**From**: Stephen Revilak, Precinct 1
**To**: Arlington Town Meeting
**Date**: October 15, 2023
**Re**: An estimate of unit production from the MBTA Communities multi-family district

Under Article 12 (MBTA Communities Overlay District), the Arlington Redevelopment's Report to Town Meeting projects that 15 – 45 parcels could be redeveloped over the next ten years, for a net increase of 50 – 200 new units. I arrived at these numbers by writing a computer simulation to model ten years of redevelopment in the proposed multifamily districts. The purpose of this memo is to provide Town Meeting members with a description of the simulation model, and how the projections were derived.

This memo will proceed in two sections: the first describes the simulation approach, and the second presents its results.

# The Simulation

The simulation models a year of redevelopment by "rolling dice" for each of the 558 parcels of land in the proposed districts, 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 probably 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).[1] For the purpose of this exercise, 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%)
- 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%)

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[1] *Report on Demolitions and Replacement Homes*, pg 7. Retrieved from
https://www.arlingtonma.gov/home/showpublisheddocument/47415/637003356259470000

- 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 three considerations:

1. Capacity is a theoretical maximum that won't always be reachable, due to site constraints or other factors.
2. A builder might choose to build units that are larger than the 1000 square feet that EOHLC's model assumes.
3. 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 Environmental.
- 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 two different scenarios:

1. The Redevelopment Board's main motion, with the assumption that one parking space/dwelling is provided.

2. The Redevelopment Board's main motion, with the assumption that all applicants request parking reductions, and 0.5 parking spaces/dwelling are provided.

I presume that reality will fall somewhere between scenarios one and two, and considering both allows us to see a range of outcomes.

Each set of simulation 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 census[2] and the proposed district has approximately 1,981 existing units.

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

# Scenario 1: One parking space/dwelling

This scenario models the multifamily district proposed by Article 12, with the assumption that one parking space is provided for each dwelling.

The simulation shows a range of 14 – 35 parcels redeveloped over a 10-year period, with 22 – 97 net new units.

**ARB Recommendation**



total net change in units (100 simulations)
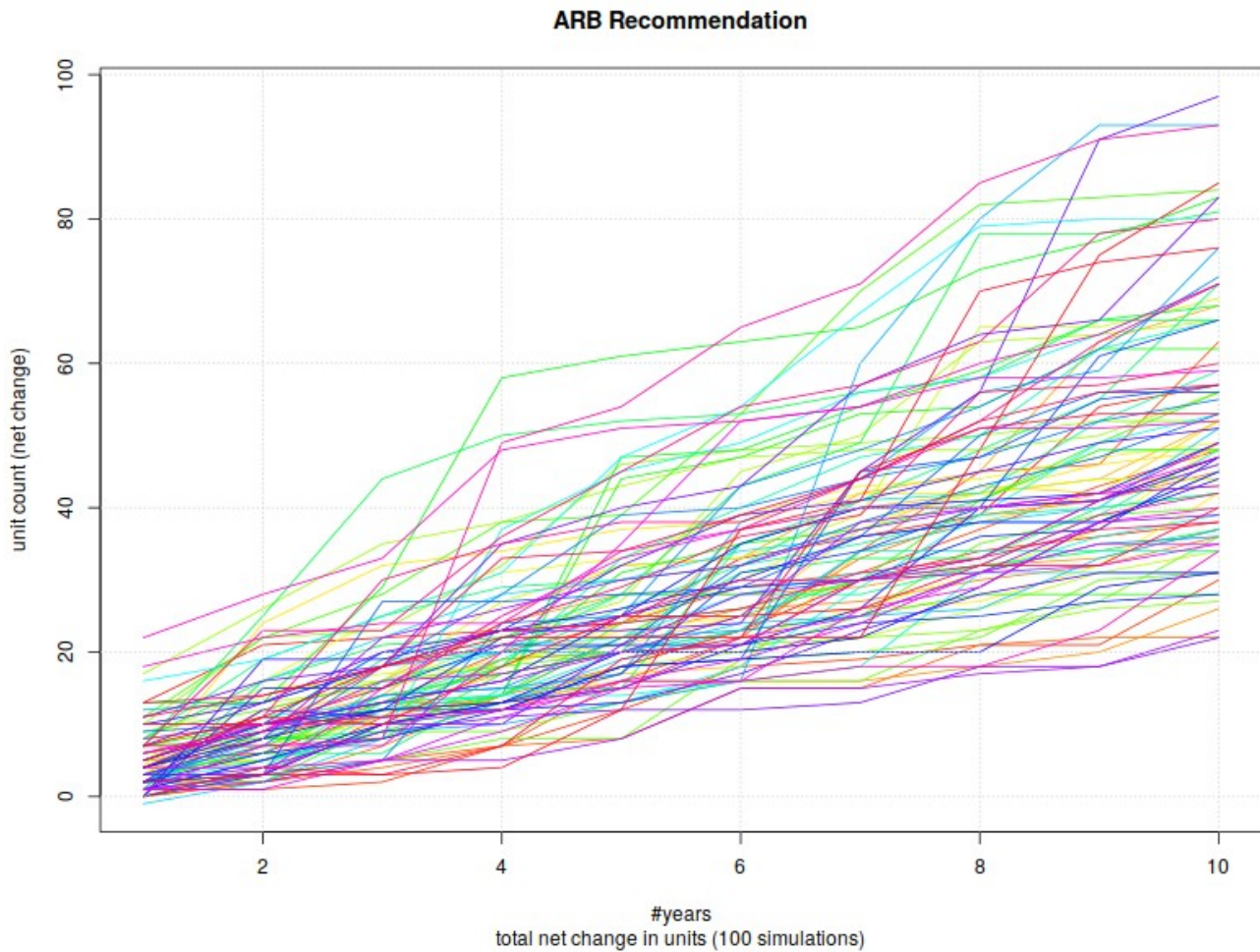
|  | Min | 1st Q | Median | 3rd Q | Max |
|---|---|---|---|---|---|
| net new units | 22 | 39 | 48 | 62 | 97 |
| parcels redeveloped | 14 | 21 | 24 | 37 | 35 |

## Scenario 2: 0.5 parking spaces/dwelling

This scenario models the multifamily district proposed by Article 12, with the assumption that all applicants request a parking reduction, and 0.5 parking spaces/dwelling are provided.

The simulation shows a range of 15 – 43 parcels redeveloped, with 31 – 158 net new units over ten years.



**ARB Recommendation (with 0.5 space min)**

#years
total net change in units (100 simulations)
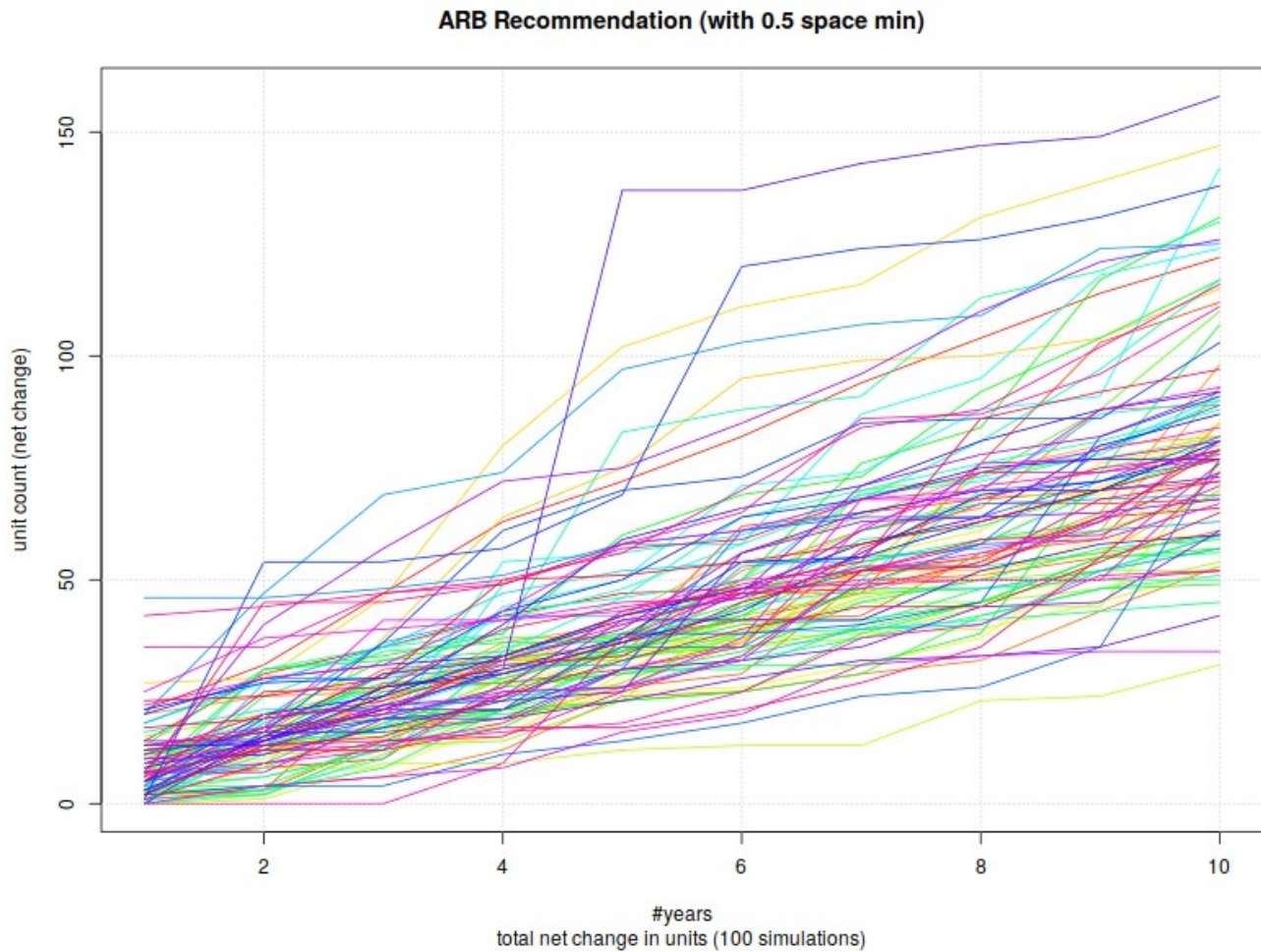
|  | Min | 1st Q | Median | 3rd Q | Max |
|---|---|---|---|---|---|
| net new units | 31 | 62 | 79 | 91 | 158 |
| parcels redeveloped | 15 | 23 | 26 | 29 | 43 |

## Conclusion

For the purpose of providing a projection for Article 12, the parcel ranges in these simulations were rounded up to the next increment of five, and the unit ranges were rounded up to the next increment of fifty (which is to say, the projections are intentionally high).  The simulated number of parcels redeveloped was 14 – 43, which rounds to a range of 15–45.  The simulated number of net new units was 22–158, which rounds to a range of 50–200.