



## **Boxborough Buildout and Alternative Futures**

**Technical Report**

**Prepared by the Metropolitan Area Planning Council**

**Data Services Department**

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# 1. Introduction

The Metropolitan Area Planning Council, under contract to the Town of Boxborough, has conducted a buildout analysis for the town as well as alternative scenarios representing possible changes in town policy. The analysis was conducted using CommunityViz, a GIS-based decision-support tool that can be used to model the outcomes and impacts of alternative land use, housing, and environmental policies. In particular, the software features a Buildout module which provides additional tools to calculate development capacity of land area based on current or proposed zoning regulations. Assumptions about the impact of certain regulations or potential zoning or regulatory changes can be input into the model to rapidly generate alternative scenarios. This memo describes the technical elements of the buildout analysis.

## Key Findings of the Analysis

- Residentially-zoned parcels in Boxborough have the “as-of-right” capacity to accommodate an additional 105 housing units in the Agricultural/Residential district, 3 units in the Residential 1 zone, and 3 units in Town Center.
- Complete buildout of the residential zones is projected to generate additional \$950,000 million of additional tax revenue (2013 dollars) based on current tax rates.
- The town is projected to experience housing demand for approximately 80 new single family homes and 110 – 125 apartments, condominiums, or townhouses between 2010 and 2030. There is capacity to meet demand for single family homes, but not multifamily demand.
- Commercial districts have the potential to accommodate an additional 2.3 million square feet of commercial development.
- Complete buildout of the commercial districts is projected to generate \$3.48 million of additional tax revenue (2013 dollars) based on current tax rates.
- Preliminary MAPC projections indicate that Boxborough’s employment base may grow by 1,150 jobs from 2010 – 2030, which would require approximately 500,000 square feet of new commercial development, one quarter of the development capacity.

### 1.1. Overview

CommunityViz calculates development capacity estimates at the parcel level, meaning that the tool uses each parcel’s existing characteristics, info, and data to estimate the “as-of-right” development potential (requiring no special permits or variances) according to existing zoning regulations and other user-defined constraints. First, the tool calculates the amount of land available for development by overlaying constraint layers (e.g. wetlands, protected open space, conservation lands, etc.) on parcels and calculating the unconstrained area. Density and dimensional regulations from the zoning bylaw (expressed as Dwelling Units per Acre and Floor Area Ratio) are input for each zone, and the tool uses these multipliers to estimate the maximum amount of possible development in terms of dwelling units, and commercial floor area. Next, the tool seeks to determine how much of this development could actually be located on the parcel without violating dimensional requirements such as setbacks, minimum separation distances and such. In CommunityViz, the first sets of estimates are called the “Numerical Buildout” - and the results of the second process are called the “Spatial Buildout.”

Results of the Spatial Buildout were further adjusted using a model MAPC developed through analyzing 31 recent subdivisions in the town of Boxborough since 1998 to estimate likely yield of developable parcels based on empirical observations of actual development patterns instead of density assumptions based on strict interpretation of the zoning bylaw.

Finally, with the help of Boxborough's town planner, MAPC conducted a parcel-by-parcel analysis on the buildout estimates and adjusted the outputs where necessary to account for parcel- and site-specific conditions not factored into the model estimates.

Following the buildout estimation, MAPC set up three CommunityViz scenarios to model the impact of alternative hypothetical changes to the town's development regulations. The results of these alternative scenarios can be compared to the buildout estimates to gauge the potential impacts of alternative development patterns. Calculated indicators that can be used to compare scenarios include total units, tax revenue, and more. These indicators are intended to help the town make informed decisions about proposed policy changes.

Finally, it is worth noting that the buildout results are estimates of development *capacity* under *current land use regulations*. They do not indicate whether development is more or less likely on a given parcel, and they do not account for development that might occur outside the constraints of current zoning (such as a Comprehensive Permit residential development.) However, MAPC has incorporated our recently completed population and housing demand projections for the town to assess whether supply may exceed or fall short of demand for various housing types.

## 1.2. About CommunityViz

The CommunityViz Scenario 360 software<sup>1</sup> is an ArcGIS extension that can be used to create land use scenarios by incorporating a variety of input datasets, conducting a set of calculations based on user-defined assumptions, and generating a variety of outputs at the parcel and town wide level. Data may include spatial information, parcel attributes, or information about densities and dimensional requirements. *Dynamic attributes* are customized calculations that use attributes from the data to calculate the estimates of interest. *Assumptions* are a select set of key input variables that can be easily adjusted to reflect specific policy alternatives (such as the minimum number of units for inclusionary zoning) or development uncertainties (such as the reduction in density that may result from impermeable or shallow soils.) Different combinations of assumption values can be used to create a range of *scenarios* reflecting different policy choices or uncertainties.

## 1.3. CommunityViz Terms

The following terms related to the analysis are used in this report:

- **Buildout Wizard:** The Scenario 360 build-out analysis module that automates the spatial and numeric components of the build-out process.
- **Dynamic attributes:** Attributes are properties or characteristics of map features (similar to fields, field attributes, or data columns). A dynamic attribute is an attribute that is automatically or manually updated as changes are made in the analysis. Dynamic attributes are, for the most part, coded by MAPC specifically for this analysis, not "out of the box" calculations.
- **Assumptions:** Assumptions are adjustable input values that reflect subjective inputs into the model, such as policy choices or uncertainties.
- **Indicators:** Indicator values are the total measurement of attribute values in any given scenario, as opposed to the value/characteristics of a single feature. For example, the total dwelling unit capacity of all parcels in town or in a specific zoning district can be summed into attributes that will vary depending on the scenario.
- **Formulas:** As defined in the CommunityViz Scenario 360 glossary, formulas are expressions that specify how the elements of an analysis depend upon one another. There are two kinds of formulas being used in the buildout analysis: Indicator Formulas, and Attribute Formulas.

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<sup>1</sup> <http://placeways.com/communityviz/productinfo/scenario360/>

- **Constraints to development:** Features that prevent development or reduce the development capacity of a given parcel, such as wetlands and protected open space. *Absolute* constraints are excluded from the lot area used for density calculations; land with *transferrable* constraints can be used to satisfy minimum lot area requirements but buildings cannot be placed on these areas.
- **Numeric buildout:** Estimated buildout capacity based on total unconstrained land area and allowable densities for that parcel. This step does not account for setbacks, irregular lots, or other dimensional barriers to development<sup>2</sup>.
- **Spatial buildout:** Buildout estimates based on spatial CommunityViz operation that attends to place points representing buildings while accounting for setbacks, maximum separation distances, and other such dimensional regulations<sup>3</sup>.

## 2. Buildout Analysis

### 2.1. Data Sources

The following datasets were used in this analysis:

- **Parcels:** The analysis used the most recently available parcel boundaries and Fiscal Year 2012 tax assessment's data provided by the Town of Boxborough. MAPC also used the latest parcel data provided in the MassGIS Parcel level 3 dataset. MAPC used the assessor's data to estimate the amount of existing development on each parcel in terms of housing units and square footage of commercial development. The Town Planner also provided a list of recent subdivisions (since 1997) that was used to calculate parcel boundaries before and after the subdivisions; this information is used to model the town's recent subdivision yield as a function of such variables as available frontage, proportion of parcel's covered by wetlands, and the proportion of parcel with more than 500 feet distance to a dead-end road to calculate the subdivision yield for any given parcel in town. All approved subdivisions are treated as "existing" even if they are not yet complete.
- **Zoning Districts:** The Town Planner provided current zoning data in GIS format, and MAPC assigned each parcel in town to a zone. In cases where a parcel spanned two or more zoning districts, the parcel was assigned to the district that contained the majority of the land area. MAPC reviewed the town's zoning bylaws and identified the critical constraints to development in both residential and commercial zones.
- **Building Structures:** LIDAR-based data showing the area covered by buildings in the town. Ortho images used were obtained in 2011 and 2012, supplemented with LiDAR (Light Detection And Ranging) data collected from 2002 to 2011 for the eastern half of the state.
- **Elevation:** LIDAR-based, 2-foot intervals
- **Roads:** The Town roadway data was provided by the town planner, MAPC also used the MassGIS MassDOT Roads layer when necessary.
- **Wetlands and Watershed Protection District (W-District):** The W-District boundary as regulated by the town's zoning. Data was provided by the town planner.
- **Hydrological features, rivers, lakes, water bodies<sup>4</sup>:** MassGIS data – major ponds and major streams.

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<sup>2</sup> <http://placeways.com/downloads/CV4-4/TutorialsCV4-4.pdf>

<sup>3</sup> <http://placeways.com/downloads/CV4-4/TutorialsCV4-4.pdf>

<sup>4</sup> <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/majhd.html>

- **Flood Zones:** FEMA national flood hazard layer; NOTE—the analysis was conducted before the revised preliminary Flood Insurance Rate Maps (FIRM) were released in the fall of 2013; the prior data was used for this analysis.
- **Protected Open Space:** Land owned by the town’s conservation commission, federal, state, or non-profit organizations, which are restricted for future development with the goal of preserving the natural environment. Data was provided by the town planner.
- **Chapter Land:** Parcels participating in the tax abatement programs authorized by MA General Laws Chapter 61, 61A, or 61B, which reduce the tax burden for parcels in active forestry, agricultural, or recreational use. A list of participating parcels was provided by the Town Planner.
- **Protected and Recreational Open Space:** MassGIS data – protected and recreational open space<sup>5</sup>. This was augmented with Protected Open Space layer, and information about recent town acquisitions and protection actions.
- **Priority habitats:** MassGIS data – NHESP priority habitats of rare species<sup>6</sup>.

## 2.2. Constraints to development

MAPC used the following data layers as constraints to development addressed in town's zoning by law:

- *Wetlands and Watershed Protection District (W-District):* The town’s Wetlands and Watershed Protection District (W-District) is defined in Boxborough’s zoning bylaw as an overlay district that should be superimposed on the underlying zone’s regulations, however any use permitted in the underlying zone requires a special permit from the town’s Board of Appeals in order to be authorized for development. This layer was used as constraints for development, and no new housing units or commercial development were placed within either the district, or land within 100 feet distance of the boundaries.
- *Protected open space:* Permanently protected open space lands, town and state owned conservation lands, semi-public lands<sup>7</sup>, and chapter lands are designated as constraints for development, and no new housing units or commercial development were placed where covered by this layer.
- *Riverfront Area:* The Massachusetts Rivers Act largely prohibits new development within riverfront areas, which are defined as land within 100 feet of the top of bank for a perennial stream. MAPC estimated the extend of the riverfront area using the hydrology data described above, buffered 100 feet from the edge of the feature. No new housing units or commercial buildings were permitted within the 100 foot riverfront area.

## 2.3. Numeric Buildout

The Numeric Buildout analysis is a mathematical calculation to estimate the capacity of each parcel based on unconstrained lot area and density measures obtained from the zoning bylaw. First CommunityViz' buildout wizard calculates the area of parcels outside the constraint layers which can be used to satisfy minimum lot area requirements.

After calculating the developable area, the buildout wizard determines whether each meets the minimum lot area, and minimum upland criteria for the zone, listed in Table 1. Parcels smaller than the minimum lot area were assumed to be nonconforming and therefore not available for further development. In addition,

<sup>5</sup> <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/osp.html>

<sup>6</sup> <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/prihab.html>

<sup>7</sup> Semi-public lands are considered protected open space. These lands are owned by private recreation or conservation organizations that can sell them for development if they choose, but given the nature of the organization are not likely to (Open Space and Recreation Plan 2002 p.44).

Boxborough has 297 parcels that do not meet the minimum upland requirements of their corresponding zones, therefore excluded from future development.

Table 1: Minimum upland requirements by zone. Source: Boxborough zoning bylaw

Zone	Minimum Lot Area (sq. feet)	Minimum Upland Requirement	Upland Requirement Unit
AR	60,000	20,000	square feet
R1	80,000	20,000	square feet
B	40,000	20,000	square feet
B1	40,000	20,000	square feet
OP	160,000	20%	% of total lot area
TC	40,000	20,000	square feet
IC	80,000	20%	% of total lot area

For parcels above the minimum lot area, the buildout wizard then calculates preliminary estimates of units or square footage based on density values derived from the zoning bylaw. The density value for residential zones is in terms of units per acre. Nonresidential densities are calculated in terms of Floor Area Ratio (FAR.) While FAR limits are not explicitly stated as part of the commercial zoning district regulations, MAPC estimated the effective FAR maximum for each zoning district based on setbacks, open space requirements, height limits, and parking requirements using the formula in Equation 1.

Equation 1: Formula used for calculating effective FAR

BA = Building Area  
 L = Lot Area  
 P = Parking Area  
 R = Ratio of parking space per building area space (for example, 500 square feet of parking area /400 square feet of building area)  
 OS = Minimum percent Open Space  
 BF = Building Footprint  
 F = Number of floors

Find:  
 $FAR = BA/L$

Given:  
 $P = BA * R$  [parking area = building area\*(parking space area /building Area)  
 $BF = BA/F$   
 $L = L(OS) + P + BF$

**$FAR = \frac{(1-OS)}{R+1/F}$**

While these calculations represent the maximum density nominally allowed by zoning, MAPC observed that almost all recent development (since 1998) has occurred at densities well below the nominal density limits. The ability to adjust commercial densities down to these observed FARs was incorporated into a later step of the process. Densities “maximum yield” value by zone is compromised in Table 2.

Table 2: Observed and nominal density, by zone.  
Source: Boxborough Zoning Bylaw, Boxborough Assessors Data

Zone	Nominal (Unadjusted) Density Value	Post-1998 Observed FAR (FAR_Adj)	Unit
AR	0.726	NA	Unit per Acre
R1	0.544	NA	Unit per Acre
B	0.21	0.30	FAR
B1	0.21	0.03	FAR
OP	0.13	0.19	FAR
TC	0.15	0.09	FAR
IC	0.13	0.04	FAR

With the estimates of developable land and densities, the buildout wizard calculates preliminary estimates of floor area and dwelling units that could be accommodated on a parcel. The existing number of units and the existing floor area, based on the assessor’s database, are subtracted from these preliminary estimates to generate a “Numeric Buildout” estimate of *additional* development potential. For example Parcel 07-5-228-0.0 is located in the AR zone, and has total lot area of 204,620 sq ft (4.7 acres.) There is currently one residential unit on this lot and 48% of the lot is covered by the W-district (with the 100 ft buffer). The buildout wizard calculates the numeric buildout capacity by dividing 98,218 sq ft (2.3 acres) of the parcels unconstrained area by the AR zones’ density unit of 0.726 units per acre to yield 3 possible units total. Since there is already one unit on the lot, the numeric buildout capacity for this parcel is 2 additional housing units.

## 2.4. Spatial Buildout

Once the numeric buildout estimates are generated, Community Viz conducts a “Spatial” buildout exercise to determine how many to determine how many buildings of typical size could be placed on the parcel while satisfying lot line setbacks and minimum building setbacks and minimum building separation distances. The setback assumptions are listed in

Table 3: Frontage, and Setback Regulations, Boxborough Zoning Bylaw.

Table 3: Frontage, and Setback Regulations, Boxborough Zoning Bylaw

Zone	Minimum Lot Frontage (ft.)	Minimum Lot Width (ft.)	Minimum Front Setback (ft.)	Minimum Side Setback (ft.)	Minimum Rear Setback (ft.)
AR	150	150	100	100	100
R1	150	150	125	125	125
B	100	100	100	100	100
B1	100	100	100	100	100
OP	200	200	125	125	125
TC	100	100	100	100	100
IC	200	200	125	125	125

## 2.5. Recent Subdivisions Model

CommunityViz buildout estimates are based on a set of formulas that attempt to replicate the various density and dimensional requirements articulated in the town’s zoning bylaw, subdivision regulations, and other local policies. However, it is evident that the actual development of a given parcel is influenced by a host of practical, environmental, political, and economic factors that are rather difficult to model directly. To account for these factors, MAPC conducted a multivariate analysis to estimate likely yield of developable parcels based on past development instead of regulatory specifications alone.

With the information provided by the town planner, MAPC analyzed 31 approved residential subdivisions in the town of Boxborough since 1998. These subdivisions are listed in Table 4. We began by delineating the tract(s) of land that were subdivided to enable development. These “parent parcels” include not only the resulting house lots, but also land used for roadways or set aside as open space. Comparing the total number of buildable house lots to the size of the parent parcel produces a much more accurate and useful estimation of development density as compared to nominal density based on the size of the house lots. The results are shown in Figure 1 and Figure 2. It should be noted that parcels currently enrolled in the Chapter 61/61A/61B tax abatement program are not included in these calculations.

Table 4: Approved residential subdivisions in the town of Boxborough since 1998

<b>Subdivision Name</b>	<b>ANR</b>	<b>Total Area After Subdivision (sqm)</b>	<b>Total Area Before Subdivision (sqm)</b>	<b>Frontage After Subdivision (sqm)</b>	<b>Frontage Before Subdivision (sqm)</b>	<b>Number of Subdivided Parcels</b>	<b>Number of Subdivided Parcels with Building Structure</b>
<b>school house</b>	0	241972.83	241972.83	785.71	785.71	12	11
<b>Hughes</b>	0	102495.56	108548.32	877.52	214.84	10	9
<b>windermere</b>	0	430129.25	456025.78	3053.41	571.35	12	3
<b>Saras</b>	0	65260.98	68625.54	582.76	206.2	8	5
<b>saddler farm</b>	0	33305.55	33305.55	387.7	334.33	5	5
<b>priest_hill</b>	0	96272.07	100997.99	858.58	328.55	10	9
<b>houghton</b>	0	79700.98	87105.43	875.8	745.75	12	11
<b>daniels</b>	0	18343.23	21212.92	272.46	43.35	2	2
<b>colonial</b>	0	62366.95	68875.22	745.75	37	10	7
<b>butler way</b>	0	12760.14	12760.14	42.61	42.61	2	2
<b>barbeau</b>	0	146948.34	150404.34	620.08	255.36	10	8
<b>avebury</b>	0	154523.37	163108.55	954.17	36.88	12	11
<b>anr1</b>	1	126082.39	126082.39	376.54	376.54	4	3
<b>anr2</b>	1	63894.11	63894.11	401.41	401.41	3	2
<b>anr3</b>	1	153944.89	153944.89	486.97	486.97	9	6
<b>anr4</b>	1	15807.82	15807.82	119.34	119.34	2	1
<b>anr5</b>	1	337344.56	337344.56	134.03	134.03	9	5
<b>anr6</b>	1	181208.92	181208.92	603.69	603.69	14	14
<b>anr7</b>	1	98572.19	98572.19	260.99	260.99	5	3
<b>anr8</b>	1	135300.78	135300.78	468.22	468.22	6	5
<b>anr9</b>	1	17276.3	17276.3	139.54	139.54	3	3
<b>anr10</b>	1	41281.82	41281.82	124.38	124.38	5	4

anr11	1	46750.33	46750.33	215.31	215.31	5	3
anr12	1	112886.37	112886.37	449.28	449.28	8	8
anr13	1	320538.37	320538.37	526.19	526.19	2	2
anr14	1	14609.57	14609.57	122.53	122.53	2	1
anr15	1	20424.98	20424.98	36.48	36.48	2	1
anr16	1	21160.42	21160.42	94.1	94.1	2	2
anr18	1	12078.49	12078.49	123.8	123.8	2	2
anr19	1	16141.53	16141.53	137.9	137.9	2	2
anr20	1	15104.27	15104.27	153.62	153.62	2	1

Figure 1: Recent Boxborough Subdivisions, 1997 - 2012

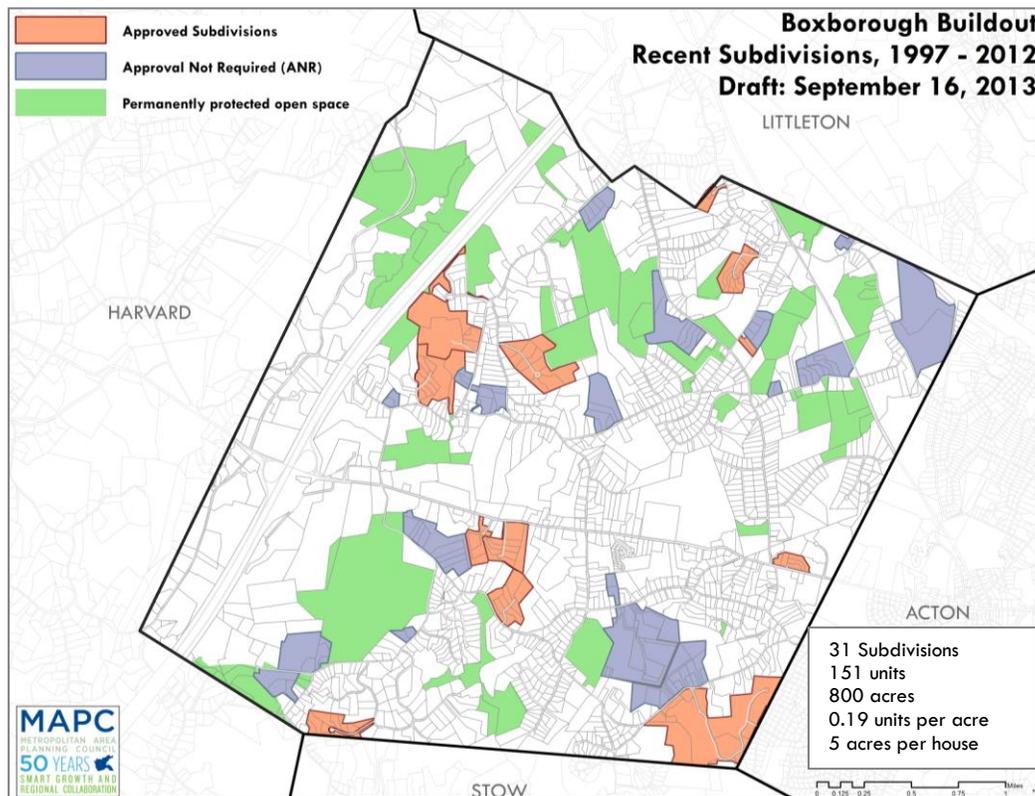
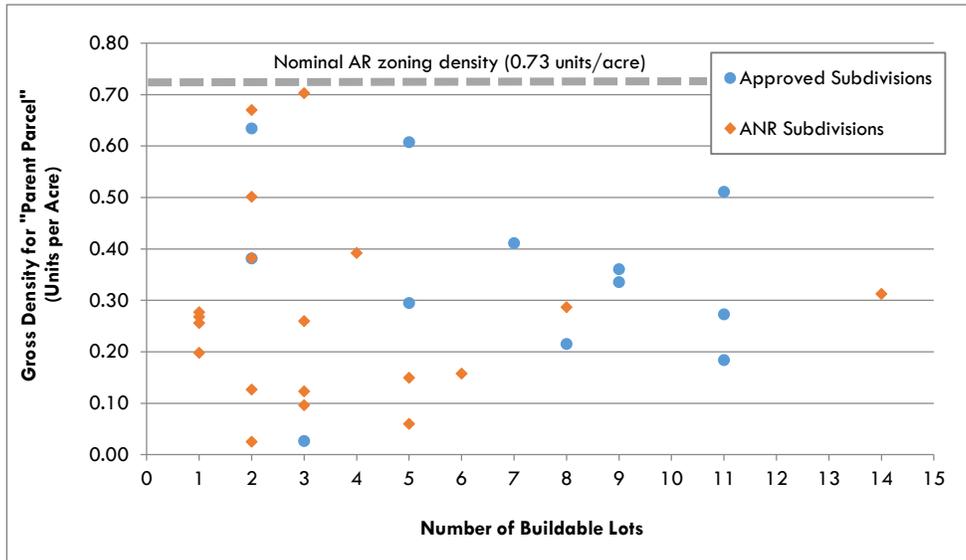


Figure 2: Recent Boxborough Subdivisions, Yield and Density, 1997 - 2012



MAPC then calculated a variety of statistical attributes for each parent parcel and subdivision, and also added a dummy variable to indicate if the development used the Approval Not Required (ANR) process. We then constructed a multivariate linear model with total units divided by the area of the parent parcel as the dependent variable. The independent variables include upland developable area, percent covered by wetlands and W-District, frontage available, and the ANR dummy variable. This set of independent variables provides a statistically significant model for explaining lot yields of the town’s recent subdivisions. Equation 2 was then derived from the model and was used to calculate two sets of development estimates for the town’s residential properties. One set of estimates are based on the ANR = 1, and the other set are based on the ANR = 0 assumption. The results of this model provided another alternative buildout estimate to be compared to the Spatial Buildout results.

Equation 2: Formula for calculating number of new residential units result of recent subdivisions model

$$\text{Units/acre\_developable\_area} = (3.294 \times 10^{-1}) + (-1.808 \times 10^{-1} \times \text{ANR}) + (-2.571 \times 10^{-6} \times \text{frontage\_norm}) + (-3.014 \times 10^{-3} \times \text{upland}) + (-1.016 \times 10^{-1} \times \text{wetland\_prop}) + (2.177 \times 10^{-1} \times \text{prop\_500ft\_road\_distance})$$

**ANR:** 0 or 1, variable whether the subdivision is Approval Not Required  
**frontage\_norm:** Frontage of parent parcel divided by the required frontage of the corresponding zone  
**upland:** upland area of parent parcel (sq. ft.)  
**wetland\_prop:** Proportion of parent parcel covered by wet lands.  
**prop\_500ft\_road\_distance:** Proportion of parent parcel greater than 500 ft. from preexisting public way

## 2.6. Development Capacity Adjustments

Once the two sets of estimates are created using the linear model approach have been calculated, the results are compared to the spatial buildout estimates and the lesser of the estimates is defined as the “adjusted” capacity. For example, a parcel with a spatial buildout capacity of 10, linear model estimates of 7 (ANR=1) and 5 (ANR=0) would have an adjusted capacity of 5.

As described previously, MAPC observed that almost all recent commercial development has occurred at densities well below the nominal density limits based on zoning bylaw interpretation. Therefore, MAPC adjusted (downward, in every case) the spatial buildout estimates for non-residential parcels based on the

ratio between nominal and observed density. (E.g., if the observed density is half of the nominal allowed density, then the spatial buildout estimates are reduced by half.) The result of this adjustment is an Adjusted Floor Area estimate which accounts for parcel constraints, zone specific density assumptions, and town's development trends.

MAPC delivered the adjusted buildout capacity estimates to the Town Planner and, where necessary, overrode the buildout estimates with a "specified" number of units or square footage based on more detailed or qualitative information that could not reasonably be incorporated into prior calculations and estimates. Factors that resulted in a "specified" value for development potential include: highly irregular lot shapes, unmapped constraints, prior or current development proposals, access limitations and frontage requirements, or market conditions. Parcels with specified values are listed in Appendix A. The result of this step is a final, best estimate of development potential based on either the adjustments, or the specified number of units. MAPC estimated that residential zoning districts in Boxborough have the capacity to accommodate an additional 105 housing units in the Agricultural/Residential district, 3 units in the Residential 1 zone, and 3 units in the Town Center zone. Commercial districts have the potential to accommodate an additional 2.3 million square feet of commercial development.

Figure 3: Estimated Housing Unit Capacity

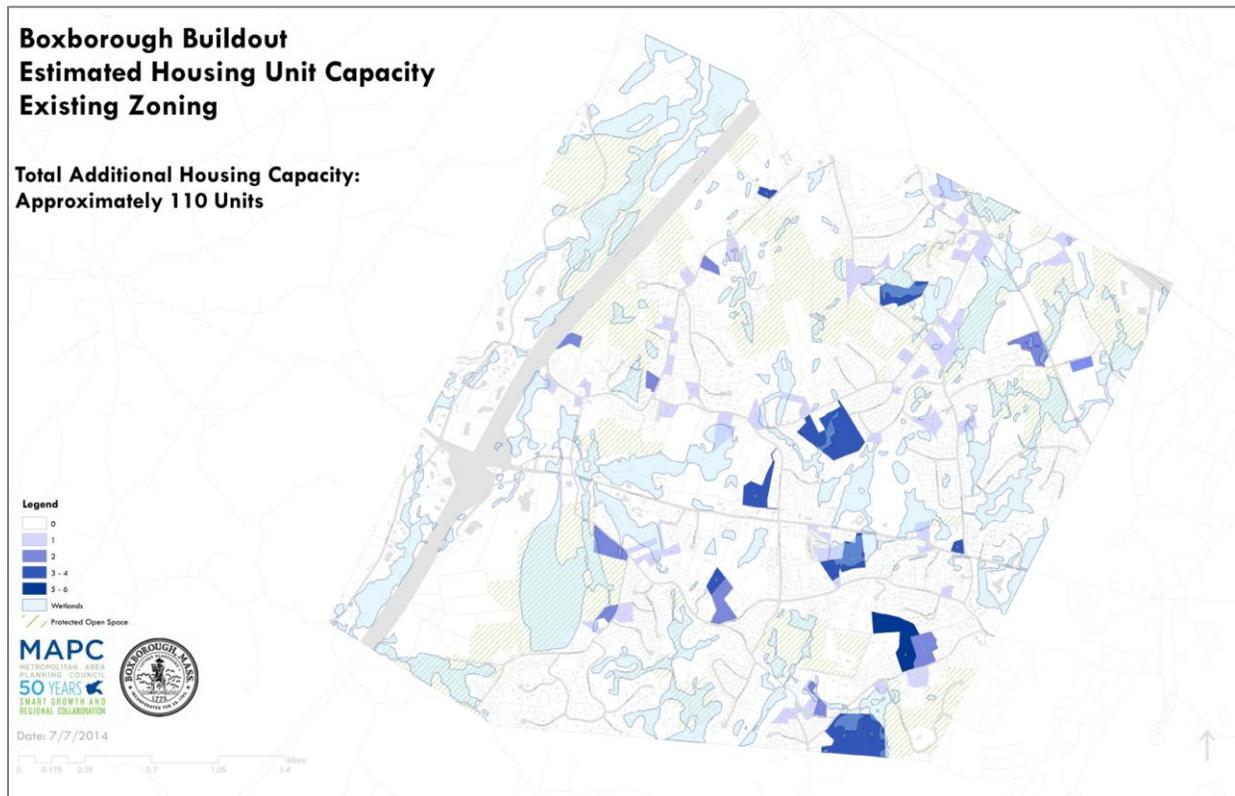
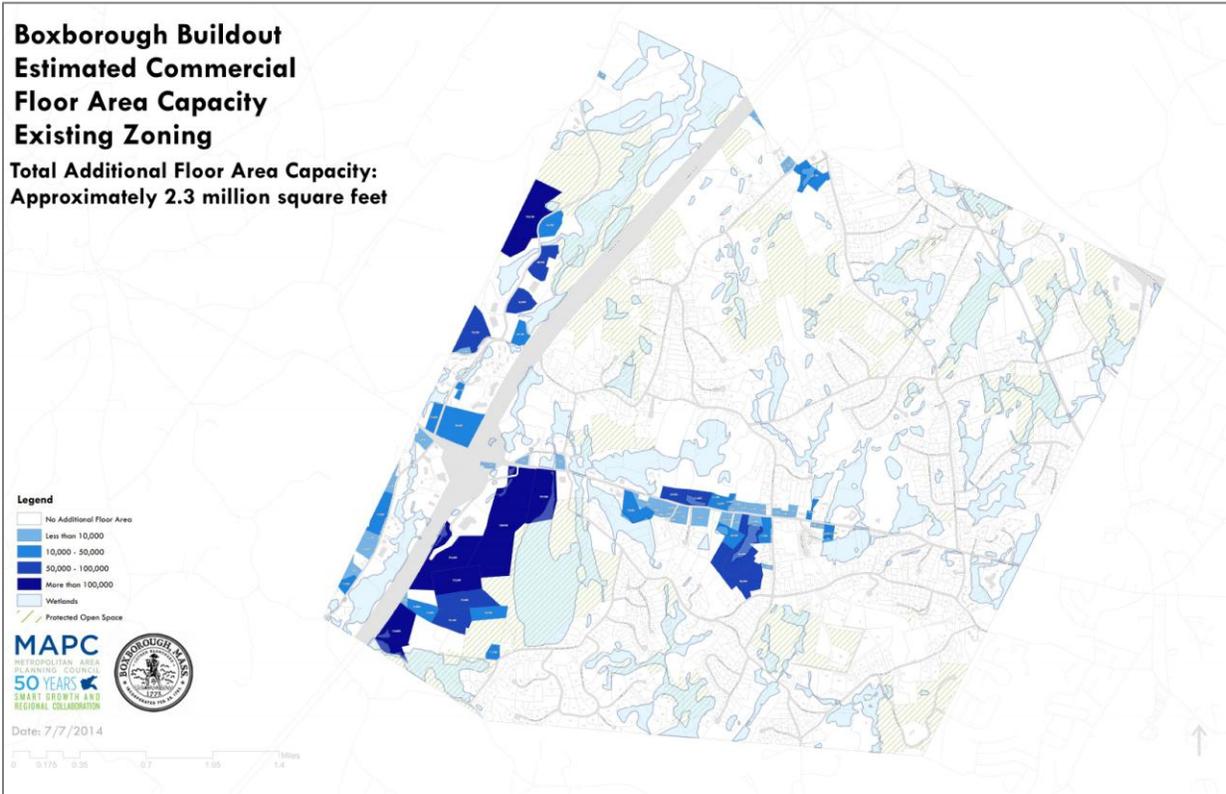
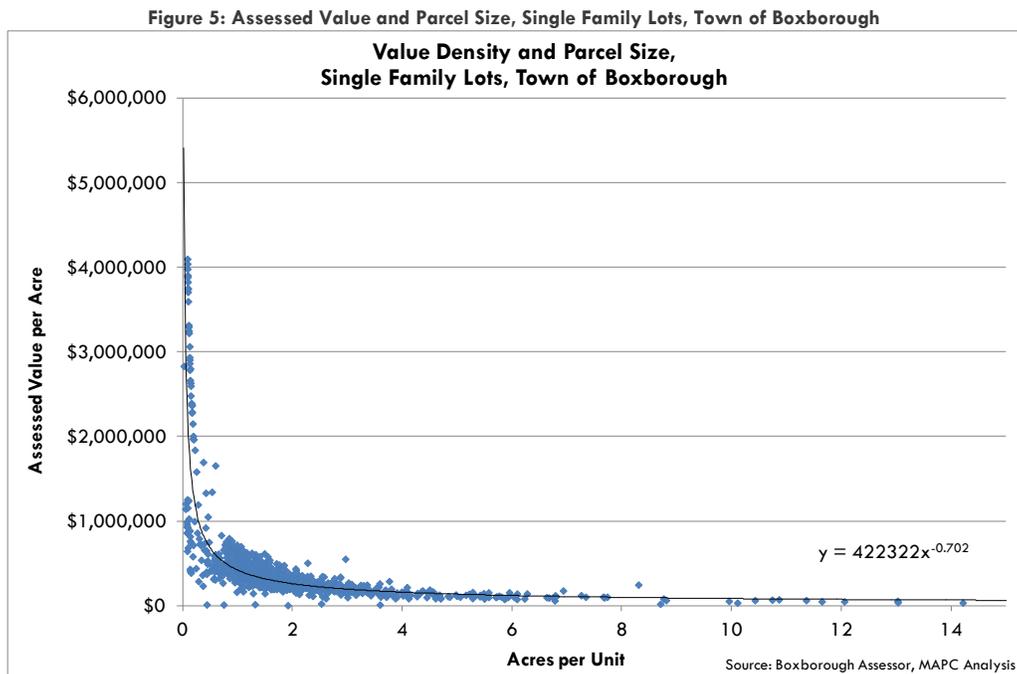


Figure 4: Estimated Commercial Development Capacity



## 2.7. Value and Tax Revenue

MAPC calculated the additional tax revenue that may result from the development of new housing units and additional commercial floor area. Our estimates are based on detailed analysis of assessor's records (including assessed value) for existing residential and commercial parcels in the town, especially recently-developed homes and businesses which may be more indicative of future valuation than older structures. Two different methods are used to estimate future tax revenue; one for residential and one for commercial development. MAPC's analysis of residential property valuation determined that, for single family lots, total assessed value of a single-family lot could be modeled with a logarithmic regression of the parcel size measured in acres per unit (Figure 5). The formula used for estimating the total value change for residential estimates could be seen in Equation 3. Using this model, MAPC estimated that the complete buildout of the residential zones is projected to generate additional \$1 million of additional tax revenue (2013 dollars) based on current tax rates.



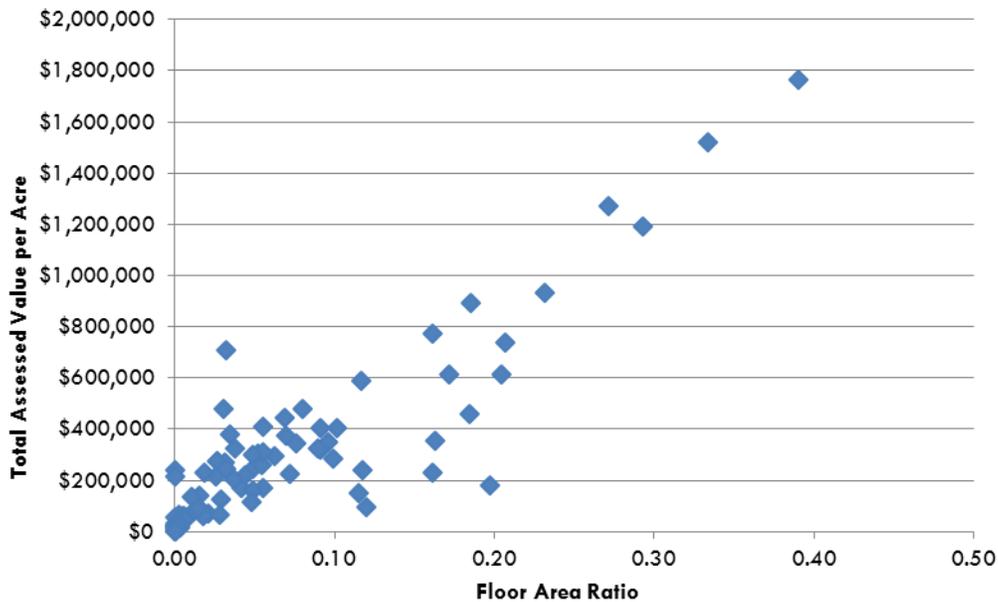
**Equation 3: Formula for calculating total value change as a result of new residential units**

$$\text{residential\_total\_value\_change} = ( ( 422322 / ( (\text{acres} / (\text{est\_new\_res\_du} + \text{num\_units} ) ) ^ { 0.702 } ) ) * \text{acres} ) - \text{total\_valu}$$

MAPC's analysis of commercial property valuation determined that, for properties in nonresidential zones built after 1990, total value per built after 1990, total value per acre is correlated with the density of the parcel (

Figure 6). As a result, we have modeled total value as a function of total floor area based on linear regression of the 2012 assessor data. The formula is presented in Equation 4. Projections of future valuation apply this function to the additional floor area for each parcel; tax revenue estimates are generated by multiplying the additional value by the FY 2013 tax rates. The value per additional square foot and tax rates are both assumptions within the model, meaning they can be easily adjusted to create additional scenarios. MAPC estimated that complete buildout of the commercial districts is projected to generate \$3.5 million of additional tax revenue (2013 dollars) based on current tax rates.

Figure 6: Assessed Value Density and Floor Area Ratio, Commercial Properties, Town of Boxborough



Equation 4: Formula for calculating total value change as a result of new commercial floor area

$$\text{commercial\_total\_value\_change} = ( ( ( 3624237.16 * ( ( \text{est\_new\_comm\_floor\_area} + (\text{far} * \text{lot\_areaft} ) ) / \text{lot\_areaft} ) ) ) + 46474.81 ) * \text{acres} ) - \text{total\_valu}$$

### 3. Allocation of Projected Housing and Job Growth

The buildout methods described above estimate each parcel’s capacity for various types of residential and commercial development. In addition to this “supply” side of the equation, it is also important to characterize the demand for different housing types and commercial real estate over the coming decades, to assess whether changes in town policy are needed to bring supply more in line with likely demand.

#### 3.1. Projected housing demand

MAPC recently published projections of population change, household growth, and housing demand for Metro Boston and its municipalities ([www.mapc.org/projections](http://www.mapc.org/projections).) According to MAPC’s “Stronger Region” scenario, Boxborough is likely to see modest housing demand over the coming decades, with demand for 180 – 210 new homes between 2010 and 2030. Approximately 60% of net demand (110 – 125 units) will be for apartments or condominiums, and 40% of the demand is projected to be for single family homes.

Over the same period, the share of householders over the age of 65 may increase from 13% of the population in 2010 to 40% of the population in 2030. With an increasing share of smaller senior-headed households, the average household size is likely to continue declining. In combination with slow housing growth, this means that the town’s population may decline by 260 people from 2010 – 2030 (Figure 7).

Figure 7: Population by Age, Town of Boxborough, 2000 - 2030, Stronger Region Scenario

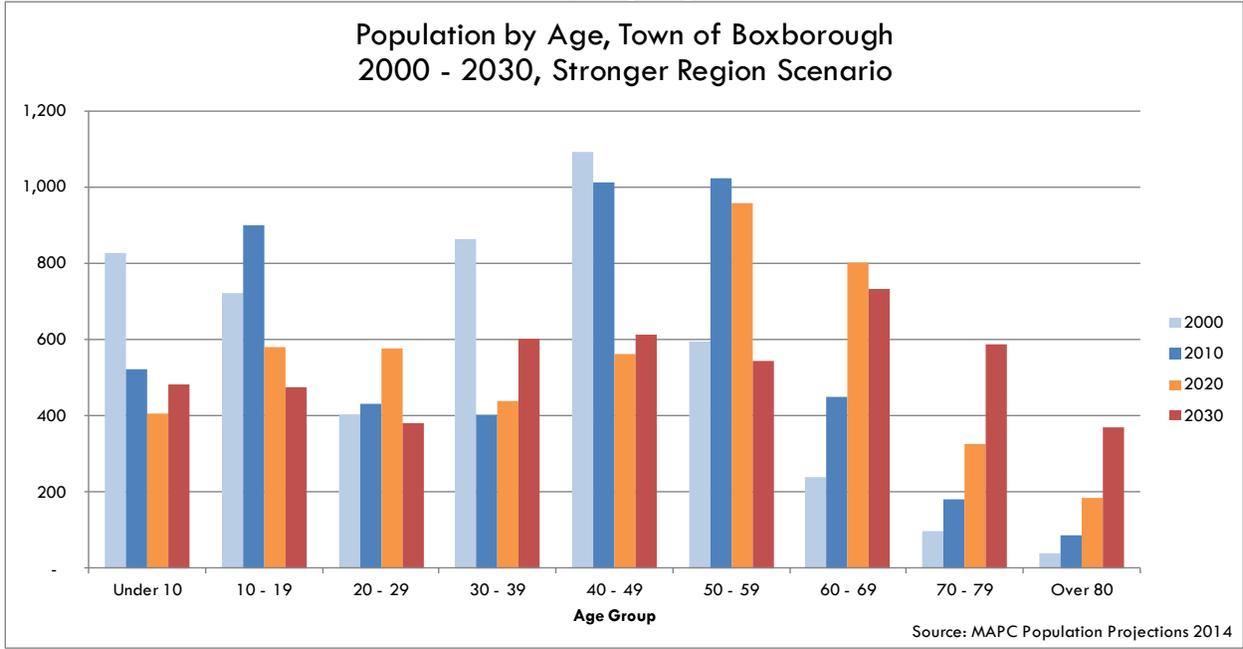


Figure 8: Households by Age of Householder, Town of Boxborough, 2010 - 2030, Stronger Region Scenario

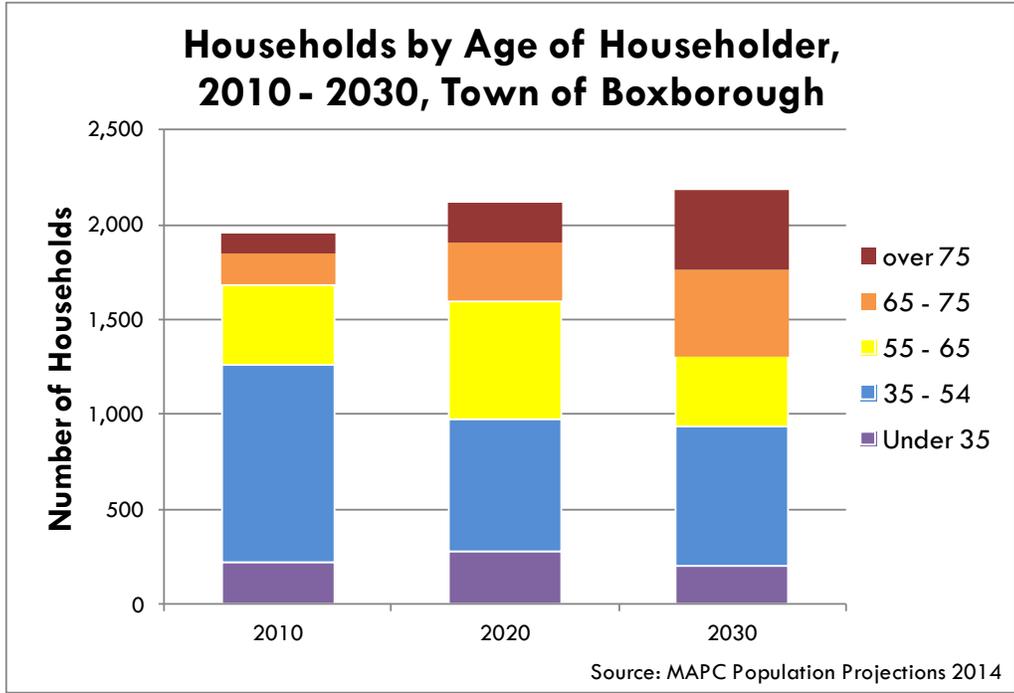
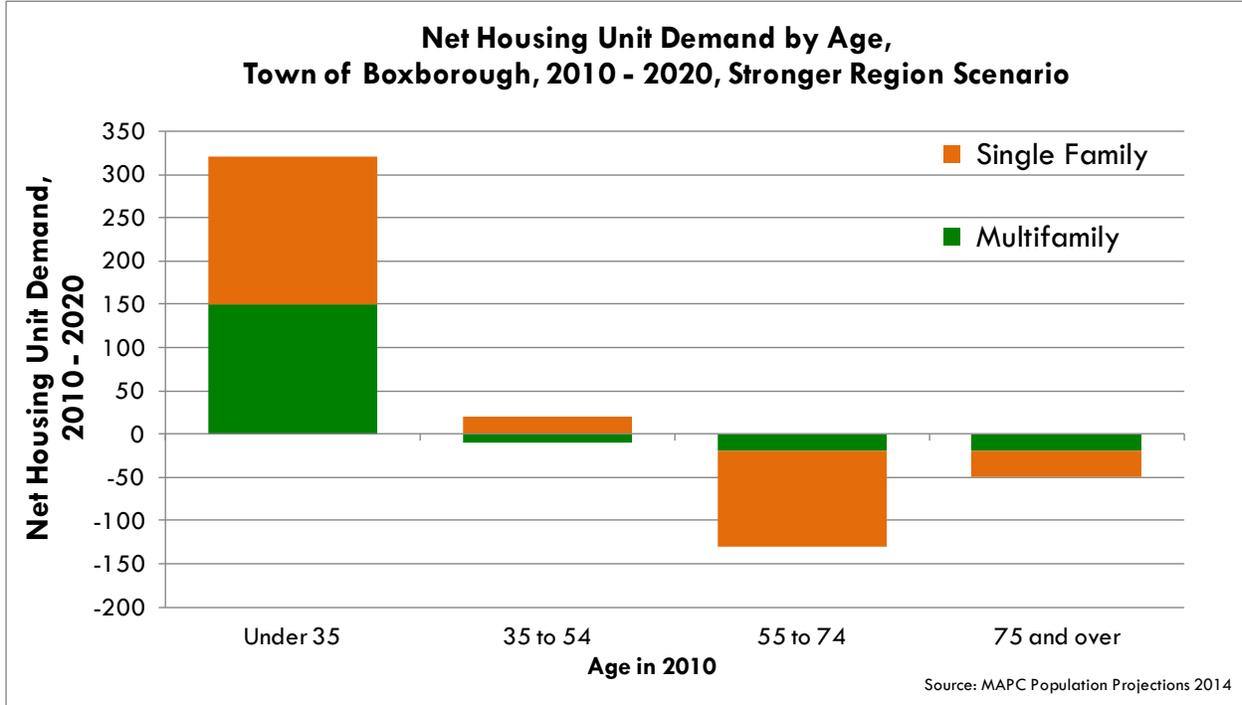


Figure 9: Net Housing Unit Demand by Age, Town of Boxborough, 2010 – 2020.

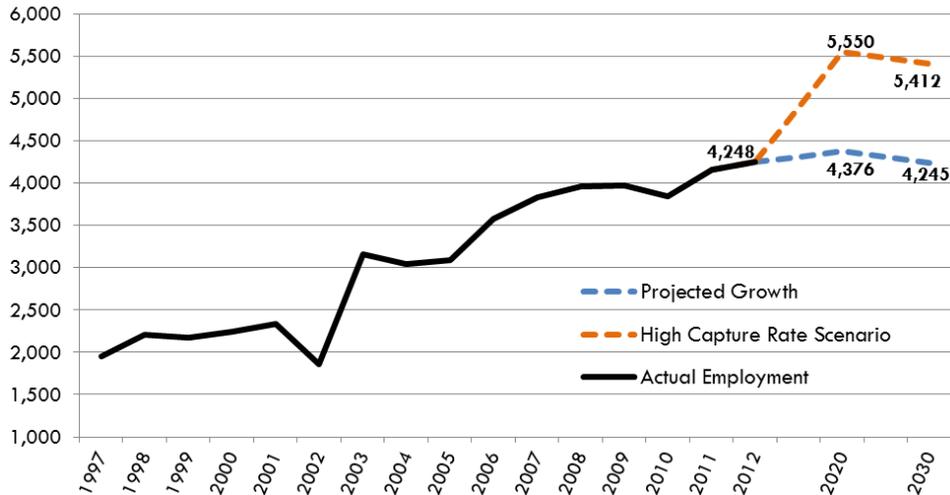


### **3.2. Projected Employment Growth**

While MAPC has not yet completed development of municipal employment projections to the year 2030, the agency prepared preliminary estimates of employment growth in Boxborough based on historical growth trends and regional/subregional projections. These estimates indicate that Boxborough may gain 125 jobs by 2020 if it retains a constant share of jobs in the MAGIC subregion (which extends from Lexington to Bolton); after 2020, jobs in the MAGIC subregion are likely to decline slightly, bringing 2030 employment back to 2010 levels if the town retains a constant share of subregional employment.

There are signs that Boxborough will gain an increasing share of the subregion's employment. Between 2000 and 2010, Boxborough's share of MAGIC employment increased from 2.2% to 4.0%, growth of 1.8 percentage points. Based on this increase, MAPC prepared a "high capture rate" scenario that assumes the Boxborough share of MAGIC employment grows to 4.9% in 2020 and 5.9% in 2030. Under this scenario, Boxborough could gain 1,300 jobs by 2020, followed by a decline of 140 jobs thereafter due to subregional employment decline (Figure 11). Assuming employment density of approximately 450 square feet per employee, this level of growth would require a net increase of 500,000 square feet of commercial space.

Figure 10: Boxborough Employment, 1997 - 2030



### 3.3. Allocation of Projected Growth

Since the projected capacity for single family housing units and commercial development exceeds the likely demand, MAPC conducted a suitability analysis to prepare a likely allocation of future growth, based on parcel capacity and other factors. Parcel attributes used in the suitability analysis include the following:

- Improvement to land value ratio (the ratio of assessed value of buildings to the assessed value of land), as indicator for utilization, with higher I/L ratios indicating lower suitability
- Available frontage (normalized by the allowable frontage in each parcel’s corresponding zone)
- Wetland coverage (percent of lot area)
- Development capacity (units or square footage)
- Distance to town center

Two separate suitability scores were calculated, for residential and commercial-zoned parcels. MAPC then allocated projected demand for commercial square footage and single family housing units to individual parcels, based on the suitability score. Since the projected demand for 110 – 125 units in multifamily housing (apartments, townhouses, or condominiums) cannot be provided “as-of-right” under the town’s zoning, these projected new units were not allocated.

The allocated housing units and commercial square footage are presented in Figures 13 and 14.

Figure 11: Residential Suitability Score

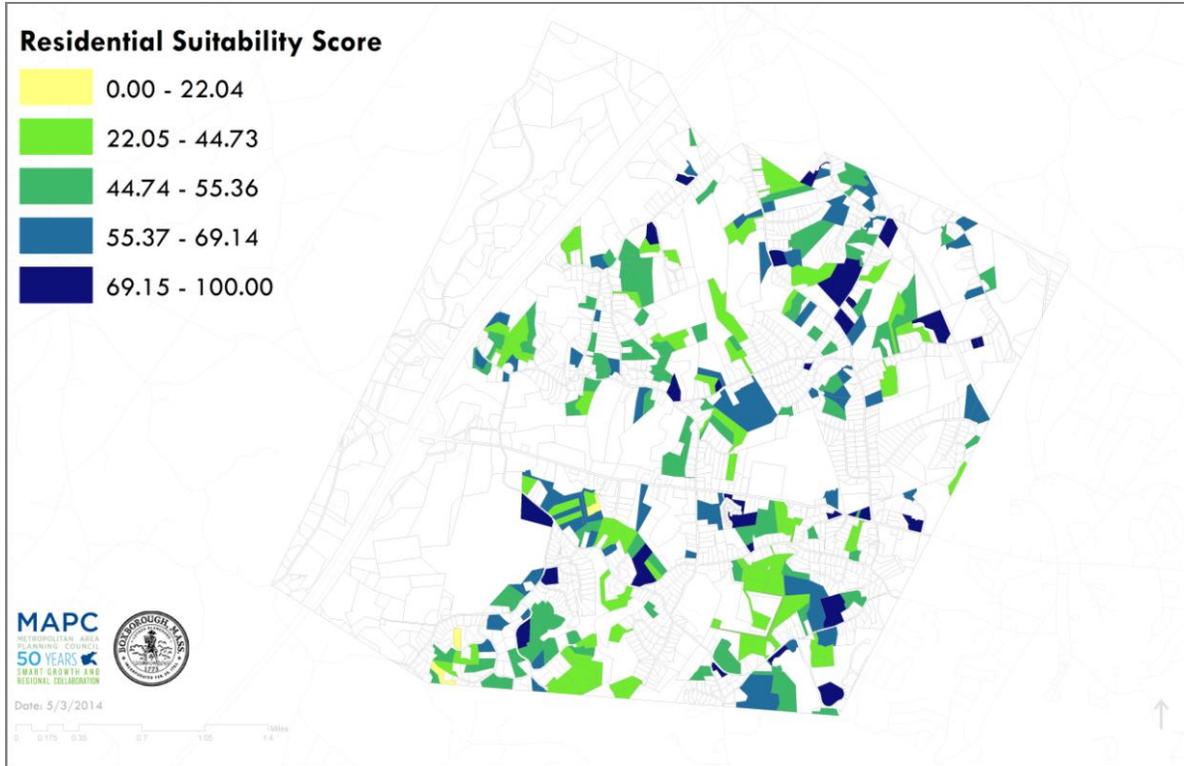


Figure 12: Commercial Suitability Score

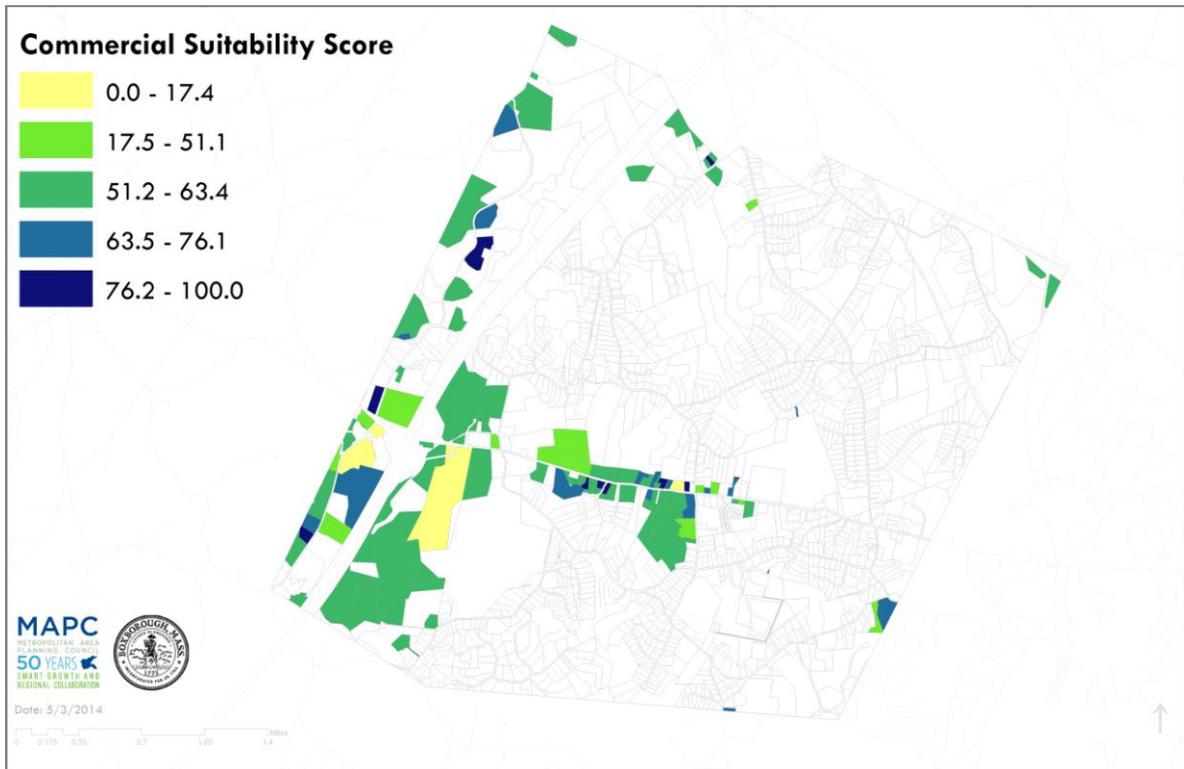


Figure 13: Allocated Single Family Housing Units

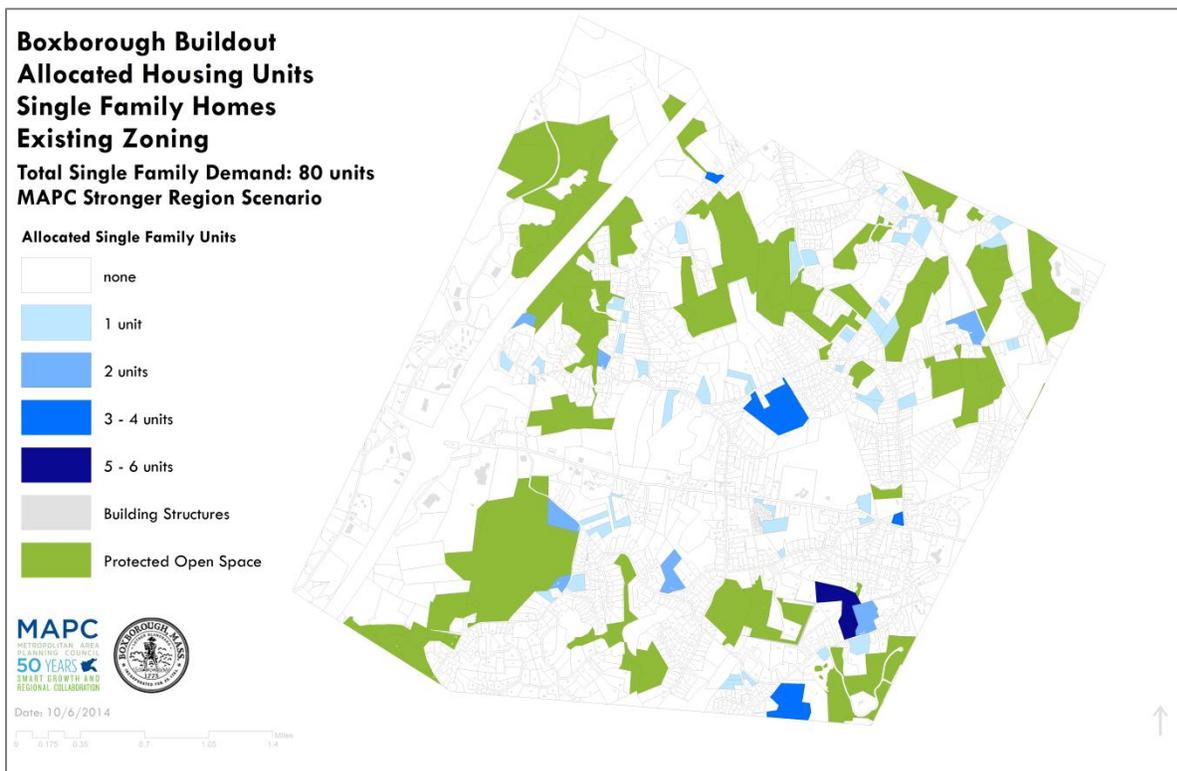
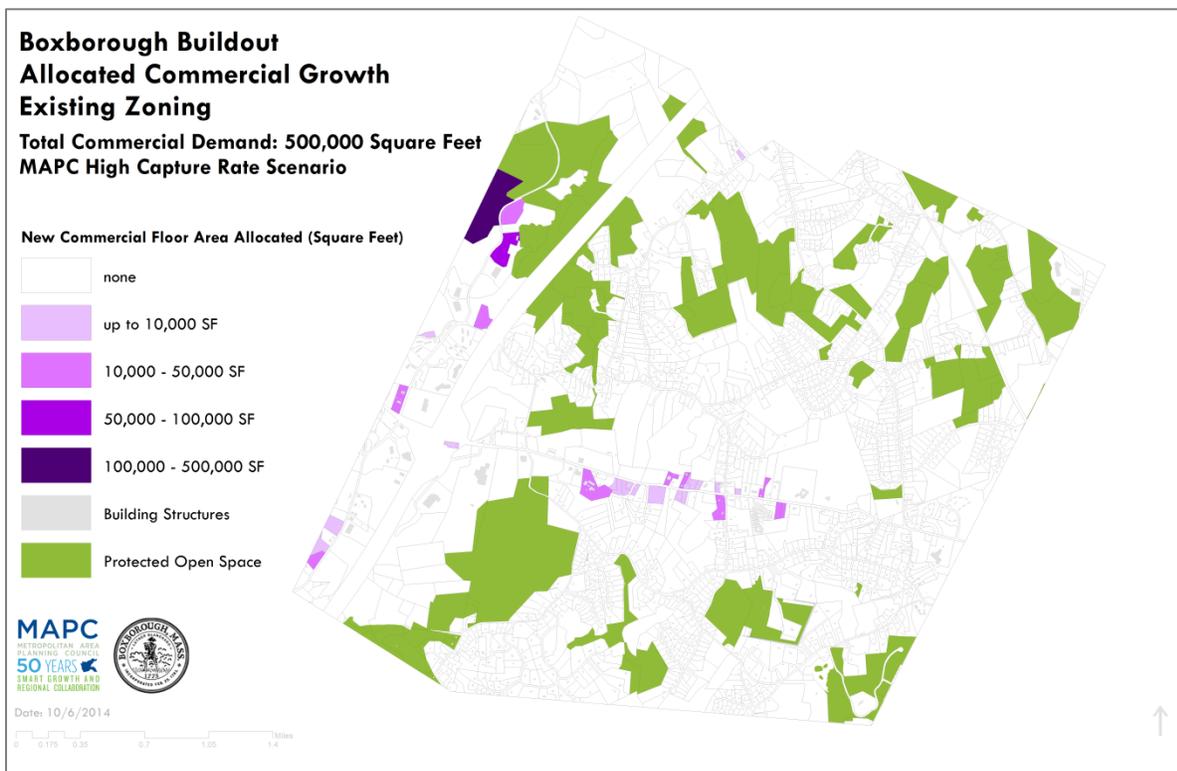


Figure 14: Allocated Commercial Growth



## Appendix A: Parcel-specific Assumptions

These tables present the number of housing units or commercial floor area specified by the Boxborough Town Planner for parcels affected by constraints and conditions that could not be fully accounted for by the Community Viz buildout model.

Table A1: Specified Housing Units

mapc_id	parloc_id	mappar_id	Specified Housing Units
110489	F_653887_3003108	07-5-236-0.0	4
110982	F_652021_3009816	08-3-184-0.0	4
109482	F_654225_2994685	09-4-332-0.B	3
110006	F_657338_2999973	11-5-313-0.0	3
110001	F_648773_2999663	06-4-108-3.8	1
110471	F_656548_3003306	11-5-241-37.2	1
110480	F_656596_3003532	11-5-241-37.3	1
110496	F_652824_3004098	07-5-224-0.C	1

Table A2: Specified Commercial Floor Area

mapc_id	parloc_id	mappar_id	Specified Floor Area
<b>109867</b>	F_641073_2999808	01-1-104-1.0	10,000
<b>109995</b>	F_640679_2999200	01-1-103-0.0	7,306
<b>110008</b>	F_641216_3000120	01-1-105-1.0	5,726
<b>110072</b>	F_641469_3000752	01-1-105-2.0	21,036
<b>110137</b>	F_641791_3001637	02-1-107-2.0	5,509
<b>110852</b>	F_653426_3010148	08-5-167-0.0	45,098