

# **Maximizing Affordable Residential Development in Devens using Passive House Standards for Net Zero Residential Construction with low impact land use and Smart Growth techniques.**

**Thoughts on how to provide an accurate assessment for the total number of developable residential units in Devens to these standards.**

**Without considering a total number of potential additional housing units it would be difficult to determine local impacts on Governance, Schools and Services if additional residential buildout is facilitated**

***Could Devens become a living example of how these building principles could be used all over the Commonwealth***

Submitted by Innovation in Development and Sustainable Housing subcommittee member

Patrick Hughes Net Zero Building Consultant Ayer MA

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## Overview

Any discussion regarding trying to add to and achieve more affordable housing at Devens (or for that matter anywhere in the Commonwealth) centers around what type of home to encourage developers to build. The general consensus is the “Missing Middle”. Small Cottage with walkable Courtyards. Starter homes clustered on smaller lots with deed restrictions on allowable expansion. Multi Family buildings. Potentially these become “Affordable” by Smart Net Zero building techniques. Very adaptable to Modular or Panelized production. Hence reduce the cost to construct that then reduces the purchase price so that not all affordable units have to be subsidized in a 40 B type use. Perhaps held to size by zoning to perpetuate affordability.

Many of the lots reviewed in this proposal are currently owned by Mass Development whether they are zoned residential or other zoning. A few are in control of the Estates of Harvard Hills HOA.

In considering how much of a parcel to impact a basic standard of 50% Preserved and 50% Impacted was used with adjustment to preserve more if the sites natural features or historic preservation dictated. Or less preserved if more has been impacted or abutting dense residential neighborhoods. This to maintain the existing rural land use and feel of the Devens campus.

The choices of housing being considered as the Missing Middle also reflect a smaller lot foot print with more shared greenways of forested or natural features, while acknowledging the need for all impervious surfaces, roads and driveways in these calculations.

# Recommended home types, Building Specifications and land development criteria with infrastructure considerations.



## Cottage Courtyard Style Homes 144 Proposed

Typically, a 5-600 SF Single story Slab on grade 1 Bedroom home on individual 3,500 SF Lots inclusive of a common walking courtyard and shared parking. Potential for a shared Solar Car port roof.

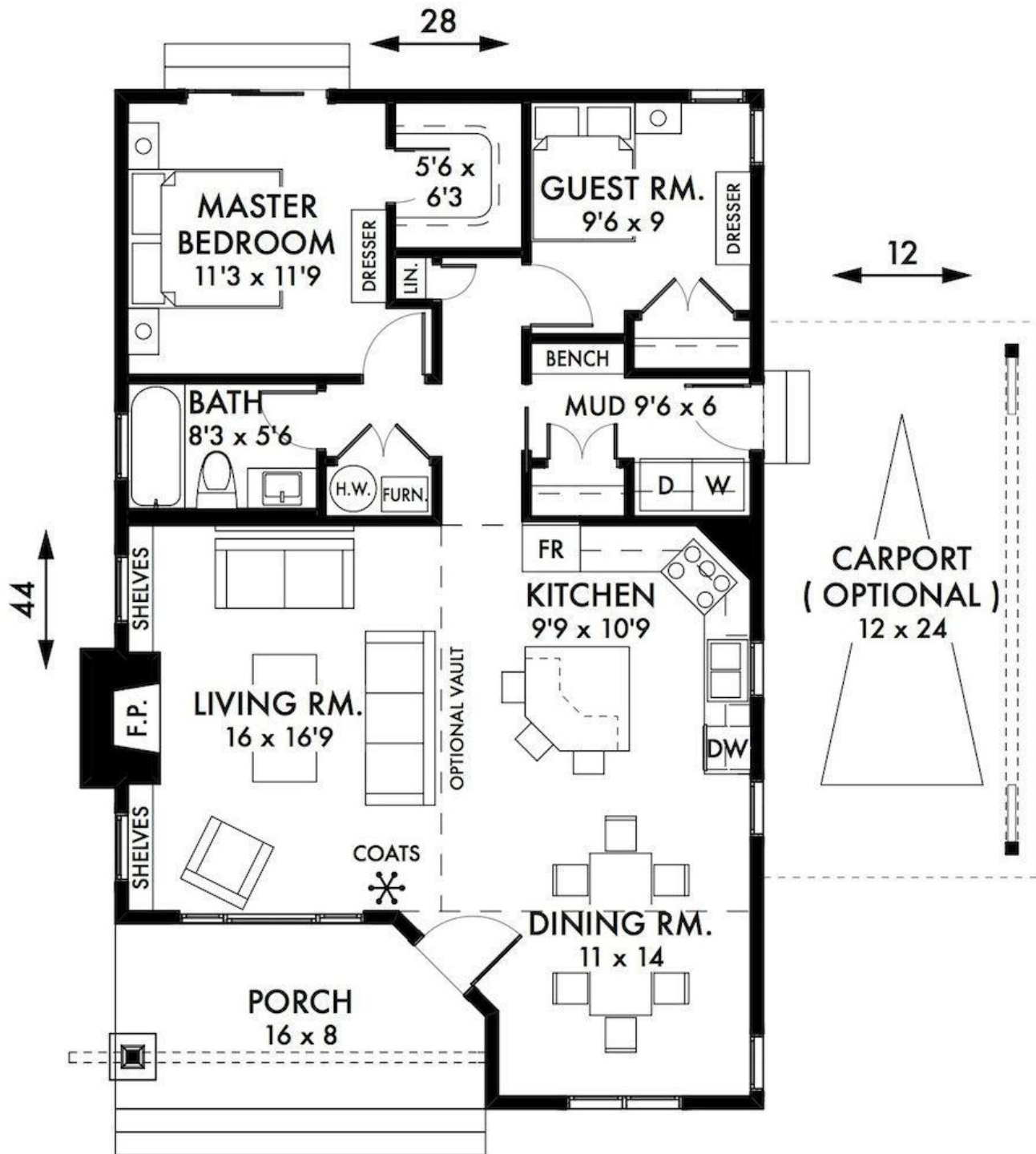


 HOUSEPLANS



## Starter Home with denser impacts on clustered looped road 171 Proposed

1,000 to 1,200 SF Single story slab on Grade. Deed restriction on a 5,000 SF Lot with Single car Garage with parking spot. Basement optional. Consider optimal orientation to maximize solar efficiency.



## Looped road type Neighborhoods with shared preserved forested scope





## **Single Family Homes existing in Devens**

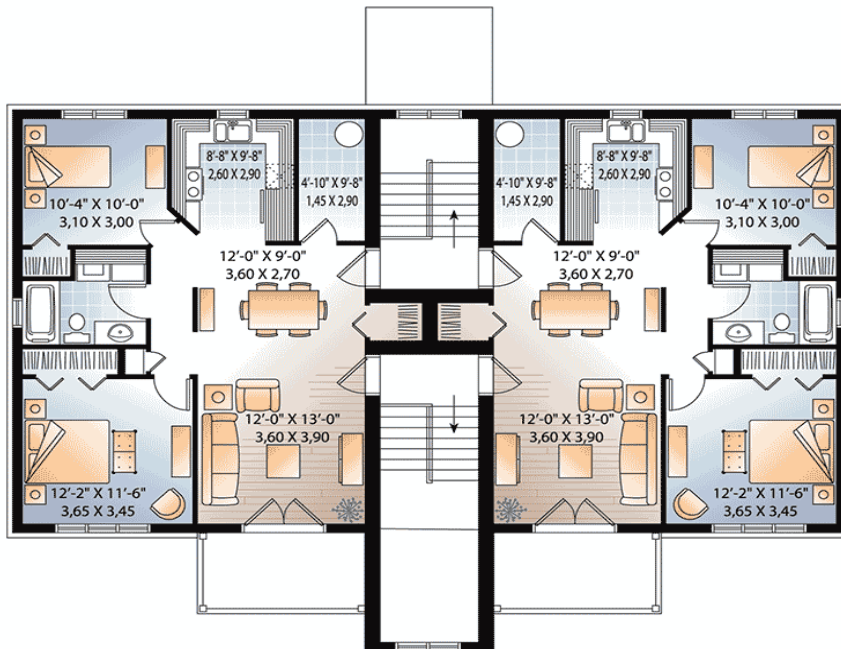
2,400 SF homes on a 7,000 SF lot

30 Proposed but potentially up to 49 more if allowed in Salerno Circle





# The Different Style potentials for Modular Multifamily homes 1,500 to 2,200 SF Units on 10,000 SF Lots 192 Units Proposed



**Typical Construction of all housing types**  
**Specifications for all housing from foundation to frame and finish. Simplify**  
**where possible to keep it affordable but adhere to Passive House Standards.**

**Review building using Panelized or Modular to reduce cost and waste**

- 1) Carpentry Exterior
  - a. Framing Shell
    - i. All Engineered lumber exterior walls with 1 ½” nail base sheathing and engineered interior partitions.
      1. KD Lumber is almost useless with high waste factors. Engineered can be ordered to lengths needed
        - a. All walls are straight and true reducing labor costs for all following trades
      2. Skip sheathing vs. Blue Skin Wrap
        - a. Cautionary note about skip sheathing and nail penetration moisture issues
    - ii. AGS 25 Floor systems with ¾ Advantix sheathing
      1. This allows maximum penetration of the Web for MEP and could use 9” instead of 12” floor systems due to great strength
    - iii. KD Roof rafters okay with nail base sheathing and full ice and water
    - iv. How to translate this into Modular or panelized construction
  - b. Doors and windows
    - i. Tripple Pane
    - ii. Thermally broken rough buck, unit frames and jambs for exterior
    - iii. Taped to Air moisture barrier and foamed at interior
  - c. Finish Trim
    - i. Azak or other synthetics typical
    - ii. Box Soffits Applied to assist in thermal envelope creation
  - d. Siding Choices
    - i. Vinyl
    - ii. Simulated
    - iii. Stucco
    - iv. Panelized
    - v. Cedar upgrades
    - vi. Brick Venner upgrades
  - e. Roofing over High Heat full Ice and Water
    - i. Asphalt type
    - ii. Metal Panel
    - iii. Solar Roofing types
    - iv. Potential for Green Garden roofs where feasible in Multifamily, Vicksburg Square Old Bachelors Quarters and Sylvia’s Haven buildings .
  - f. Painting
    - i. All low and No VOC
- 2) Insulation Values
  - a. Creating insulation enclosures
    - i. Continuous from Below Slab thru roof or Attic
  - b. Nailbase sheathing

- i. ½ Ply /t 1 ½ HD Foam at walls. Roof ¾ Ply. Same HD foam as walls
- c. Thermally broken rough Buck mounting frame
- d. Triple Pane glass windows and doors
- e. Building wraps (Blue Skin or Equivalent No Tyvek) Or Taped Skip sheathing
  - i. Higher “R” and Air Penetrations ratings reduce HVAC load hence reduced equipment costs
- f. Spray foam vs Rock wool vs Cellulose
- 3) MEP Systems
  - a. Air Source heat pumps
    - i. Geo thermal ( At Vicksburg Square, Bachelors quarters and cottage courtyards)
  - b. All Electric Kitchen and water heating
  - c. LED Lighting
  - d. Pecs tube Supply with hot water insulated
    - i. Efficient hot water runs
    - ii. Copper Exposed
  - e. PVC waste
  - f. Low Flow Fixtures
- 4) Interior Finishes
  - a. Plaster or Drywall
  - b. Brosco typical doors with Trustile up grade
  - c. Plastic, Finger joint or real wood trim
  - d. Flooring
    - i. Engineered wood floor with Real wood upgrades
    - ii. Carpet
    - iii. Synthetic flooring
    - iv. Tile
  - e. Modular type Cabinets and counters
    - i. Stone counter tops upgrade
  - f. Shower and tub Inserts
    - i. Tile upgrades
  - g. Low or no VOC paints
  - h. Insulated Shades



**All site considerations, existing conditions, existing utilities, excavation, Lot locations, % of Preserved Land Vs Impacted land. Needed to review as to how housing types and quantities could/would work in that lot location and abutting Neighborhoods with the densities proposed.**

1. Utilities
  - a. Water and sewer capacity
    - i. Sets Limits and/or defines how many homes or apartments can be built without adding more capacity thru underground utilities
    - ii. It is confirmed the treatment plant and wells have enough volume/capacity to support significant increases in population
    - iii. Just needs the infrastructure as noted.
  - b. New water and sewer Branch lines to support Denser development in currently zoned or new areas
  - c. All new underground electrical and communications supply likely.
    - i. Should gas be excluded?
  - d. Solar
    - i. Support Solar oriented housing layouts
    - ii. Solar fields for neighborhoods
    - iii. Moore Air Field for Solar
    - iv. Vicksburg Sqr Roofs
  - e. Geo thermal per Neighborhood or apartment building
    - i. Vicksburg Sqr Buildings
    - ii. Batchelor Officer Quarters Buildings
2. Road layout and land usage per Lot of developable area
  - a. Reuse existing to the greatest extent possible but repave with impervious asphalt and Low impact storm water collection.
    - i. Impervious Asphalt Already a DEC Standard
  - b. Repave all as impact of new Underground Utilities will significantly degrade existing asphalt.
    - i. Minimize revisions
  - c. Preserve important natural features
3. Road work and drainage
  - a. If adding new roads Minimal Road width with enhancements to reduce speeds
    - i. Visitor parking????
  - b. Sidewalks or none
    - i. Impedes using low impact storm water collections swales
    - ii. If so adds considerably to infrastructure cost to build Sidewalks and Drainage catch basins, underground piping and retention ponds
4. Excavation and site work
  - a. Existing Tree and Historical features protections
  - b. Preserve interesting ledge out cropping's if relevant
  - c. Deeded access Utility right of ways on lots if it reduces underground utility cost for new lines if needed
  - d. Slab vs Basement
  - e. Soil conditions for ease of excavation Reported Generally Sandy

# Lots in Devens to consider adding housing with challengers noted

Summary of all 5 Tabs												
Location	Total Acres Available per lot	Acres Preserved	Acres Impacted	Cottage (Affordable to Construct)	Starter (Affordable to Construct)	Singel Family	Apt Units	Mixed use retail Rodgers field	Multi Family units	Multi family buildings with 4 units	Total Units per lot	Total Unit per page
3 and 15 Buena Vista Street	13.92	6.96	6.96	16	16				24	6	56	VKSBG SQ RF Area
308 and 309 0 Buena Vista St. 93 & 101 Sherman 105 Sherman Ave to remain	13.24	6.62	6.62	12	12		85	21			130	
Vicksburg Square	19.75		19.75				256		0		256	442
1 Pine Road	2.15	1.08	1.08						16	4	16	Pine St
15 Pine Road	3.12	1.56	1.56						16	4	16	32
59 Grant Road	45.70	22.85	22.85	30	45	30			40	10	145	Grant Road Area
140 Grant Road	7.00	3.50	3.50	8	8				12	3	28	
160 Grant Road	12.83	8.21	4.49	12	10				28	7	50	223
100 Adams Circle	11.60	5.80	5.80	12	10				28	7	50	Adams Circle Cavite Street Area
1 Bates Street	1.50	0.38	1.13		8						8	
95 Buena Vista Antietam Fields	7.31	1.83	5.48	12	8				12	3	32	147
24 Cavite Street	9.22	4.61	4.61	12	15				4	1	31	
99 Cavite Street	5.14	1.29	3.86	6	8				12	3	26	147
4 Auman Street	1.14	0.57	0.57		4						4	Est Harvard Hills Salerno Circle
5 Auman Street	0.84	0.42	0.42		3						3	
0 Walnut Street	4.85	2.43	2.43	12							12	
50 Walnut Street	6.20	3.10	3.10	16							16	
40 Salerno Circle	87.14	65.36	21.79		24	49					73	108
Total of each type	252.65	136.54	115.98	148	171	79	341	21	192	48	952	952
319	# of cottage and starter homes that become affordable by less expensive to construct											
0.34	% of total that potentially do not need to be subsidized (40B type) to achieve affordability											

# **The Innovation and Technology Rodgers Field and Vicksburg Square area the Secretaries Focus 442 Proposed**

## **3 and 15 Buena Vista Street**

- 13.92 Acres
- 50% Preserved
- 50 % Impacted
- 2 Cottage style 8-unit Courtyards
- 16 Starter Homes on clustered looped road.
- Multi Family 6 4-unit buildings

## **93 and 101 Sherman Ave, 308 and 309 0 Buena Vista St.**

- 13.24 Acres
- 50% Preserved
- 50 % Impacted
- 2 Cottage style 6-unit Courtyards
- 12 Starter Homes on clustered looped road.
- **21 Unit Walkable single floor retail mall**
- **85 Apartments in Rehabbed Old Officers Quarters and former Sylvia's Haven**

## **Vicksburg Square**

- 19.74 Acres Existing
- **256 Apartments in Rehabbed Old Command Buildings**

Currently Zoned Innovation and technology, this area is the focus of the Innovation in Development and Sustainable Housing subcommittee work as to how to maximizes housing. These lots abut the existing original officers' quarters at the Estates at Harvard Hills, have many important monuments and historical areas of note to be preserved and all border the Rogers Field area. Widely used for sports by many towns in the commonwealth. As this area already has many single family homes the suggestion is to build Cottage Courtyard, smaller starter homes on Looped roads, new Multifamily and rehab existing buildings into Apartments or Condos .

**Further given the existing and new neighborhoods proposed with wide public use and support of Rodgers field, having an abutting walkable retail Mall area of shops, restaurants, bistro's etc., could prove a valuable addition to the local land use for housing and recreational as well as regional sports events .**

**It is noted added parking will be required if rezoned residential to facilitate the wide use of Rodgers Field suggesting the value of a parking deck at 205 Jackson Road with amenities like large public bath rooms to support the larger use of those fields.**



## **Special Challenges the Old Batchelor's Quarters and former Sylvia's Haven Apartment units 85 Proposed**



Per the Batchelor's Adaptive Reuse Study 2010 these buildings present a reasonable conversion to a similar breakdown as the Vicksburg square apartments or condos noted but an existing building structure more amenable to revamping the interiors to the new usage and specifications for passive house required.

Note no need for added parking

The 101 Sherman Building (Red) is also part of this assessment

## **Special Challenges Vicksburg Square Buildings**

### **Apartment units: 256 Proposed**



Preservation and repurposing of the Vicksburg Square Buildings present many unique and expensive challenges. The first of which is the Guting of the buildings back to the concrete structures of foundations, walls, floors and the framed roofs. As outlined in the Vicksburg Square Site Assessment and Hazard Identification 2017 report. It is nothing less than a hazmat level full gut just to begin.

A full Structural site/building assessment is needed to determine the ability to convert extensively these existing buildings into useable small, medium and larger apartments with some of the larger apartments hopefully set aside for Affordable but would need to be subsidized. Given the historical designation of these buildings preservation of the exteriors is essential to any plan. This would include upgrade to thermally efficient doors and windows maintaining the historical look. Gable ends being restored but likely roof areas could facilitate Solar panels or a solar typical roof sheathing available now by many companies. Achieving the goal of a passive house level of Net zero does represent challenges, given the potential of thermal transfer of the existing masonry walls and concrete floor design into the interior of any new configuration affecting room HVAC conditioning, even with new spray foam interior walls

The Center courtyard may also need a 2<sup>nd</sup> deck to facilitate the resident parking along with guest parking. Suggested to make a garden surround at the street and 2<sup>nd</sup> deck level.

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**Proposed Additional Housing on Pine Road**  
**Currently Zoned Residential abutting other existing residential**  
**Multi Family Condos 32 Proposed**

**1 Pine Road**

- 2.15 Acres
- 50% Preserved
- 50% Impacted
- 4 4-unit Multi Family buildings

**15 Pine Road**

- 3.12 Acres
- 50% Preserved
- 50% Impacted
- 4 4-unit Multi Family buildings

To keep the character of the neighboring and existing buildings while minimizing the impact on the rural, wooded, open space feel, it is recommended to just do the multi-family units as noted. Ideal location for flat garden roof type units.



## **Additional housing on Grant Road Potential Currently Residential abutting other existing residential 223 Proposed**

### **59 Grant Road**

- 45.70 Acres
- 35% Preserved
- 65% Impacted
- 2 Cottage style 8-unit Courtyards
- 2 Cottage style 7-unit Courtyards
- 45 Starter Homes on clustered looped road.
- 30 Single Family Homes
- 10 4-unit Multi Family buildings

### **140 Grant Road**

- 7.00 Acres
- 35% Preserved
- 65% Impacted
- 1 cottage style 8-unit Courtyard
- 8 Starter Homes on clustered looped road.
- 3 4-unit Multi Family buildings

### **160 Grant Road**

- 12.83 Acres
- 35% Preserved
- 65% Impacted
- 2 Cottage style 6-unit Courtyard
- 10 Starter Homes on clustered looped road.
- 7 4-unit Multi Family buildings

Grant Road has already committed to a more focused residential look while keeping to the best of passive house and low impact site design. All that is proposed respects that but with the “Missing middle” homes proposed to break up the look of the single family home neighborhood while keeping it walkable. Consider maximizing solar orientation of roofs where reasonable.

**Note easy access to the Walkable Commercial mall at Rodgers field.**

Any additional roads would be of the looped type noted

# **Adams Circle and Cavite Street Area Residential Potential 147 Proposed**

## **100 Adams Circle**

- 11.60
- Acres
- 50% Preserved
- 50% Impacted
- 2 Cottage style 6-unit Courtyards
- 10 Starter Homes on clustered looped road.
- 7 4-unit Multi Family buildings

## **1 Bates Street**

- 1.5 Acres
- 25% Preserved
- 75% Impacted
- 8 starter Homes on clustered looped road.

## **95 Buena Vista Antietam Fields**

- 7.31 Acres
- 25% Preserved
- 75% Impacted
- 2 Cottage style 6-unit Courtyards
- 8 Starter Homes on clustered looped road.
- 3 4-unit Multi Family buildings

## **24 Cavite Street**

- 9.20 Acres
- 50% Preserved
- 50% Impacted
- 2 Cottage style 6-unit Courtyards
- 15 Starter Homes on clustered looped road.
- 1 4-unit Multi Family 1 4-unit building

## **99 Cavite Street**

- 5.14 Acres
- 25% Preserved
- 75% Impacted
- 1 Cottage style 6-unit Courtyards
- 8 Starter Homes on clustered looped road.
- 3 4-unit Multi Family buildings

This is similar to the Grant Road area lots, that abut existing residential housing. It is the same thought to add the missing middle to add more diversity of housing type choices to an already single family home residential area.

# **Auman Street, Walnut Street residential Challenges per Estates of Harvard Hills approval and Salerno Circle Potential if rezoned Residential 108 Total**

## **4 Auman Street**

- 1.14 Acres
- 50% Preserved
- 50% Impacted
- 4 Starter Homes on clustered looped road.

## **5 Auman Street**

- .84 Acres
- 50% Preserved
- 50% Impacted
- 3 Starter Homes on clustered looped road

## **0 Walnut Street**

- 4.85 Acres
- 50% Preserved
- 50% Impacted
- 2 Cottage style 6-unit Courtyards

## **50 Walnut Street**

- 6.20 Acres
- 50% Preserved
- 50% Impacted
- 2 Cottage style 8-unit Courtyards

## **40 Salerno Circle**

- 87.14 Acres
- 75% Preserved
- 25% Impacted
- 24 Starter Homes on Existing Roads
- 49 Single Family Homes on Existing Roads

***Any approval for changes on lots and properties under the rules of the HOA for the Estates at Harvard Hills has to have a 100% approval of the members.***

For the Auman Street properties the suggestion would be Starter homes to match the density of the existing homes on those lots but lean toward that affordable goal.

For the Walnut Street properties, the suggestions would be the Courtyard cluster type. They could represent retirement homes as families downsized and those in the old officers' quartets could now retire in the neighborhood they have lived in for years. Or could be used as an ADU or in-law apartments for the abutting homes.

4 Salerno Circle presents the challenge of being a view shed that had been impacted. So, the suggestion is no new roads and single family homes on already disturbed lots as much as possible. All to preserve this view shed. Total Acreage available 87 but only 22 acres impacted with new housing on existing roads. Solar orient layouts and Design style to maximize potential

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**Methodology for Parcel assessment based on the  
criteria noted on the previous pages  
per lot and in general.**

**How the attached Excel spread sheets were  
conceived, programed and used**

**An Important consideration is the Certification of any lot to build on that the toxic cleanup of each area and lot is complete if relevant to currently or future zoned residential sites given the history of remediation in Devens**

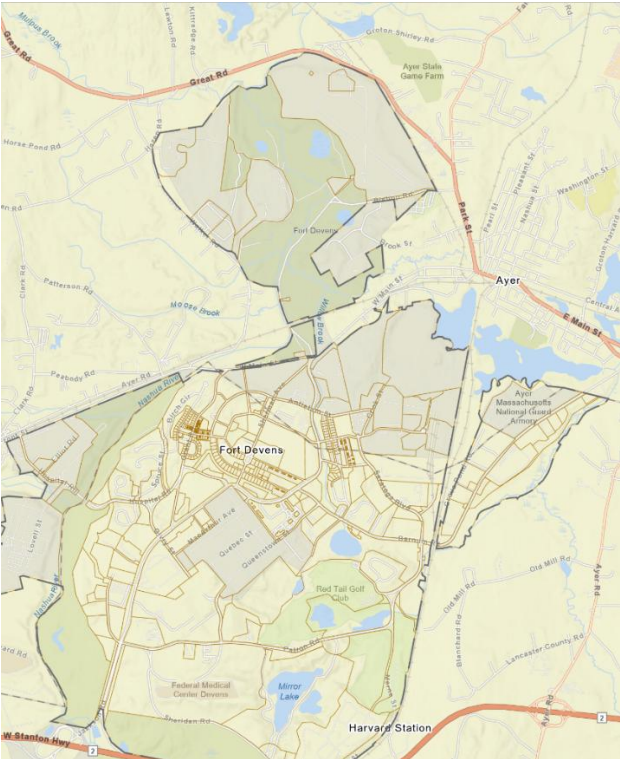
**What follows is how the number of Unit types were chosen and how to evaluate each lot to determine appropriate usage of a parcel with its relationship to the existing area it is located in as well as its own characteristics.**

**Noting additional infrastructure costs can affect density and ultimately housing costs**



## Google Earth Satellite view

Take any given Lot in Devens noted on the interactive AxisGIS map shown below to find ownership, zoning and Data to calculate potential preservation and impacts in Acres and SF.  
<https://www.axisgis.com/devensMA/#>



Take DATA from the IAS Property Card file (From Map website page Menu top at the left) as to who Owns, what is the Zoning, Acreage and Square Feet for that lot

PARID: 3520260001001000  
MDFA / BV HSG  
Property Information

MUNICIPALITY: DEVENS  
100 ADAMS CIRCLE

LUC: 930  
PARCEL YEAR: 2025

Property Location:

100 ADAMS CIRCLE

Class:

E-EXEMPT

Use Code (LUC):

930-VACANT - SELECTMAN/CITY COUNCIL

District:

MA352 - DEVENS

Deeded Acres:

11.6000

Square Feet:

505,296

Owner

Owner	Co-Owner	City	Address	State	Zip	Deed Book/Page
MDFA / BV HSG	CORNER OF JACKSON & CAVITE	BOSTON	99 HIGH STREET 11TH FLOOR	MA	02110	17907/1

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Add it in where noted on the Excell spread sheets ( Attached 6 Tabs one per each area and summary of all impacts)

Parcel address	Zoned	Who owns	Acreage from GIS data
100 Adams Circle	Residential	Ma Dev	Acres Available
			11.60
			Square Feet Available
Total Square Feet Per GIS Data			505269

Which then calculates at generally 50% Preserved and 50% impacted unless otherwise noted to include preserved space or Historical features.



You then note how many of **each type of unit you want** and that calculates the total impact of allowable lot SF to be impacted.

50% - 70% <b>Acreage preserved</b> as walkable forested or existing to be reused	50%-30% <b>Acreage Developable</b> using cluster loop road Impervious roads, drives and lot foot print combined	LF and SF of Impervious Road, driveway, guest parking and Emergency Access	<b>Total Proposed Building/ Lot Foot print</b>	Cottages 5-600 sf Unit 3500 sf lots inclusive of courtyard and shared parking	Starter 1000 to 1200 sf unit 5000 sf lot Deed restricted as to allowable added sf	Single Family home to 2400 sf 7000 sf Lot	Multi family 1500 - 2200 sf 2 story 3-4 units per bldg. 10000 sf lot with parking at lower level	<b>Total units per site</b>
Acres Available		LF	Quantity of each housing type					
5.80	5.80	1650		12	20		3	44
Square Feet Available			Totals in Square Feet					
252300	252300	36300	216000	56000	100000	0	60000	

- You then have **available square feet** to be **preserved** or **impacted** as a usable measure for the calculation of the total of individual units any site potentially can develop.
- In the Unit type columns, you can **add how many** of each type, which will then calculate the impact of those decisions in **total square feet** for that type.
  - This is an estimation of the noted housing types which then uses the lot size to calculate the total SF impacted per lot while considering the Google Satellite map of Devens as to how that could work out gracefully in the lot provided for the estimated unit numbers abutting properties, preserved areas and/or usage.
  - (A professional experienced judgment call)
- The **Total Proposed building lot footprints SF** column is then subtracted from the **Acreage Developable SF** that will be impacted, that will then set up the calculation of how much is left for **roads/impervious surfaces**.
  - Road LF is calculated at 22' wide
- It is helpful to have Google Earth Satellite view on an adjacent screen ( Viewed above) in assessing lots along with local knowledge of the sites

## Patrick Hughes Qualifications

My experience comes from a 47-year career in the custom residential building industry. Overseeing construction of Architecturally designed homes in many towns and communities in the Commonwealth. I also note 20 plus years of involvement with the town of Ayer and other regional advocacy. Including 6 Years on the board of the Nashua River Watershed Association. 8 years ACEC Implementation then Stewardship committees. 3 Town of Ayer master plans. Restoration of Ayer town hall and down town Historical District restoration advocacies. Ayer Greenway Committee to touch on a few of them.

My interest in Devens goes back to the work of PACE (People of Ayer Concerned about the Environment) in the late 90's when the enormous cleanup effort of the former base was needed and its potentially negative impact on Ayer. An important issue for the town to be involved with. As I was advocating to protect Ayer's Forested legacy from a Planning Board, more interested in the profits of big developers than protecting that legacy, I used my experience as a builder to learn subdivision design and planning so as to try and encourage a smaller foot print than just chewing up land to build subdivisions. That along with my land preservation advocacy, I was invited to join the Devens Open Space and Recreation Committee back in the early 2000's which I served on for 6 years.

20 years ago, there was a push to go beyond the original reuse plan and craft how Devens could be developed. This was known as the Disposition of Devens Stakeholder MOU referred to as the 2B proposal that notes other possibilities or outcomes were considered. But the consensus was to create a template to form a Town of Devens. At that time, I was recruited to be on the Land use and Zoning committee, which I served on for close to 3 years. In 2006 I was a member of a consortium known as the Sustainable Design Working group. Our advocacy was how to achieve Net zero building and low impact land usage in roads and neighborhoods layouts at the subdivision level while remaining profitable. With my connections to Mass Development, I was able to present the Groups findings to them. A result was influencing the RFP that created the Transformation Net Zero Subdivision and evolved to the recently completed Emerson Green project that is getting so much attention for adhering to those principles. As a side note a few years later I worked for Transformations and 6 years back was in discussions with the Emerson Green Developer to be the Field Project manager when another opportunity arose that I recently retired from. Working as a full-time residential construction estimator. I further note that in my retirement I am setting up a Net Zero Building Consulting advocacy. Not to teach Architects or Planners what that is. But for builders as how to do it simply and effectively so it does not become an expensive option.

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