BUILD-OUT ANALYSIS
GREGG LAKE WATERSHED

FOR THE TOWN OF ANTRIM

[**FINAL** JULY 2019]

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[FINAL JULY 2019]

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EXECUTIVE SUMMARY

Concerned with protecting the water quality and ecological integrity of the Gregg Lake watershed, the Town of Antrim hired FB Environmental Associates (FBE) to perform a build-out analysis of the Gregg Lake watershed. “Full Build-out” is a theoretical condition which represents the period when all available land suitable for residential, commercial, and industrial uses has been developed to the maximum conditions permitted by local ordinances. A build-out analysis is a planning tool that identifies areas with development potential and projects future development based on a set of conditions (e.g., zoning regulations, environmental constraints) and assumptions (e.g., population growth rate). The results of the build-out analysis can be used for planning purposes to help guide future development activities in the watershed, as well as target specific areas for conservation. Note that the analyses presented herein provides a full build-out scenario based on Antrim’s current zoning standards (which are subject to amendment) and should be viewed as estimates only.

Approximately 178 parcels were identified as within or partially within the watershed, ranging in size from less than one acre to 822 acres. The largest parcel completely within the watershed covers 184 acres. The build-out analysis showed that 36% (941 acres) of the watershed is buildable under current zoning regulations. The Rural Conservation zone has the most acreage of land available for development at 909 acres. FBE identified 126 existing buildings within the watershed, and the build-out analysis projected that an additional 275 buildings could be constructed in the future, resulting in a total of 401 buildings in the watershed. Three iterations of the TimeScope Analysis were run using compound annual growth rates (CAGR) for 10-, 20- and 30-year periods from 2000-2010 (0.74%), 1990-2010 (0.56%), and 1980-2010 (0.59%), respectively. Full build-out is projected to occur in 2180 at the 10-year CAGR and 2214 at the 20-year and 30-year CAGR.

1. INTRODUCTION

Concerned with protecting the water quality and ecological integrity of the Gregg Lake watershed, the Town of Antrim hired FB Environmental Associates (FBE) to perform a build-out analysis of the Gregg Lake watershed (hereafter "study area") (FIGURE 1). The results of the analysis provide estimates of the numbers of potential lots and new building units the study area may see developed at some point in the future. "Full build-out" refers to the time and circumstances whereby no more building construction may occur, or the point at which lots have been subdivided to the minimum size allowed and there is no more "developable" land. Performing a build-out analysis shows a locality what land is available for development, how much development can occur, and at what densities. Municipalities can use the analysis as a tool for planning development patterns in the future and understanding development impacts to water quality.

2. METHODS

2.1 COMMUNITY VIZ SOFTWARE

FBE conducted the build-out analysis using ESRI ArcMap v. 10.5 geographic information system (GIS) software and CommunityViz v. 4.3. CommunityViz is a GIS-based, decision-support tool designed to help planners and resource managers visualize, analyze, and communicate about important land use decisions. FBE utilized the software's 'Build-out Wizard' to calculate the development capacity of the study area (numerically and spatially), as well as the 'Time Scope Analysis' tool to project and visualize how future development might occur over time.

The build-out analysis was performed according to the following general steps:

- Collect data on existing conditions in the study area: existing buildings, zoning, and growth rates.
- Collect and/or create relevant GIS data (e.g., development constraints layers such as wetlands and steep slopes).
- Analyze build-out potential using CommunityViz's Build-Out Wizard tool.
- Determine potential dates at which full build-out is reached using CommunityViz's TimeScope Analysis tool.

2.2 DISCLAIMER AND DATA LIMITATIONS

The data used in the analysis represented stock data sets obtained from New Hampshire's Statewide Geographic Information System Clearinghouse (NH GRANIT) online data catalog. Many of these data layers were created from remotely-sensed data (e.g., aerial photography, digital orthophotos, and satellite images) and large, landscape-level mapping projects (e.g., Soil Units). As a result, the data layers are intended to be viewed at certain scales (generally 1:24,000 or 1:25,000) due to accuracy levels. NH GRANIT maintains a continuing program to identify and correct errors in these data but make no claims as to the validity or reliability or to any implied uses of these datasets. As a result, the data presented herein should be used for planning purposes only. If greater data precision is required, this report should be supplemented with field surveys or other on-the-ground methods of data collection. There may also be minor data discrepancies throughout this document due to the variety of source materials and mapping standards used. The reader is encouraged to refer to the original referenced sources if specific data inconsistencies need to be resolved.

2.3 EXISTING BUILDINGS

FBE used 2017 ESRI World Imagery and 2015 aerial imagery obtained from NH GRANIT to create a GIS layer of existing buildings within the study area. Examination of aerial imagery resulted in the creation of a shapefile with 126 points representing principal structures (secondary structures were not included) (FIGURE 2). In areas where it was difficult to discern the presence of a dwelling (typically due to shadows or the presence of trees), aerial imagery was cross-checked using Antrim's online GIS viewer.

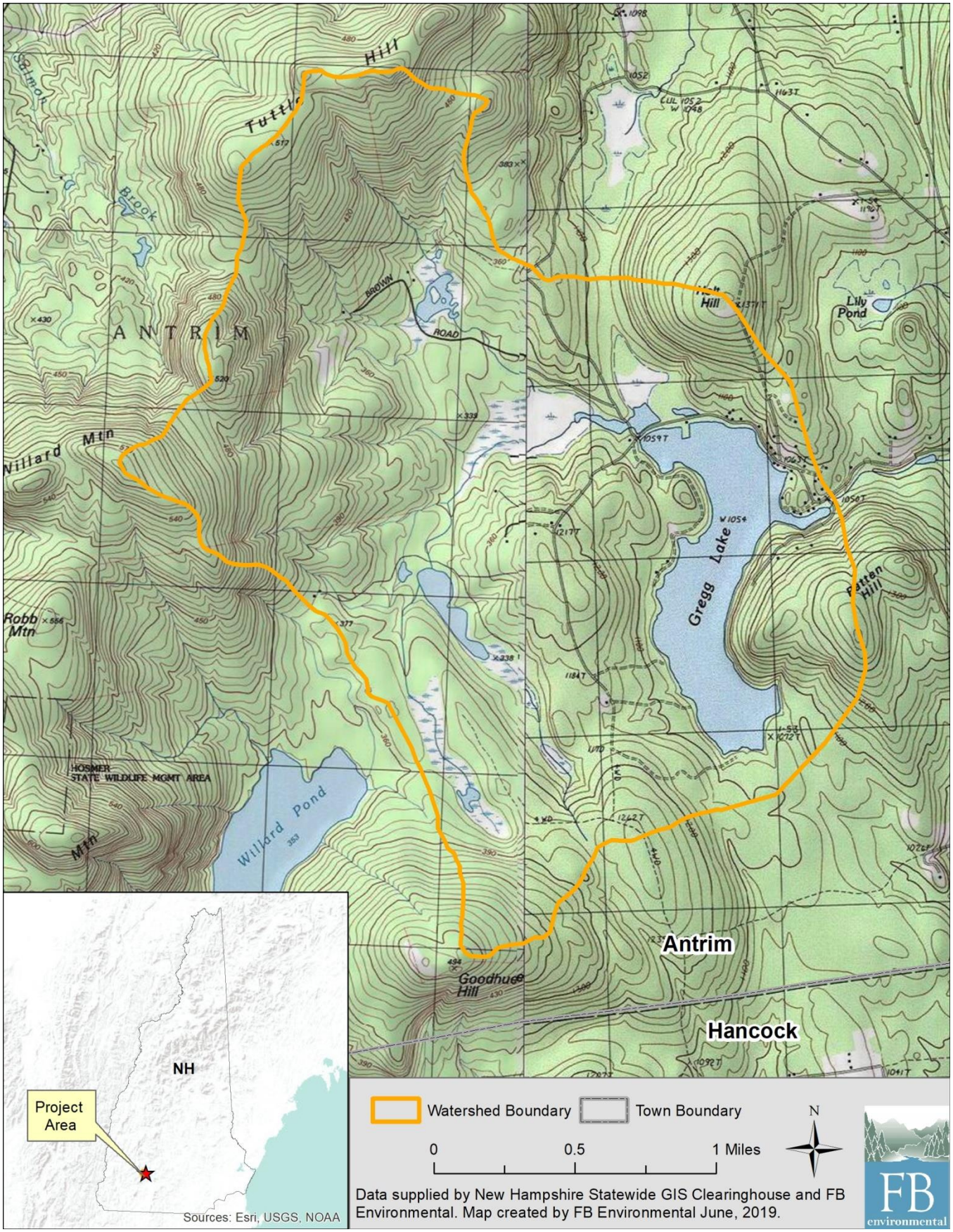

FIGURE 1. The Gregg Lake watershed, Antrim, New Hampshire.

2.4 ZONING

Crucial to a build-out analysis is the feasibility of modeling zoning requirements (TABLE 1). Certain zoning requirements are too site-specific to enable incorporation to the analysis. Given this, the analysis makes use of the following qualifications in determining build-out zoning restrictions:

- Future lots were made the smallest size allowable for the zoning district.
- Potential unit types (e.g., residential house, commercial building) were not specified.

The study area encompasses Antrim's Rural Conservation and Lakefront Residential Districts. FBE created a zoning layer for the study area by following district boundaries outlined in the town's zoning ordinance and associated zoning map.

TABLE 1. Base zoning standards for Antrim zones within the Gregg Lake watershed.

Zoning District	Front Setback (ft)	Side/Rear Setback (ft)	Minimum Lot Size (sq. ft)	Minimum Lot Size (acres)
Lakefront Residential	50	20	90,000	2.07
Rural Conservation	75	50	130,000	2.98

2.5 POPULATION GROWTH RATES

According to the US Census Bureau, Antrim has experienced steady population growth since the middle part of the last century (TABLE 2). The town's population has increased from 1,121 people in 1960 to 2,637 people in 2010 – a 135% increase. FBE used compound annual growth rates representing 10-, 20-, and 30-year periods to run three iterations of the TimeScope analysis for the study area (refer to Section 3.4).

TABLE 2. US Census Bureau population and growth rates for Antrim, New Hampshire, 1960-2010. CAGR = compound annual growth rate.

1960	1970	1980	1990	2000	2010	30 yr. CAGR 1980-2010	20 yr. CAGR 1990-2010	10 yr. CAGR 2000-2010
1,121	2,122	2,208	2,360	2,449	2,637	0.59%	0.56%	0.74%

2.6 DEVELOPMENT CONSTRAINTS

To determine where development may occur in the study area, build-out calculations deduct land unavailable for development due to physical constraints, including environmental restrictions (e.g., wetlands, steep slopes), zoning restrictions (e.g., shoreland zoning, street Right-of-Ways (ROWs), and building setbacks), and practical design considerations (e.g., lot layout inefficiencies). Existing buildings also reduce the capacity for new development (FIGURE 2).

Except for existing buildings, FBE obtained all development constraints data from NH GRANIT. GIS data used to model development constraints are listed below.

- Conserved land
- Waterbodies and watercourses appearing in the National Hydrography Dataset
- Wetlands appearing on the NH Wetlands Basemap
- Steep slopes (slopes 15% and greater)
- Hydric Soil
- Existing buildings

The development constraints considered above do not represent the full range of possible restrictions or resources that may be found in the field. For example, rare and/or state-listed species may be present but are not considered because data regarding their specific location(s) are not available. Unmapped wetlands may also be present that would further restrict development.

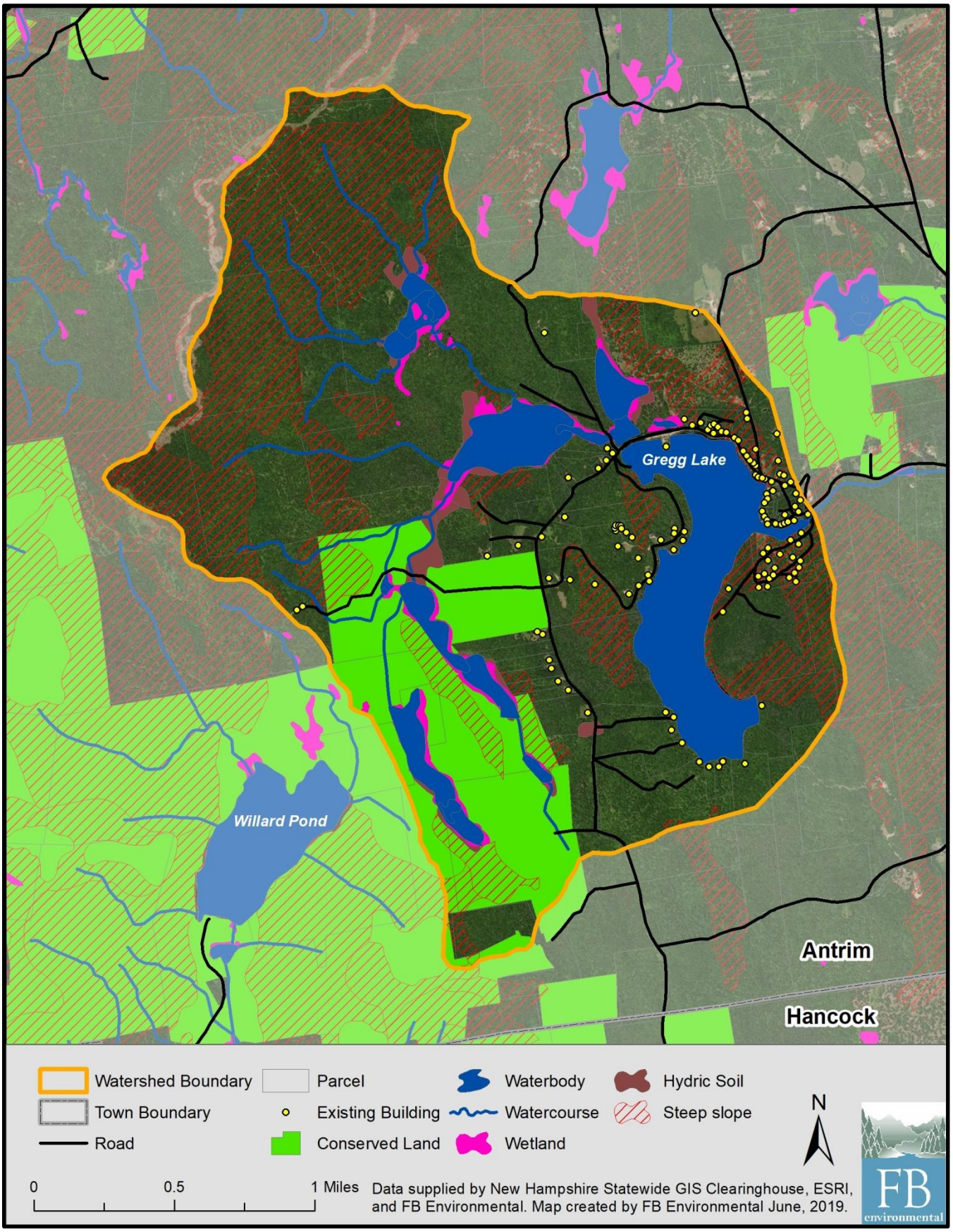

FIGURE 2. Development constraints (including existing buildings) in the Gregg Lake watershed, Antrim, New Hampshire.

2.7 BUILD-OUT ASSUMPTIONS

To determine how many building units can be built on the available buildable land, various density and other design factors are considered based on the zoning requirements for a town. However, build-out analyses require some simplifying assumptions. FBE used the following assumptions based on Antrim's zoning requirements.

- **Building setbacks** were estimated based on the average front and rear setbacks specified by the town's zoning ordinance (TABLE 1). Setbacks are measured from building center points in CommunityViz. To account for this, building footprints need to be estimated to avoid building overlap. FBE estimated the dimensions of the minimum building footprint to be 35 feet x 35 feet. This number was added to the average front/rear setback for each zone to estimate the "Minimum Separation Distance" used in CommunityViz.
- **Wetland and stream setbacks** were set to 25 feet for both wetlands and streams.
- A **shoreland setback** of 100 feet was applied to Gregg Lake.
- **Minimum lot size requirements** used were based on requirements for each zone (TABLE 1).
- **Efficiency factors** adjust density values to account for common density losses. Lot efficiency refers to the amount of land on a parcel that is available for construction after addressing such considerations as drainage facilities, parcel contiguity, ROWs, setbacks, road frontage, conservation restrictions, and anything else that can reduce the amount of buildable land within a zone. They are entered as a percentage, where 100% means complete efficiency (no density lost) and 0% means no buildings are estimated for a zone. FBE used an efficiency factor of 66% for the build-out.

3. RESULTS

3.1 PARCELS

Approximately 178 parcels were identified as within or partially within the Gregg Lake watershed, ranging in size from less than one acre to 822 acres. The largest parcel completely within the watershed covers 184 acres.

3.2 BUILDABLE AREA

The build-out analysis showed that under current zoning regulations 36% (941 acres) of the study area is buildable. The Rural Conservation district has the most acreage of land available for development at 909 acres. (TABLE 3, FIGURE 3).

TABLE 3. Amount of buildable land within the Gregg Lake watershed, Antrim, New Hampshire. Total area does not include Gregg Lake itself.

Zoning District	Total Area (Acres)	Buildable Area (Acres)	Percent Buildable Area
Lakefront Residential	242	32	13
Rural Conservation	2,361	909	39
Total	**2,603**	**941**	**36**

3.3 PROJECTED BUILDINGS

The digitization of existing buildings within Antrim identified 126 principal buildings. Based on the current input parameters, the build-out analysis projected an additional 275 buildings could be constructed in the future, resulting in a total of 401 buildings (TABLE 4, FIGURE 3).

TABLE 4. Projected increase in buildings by zone within the Gregg Lake watershed, Antrim, New Hampshire.

Zoning	No. Existing Buildings	No. Projected Buildings	Total No. Buildings	Percent Increase
Lakefront Residential	84	11	95	13
Rural Conservation	42	264	306	629
Total	**126**	**275**	**401**	**218**

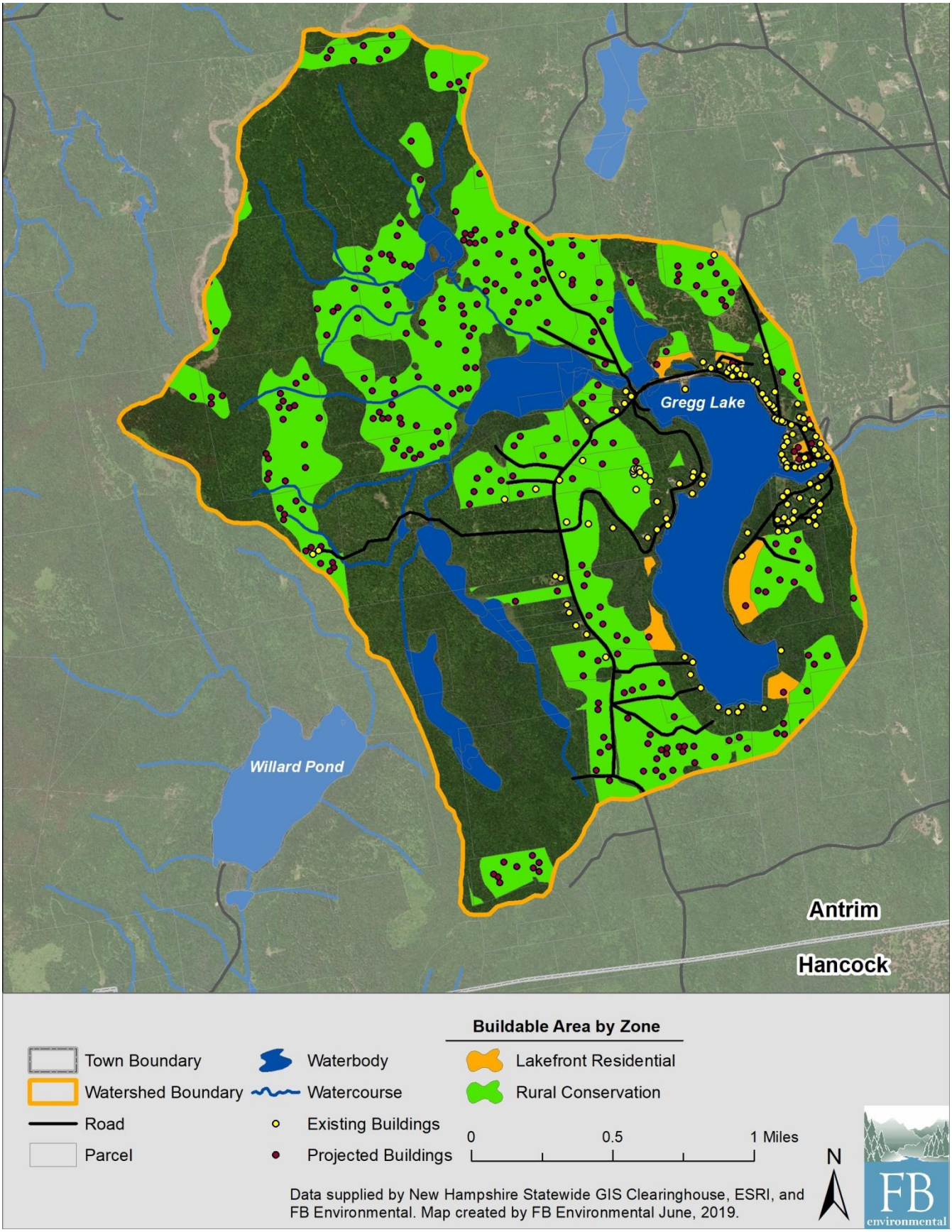

FIGURE 3. Buildable area by zone and projected buildings in the Gregg Lake watershed, Antrim, New Hampshire.

3.4 TIMESCOPE ANALYSIS

Three iterations of the TimeScope Analysis were run using compound annual growth rates (CAGR) for 10-, 20- and 30-year periods from 2000-2010 (0.74%), 1990-2010 (0.56%), and 1980-2010 (0.59%), respectively (TABLE 2). Full build-out is projected to occur in 2180 at the 10-year CAGR and 2214 at the 20-year and 30-year CAGR (FIGURE 4). Note that the growth rates used in the TimeScope Analysis are based on town-wide census statistics but have been applied here to a portion of the town. It is important to note that using census data to project population increase and/or development has inherent limitations. As such, the TimeScope Analysis might over or underestimate the time required for the study area to reach full build-out. Numerous social and economic factors influence population change and development rates, including policies adopted by federal, state, and local governments. The relationships among the various factors may be complex and therefore difficult to model.

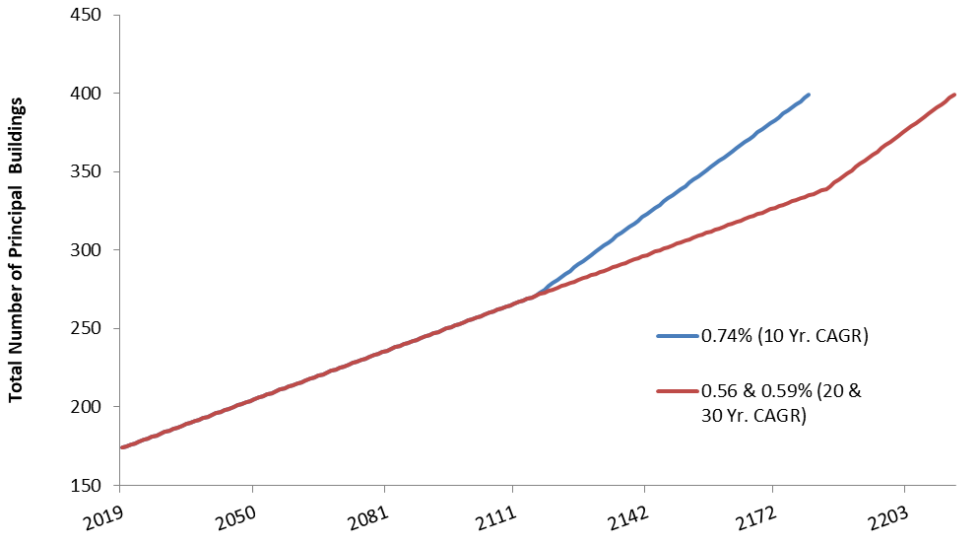

FIGURE 4. Full build-out projections for the Gregg Lake watershed, Antrim, New Hampshire (based on compound annual growth rates reported in TABLE 2).

4. REFERENCES

Antrim (2017). Town of Antrim Zoning Ordinance. Town of Antrim, New Hampshire.

Antrim (date unknown). Zoning Map. Downloaded from Town of Antrim website January 17, 2019.