Haverhill, MA Downtown Redevelopment

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Introduction

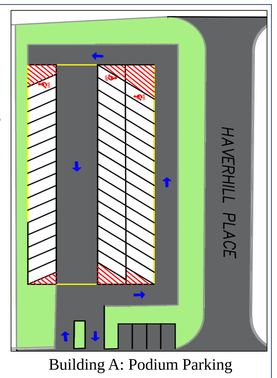
Haverhill, Massachusetts, one of the oldest communities in the state, is home to sprawling agricultural, suburban, and urban spaces. This project aims to redevelop a six-acre site in the heart of the city's downtown, adjacent to the Merrimack River. A product of 20th century zoning policies, the site is dominated by parking infrastructure. Redeveloping the site is an effort to introduce mixed-use design in the downtown to emphasize pedestrian access, promote economic growth and reinvigorate an urban community. Site design investigation has taken place to consider project viability and develop efficient and effective engineering practices.

Parking

The proposed site has three separate parking areas including a parking garage podium parking, and a parking lot. With a Total onsite parking capacity of 750 spaces. The parking garage holds majority of the parking at 636 spots, making it the main method to park on site.

Parking Required and Availibility		
Building	Total Parking Required	Availability
A	84	51
B	300	36
C	157	636

Total Parking Spaces		
Allotted For	Spaces Required	Spaces Available
Residents	541	541
Guests and Shoppers	171	182



Building A: Podium Parking

Cost Analysis

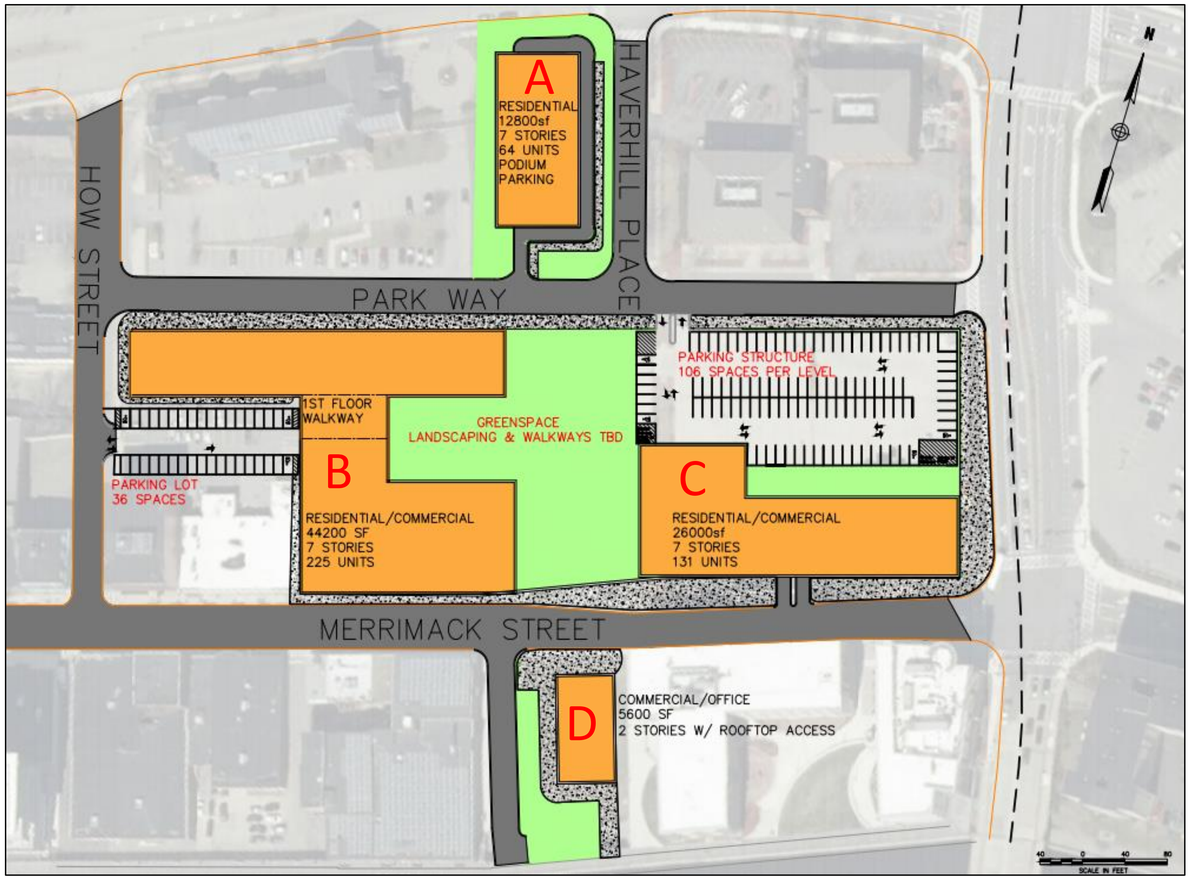
Cost Estimate Breakdown		
Item	Cost per sqft (USD)	Cost (Million USD)
Buildings	$ 204.63	$ 122.33
Parking Garage	$ 92.50	$ 19.17
Parking Lot	$ 6.00	$ 0.06
Podium Parking	$ 7.00	$ 0.09
Roads	$ 20.00	$ 0.34
Site Grading	$ 4.00	$ 1.13
Construction Cost		$ 143.12
Design (15%)		$ 21.47
Legal and Inspection (8%)		$ 11.45
Misc. Extra Costs (5%)		$ 7.16
Final Adjusted Total (+ 28%)		**$ 183.20**

Building Construction Costs		
Building	Building Cost (USD)	Cost per sqft (USD)
A	$ 18,262,246.40	$ 203.82
B	$ 63,061,819.60	$ 203.82
C	$ 37,095,188.00	$ 203.82
D	$ 3,907,982.40	$ 232.62

Parking Construction Costs	
Parking Option	Cost per Space (USD)
Garage	$ 30,136.29
Lot	$ 1,745.67
Podium	$ 1,756.86

Greenspace and Building B

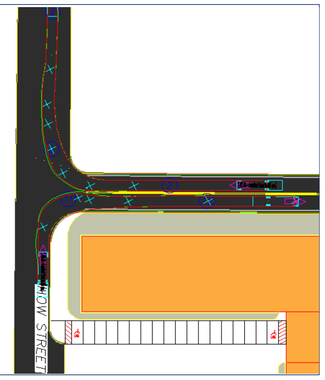
Proposed Site Plan



Architectural Rendering of Building D

Traffic

The extension of Park Way makes the site more accessible to cars without compromising pedestrian access. Using the AutoCAD Vehicle Tracking feature, the turning radius of a 40' city transit bus was used to govern the design of the site layout. The turning radius of a 19' passenger vehicle was used to determine the layout of the parking structure and podium parking.



Stormwater

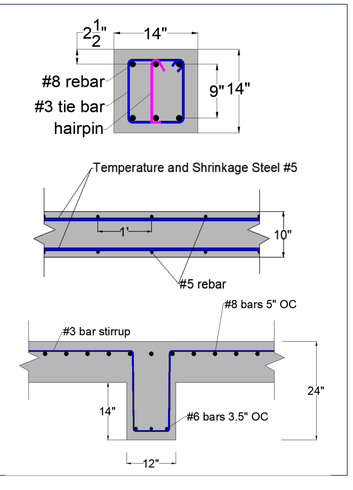
The Haverhill downtown site is subject to follow the Massachusetts Stormwater Handbook Standards 2, and 3 as well as the applicable BMPs of Standards 4,5, and 6. The goal of these standards are to reduce the site runoff and peak flows values less than the predeveloped condition, provide capacity of 2, 10, and 100-year storm events, improve the water recharge capacity of the site, and prevent Total Suspended Solids and Pollutants from entering waterways.

Stormwater Areas	
Total Area (ac)	6.57
Existing Impervious (ac)	5.72
Existing Impervious (%)	87.1
Proposed Impervious (ac)	5.10
Proposed Impervious (%)	77.6

Stormwater Dainage Volumes					
Drainage Type	Area (sqft)	Runoff Coefficent	2 years (cfs)	10 years (cfs)	100 years (cfs)
Existing Impervious	249,163	0.80	14.72	23.3	36.9
Existing Pervious	37,026	0.20	0.547	0.866	1.370
Proposed Impervious	222,156	0.80	13.12	20.8	32.9
Proposed Pervious	64,033	0.175	0.827	1.310	2.073

Structural Analysis

The waterfront building will have its structural components made of reinforced concrete. The structural analysis of a one-way slab, beam, and interior column on the first floor was done using the American Concrete Institute Building Code Requirements for Structural Concrete (ACI) 318-19 and IES Visual Analysis software. The images on the right show the reinforcement needed for each aspect of the floor system to resist maximum positive and negative moment, shear, and deflection.



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