



Case Study

Barrier Island Study Center

LID Retrofit

Bald Head Island, North Carolina

Nick Laretta, PE, LEED AP®

Owner: Bald Head Island Conservancy & Smith Island Trust

Architect: Jay DeChesere Architect

Engineer: McKim & Creed

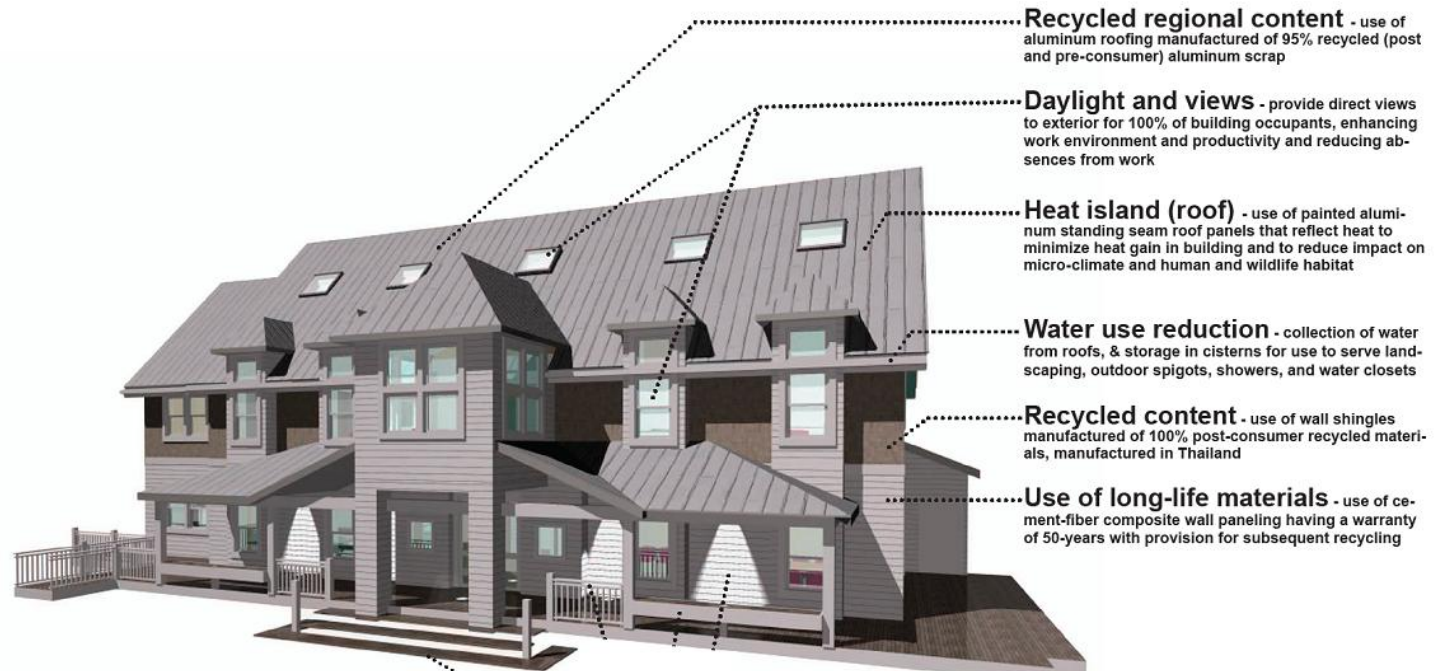
Landscape Architect: B+O Design Studio

Contractor: Adams Southeastern Construction



Designed LEED Platinum

Barrier Island Study Center



Recycled regional content - use of aluminum roofing manufactured of 95% recycled (post and pre-consumer) aluminum scrap

Daylight and views - provide direct views to exterior for 100% of building occupants, enhancing work environment and productivity and reducing absences from work

Heat island (roof) - use of painted aluminum standing seam roof panels that reflect heat to minimize heat gain in building and to reduce impact on micro-climate and human and wildlife habitat

Water use reduction - collection of water from roofs, & storage in cisterns for use to serve landscaping, outdoor spigots, showers, and water closets

Recycled content - use of wall shingles manufactured of 100% post-consumer recycled materials, manufactured in Thailand

Use of long-life materials - use of cement-fiber composite wall paneling having a warranty of 50-years with provision for subsequent recycling



Introduction

The Barrier Island Study Center represented the last phase of development of the Bald Head Island Conservancy site. The first phase of the project, which consisted of the core of three [of four] buildings, plus one existing small Generator Building, was constructed in the late 1990's.

A Low-Density Stormwater Permit (Permit SW8 950824), was issued on 18 September 1995 as part of the Major CAMA Permit to Bald Head Island Ltd. The Conservancy site was donated to them by Bald Head Island Ltd .

The Low-Density Stormwater Permit was not updated or modified during the first phase of the project, as the Conservancy and the Village of Bald Head Island were unaware of this permit or the need to update or modify it.

During the final review of the project, the Bald Head Architectural Review Committee brought the Stormwater Permit to the attention of the Conservancy's architect. The stormwater issue needed to be resolved before final approval and building permits could be obtained.



Existing Conditions



OVERLAYS

ZONE	HS-20
FRONT	30'
SIDE	0'
REAR	10'
CORNER LOTS	15'
REAR	10'

NOTES

*THE PLATTED TRACT IS IN FLOOD ZONE "A" FIRM 270200200 & DATED 6-15-06. *THE FLOOD MAPS ARE BASED ON N.A.V.D. 1988. *ALL ELEVATIONS ARE BASED ON N.A.V.D. 1988.

SHEET NOTES

1. EXISTING UTILITIES AND STRUCTURES SHOWN, BOTH UNDERGROUND AND ABOVE, ARE BASED ON A FIELD SURVEY PROVIDED ON MAY 01, 2008 BY WENDELL B. RAVENEL - BRUNSWICK SURVEYING. THE CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES, UNDERGROUND LINES AND STRUCTURES AS NECESSARY TO AVOID DAMAGING OR DESTROYING EXISTING SERVICES.

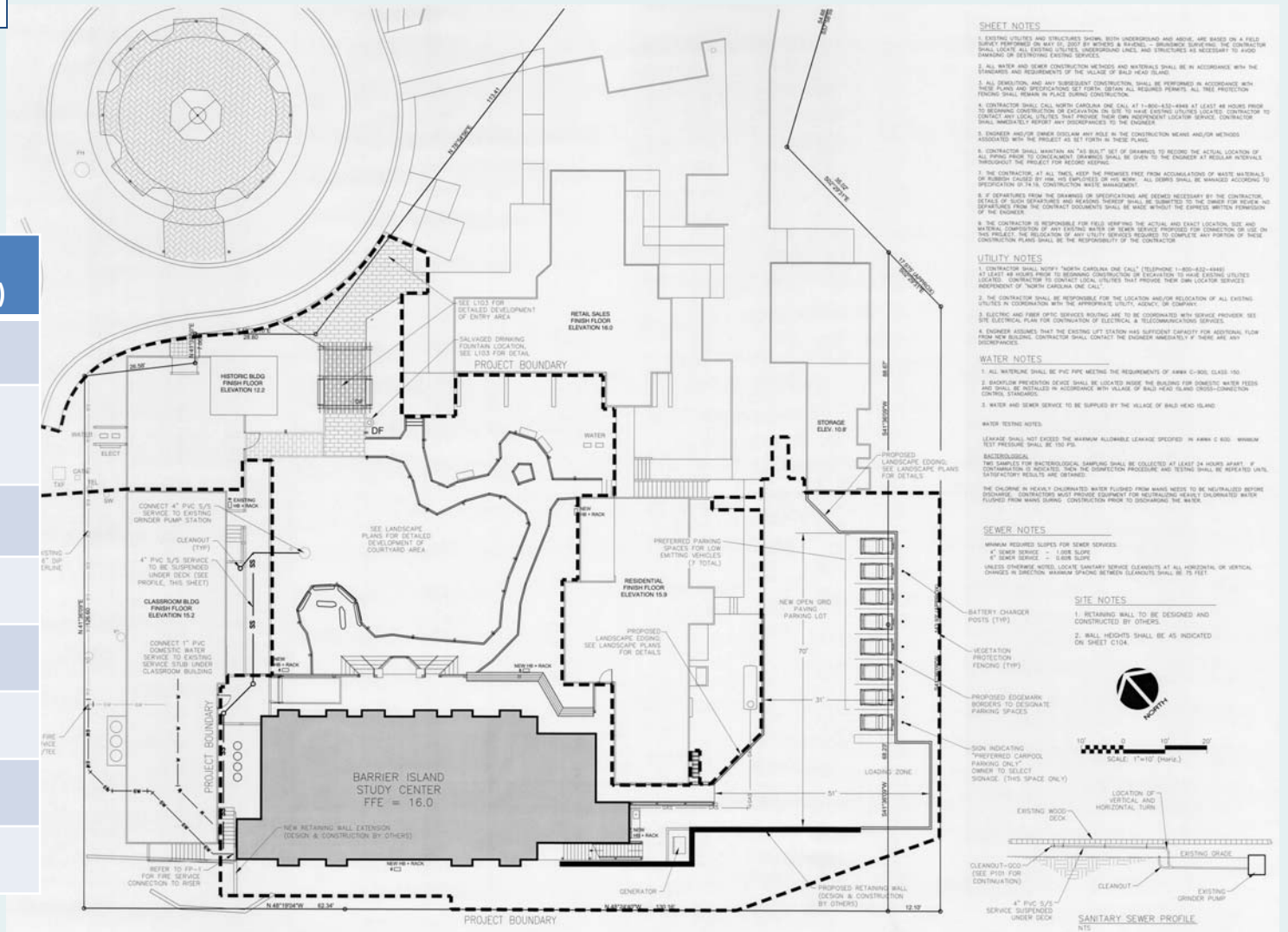
Existing Impervious Area (Built-Up-on-Area)	
Land Use	Area (sf)
Buildings & Overhangs	8,141
Gravel Parking	3,012
Concrete	1392
Total =	12,545
Site Area =	37,739
Imp. % =	33.2%
Allow Imp. % (Low Density)	30%





Proposed Development

Proposed Impervious Area (Built-Upon-Area)	
Land Use	Area (sf)
Buildings & Overhangs	11,782
Gravel Parking	3,012
Concrete	2,328
Pavers	2,872
Total =	19,994
Site Area =	37,739
Imp. % =	53.0%



- SHEET NOTES**
- EXISTING UTILITIES AND STRUCTURES SHOWN, BOTH UNDERGROUND AND ABOVE, ARE BASED ON A FIELD SURVEY PERFORMED ON MAY 10, 2007 BY WITHERS & BAUVEL - GEOTECHNICAL SERVICES. THE CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES, UNDERGROUND LINES, AND STRUCTURES AS NECESSARY TO PROCEED.
 - ALL WATER AND SEWER CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH THE STANDARDS AND REQUIREMENTS OF THE VILLAGE OF BALD HEAD ISLAND.
 - ALL DEMOLITION AND ANY SUBSEQUENT CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS SET FORTH. OBTAIN ALL REQUIRED PERMITS. ALL TREE PROTECTION FENCING SHALL REMAIN IN PLACE DURING CONSTRUCTION.
 - CONTRACTOR SHALL CALL NORTH CAROLINA ONE CALL AT 1-800-452-4848 AT LEAST 48 HOURS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION IN THE AREA WHERE EXISTING UTILITIES LOCATED. CONTRACTOR TO CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN INDEPENDENT LOCATION SERVICE. CONTRACTOR SHALL IMMEDIATELY REPORT ANY DISCREPANCIES TO THE ENGINEER.
 - ENGINEER AND/OR OWNER DISCLAIM ANY ROLE IN THE CONSTRUCTION METHOD AND/OR METHODS ADOPTED WITH THE PROJECT AS SET FORTH IN THESE PLANS.
 - CONTRACTOR SHALL MAINTAIN AS FAR AS PRACTICABLE THE ACTUAL LOCATION OF ALL FINISHED FLOOR ELEVATIONS. DRAWINGS SHALL BE GIVEN TO THE ENGINEER AT REGULAR INTERVALS THROUGHOUT THE PROJECT FOR REVIEW KEEPING.
 - THE CONTRACTOR, AT ALL TIMES, KEEP THE PREMISES FREE FROM ACCUMULATIONS OF WASTE MATERIALS OR DEBRIS CAUSED BY HIM, HIS EMPLOYEES OR HIS SUPPLIERS. ALL DEBRIS SHALL BE MANAGED ACCORDING TO SPECIFICATION 07.14.16, CONSTRUCTION WASTE MANAGEMENT.
 - IF ANY DISCREPANCIES FROM THE DRAWINGS OR SPECIFICATIONS ARE DETECTED NECESSARY BY THE CONTRACTOR, NOTIFY US IMMEDIATELY. ANY DISCREPANCIES SHOULD BE SUBMITTED TO THE ENGINEER FOR REVIEW AND CORRECTION. THE CONTRACT DOCUMENTS SHALL BE MADE UPON THE EXPRESS WRITTEN PERMISSION OF THE ENGINEER.
 - THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING THE ACTUAL AND EXACT LOCATION, SIZE AND WATER CAPACITY OF ALL GAS AND OTHER UTILITIES. ALL DEBRIS RESULTING FROM CONSTRUCTION OR USE ON THE PROJECT IS THE RESPONSIBILITY OF ANY PARTY SERVING. TO COMPLETE ANY PORTION OF THESE CONSTRUCTION PLANS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

- UTILITY NOTES**
- CONTRACTOR SHALL NOTIFY "NORTH CAROLINA ONE CALL" (TELEPHONE 1-800-452-4848) AT LEAST 48 HOURS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. CONTRACTOR TO CONTACT LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCAL SERVICE REPRESENTATIVE OF NORTH CAROLINA ONE CALL.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND/OR RELOCATION OF ALL EXISTING UTILITIES IN ACCORDANCE WITH THE APPROPRIATE UTILITIES AGENCIES OR COMPANY.
 - ELECTRIC AND FIBER OPTIC SERVICES MOVING ARE TO BE COORDINATED WITH SERVICE PROVIDER. SEE SITE ELECTRICAL PLAN FOR CONTRACTOR OF ELECTRICAL & TELECOMMUNICATIONS SERVICES.
 - ENGINEER ADVISES THAT THE EXISTING LOT ELEVATION HAS SUFFICIENT CLEARANCE FOR ADDITIONAL TUM FROM NEW BUILDING. CONTRACTOR SHALL CONTACT THE ENGINEER IMMEDIATELY IF THERE ARE ANY DISCREPANCIES.

- WATER NOTES**
- ALL WATERLINE SHALL BE PVC PIPE MEETING THE REQUIREMENTS OF ASTM C-300, CLASS 140.
 - BACKFLOW PREVENTION DEVICE SHALL BE LOCATED UNDER THE BUILDING FOR DOMESTIC WATER FEEDS AND SHALL BE INSTALLED IN ACCORDANCE WITH VILLAGE OF BALD HEAD ISLAND CROSS-CONNECTION CONTROL STANDARDS.
 - WATER AND SEWER SERVICE TO BE SUPPLIED BY THE VILLAGE OF BALD HEAD ISLAND.
- WATER TESTING NOTES**
- LEAKAGE SHALL NOT EXCEED THE MAXIMUM ALLOWABLE LEAKAGE SPECIFIED IN ASTM C 800. MINIMUM TEST PRESSURE SHALL BE 100 PSI.

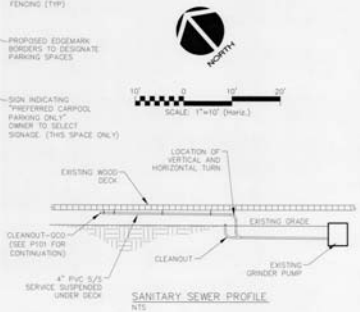
BACTERIOLOGICAL

THE SAMPLES FOR BACTERIOLOGICAL SAMPLING SHALL BE COLLECTED AT LEAST 24 HOURS APART, IF INFORMATION OR INDICATES THAT THE CONSTRUCTION PROCEDURE AND TESTING SHALL BE REPEATED UNTIL SATISFACTORY RESULTS ARE OBTAINED.

THE CHLORINE IN HEAVILY CONTAMINATED WATER FLOWING FROM MAINS NEEDS TO BE NEUTRALIZED BEFORE PROVIDING. CONTRACTORS MUST PROVIDE EQUIPMENT FOR NEUTRALIZING HEAVILY CONTAMINATED WATER FLOWING FROM MAINS DURING CONSTRUCTION PRIOR TO SHOWING THE WATER.

- SEWER NOTES**
- MINIMUM REQUIRED SLOPES FOR SEWER SERVICES:
- 4" SEWER SERVICE - 1/8" PER SLOPE
 - 6" SEWER SERVICE - 1/4" PER SLOPE
- UNLESS OTHERWISE NOTED, LOCATE SANITARY SERVICE CLEANOUTS AT ALL HORIZONTAL OR VERTICAL CHANGES IN DIRECTION. MAXIMUM SPACING BETWEEN CLEANOUTS SHALL BE 75 FEET.

- SITE NOTES**
- RETAINING WALL TO BE DESIGNED AND CONSTRUCTED BY OTHERS.
 - WALL HEIGHTS SHALL BE AS INDICATED ON SHEET C104.





LID-EZ

Stormwater Management Plan

Project #: 5098-0001
 Date: 11/30/09
 Designer: Nick Lauretta, PE



PROPOSED STORAGE DEVICES

Enter only runoff volume below that will be infiltrated or drawn down over 2 to 5 days. Additional volume provided in devices should not be entered in this worksheet. Drawdown time requirement applies to all storm events.

#	Name	Location	Type of Device	Storage Volume Provided (ft ³)	Impervious Area (ac.)	D.S BMP #	% of Total Imp. Area	Required Storage (cf)	% of Storage Provided
1	BMP A		Cistern	978	0.121		28.14%	978.00	100%
2	BMP B		Bioretention	177	0.025		5.81%	164.00	108%
3	BMP C		Bioretention	192	0.035		8.14%	191.00	101%
4	BMP D		Bioretention	254	0.044		10.23%	247.00	103%
5	BMP E		Infiltration Trench	499	0.092		21.40%	495.00	101%
6	BMP F		Infiltration Trench	613	0.114		26.51%	602.00	102%
7									
8									
9									
10									
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16									
17									
18									
19									
20									

PEAK FLOW CALCULATIONS

	Pre-Dev	Post-Dev	Increase
Q _{1-year} =	0.18 cfs	0.00 cfs	-100.0%
Q _{2-year} =	0.37 cfs	0.05 cfs	-87.6%
Q _{10-year} =	1.15 cfs	0.92 cfs	-20.1%
Q _{25-year} =	1.81 cfs	1.29 cfs	-28.7%
Q _{50-year} =	2.26 cfs	2.05 cfs	-9.3%
Q _{100-year} =	2.73 cfs	2.59 cfs	-5.3%

Eff. WQ Treatment Volume Provided: 2,713 ft³

Total Impervious Treated: 100.00%

Calculate Removal

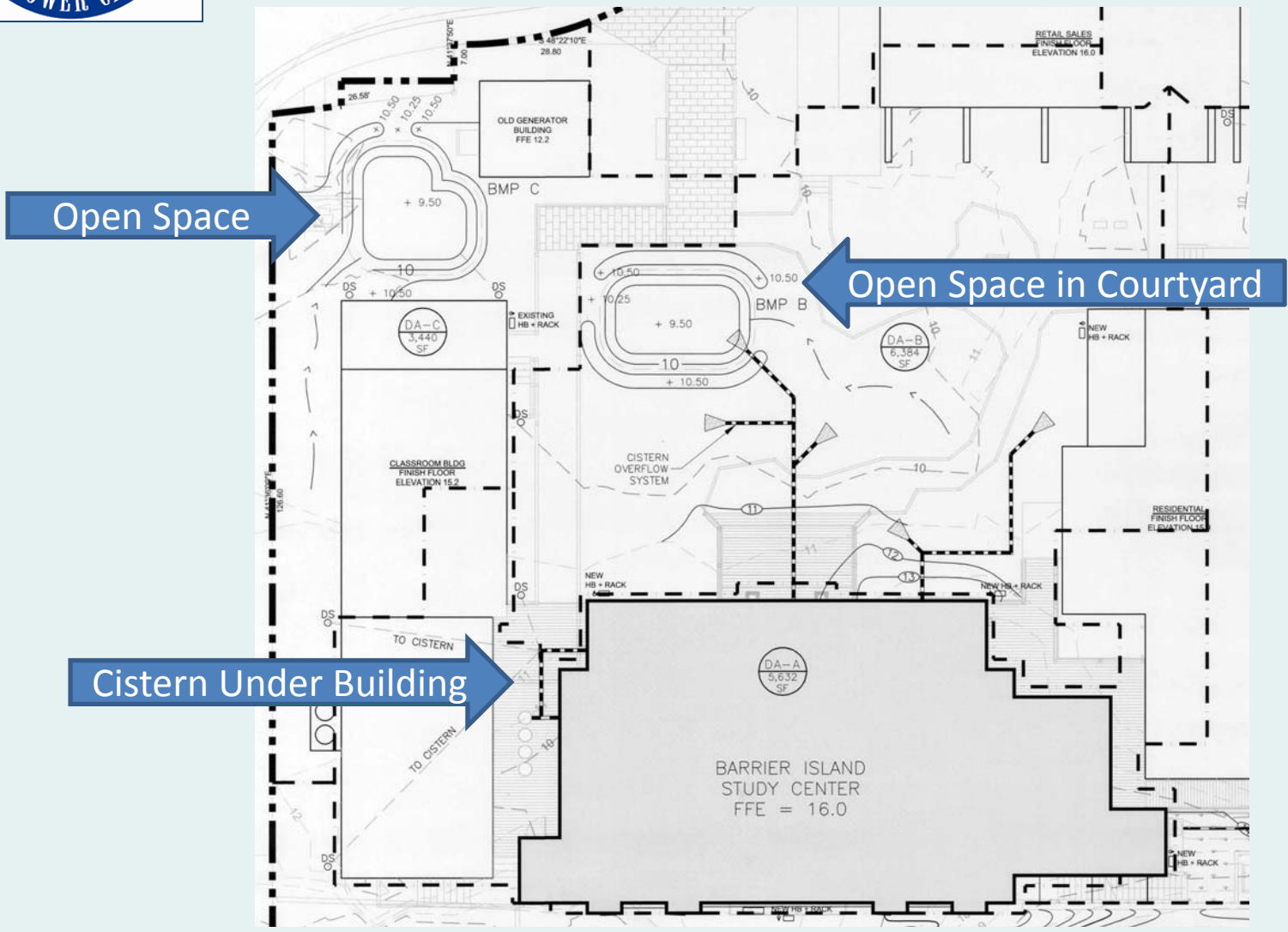
Minimum Required Volume for First Flush: 960 ft³

Minimum Volume Required to Meet Δ 1-yr Runoff Volume Requirements: 523 ft³

Net Pollutant Removal (%)	Target %
TSS	64.2
TN	25.3
TP	31.8
Fecal	Med
Temp Concern	Low

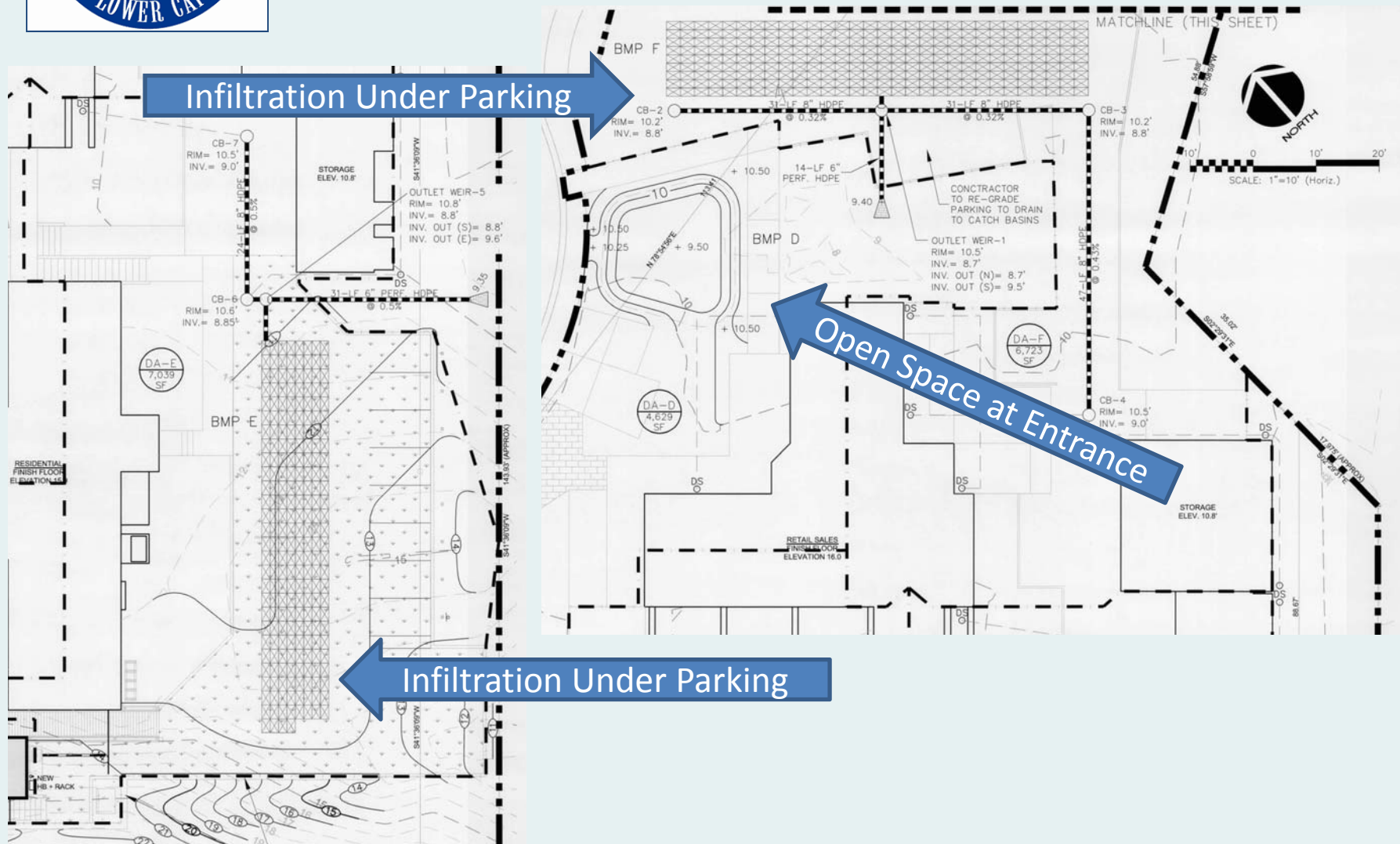


Siting LID BMPs



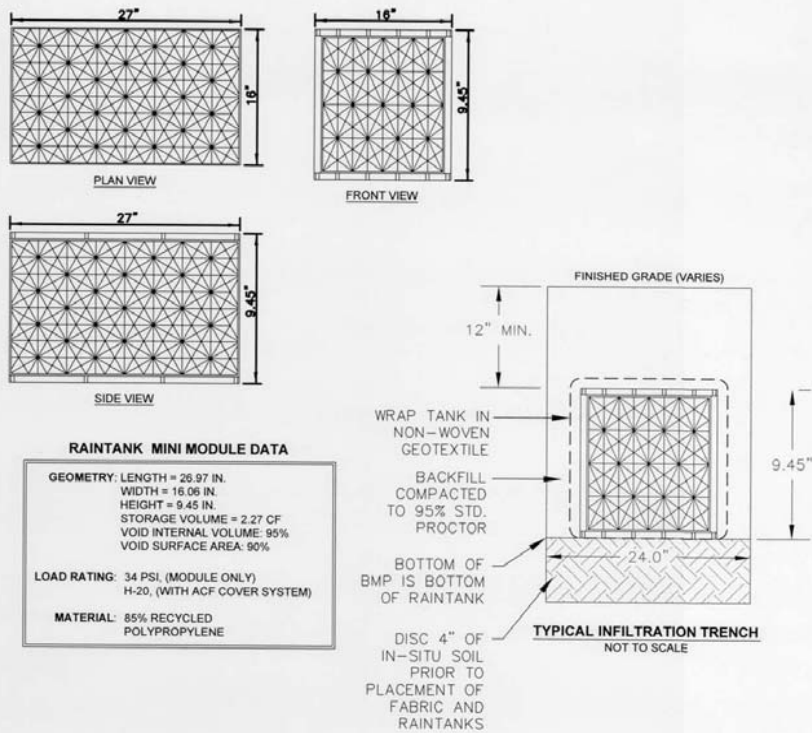


Siting LID BMPs





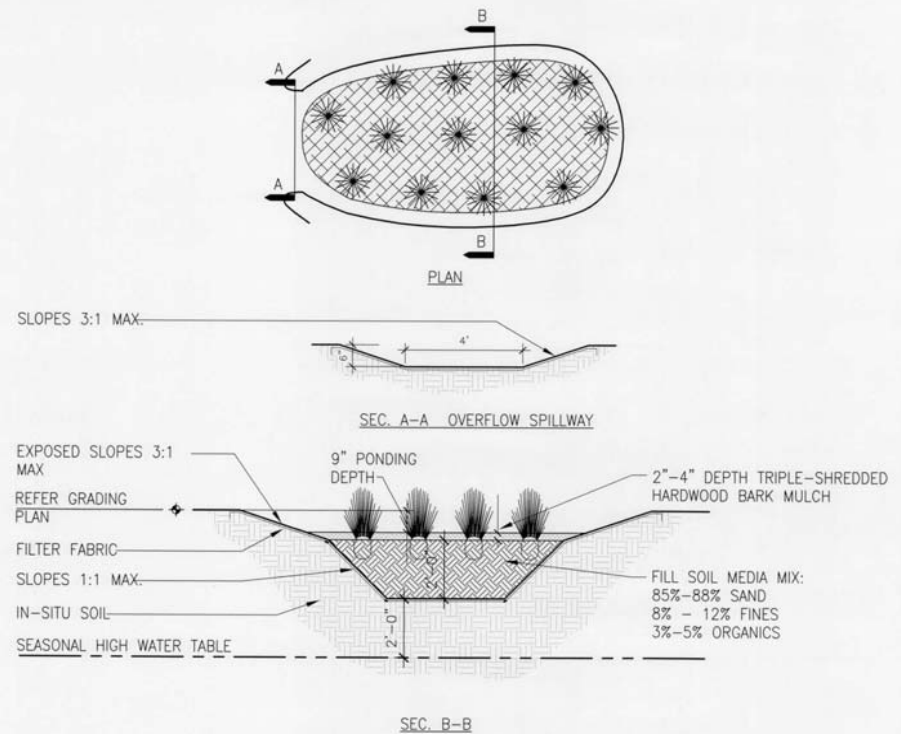
Details



INFILTRATION TRENCH DETAIL

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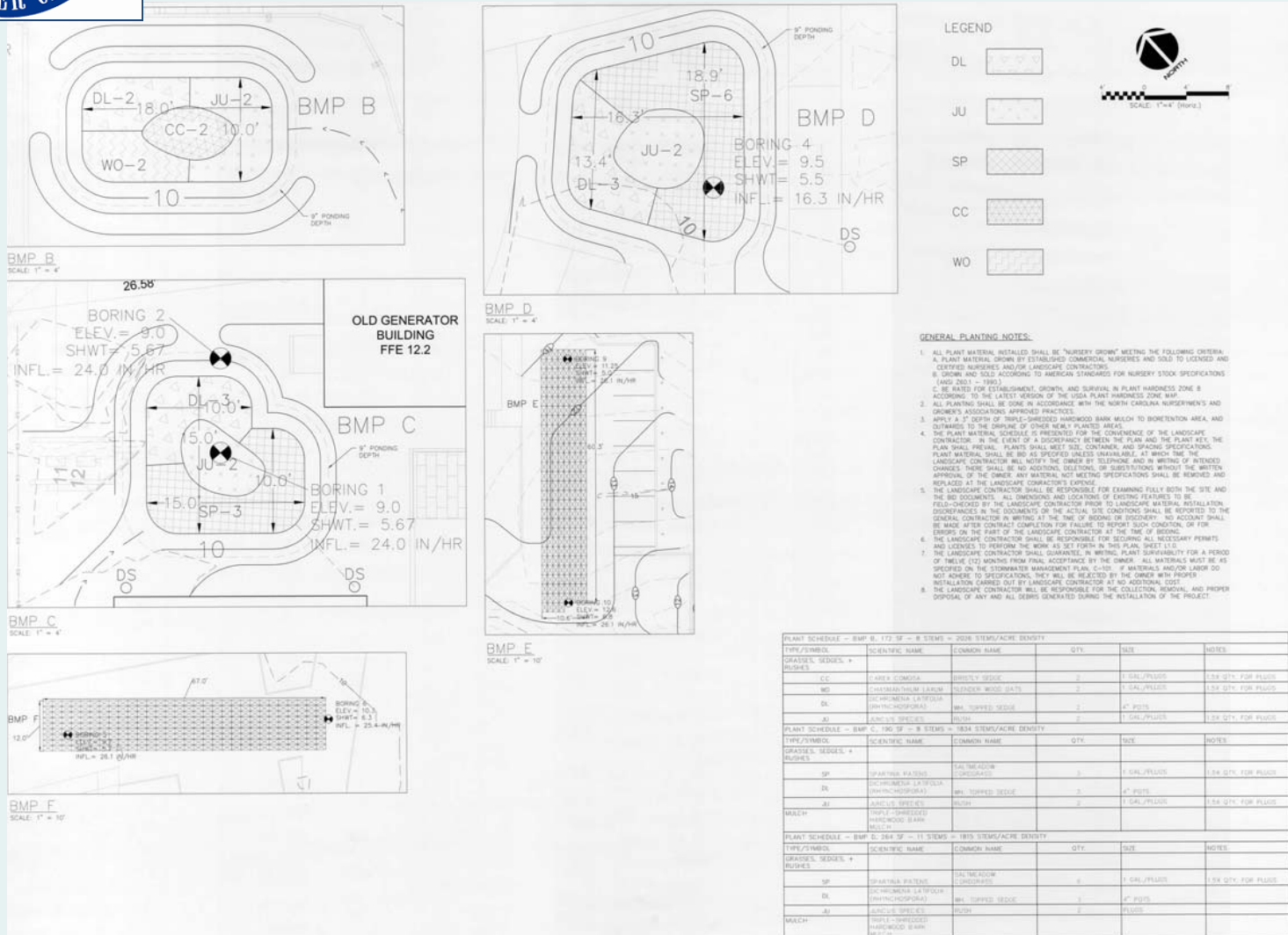
BIORETENTION FILTER

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Landscaping





Construction Cost

LID Retrofit Costs

Item	Cost
Cistern (BMP A)	\$19,685.28 (Material and Labor) Including Valves and Piping
Bioretention B and C Infiltration E	\$25,128.00 (Material and Labor)
Bioretention D Infiltration F	\$34,895.00 (Material and Labor)
Total	\$79,708.28
Cost/CF Storage (2,713 CF)	\$29.38/CF

