

From: Stephen Revilak
To: Arlington Redevelopment Board
Date: September 29, 2023
Re: An estimate of unit production from the MBTA Communities multi-family district

During recent weeks, I've heard a number of Arlington residents ask about the number of dwelling units that might result from the multi-family district proposed in response to the MBTA Communities Act (aka, MGL Chapter 40A, Section 3A). In an effort to answer this question, I've written a computer simulation to model ten years of redevelopment in the proposed districts, and I'd like to share the results of this experiment with the Board.

This memo will proceed in two sections: the first describes the simulation approach, and the second presents its results. The work is based on the "Alternative 1" map and compliance model.¹

The Simulation

The simulation models a year of redevelopment by "rolling dice" for each of the 554 parcels of land in the proposed district, in order to determine which parcel are redeveloped during that year. If the dice roll indicates that redevelopment takes place, the simulation determines the number of units after redevelopment, and the net change in unit count (i.e., units after redevelopment, minus units before redevelopment). Repeating this process nine more times gives a ten-year projection. In randomized simulations, it's common to run the simulation some number of times, in order to establish a range of possible outcomes. I've used 100 repetitions for this experiment.

A key consideration is establishing the probability at which redevelopment occurs. The Department of Planning and Community Development's 2019 *Report on Demolitions and Replacement Homes* found that there were an average of 27 demolitions and home replacements per year, between the years 2010-2019 (about 0.23% of residential properties/year).² For the purpose of this experiment, I've taken that probability and doubled it. The doubling is based on an assumption that residential properties in the multi-family districts will provide more attractive redevelopment opportunities than properties outside of the district. The *base probability* of redevelopment used in this simulation is $(2 * 27)/11852 = 0.004556193$.

Some parcels are better candidates for redevelopment than others, and the simulation tries to account for this by adjusting the base probability as follows:

- Parcels with condos (MassDOR land use code 102) are less likely to be redeveloped (base probability reduced by 80%)
- Parcels with institutional and religious uses (land use codes in the 900-range) are less likely to be redeveloped (base probability reduced by 90%)

¹ https://arlingtonma-my.sharepoint.com/:x/g/personal/jenniferjs_town_arlington_ma_us/EVLGZnEmcyhGmlpAUetBDIBmvMM_6QJS-IgDtaCbFUe4g?e=UC2hv7

² *Report on Demolitions and Replacement Homes*, pg 7. Retrieved from <https://www.arlingtonma.gov/home/showpublisheddocument/47415/637003356259470000>

- Parcels where the modeled capacity is more than double the existing number of dwellings are more likely to be redeveloped (base probability increased by 25%)
- Parcels where the modeled capacity is smaller than the existing number of units will not be redeveloped.
- Larger parcels are more likely to be redeveloped (base probability increased by 15% for parcels over 8000 square feet).
- Parcels with older buildings are more likely to be redeveloped (base probability increased by 25% for buildings built before 1930)
- Parcels with relatively newer buildings are less likely to be redeveloped (base probability decreased by 50% for buildings built after 1960).
- Parcels that were redeveloped in the last 30 years will not be redeveloped.

When a parcel is redeveloped, the number of built units is randomly chosen between the range of 70% and 110% of EOHLC's modeled capacity. For example, if EOHLC's capacity model determined that a given parcel had a capacity of 100 units, the simulation would choose a new unit count from the range 70--110. The use of a range is motivated by two considerations:

1. Capacity is a theoretical maximum that won't always be reachable, due to site constraints or other factors. Or, a builder might create units that are larger than the 1000 square feet that EOHLC's model assumes.
2. A builder might choose to build units that are less than 1000 square feet (e.g., studios and one-bedroom apartments).

The simulation also considers bonuses, as follows:

- When a parcel in the Mass Ave/Broadway Multi-family district is redeveloped, there is a 50/50 chance that the redevelopment will take advantage of a bonus.
- When bonuses are used, 50% of them will be mixed-use, 25% will be affordable housing, and 25% will be SITES.
- When the mixed use and affordability bonuses are used on parcels along Mass Ave, there is a 50% chance of using one bonus story, and a 50% chance of using two bonus stories.

Simulation Results

This section shows the results of simulating ten years of redevelopment under three different scenarios:

1. The Alternative 1 working group proposal (capacity = 7268)
2. The Alternative 1 working group proposal, modified so that the neighborhood multi-family district has a height limit of three stories (capacity = 6259)
3. The Alternative 1 working group proposal, modified so that the neighborhood multi-family district has a height limit of three stories, and both multi-family districts have a minimum parking requirement of one space per dwelling (capacity = 3291)

Each set of results includes a visual representation showing all 100 simulation runs (each run is represented by one line on a graph), along with statistical summaries of the number of parcels redeveloped and net new units.

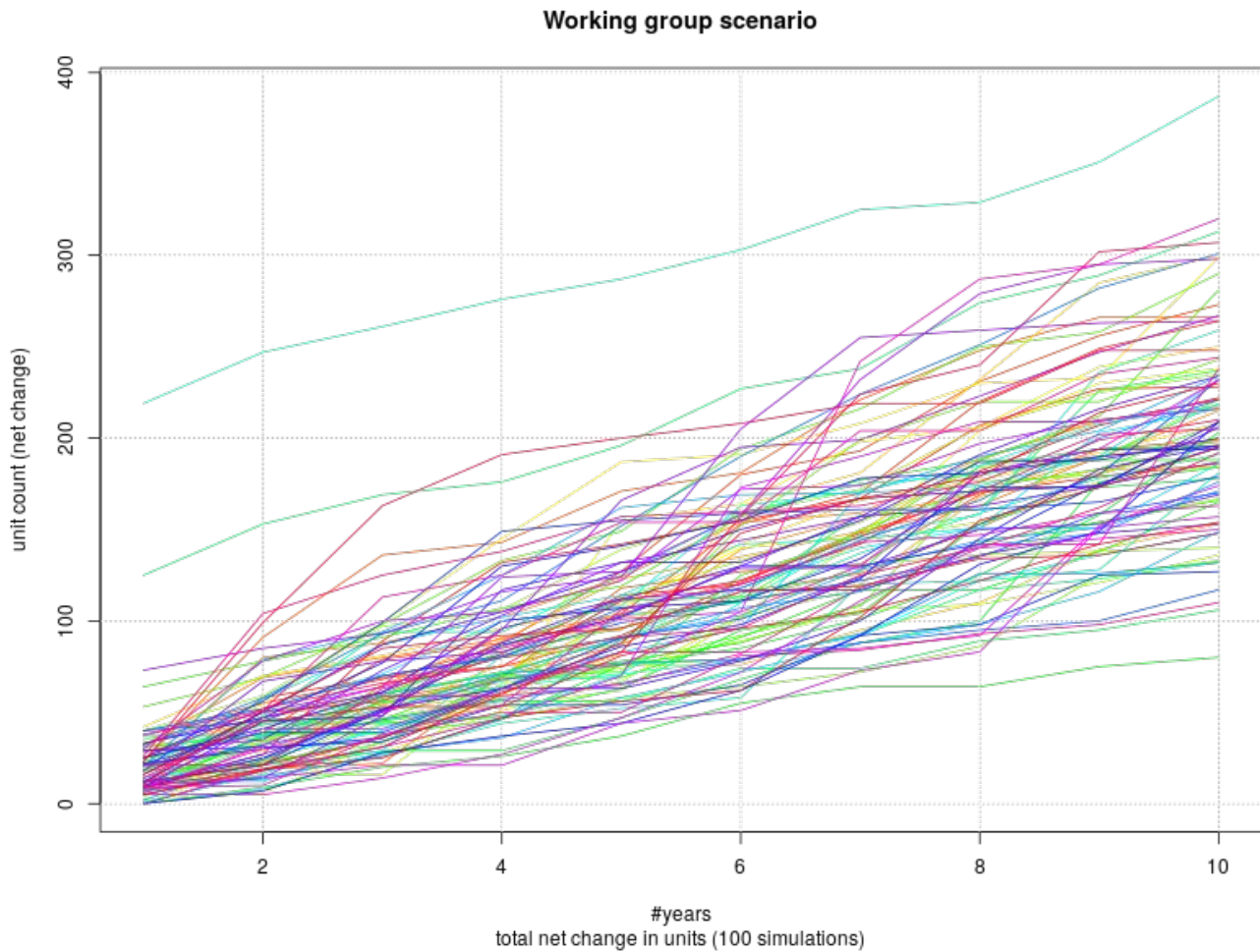
As a point of reference, Arlington had 20,461 housing units in the 2020 census³ and the Alternative 1 map has approximately 1,975 existing units.

³ <https://www.mass.gov/doc/mbta-communities-community-category-designations-and-capacity-calculations/download>

Working Group Proposal

This simulation uses the MBTA-C Working Group's Alternative 1 proposal to the ARB (capacity = 7268).

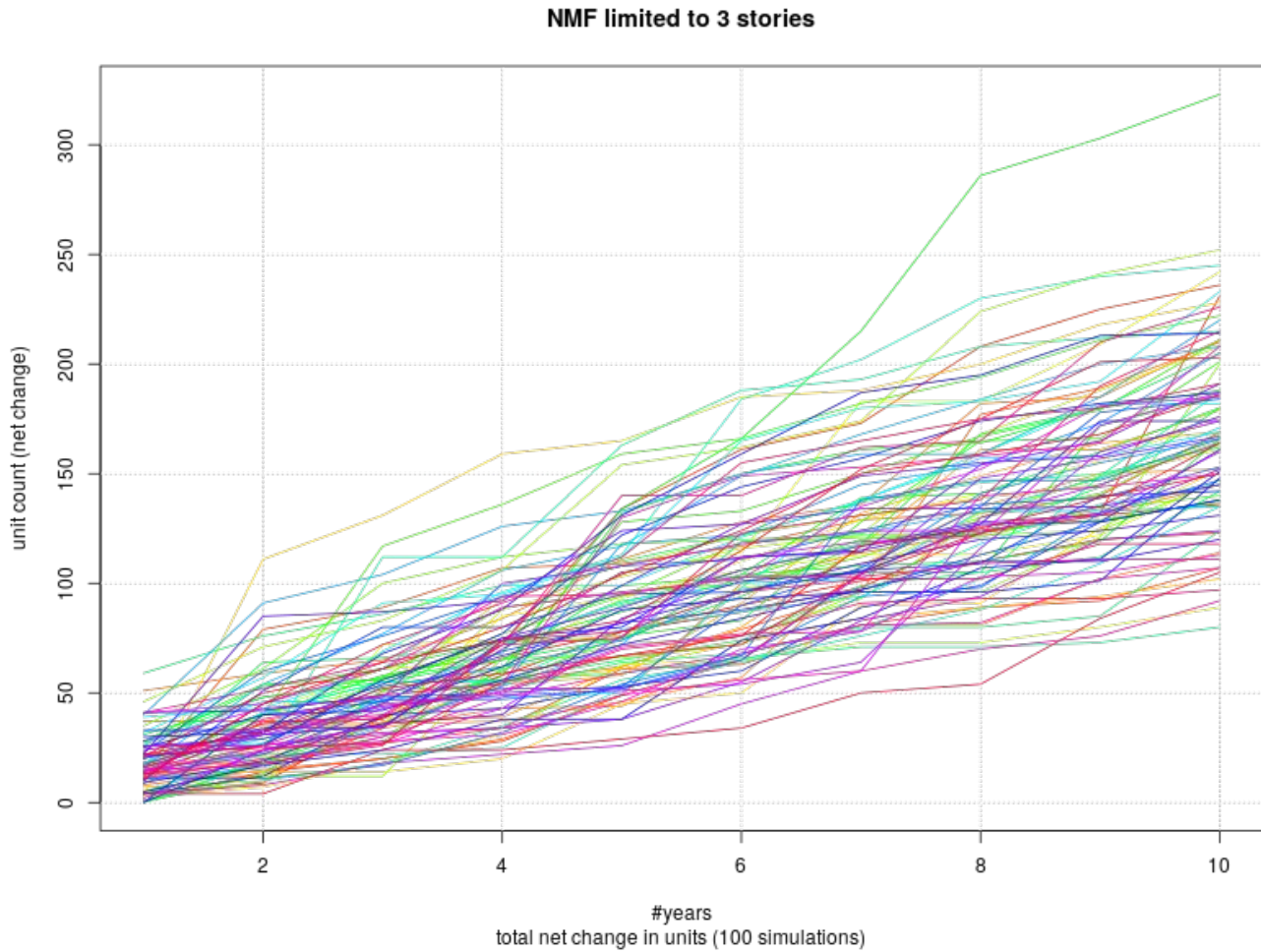
The simulation shows a range of 18--39 parcels redeveloped over a 10-year period, with 80-387 net new units. (Note that there are outliers on both the high and low ends of the range.)



	Min	1st Q	Median	3rd Q	Max
net new units	80	173	201	234	387
parcels redeveloped	18	24	28	32	39

3 Story-limit in NMF

In this simulation, the Neighborhood Multi-family district has been given a height limit of three stories. The simulation shows a range of 19--41 parcels redeveloped, with 80--323 net new units over ten years. (Note that there is an outlier on the high end of the range.)

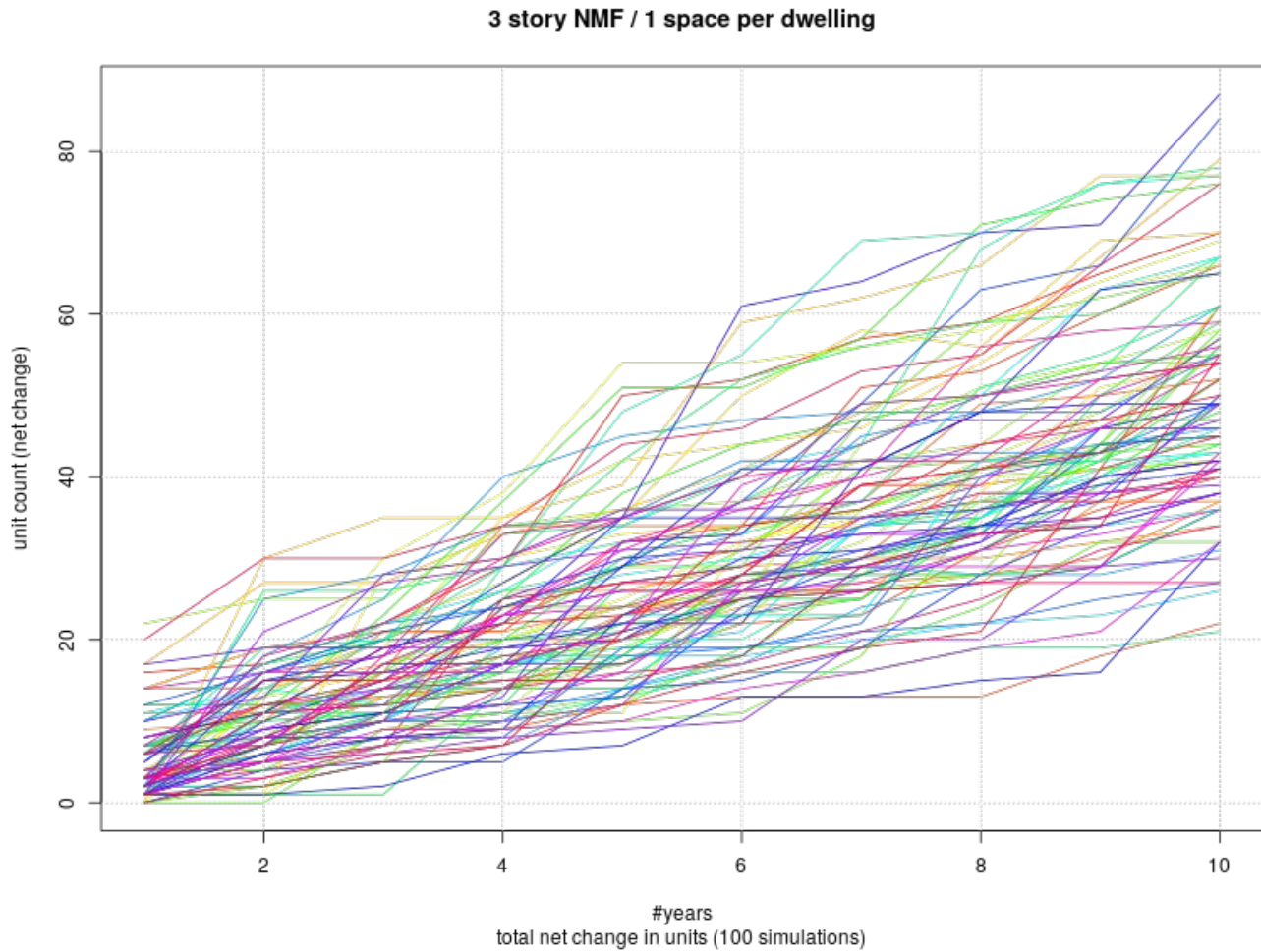


	Min	1st Q	Median	3rd Q	Max
net new units	80	142	166	193	323
parcels redeveloped	19	25	28	32	41

One parking space/dwelling + 3 story NMF

This simulation applies a three story height limit to the Neighborhood Multi-family district, and a one space/dwelling minimum parking requirement for both districts.

The simulation shows a range of 12--36 parcels redeveloped, with 21--87 net new units over ten years.



	Min	1st Q	Median	3rd Q	Max
net new units	21	40	49	58	87
parcels redeveloped	12	19	22	25	36