIORETENTION

SCM 5-2
2 SWALE

SCM 5-5
2 SWALE

HA5-2
Approx. 3.5' below existing grade.

SCM 5-3
PERMEABLE PAVERS
2 SWALE
BIORETENTION

B5-1
Approx. 4' below existing grade.

B5-2
Approx. 3' below existing grade.

EMERGENCY
WATER DISCHARGE
PLAN

HP

LP

LP

LP

LP






HP

LP

LP

Ocean Crest AREA #5

Legend

-  Boring
-  Hand Auger w/ Infiltration
-  Neighborhood Flooding Focus Area
-  Parcel Lines
-  Town of Duck Boundary



Area 5 - Table 1 - Stormwater Control Measures and Costs										
Neighborhood	SCM Location	SCM Option	Street/Location	SCM Size (SF)	SCM Vol/SF	SCM Total Storage Vol (CF)	SCM \$/unit	SCM Total Cost	SCM \$/CF	Notes
The Tides	5-1C	Bioretention	Tides Drive	109	2.90	317	\$20.00	\$2,188.70	\$6.90	
	5-1B	Removal of Pavement	Tides Drive	5379	0.50	2690	\$5.00	\$26,896.20	\$10.00	
	5-1A	Permeable Pavers	Tides Drive	5379	0.80	4303	\$15.00	\$80,688.63	\$18.75	
Bias Shores	5-2	Dry detention (2' swale)	Bias Lane	258	1.00	258	\$10.00	\$2,579.80	\$10.00	
	5-4	Bioretention	Bias Lane Cul-de-sac median island	147	2.90	426	\$20.00	\$2,940.00	\$6.90	
		Dry detention (2' swale)	Bias Lane Cul-de-sac	1968	1.00	1968	\$10.00	\$19,680.00	\$10.00	
		Permeable Pavers	Bias Lane Cul-de-sac	4143	0.80	3314	\$15.00	\$62,145.00	\$18.75	
Ocean Crest	5-3	Bioretention	Vivian Court Cul-de-sac median island	147	2.90	427	\$20.00	\$2,948.04	\$6.90	
		Dry detention (2' swale)	Vivian Court Cul-de-sac	276	1.00	276	\$10.00	\$2,755.38	\$10.00	
		Permeable Pavers	Vivian Court Cul-de-sac	4143	0.80	3314	\$15.00	\$62,144.73	\$18.75	
	5-5	Dry detention (2' swale)	E Charles Jenkins Lane	4775	1.00	4775	\$10.00	\$47,745.60	\$10.00	

*Prices sourced from recent construction projects

Note: Area 4 neighborhood focus area = ~8 ac

Area 5 - Table 2 - Rainwater Harvesting and Costs										
Neighborhood	Approx. No. of Units	Rain Barrel Size (gal)	Rain Barrel Volume (CF)	No. of Rain Barrels Per Unit	Total Storage Vol Per Unit (CF)	Storage Provided Per Neighborhood (CF)	Price (4 Barrels w/ Gutters)	Total Neighborhood Cost	SCM \$/CF	Notes
The Tides	9	50	7	4	27	241	\$10,000.00	\$90,000.00	\$374.00	
		125	17	4	67	602	\$12,500.00	\$112,500.00	\$187.00	
Bias Shores	18	50	7	4	27	481	\$10,000.00	\$180,000.00	\$374.00	
		125	17	4	67	1203	\$12,500.00	\$225,000.00	\$187.00	
Ocean Crest	38	50	7	4	27	1016	\$10,000.00	\$380,000.00	\$374.00	
		125	17	4	67	2540	\$12,500.00	\$475,000.00	\$187.00	

Area 5 - Table 3 - Boring Groundwater Elevation					
Neighborhood	B/HA Name*	FT Below Grade	Existing Grade (FT)	GW Elevation (FT)	Notes
Bias Shoes	B5-1	4	6	2	
Ocean Crest	B5-2	3	6	3	
	HA5-1	3.5	6	2.5	

*B = Boring HA = Hand Auger

Existing Drain Field Locations

Area No.	Neighborhood	Address	Notes
1	Ocean Pines	Ocean Pines Drive	open space adjacent to Tennis Court
	Sound Sea Village	109 Ocean Bay Boulevard	
		110 B Sound Sea Avenue	
	Caffey's Inlet	108 Carrol Drive	
		127 Hillside Court	
4	Duck Blind Villas	134 Plover Drive	
	Georgetown Sands	135 Georgetown Sands Road	
		131 Georgetown Sands	
		127 Georgetown Sands	
		123 Georgetown Sands	