Deck Extension Design: Philip Merrill Environmental Center Chesapeake Bay Foundation

ChesBay1
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Problem Statement

Aerial View of Project Site - 6 Herndon Ave, Annapolis, MD

The Philip Merrill Environmental Center (PMEC), owned by the Chesapeake Bay Foundation, is located at 6 Herndon Ave in Annapolis, MD. It offers reservable event spaces, including a tented deck and beachside venue.

The current configuration of the PMEC presents several operational challenges that impact event efficiency and safety. Event caterers are required to transport heavy equipment through an indirect and extensive path which reduces preparation efficiency and increases labor demands. Additionally, the tented deck, classified as a temporary structure, must be seasonally dismantled, creating safety risks for facilities staff. The existing venue also lacks sufficient space for optimal catering, workflow, and guest accommodation.

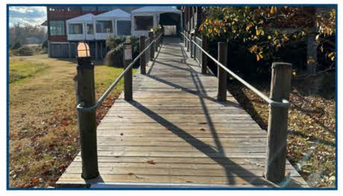
The goal of this project was to design a new ramp, extend the existing deck, and introduce a permanent heavy timber structure.

The ChesBay1 team created a design that improved access, safety, and capacity of the PMEC building, while adhering to environmental and regulatory constraints specific to the Chesapeake Bay area. All new features were designed in alignment with proper codes, design standards, and regulations.

Base Conditions

Southwest View - Event Deck and Auxiliary Building Access

Southeast View - Main Event Deck and Temporary Tent

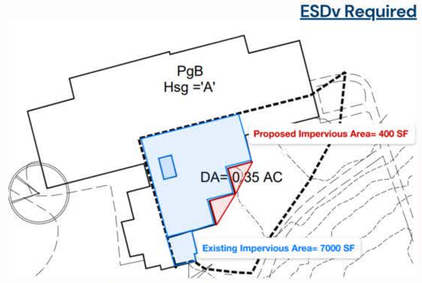


East View - Main Event Deck and Ramp

Environmental Analysis

Given that this project is located within the **Critical Area (CA),** Environmental Analysis was crucial to ensure that our design adhered to CA regulations and Pre-Approved Anne Arundle SWM practices and procedures.
The Anne Arundle County Stormwater Management Practices and Procedures, Chapter 7 require that a Best Management Practice (BMP) must be based on the following: **ESDv, CPv, Qp, and WQv**

ESDv Required



Aerial View DA and Impervious Fraction(s)

ESDv Required

DA (AC) = 0.35
Ex Impervious Area (SF) = 7000
Prop. Impervious Areav (SF) = 400
ESDv = (PE)(Rv)(A)/12
ESDv Required (CF) = 1113.91

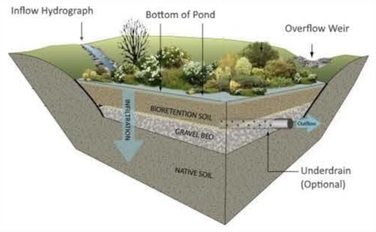
CPv and Preliminary Pond Sizing

Use Classification	Maximum Hours Allowable
Use I (general)	24
Use II (tidal)	N/A (if direct discharge)
Use III (reproducing trout)	12
Use IV (recreational trout)	12

Our project is located along the lower Chesapeake Bay and is classified under the Use II classification; therefore, Channel Protection Volume (CPv) measures for quantity attenuation are not required.

For our SWM BMP we selected the M6-Microbioretention Pond. The benefits of using this BMP are as follows:

- Optimal for space
- Topography of site aligns with M6 criteria (<5% slope)
- Site contains sandy soils which is great for groundwater recharge
- Simple Design

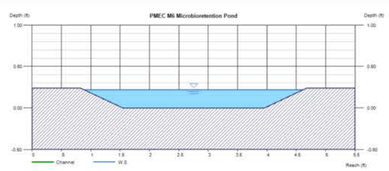


Example Bioretention Pond Detail

Preliminary Pond Sizing Specs

Depth of Ponding (ft) = 0.5
Area of Ponding (sf) = 900
Depth of Filter Media (ft) = 2
Total Water Volume in Pond = 1161.1

Final Pond Design/ Location, Qp and Overflow Weir Design, Water Quality Volume (WQv)

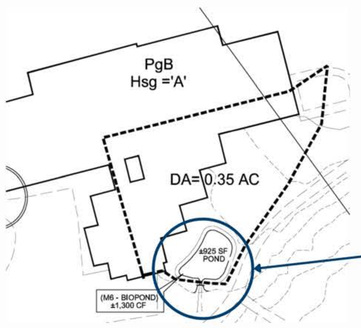


Hydraflow Weir Modeling

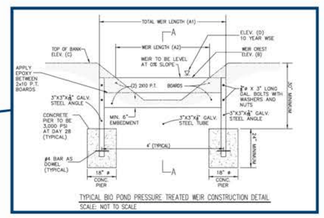
Technical Release 55 Calculations were done using the NOAA hydrograph to calculate Qp for the 10-Yr storm for our Weir Design and the Autodesk Hydraflow Extention was used to calculate the size and dimensions for the weir

Weir Formula and Dimensions

Q = C L H ^ 3/2
Qp10 (cfs) = 0.94
V10 (fps) = 1.63
Depth of Weir (ft) = 0.25
Top Width of Weir (ft) = 2.42
Ebankment Slope (%) = 1:3
Bottom Surface Area (sf) = 1314.33
Top Surface Area (sf) = 925.48
WQv (cf) = 1300 (>1113.9)



Location of MBR Pond



MBR CAD Pond Detail

Structural Analysis

Material Selection
- Parallam Strand Lumber (PSL)
- Structurally Efficient
- Sustainable
- Complements PMEC green building materials
- Structurally Insulated Panels (SIP)
- Provides high thermal insulation
- Efficient load-carrying capacity

Design Approach

Site Conditions → Load Conditions → Member Sizing → Structural Modeling → Design Checks → Drawings

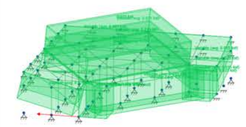
Key Design Components

- Sustainable Materials
- Design includes connections to an existing wall and cross-braced frame
- Structure is designed to resist high wind pressures since it has an exposure of D with the Chesapeake Bay

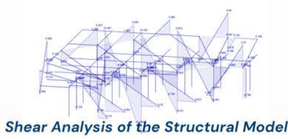
Load Conditions
- Site: Category Risk II
- Wind Load: Variable 21-25 psf (critical)

Member Sizing
- Beams: 3.5" x 9/5" PSL
- Columns: 7" x 7" PSL
- Footings: 2' x 2' x 1' Concrete Square

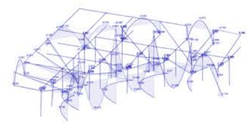
Render of the Structural Model



Wind Load Analysis of the Structural Model



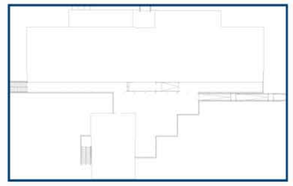
Shear Analysis of the Structural Model



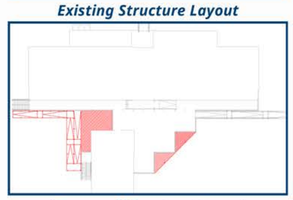
Moment Analysis of the Structural Model

Structural Design Checks	
Member	**Check**
Beams	Flexure, Shear, Deflection
Columns	Axial Compression, Flexure, Combined Axial and Bending, Buckling
Connections	Shear, Bearing

Methodolgy
SkyCiv was used to model and analyze the structural frame. Hand Calculations were performed to verify the structural design of the individual members. The design was conducted in accordance with applicable codes and standards, including the NDS, IBC, and ASCE 7.

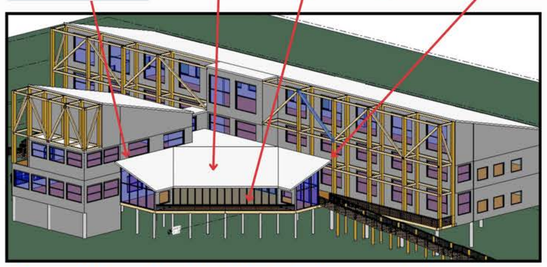


Existing Structure Layout

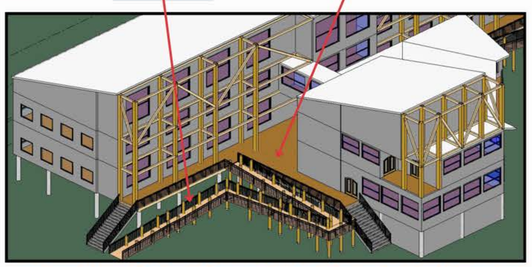


Proposed Structure Layout

Final Design



Southeast View-Render of enclosed structure covering the venue space



Southwest View-Render of Proposed Ramp Design and deck extension

Conclusion

Travel Distance: Decreased by 57.3%
- Before: 415 ft
- After: 177 ft

Venue Size: Increased by 43.8%
- Before: 2760 ft2
- After: 3970 ft2

Venue Coverage: Increased by 20.9%
- Before: 205 ft2 + 2360 ft2 (Temp)
- After: 2855 ft2