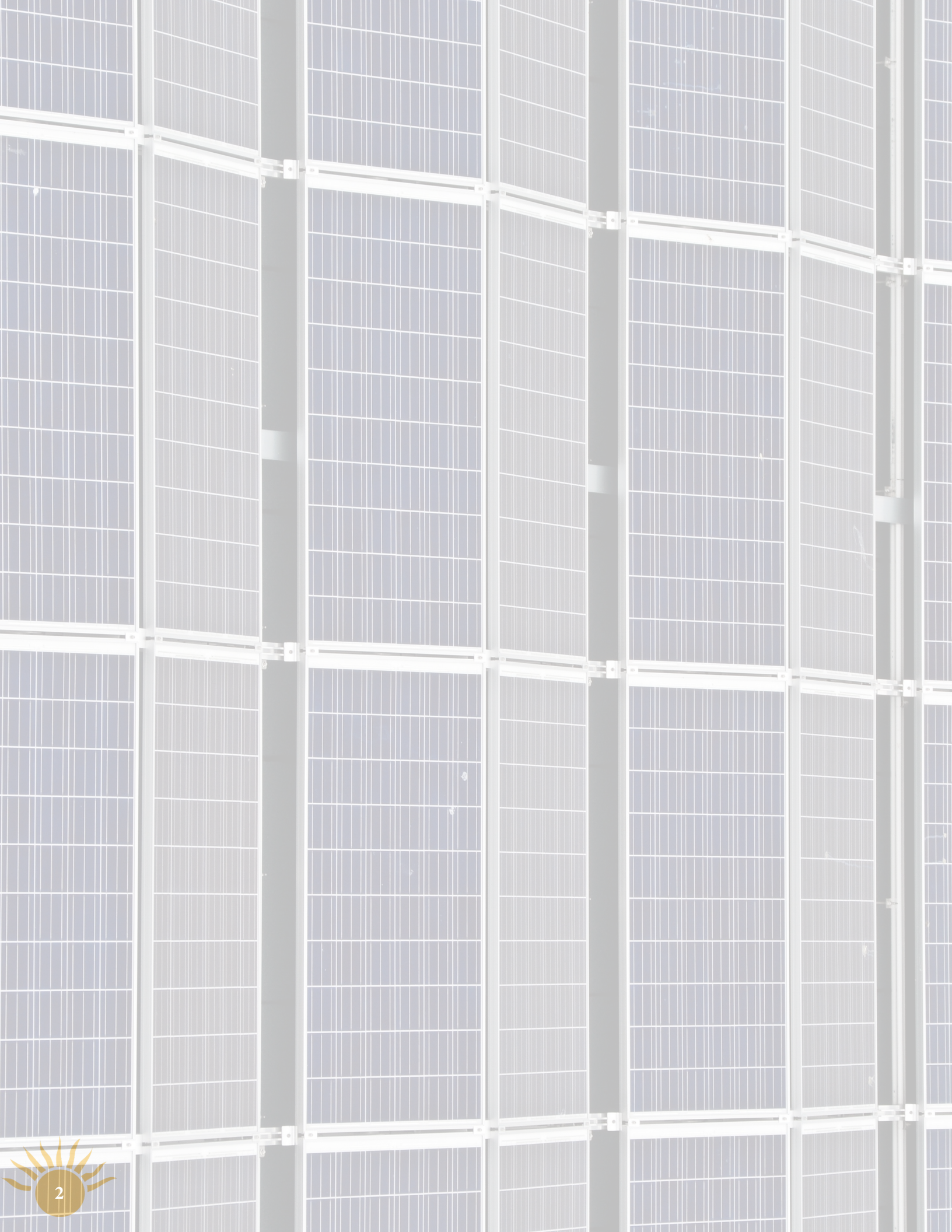


Athol Solar Zoning Bylaw Assessment

**Urban and Environmental Policy and Planning
Field Projects 2019**

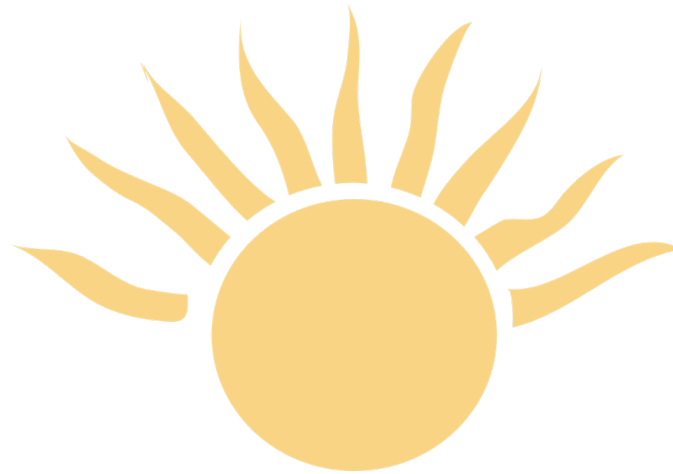
By Elisabeth Kellam, Lina Xie, Brian Froeb, Yuehui “Aurora” Li





Athol Solar Zoning Bylaw Assessment

Tufts University
Urban and Environmental
Policy and Planning Program

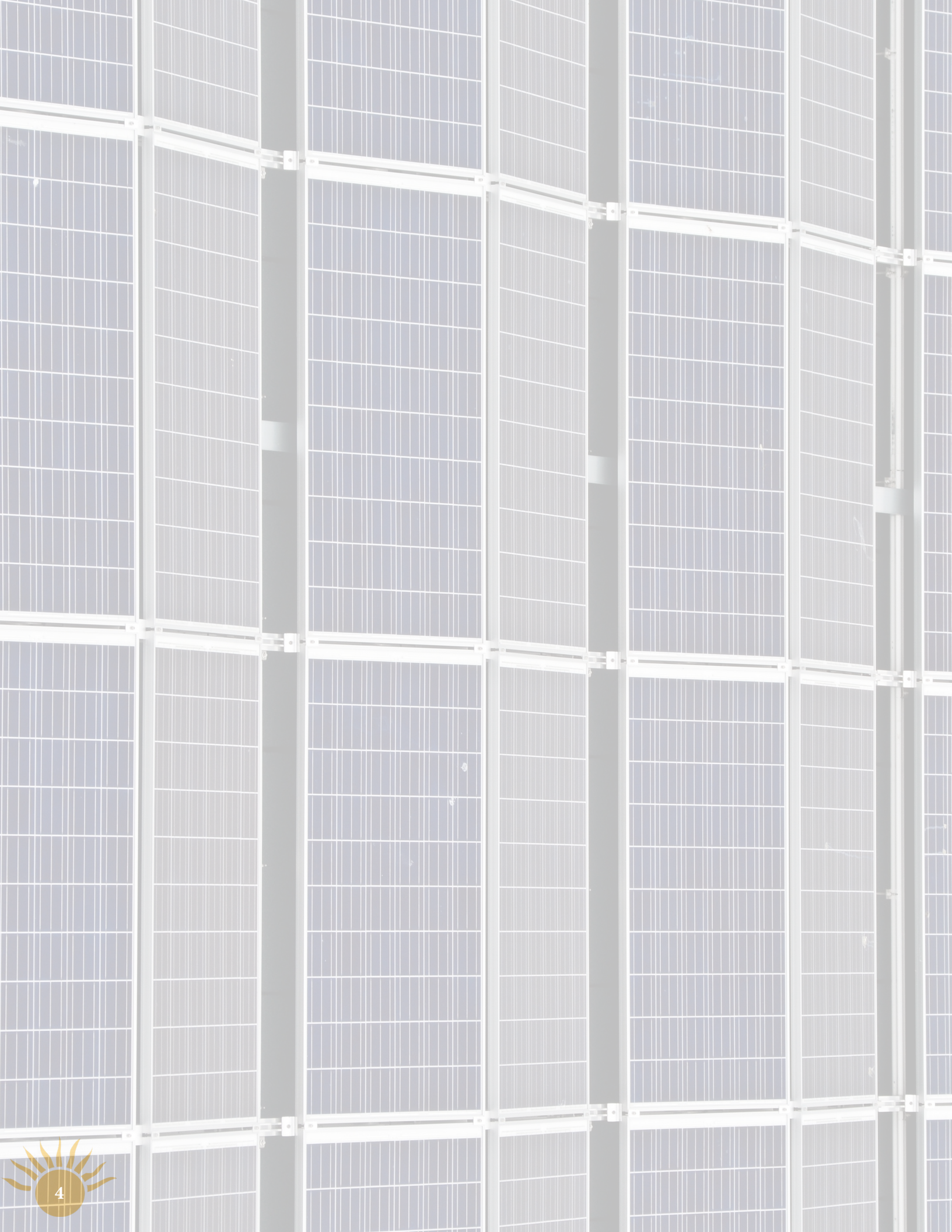


Elisabeth Kellam Lina Xie Brian Froeb Yuehui “Aurora” Li



GRADUATE SCHOOL OF ARTS AND SCIENCES
Urban and Environmental
Policy and Planning





The background of the entire page is a close-up, vertical view of several rows of solar panels. The panels are dark blue with a grid of thin white lines. They are mounted on a metal frame, and the perspective is looking down the length of the array, creating a sense of depth.

Table of Contents

6

TEAM MEMBERS

Get to know Liz, Lina, Brian, and Aurora

7

ACKNOWLEDGEMENTS

8

EXECUTIVE SUMMARY

10

CONTEXT

Introduction

Background

18

METHODS

Literature Review of Towns' Solar Bylaws

Stakeholder Interviews

Geographic Information System (GIS) Analysis

28

ANALYSIS

Zoning Bylaws

Stakeholder Interviews

GIS Results

56

RECOMMENDATIONS

Amendments to Solar Zoning Bylaw

Potential Sites for Future Solar Array Development

62

CONCLUSION

66

WORKS CITED

72

APPENDICES

Glossary of Important Terms

Interview Questions

List of Communities' Solar Bylaws

Model Solar Bylaw

Preface

Because this report is focused on improving specific sections of Athol's solar zoning bylaw, technical jargon is used throughout. Instead of breaking the flow of the report to define these terms as they come up, we have included a glossary in the Appendices of this report that defines these terms.

The background of the entire page is a close-up, vertical view of several rows of solar panels. The panels are dark blue with a grid of white lines. They are mounted on a metal frame, and the perspective is looking down the length of the array.

List of Tables and Figures

- Table 1, Page 17
- Table 2, Page 26
- Methods Graphic, Page 19
- Temperature, Page 43
- Long Eared Bat, Page 44
- Table 3, Page 58-60

List of Maps

- Town of Athol Map, Page 13
- Solar Sites Map, Page 14
- MPAC Map, Page 21
- Secret Lake Map, Page 32
- Secret Lake Plans, Page 33
- Long Eared Bat Habitat, Page 44
- Map 1 Wetlands, Page 45
- Map 2 Steep Slopes, Page 46
- Map 3 Zoning, Page 47
- Map 4 Roads, Page 48
- Map 5 Protected Areas, Page 49
- Map 6 Environmental Concerns, Page 50
- Map 7 Transmission Line, Page 51
- Map 8 Digital Elevation Model, Page 52
- Map 9 Potential Sites and Visable Areas, Page 53
- Map 10 Suitable and Unsuitable Sites, Page 61

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Field Project Team



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We would like to thank the entire UEP Faculty for lending their expertise to us, which was invaluable to the completion of this project. Specifically, we would like to thank Jon Witten and Sumeeta Srinivasan. Jon Witten provided us with his extensive knowledge on land use regulation in Massachusetts, which was essential to the development of our recommended changes to Athol's solar bylaw. Sumeeta Srinivasan's expertise in GIS was vital in the development of our GIS maps. We would also like to thank Barbara Parmenter and Ann Rappaport for allowing us to use their offices as work spaces and Michael Flanary for providing additional support and assistance when necessary.

Our Project Partners, Eric Smith, the Director of Planning for the Town of Athol, and Dave Small, the Chairmen of the Board of Planning and Community Development also deserve tremendous thanks for their timely feedback and direction throughout the preparation of this report. Additionally, we are thankful to all the stakeholders who participated in our research as well as the Board of Planning and Community Development for holding an additional public meeting to help us with our work.

We would like to thank our fellow UEP classmates for their solidarity and support during this semester. Lastly, we would like to thank our friends, families, and anyone else who may not be explicitly listed here. We cannot thank you all enough.



Executive Summary

The Town of Athol, Massachusetts is a rural, post-industrial town located near the Millers River in the northwest corner of Worcester County. Athol is one of nine towns that reside in the North Quabbin Region, an area of Massachusetts known for its quintessential New England setting, filled with beautiful scenic views, historic villages, farms, and orchards. The region is a valuable travel destination due to the abundance of available activities, including festivals, concerts, artisan culture, and access to delicious produce, cheese, wine and ale. The region is also home to over 100,000 acres of public conservation land, where people can hike, bike, fish, climb, ski or snowshoe (North Quabbin Chamber of Commerce, 2019).

A recent trend of development in the region, and in the state as a whole, that is seen by many community members to be detrimental to the character of the area is the installation of large-scale ground-mounted solar photovoltaic arrays. The developments are common throughout central and western Massachusetts, where undeveloped land is more readily available as well as amenable to projects that require a substantial spatial footprint such as solar. Over the past few years, Athol has hosted an increasing number of solar array installations. The town's Board of Planning and Community Development expects solar development to continue in the future based on the level of interest of solar developers in the region and current trends in Massachusetts' renewable energy sector. The rate of solar development

shows no sign of slowing down, creating widespread concerns among Athol's citizens regarding how solar development will impact their community.

These concerns include visual impacts, including interrupted scenic views or the destruction of natural beauty; environmental impacts, such as soil erosion and disposal of hazardous materials; animal habitat impacts, like the disruption of wildlife corridors; and, economic impacts, like decreased property values and reduced tourism. In order to address these concerns in a way that aligns with the values of the community and maintains the character of the town and region, the Town of Athol partnered with our Field Project Team to develop a stronger solar zoning bylaw as well as identify potential ideal sites for solar development. Therefore, the team was guided by these two questions:

1) What are innovative zoning bylaw criteria being utilized by other Massachusetts communities and how might Athol utilize these?

2) How can Athol identify and prioritize ideal sites for solar array development based on the various considerations expressed by the community?

A solar zoning bylaw determines the placement, design, construction, operation, supervision, modification, and removal of ground-mounted solar photovoltaic installations. By adjusting the criteria of the bylaw to be more restrictive, our hope was to protect the interests of the community by making it more difficult for developers to construct installations in ways that would intensify the concerns of Athol's residents. We also recommended areas within the town that would be ideal for the placement of solar development, with the intent that the town could potentially encourage future solar construction to take place in these locations.

After we arrived at our results of the analyses, we grouped recommended changes to Athol's solar zoning bylaw into low, medium, and high priority categories. Recommended changes specifically target landscaping, screening, environmental, and wildlife concerns as well as issues of visual impact and scenic view disruption. We hope that these recommendations will be seriously considered and eventually integrated into the town's solar zoning bylaw. We believe that our analysis could be beneficial to other municipalities as they go through the process of developing, strengthening, and evaluating their solar bylaws.



CONTEXT

Introduction

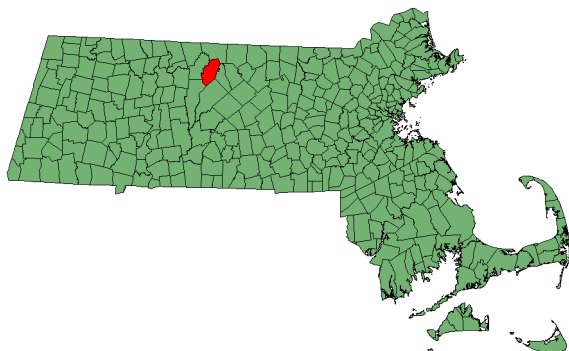
Founded along the shore of Millers River in the northwestern corner of Worcester County, the Town of Athol is a quintessential post-industrial community, marked by a downtown where large, former manufacturing building complexes reside next to newly built structures, like their recently constructed, LEED certified library branch. Athol was originally settled in 1735 under the Algonquian name of Pequoiag until it was officially incorporated as Athol in 1762. Today, it is included within the Montachusett Regional Planning Commission planning boundary, a commission that provides technical planning assistance to 22 communities. According to the 2010 census, the Town of Athol had a population of 11,584 residents and an area of 33.4 square miles. The town, like surrounding communities of the North Quabbin Region, offers many recreational opportunities, including camping, swimming, fishing, and hiking, that take advantage of the town's beautiful open spaces and flora and fauna.

The Town of Athol's Board of Planning and Community Development works on matters pertaining to the

physical, economic, and environmental development of the town in order to maximize the quality of life for its residents. Their main responsibilities include, but are not limited to, developing a comprehensive plan for the town, proposing and making recommendations for zoning by-law changes, and reviewing and approving site plans for development projects (Town of Athol n.d.). According to the Board, the community is reinventing itself by finding new usages for its former mills and highlighting the many natural resources and protected open spaces.

Over the past few years, the Town of Athol has seen an increasing number of large-scale ground-mounted solar array developments in the community and within Worcester County, with more expected in the future based on the interest of potential solar developers. For example, the Town of Athol recently reviewed a proposed solar array project for the top of the Chestnut Hill Ridge system that overlooks Tully Lake, a very popular recreational resource within the region, owned and maintained by the Trustees of Reservations. However, after the project drew negative community input, it was withdrawn. Another solar array development is proposed on a 161.5-acre wooded parcel near the Harvard Forest, just south of Athol in the neighboring Town of Petersham. In addition, an 80-acre clear cutting (the removal or cutting down of trees in an area) solar array project is proposed by Cypress Creek Renewables for the Secret Lake

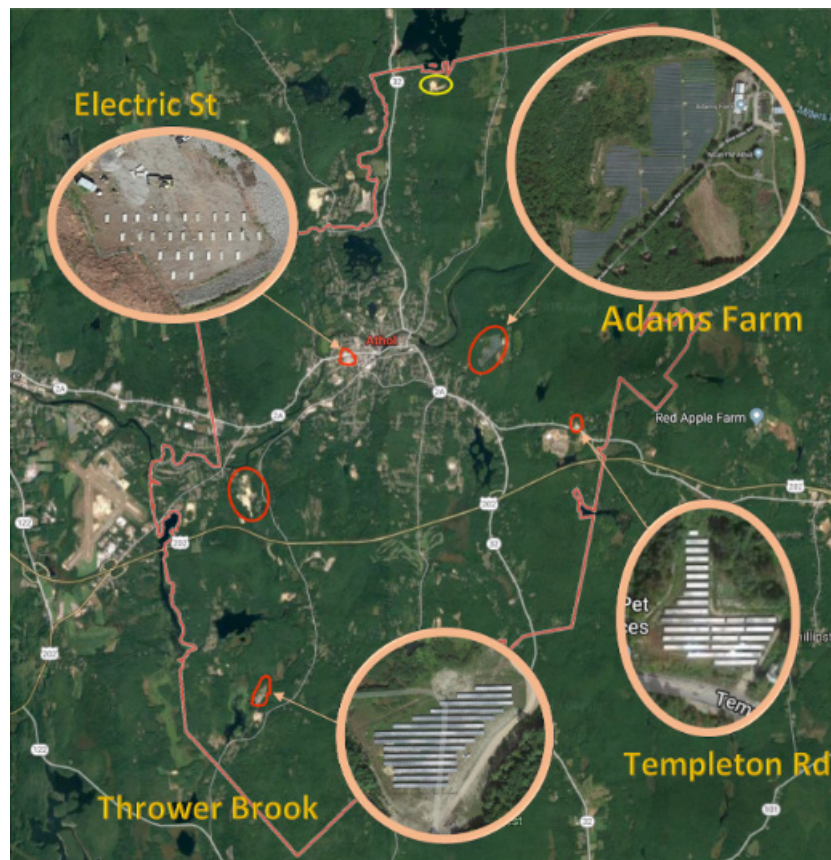
The Town of Athol



neighborhood, an area in the southeast corner of Athol along Secret Lake, which lies right on the border with the neighboring Town of Phillipston.

Athol has allowed by-right ground-mounted solar zoning throughout the town with only limited considerations toward screening or landscaping requirements. The impetus for strengthening the solar zoning bylaw was due to a negative community response to the first few solar arrays constructed in the town. In 2013, a large solar array was installed just west of Adams Farm, a retail and wholesale meat farm located high upon a ridge in central Athol

Current Solar Sites in Athol, MA



(Data from Google, Created by Field Project Team)

(Barnes 2012). This array has drawn ire from the community ever since, mainly due to its extreme visibility from downtown Athol and its negative impact on the scenic view from the hilltop. The array is located just below the peak of the tallest ridgeline in the town, and because of this it is visible from anywhere with a clear view east. Additionally, the transmission lines that link the array's inverters to the power grid were placed in front of Adams Farm's parking lot, a popular destination within the town due to its panoramic views (Young 2018). The transmission lines partially obstruct these views, an outcome which could have been prevented with appropriate bylaws. While the town has made significant improvements to its solar bylaws since 2013, it still does not adequately address the community's concerns.

The Athol Board of Planning and Community Development has indicated, despite recent concerns, that residents support the development of renewable energy, especially solar energy. One reason is that new large ground-mounted solar arrays have been constructed in significantly forested areas and other important scenic locations. This has caused conflicts with abutting homeowners and land protection organizations. Specifically, members of the community are concerned about protecting existing residential and scenic viewsheds as well as outdoor recreation areas. These concerns are especially important in Athol because current zoning bylaws do not account for viewshed considerations, and tourism is significant to the region's economy. A small turning point occurred on October 4, 2017, when the Board of Planning and Community Development held a public hearing to review and amend the solar zoning bylaw. Amendments included providing greater front, side and rear setbacks for solar arrays, new landscaping and screening design criteria, and the prohibition of herbicide use to control vegetation, just to name a few. These changes were based on reviewing other communities' bylaws, collecting input from the public, and then incorporating that information into amendments.

Going forward, the Town of Athol would like to further strengthen its solar zoning bylaw by addressing all the gaps that currently exists. These gaps will be identified and addressed by analyzing other communities' bylaws to look for areas where Athol's bylaw could improve and

incorporating elements that could help address the concerns raised by Athol's citizens.

Our Field Project Team undertook a study to address the following two main research questions:

1) What are innovative zoning by-law criteria being utilized by other Massachusetts communities and how might Athol utilize these?

2) How can Athol identify and prioritize ideal sites for solar array development based on the various considerations expressed by the community?

This final report will focus on the application and evaluation of solar bylaws adopted by other communities, the concerns and inputs of Athol community residents and other stakeholder groups from our interviews, and implications for planning and land use from examining GIS data to better strengthen and close the gaps within Athol's solar bylaw as well as account for other potential circumstances and challenges that may be overlooked. The combination of results from these methods will help develop comprehensive land use and planning recommendations to our Project Partner.

Background

With decreasing solar energy costs, pressing environmental pollution concerns, and growing demand for clean and renewable energy, more and more homeowners, businesses and municipalities are beginning to invest in solar electricity. A recent MIT study showed that solar technology costs have dropped 99% between 1980 and 2012, making solar electricity increasingly cost-competitive and cost-efficient compared to natural gas electricity and without posing severe environmental impacts from fracking or burning shale gas (Kavlak et al 2018). The study indicated many reasons for the drop in price for solar energy projects. First, since 2001, solar cells and manufacturing plants have increased in size compared to earlier years, which allowed for reductions in manufacturing costs even during periods of production growth. Second, government policies have helped stimulate market growth through measures such as renewable portfolio standards, tariffs, and a variety of subsidies that decreased overall cost. Lastly, government-funded and privately-funded research and development has played a key role in reducing solar photovoltaic costs by examining and improving the devices themselves, their manufacturing methods, their production processes, and their modules and mechanisms.

Additionally, state initiatives such as the Solar Massachusetts Renewable Target (SMART) Program have played an important role in the growing demand market for solar arrays. SMART is the State of Massachusetts' replacement for the Solar Renewable Energy Credit (SREC) system. Both were implemented by the state's Department of Energy Resources (DOER).

The SREC system helped generated over 2.3 gigawatts, or 2300 megawatts (MW) of solar power. The SREC system encouraged solar development by granting solar array owners certificates that were traded in the market to the three investor-owned utilities that service Massachusetts, National Grid, Eversource, and Unitil. Each utility company was required to have a certain number of credits that represented a percentage of their total electricity generation (Hacker 2018).

The SMART program was signed into law in 2018 and is a part of the Renewable Portfolio Standard initiative developed by DOER, which was one of the first programs in the nation that required a certain percentage of the state's electricity to come from renewable energy (Mass.gov 2019). The goal of SMART is to produce 1600 MW of solar energy to ensure that 40% of electricity generated in Massachusetts comes from renewable energy by 2040. The 1600 MW are divided into 20 MW blocks. The SMART program differs from the SREC system by having the utilities pay solar array owners a set rate per kWh generated. This new approach was meant to be an improvement upon the SREC system because it ensured payments to solar array owners remain consistent and not subject to market fluctuations. Payments for the first 20 MW block are described in Table 1 on the following page.

Each successive 20 MW block will have the base compensation drop by 4% for each block. Moreover, the base compensation rate varies based on "adders" and "subtractors" present in the program. Adders include funding for arrays in

Table 1: SMART Program Payment Structure, First 20 MW Block.			
Array Generation Capacity	Base Compensation Rate	Payments Term	Payment per kWh
1000 to 5000 kWh	100%	20-Year	\$0.15563
500 to 1000 kWh	110%	20-Year	\$0.17119
250 to 500 kWh	125%	20-Year	\$0.21250
25 to 250 kWh	150%	20-Year	\$0.25500
25 kWh or less	200%	10-Year	\$0.34000
25 kWh or less Low Income Owner	230%	10-Year	\$0.35795

mixed-use development, and for those that allow for either grazing or crop growth on the same land. A Subtractor is for solar development on Greenfield (previously undeveloped) sites. Large solar array projects, those between one and five megawatts can also receive a one-time payment during the proposal or construction phase (Department of Energy Resources 2018; Solar Massachusetts Renewable Target Program, §§ CMR-225-20.00 (2018)). With a dramatic increase in the profitability of solar development and limited research done on the potential negative impacts of solar, such projects could prove to be a source of valuable income to towns like Athol.

However, a study conducted in 2016 found that when large scale ground mounted solar systems are not located out of sight, the public is significantly less likely to accept the project and much more likely to form a negative opinion of the project (Scognamiglio 2016). Because visual impacts produced by solar arrays on the natural landscape can potentially change residents' perception of their neighborhood character (Chiabrando 2009), it is

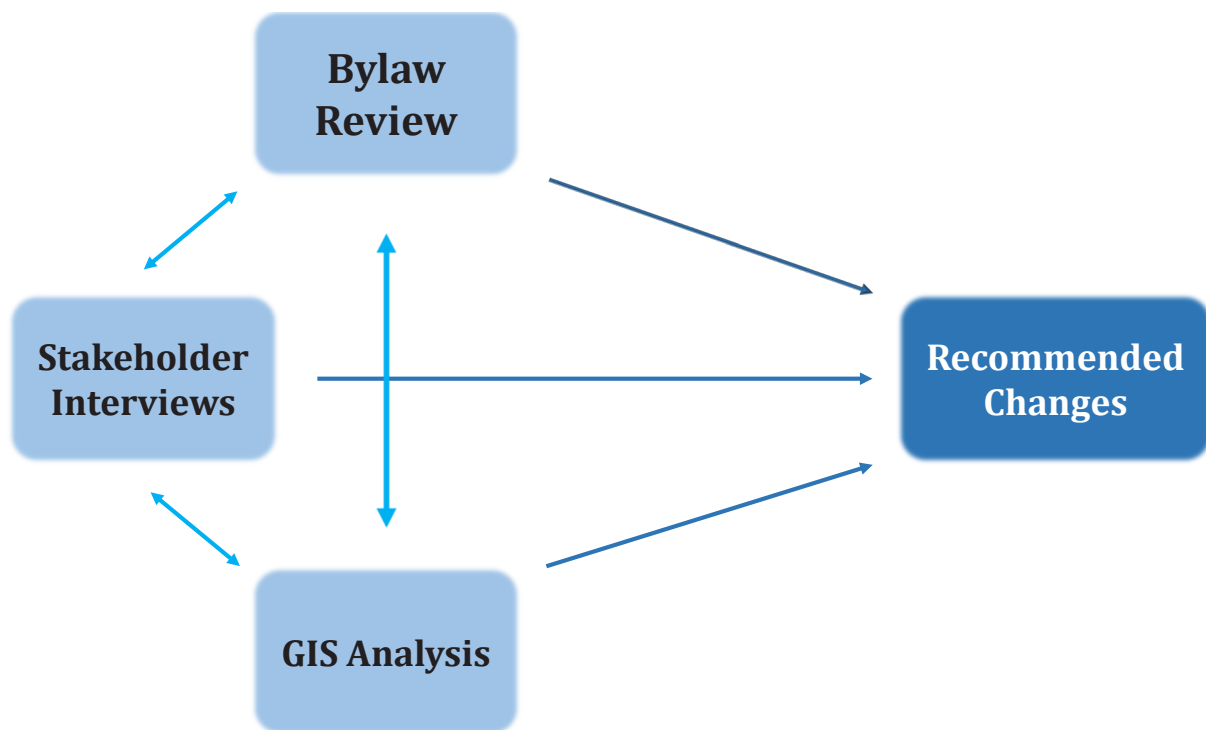
crucial that we account for the social, economic, visual, and environmental impacts that solar development may create and their potential mitigation approaches to address those impacts.



METHODS

Methods Processing

Our project utilized both qualitative and quantitative methods to answer our research questions and achieve the goals of the project. First, we compared and contrasted other communities' solar zoning bylaws with Athol's to find areas within the bylaw that could be strengthened or improved. Second, we conducted stakeholder interviews to explore different narratives of solar energy and solar development in Athol as well as find areas of agreement and disagreement. Finally, we employed GIS to identify potential sites for solar arrays that comply with the requirements of Athol's existing bylaw and the additional considerations identified by our Field Project Team.



The graphic above represented how the three research methods that our team had chosen were all interconnected and did not stand alone. Our stakeholder interviews informed our team of which areas and factors to focus on in our bylaw review and GIS analysis. Our GIS analysis revealed the values and concerns our stakeholders and bylaw wanted to concentrate on. Review of Athol's solar bylaw allowed our team to recognize the criteria or standards that are involved in solar siting, which further supported our GIS and stakeholders analysis. Overall, our three research methods worked together to support our team's development of recommended changes to Athol's solar zoning bylaw.

Bylaw Review

Our first course of action was to begin primary research to examine existing solar zoning bylaws in other towns in Massachusetts. This served two purposes: First, it helped our Field Project Team keep abreast of current solar zoning bylaws and second, it helped our team determine which solar bylaw elements from other communities could successfully be applied to Athol's solar zoning bylaw. Elements of the bylaw review included identification of additional towns' solar bylaws, criteria from those bylaws that were categorized as exceptional by the team, and how those bylaw standards compare to the Town of Athol's. In combination, these elements assisted us in recommending bylaw changes that account for the town's characteristics and uphold the goals of the community, ultimately connecting back to our research question:

What are innovative zoning bylaw criteria being utilized by other Massachusetts communities and how might Athol utilize these?

Before gathering more bylaws, we had to decide upon a criteria to help us determine which community solar bylaws to examine for exceptional elements. This would allow us to narrow the scope of our bylaw review to include only towns that share comparable characteristics with Athol.

Our criteria for choosing other communities' bylaws followed the 2008 Met-

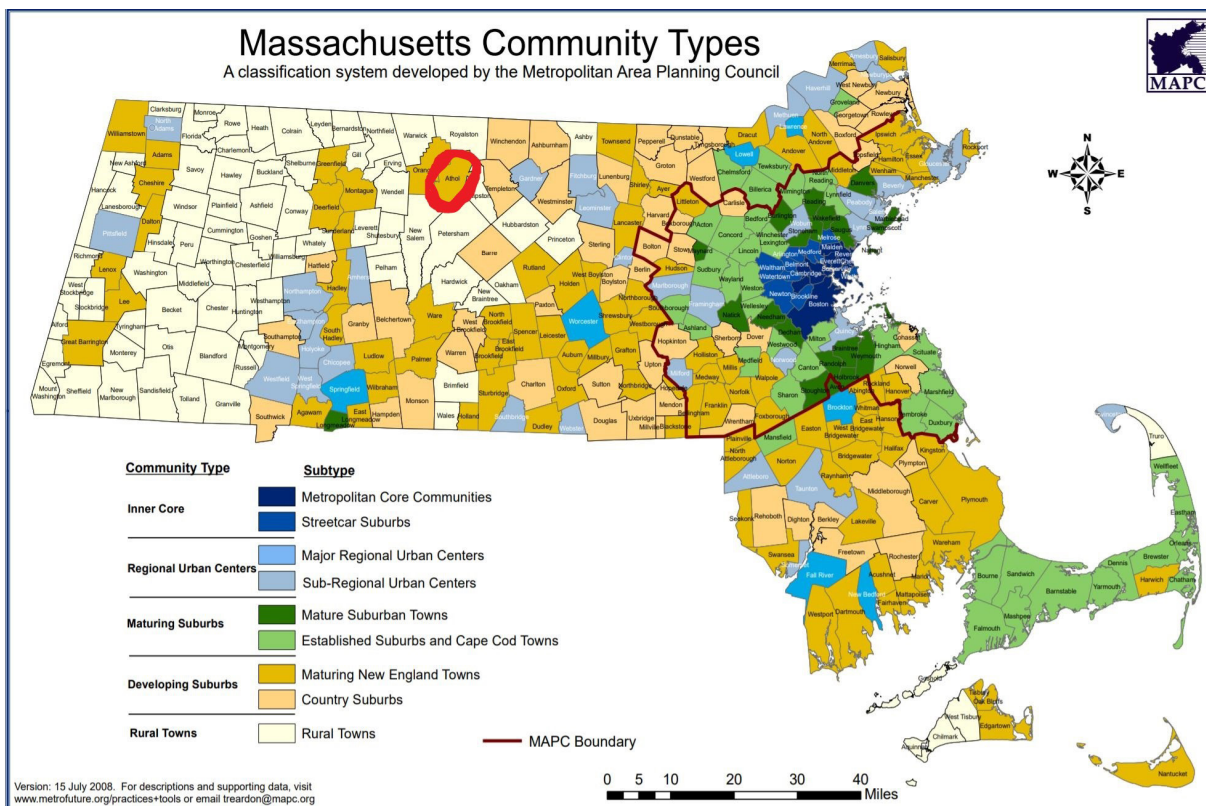
ropolitan Area Planning Council (MAPC) "Massachusetts Community Types" classification system, whose criteria included "land use and housing patterns, recent growth trends, and projected development patterns." The classification system divided Massachusetts communities into five main community types and nine subtypes.

Map 1 on the following page displays the communities by type and how they relate to each other spatially. Athol, outlined in red, is classified as a Maturing New England Town within the Developing Suburb community type classification. Therefore, we narrowed our bylaws review to other communities with the same or similar classification. We ended up deciding to focus on communities located in five counties within Central and Western Massachusetts: Worcester (which contains Athol), Franklin, Hampshire, Hampden, and Berkshire Counties. The communities within these five counties were primarily under the main community types Rural Towns and Developing Suburb, which also included the following subtypes:

Maturing New England Town, Country Suburb, and Rural Town. The definitions of these three sub-types are as follows:

- 1. Maturing New England Town:**
Well-defined town center, mixed densities, room to grow
 - a. Mixed-use town center surrounded by compact neighborhoods ($\frac{1}{4}$ - $\frac{1}{2}$ acre lots); low-density outlying areas
 - b. Large amounts of vacant developable land (>25% of total town area is vacant & developable)





- c. New growth: conventional subdivision development on vacant land
- d. Population and households growing rapidly; adding residential land rapidly
- 2. **Country Suburb:** Very low density, room to grow, country character
 - a. Low density communities with no significant town center and no compact neighborhoods
 - b. Large amounts of vacant developable land (>35% of total town area is vacant & developable)
 - c. New growth: conventional low-density subdivision development on vacant land
 - d. Generally growing rapidly (population and households)

(Data Source: Metropolitan Area Planning Council)

3. **Rural Town:** Small, scattered population, slow growth

- a. Very low density communities with no significant town center and scattered "farmstead" settlements; very few subdivisions; very limited economic development
- b. Very large amounts of vacant developable land (>40% of total town area is vacant & developable)
- c. New growth: small amounts of scattered residential development (average below 15 acres/year)
- d. Population less than 2,500 and growing slowly

Even though this data was the most comprehensive categorization of Massachusetts towns that we were able to find,

by no means did this encompass all of the intricacies and complexities of these towns nor was it enough to serve as the sole criteria framework for why we chose the aforementioned five counties. Another source we used to determine what types of communities we should analyze was a list of community solar zoning bylaws supplied to us by our Project Partner near the start of our research. These communities acted as guides for what to look for during our search for solar bylaw elements from other communities. The following contains the names of the 14 towns in the list along with their 2010 census population data:

1. Royalston; 1,258 people
2. Shutesbury; 1,771 people
3. Becket; 1,779 people
4. Leverett; 1,851 people
5. Bernardston; 2,129 people
6. Brimfield; 3,609 people
7. Ashburnham; 6,081 people
8. Westminster; 7,277 people
9. Shirley; 7,211 people
10. Monson; 8,560 people
11. Sturbridge; 9,268 people
12. Raynham; 13,383 people
13. Webster; 16,767 people
14. Falmouth; 31,531 people

All but one of these towns were classified as either Maturing New England Town, Country Suburb, or Rural Town. Since the counties of Worcester, Franklin, Hampshire, Hampden, and Berkshire primarily contained towns of those three subtypes, our Field Project Team felt secure in choosing these five counties as our scope for the community solar bylaw literature review.

The towns that fell into these three subtype classifications also shared two

important characteristics with Athol: low density and substantial amounts of vacant and developable land. These characteristics are important to ground-mounted solar array developments because they, in many cases, require a substantial spatial footprint. Thus, our study of these communities, which possess related characteristics, should provide beneficial and applicable findings to the Town of Athol, a community that has a fairly low density and a great deal of open and developable spaces.

However, developing ground-mounted solar array installations in low density areas also raises issues and questions uniquely related to this kind of space concerning personal property, nuisances, and negative visual impacts. Moreover, two installations currently reside on farms, which also raises the question of whether or not farmland, which has high value as a food production space, is appropriate as developable sites for solar installations.

Lastly, it is also useful to keep in mind that the spatial footprint of solar installations will change as technology advances and solar arrays become more efficient. Larger arrays could potentially be replaced with those that are smaller, changing the way that these installations interact with and affect the surrounding environment, including the viewsheds of abutting or nearby residential property owners.

Stakeholder Interviews

Our second course of action was to conduct stakeholder interviews to ensure that recommended amendments to the bylaw best represented the wishes of the varied stakeholder groups in town. These interviews were semi-structured and contained open-ended questions, a format based on the techniques developed by Shawn Olson-Hazborn in a 2018 journal article assessing attitudes towards solar development in communities economically dependent upon fossil fuel extraction.

While Athol is not economically dependent upon fossil fuel extraction industries, it shares similar characteristics to other communities that were studied, which included Emery and Uintah County in Utah, the town of Gladstone in Queensland, Australia, and the town of Lithgow in New South Wales, Australia (Bosca and Gillespie 2018; Goddard and Farrelly 2018; Olson-Hazboun 2018). These communities are rural, post-industrial, and have similar levels of unemployment, income, and education. The only characteristic that significantly differed between them was population density, which ranges from two residents per square mile in Emery County to seven hundred residents per square mile in Gladstone. Athol fell into the middle of this range, at around three hundred residents per square mile, making Olson-Hazborn's framework appropriate for use.

Both our team and Project Partner jointly identified various stakeholder groups relevant to solar zoning in Athol. Our stakeholder list included twenty-one potential participants including Athol's

Board of Planning and Community Development members, land trusts such as Mt. Grace Land Trust and Mass Audubon, planners from other towns, solar developers operating in Athol and Central Massachusetts, and Athol community members including landowners, abutters, and community groups.

Additionally, our team used "snowball" sampling to recruit additional interviewees, reaching out to additional stakeholders based on referrals from stakeholders we had already spoken to. This method has some drawbacks such as potentially creating biased samples where only one side of an issue was properly represented. However, snowball sampling is also one of the best ways to break the ice with participants and limit the use of cold calling for recruitment (Olson-Hazboun, 2018). Our team believed the potential issues caused by snowball sampling are outweighed by the benefits it presents to this project. Moreover, it should be noted that the stakeholders we interviewed were not a representative sample of the groups they represent, with the exception of the Planning Board. The number of different stakeholder groups that we interviewed helped provide the team with various narratives on solar development that were sufficient enough for the team to analyze for similarities and differences.

Our interviews were between thirty minutes to an hour long, except for one group interview with six members of Athol's Board of Planning and Community Development, which was almost two hours long. The interview with the members

of the Board was required to be an open public meeting to stay in accordance with Massachusetts' Open Meeting Laws. All interviews were recorded and transcribed, which allowed for a more comprehensive analysis. The goal of our interviews was to discover the stakeholders' opinions on solar zoning and development and then to assess where they agreed and disagreed. With this information the team could ensure that our recommended changes best represent the opinions and desires of the stakeholders and town.

GIS Methods

Our last course of action was to perform GIS mapping and analysis. The site evaluation process for solar arrays is an ongoing complex issue in the Town of Athol due to the significance of climate and weather factors, the projects' proximity to public infrastructure, and the presence of environmentally protected areas. Thus, our Field Project Team used GIS primarily to explore spatial, environmental, and geographical information that will help to develop a framework for making spatial decisions regarding recommendations for siting of solar facilities. GIS analysis and representation had been an excellent tool used for quantifying the potential influence factors, evaluating the best sites for solar photovoltaic arrays, and presenting our findings visually for readers to comprehend.

The GIS framework used for this research was mainly based on other academic research focusing on solar development (Al Garni 2017; Fernandez-Jimenez 2015; Majumdar 2019). However, the areas covered in that research were significantly different from Athol. Research has focused primarily on large-scaled development projects occurring in large cityscapes and in vastly different climates compared to Athol's small size and its New England climate. This necessitated some modifications to the analytical framework so that we could apply it to Athol.

The method that we utilized is a GIS analysis using a multi-criteria decision-making (MCDM) model (Charabi 2011). MCDM focused on using a range of different information sources and data-

sets to account for the various spatial factors important in solar development. This model considered different factors such as economic, environmental, and community values, while focusing on ensuring maximum power efficiency and minimum environmental, economic, and social costs. These factors were evaluated based on their importance level and can be adjusted to ensure that even qualitative data such as community inputs were considered. We believe this will help provide information towards the goal of balancing the Town of Athol's desire for renewable energy without negatively impacting their citizens.

We used local GIS data to highlight areas suitable for solar array development that satisfy existing zoning bylaws and are amenable to upholding the bylaw amendments proposed by the team. Multiple data sources were used for GIS analysis, including some provided by the town of Athol (such as slope and zoning districts), United States Geological Survey (USGS), MassGIS (such as digital elevation and road) and Information for Planning and Consultation (IPaC). Moreover, after we finished interviewing stakeholders, we incorporated interview responses into GIS to highlight areas reflected by town residents as being undesirable locations for solar development based on other local factors not considered previously. The softwares used for analysis were Arcgis, QGIS, and Carto. Our data sources are summarized in Table 2 on the next page.

Table 2. GIS Data Sources	
Data	Data Source
Land Use Zoning	Town of Athol
Wetland	Town of Athol
Slopes	Massachusetts Regional Planning Commission (MRPC)
Lidar	National Oceanic and Atmospheric Administration (NOAA)
Public Roads	United States Geological Survey (USGS)
Power Transmission Line	Homeland Infrastructure Foundation (HIFLD) Level Data
Threatened Species	Information for Planning and Consultation (IPaC) and U.S. Fish and Wildlife Service (USFWS)
Local and State Protected Areas	United States Geological Survey (USGS)
Environmental Conservation	MassGIS (Oliver)

The team also performed additional investigation on these GIS datasets to determine their applicability and generalizability to the Athol context. After thoroughly analyzing and assessing all appropriate data and available community inputs, we produced one map that determined current suitable and unsuitable sites within the Town of Athol to situate photovoltaic solar array developments.



ANALYSIS

Bylaw Analysis

When looking through other bylaws, we analyzed all the elements in each section, paying the most attention to areas specify by Athol stakeholders. We also took note of criteria that were absent from Athol's bylaw as compared to other communities' bylaws that were exceptional. Exceptional community bylaw elements were those that stood out to our team because they either existed in only a handful of bylaws, addressed issues identified in our stakeholder interviews, or were more comprehensively expanded upon in elements that were foundational to a general solar zoning bylaw. Exceptional bylaw elements contained language that was clear, concise, and ambitious. Because they were more comprehensive than Athol's current criteria, we were able to supplement the foundational elements in Athol's solar bylaw with these elements so that Athol's solar bylaw could have stronger protective and restrictive language.

In order to display the recommendations in a form that was clear and digestible, we created a model solar bylaw to stay true to the structure that the recommended bylaw criteria will eventually take, and to provide an example of what that structure would look like if the changes were incorporated. Our team hopes that by designing the recommended criteria in this way, our Project Partner is better able to specifically focus on the highest priority recommended criteria while at the same time observing how it fits within the overall solar bylaw framework.

The following list of bylaws summarizes those that our team reviewed.

These towns either had pre-existing solar zoning bylaws or had recently developed drafts of solar zoning bylaws that were not yet incorporated into their overall zoning bylaws. Towns that did not have a solar bylaw were not included in the study. A complete list of the names of the towns can be found in the Appendices section:

1. Worcester County:
32 communities' solar bylaws
2. Franklin County:
18 communities' solar bylaws
3. Hampden County:
12 communities' solar bylaws
4. Hampshire County:
19 communities' solar bylaws
5. Berkshire County:
16 communities' solar bylaws
6. Other Counties:
6 communities' solar bylaws

The following were bylaw elements that Athol has in common with a significant number of other communities and were classified by our team as basic or foundational to the construction of a general solar zoning bylaw:

1.1 Purpose and Intent

1.2 Applicability

1.3 General Requirements

1.3.1 Compliance with Laws, Bylaws, and Regulations

1.3.2 Building Permit and Building Inspection

1.3.3 Fees

- 1.3.4 Waivers
- 1.3.5 Site Control
- 1.3.6 Site Plan Review Application and Requirements
- 1.4 Operations and Maintenance Plan
- 1.5 Utility Notification
- 1.6 Dimension and Density Requirements
 - 1.6.1 Setbacks
 - 1.6.2 Appurtenant Structures
 - 1.6.3 Size
- 1.7 Design Standards
 - 1.7.1 Lighting
 - 1.7.2 Signage
 - 1.7.3 Utility Connections
- 1.8 Safety and Environmental Standards
 - 1.8.1 Emergency Services
 - 1.8.2 Land Clearing, Soil Erosion, and Habitat Impacts
- 1.9 Monitoring and Maintenance
 - 1.9.1 Installation Conditions
 - 1.9.2 Modification Conditions
- 1.10 Decommissioning and Abandonment
- 1.11 Financial Surety
- 1.12 Severability

The following list consists of communities that our team had found to contain exceptional bylaw elements in their solar zoning bylaw:

Worcester County:

Ashburnham, Auburn, Barre, Boylston, Hardwick, Hubbardston, Leicester, Lunenburg, New Braintree, North Brookfield, Oakham, Shrewsbury, Southborough, Spencer, Warren, Webster, Westminster, and Winchendon

Franklin County:

Ashfield, Bernardston, Buckland, Colrain, Deerfield, Erving, Greenfield, Heath, Leverett, Montague, Orange, Rowe, Shutesbury

Hampden County:

Blandford, Brimfield, East Longmeadow, Granville, Monson, Southwick, Wales, and Wilbraham

Hampshire County:

Belchertown, Goshen, Hadley, Huntington, Middlefield, Pelham, Plainfield, Shelburne, South Hadley, Southampton, Warwick, Williamsburg

Berkshire County:

Adams, Alford, Cheshire, Egremont, Great Barrington, Monterey, New Marlborough, and Stockbridge

Other Counties:

Acton, Falmouth, and Shirley

Using the exceptional bylaw elements we identified during this analysis in combination with the results of stakeholder interviews and GIS analysis, we developed a list of recommended changes to the Athol's solar bylaw, which can be found in the Recommendation section.

Interview Analysis

Opinions on solar development in Athol and Massachusetts in general were not so much divided as they were in a constant state of tension. Not just tensions between groups but also between respondents' own positions, desires, and visions as well. We determined that exploring these tensions was not likely to reveal a perfect solution, but they would help Athol design a more equitable solution when it comes to balancing public and private interests.

While we were aware of the potential tensions we would encounter during these interviews, reflecting on our own experiences, examining past town meeting minutes, reading local newspaper articles, and speaking with our Project Partner, experiencing these tensions in person was extremely beneficial to our project. Additionally, many tensions that were not expected came up during the interviews too, especially during our interview with the Planning Board. The following sections summarize the tensions by each group as they perceive them.

Planning Board

Our interview with the Planning Board was conducted as part of a public meeting in order to comply with Massachusetts' Open Meeting Law. Our meeting was attended by most members of the Planning Board and two citizens representing the Secret Lake neighborhood of Athol. More information on the specifics of the Secret Lake solar project can be found in the Secret Lake section on pages 32 and 33. Having members of the public present

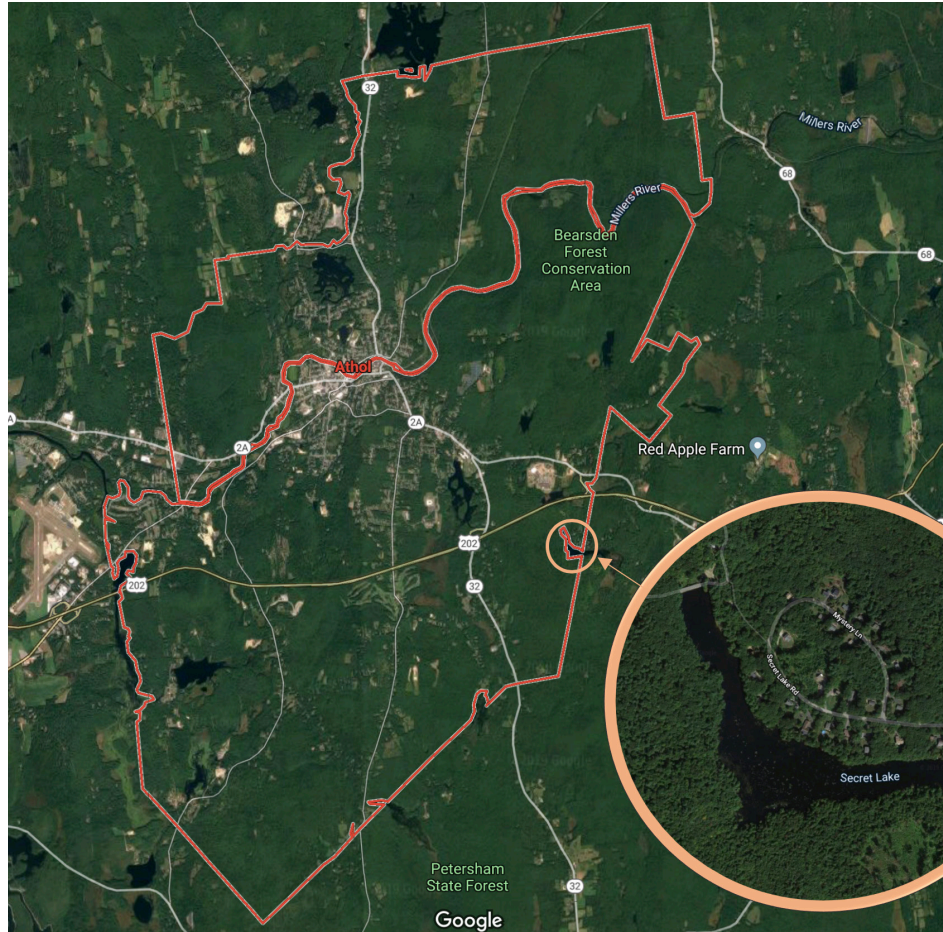
allowed us to see the tensions between the Planning Board and citizens of Athol firsthand and examine them with greater depth than through a series of interviews with each group in isolation.

During the interview, it became clear quite quickly that solar development in Athol has been a contentious issue, not just between the Planning Board and solar developers but also between the Planning Board and the citizens of Athol. Citizens of the town were concerned about the impacts of development, including environmental impacts, economic impacts, and visual impacts and believe the Planning Board should be taking more actions to regulate and limit solar development. While the members of the Planning Board were divided on their opinions of solar development, they were quite in unison on how they prioritized and handled property rights.

While the Board would like to be able to limit solar development to appropriate zoning areas, they do not want to infringe on citizens' private property rights even if the property owners are taking action that the Board does not agree with. One member of the Planning Board said, "the tough part here is that this is someone's [else's] property ... You don't want someone to tell you what to do with your property. They don't want someone to tell them what to do. So that's where our Board's really conflicted on this issue because they can just clear cut their trees if they want to... they have the right to clear cut their trees and make the money on the logging". The Planning Board general-

Secret Lake

Secret Lake Athol, MA

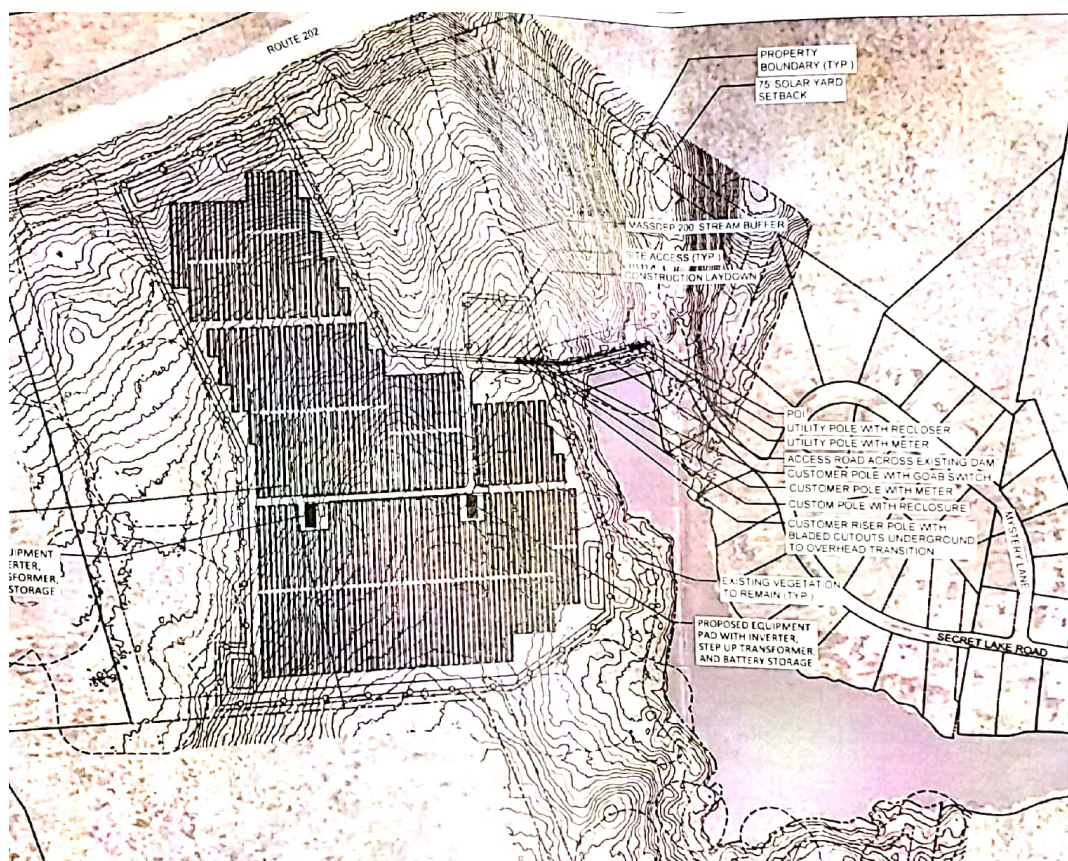


(Data from Google, Created by Field Project Team)

The Secret Lake neighborhood consists of approximately 40 homes on the border of Athol and Phillipston. Currently, Cypress Creek Renewables is proposing clear cutting approximately 80 acres of dense forest to place a 10 megawatt solar array on the other side of the lake. The project is, at time of writing, being presented before the Conservation Commission and will likely not be subject to any changes made to the solar bylaw based on the recommendations of this report. The Conservation Commission is taking particular interest in this project as it may be near a federally protected wetland area and will likely require a wetlands delineation to ensure the project does not infringe on the area.

The main concern expressed by the citizens of Secret Lake during our interview with the board was the visual impact of the proposed project. The solar array will be placed on a steep slope, suggesting that at least part of the array will be visible from every house in the neighborhood and effective screening will be difficult. Additionally, the clear cutting

required to place such a large array will leave an intense spatial gap in the ridgeline, making the viewshed from the neighborhood less appealing. Moreover, to connect the solar array to National Grid's current system, transmission lines will have to be put up along a private access road maintained by the Secret Lake's Homeowners Association. The residents were concerned that these visual impacts will affect their quality of life, as many of them had moved to the area because of its natural scenic beauty.



The Engineering Plans for one of Cypress Creek's proposed arrays, directly across from the Secret Lake Neighborhood.

Moreover, the representatives from Secret Lake were concerned how the clear cutting would affect the animals that live in the area, including moose, foxes, coyotes, bears, and deer. Many were worried that solar will also interfere with the movement of smaller animals or affect animal migration patterns. Others were worried that vulnerable habitat areas like wetlands were not being adequately protected under state regulations and that Athol should create stricter regulations for these areas in its bylaw.

ly agreed that they could not discriminate when it comes to what land usages they allow for, even for something as contentious as solar.

“The tough part here is that this is someone[else’s] property”- Athol Planning Board Member

The Planning Board was also hesitant to intensely regulate solar development because of how economically beneficial it has been for the town and property owners who had leased their land out for solar development. Several local farms were able to stay afloat by leasing their land to developers. Other landowners who have inherited land in the town were also able to keep their land by allowing solar development and using that income to cover property taxes as well as make a profit. Additionally, the town government receives payments in lieu of taxes from solar development without incurring increased costs that come with other new development projects, such as building or connecting new utility and water lines.

Furthermore, regulations on solar energy developments were made especially difficult because the State of Massachusetts passed Title VII, Chapter 40A, Section 3 in 2016, which requires that “no zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare.” The meaning of “reasonable” became a point of contention between the Planning Board and the two citizens from Secret Lake.

The two citizens believed the town could be doing more to mitigate the visual and environmental impacts imposed by solar development, and the Planning Board claimed that they are restricted by Title VII, specifically any serious restrictions would not be able to have legal standing in court.

“No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare.”-

Massachusetts General Laws, Title VII, Chapter 40A Section 3

At the time of this analysis writing, only one case had been tried before the Land Court that would have provided guidelines as to how far a regulation can go before becoming “unreasonable.” The 2014 case, *Briggs v. Zoning Board of Appeals of Marion*, ruled that bylaws that distinguish between commercial and residential solar arrays for the purpose of more heavily restricting commercial arrays was reasonable. This ruling could be seen as an advantage for municipalities because without clear limitations or guidance, town governments would be free to negotiate however they like around the boundary of land use regulations or development agreements, a contract between the developer and municipality where the developer provides money, goods, or ser-

vices in exchange for development rights. On the other hand, this ruling can also be seen as problematic because without clear limitations or guidance, it would be easy for town governments to pass measures deemed as “unreasonable” and become entangled in extensive and expensive lawsuits.

On a separate note, the most common frustrations we heard from the Planning Board, which were echoed by solar developers and land trusts groups, were how concerned citizens only became involved in the planning process around solar development when they were directly affected by solar projects. Athol’s changes to their solar bylaw in 2017 arose out of general frustrations when the first solar projects came into the town, and the Planning Board believed they had worked quite proactively to hear and incorporate citizens’ concerns. They included open discussions at seven public meetings throughout 2017. However, many abutters and other citizens felt that they had minimal input into developing the solar zoning bylaw as it currently stands. While the Board was frustrated considering how much effort they put into multiple public hearings for the bylaw, one of the citizens from Secret Lake brought up a concern that very rarely gets addressed: do bylaws accurately reflect the will of citizens in a growing town?

Do bylaws accurately
reflect the will of citizens
in a growing town?

Athol is projected to grow by around 6% per year by 2030, up from 2.5% per year from 2000-2010. Many of these new incoming citizens did not participate in the designing of the 2017 solar bylaw because they did not live in Athol at the time or were unaware of this process that was taking place (Town of Athol n.d.). What towns could feasibly do to account for new population growth is unclear. The best alternative may be to either revise or repass their bylaws every few years. Yet, the lack of solar zoning regulations, specifically those that address visual impacts, will likely leave many citizens unsatisfied as more solar development comes to the region.

Currently, the progress of solar development in the area is slowing down as National Grid, the power utility for Western Massachusetts, faces serious capacity issues. National Grid has undertaken multiple year-long studies to evaluate how many upgrades it needs to make for its transmission lines and substations to keep up with the demand for solar development, which causes many current solar projects to be delayed in their process. While the National Grid bottleneck issue offers towns like Athol a short timeframe to incorporate necessary changes and new citizens’ opinions into their bylaws, it is far from an ideal solution.

On the other hand, not all citizens who feel unheard are new to the town, though. As previously mentioned, many citizens only became concerned when they became directly affected by solar development projects themselves. This is a perfect example of NIMBYism or Not In My BackYard. NIMBYism is common in a variety of land use issues that involve undesir-

able land uses such as landfills, industrial parks, chemical refiners, and, increasingly common in Massachusetts, marijuana cultivation and distribution. It is also common in cases involving beneficial land uses such as solar energy (Fischel 2001).

The conflicts surrounding NIMBYism and solar development are multifaceted but can be oversimplified to describe the phenomenon of citizens wanting solar development as long as it is not visible in their “backyard”. Nevertheless, it is extremely difficult for the state to achieve its 1.6 gigawatt renewable energy target without also impacting some citizens’ private properties. Moreover, even if a town government has the time and resources necessary to conduct greater local outreach efforts, an important consideration to keep in mind is if citizens only view solar and renewable energy as detrimental when they are directly affected, how can town government ensure that citizens not yet personally affected by solar are participating in its outreach efforts so that it can develop precautionary and proactive measures for the town?

How can town government ensure that citizens not yet personally affected by solar are participating in its outreach efforts so that it can develop precautionary and proactive measures for the town?

Citizens

Almost all six of the citizens we interviewed over the course of this project were abutters to solar projects being proposed or had been abutters to solar projects. In almost every interview we conducted, they pointed out their dissatisfaction about the town’s public engagement process. One of the most common complaints about the engagement process was how town meetings were advertised. According to the citizens, town meetings are exclusively published in the local newspaper, Athol Daily News, and on the newspaper’s website, which is not widely read. The newspaper’s website limits the number of articles you can read if you do not have a subscription, making it difficult to be notified of meetings unless an individual already has a subscription to the paper. Additional complaints were directed towards the Town of Athol’s official website where citizens found it confusing to navigate and difficult to find the schedule for public meetings. Many citizens felt the town government was only performing the bare minimum of outreach that the state legally requires but should be doing more to involve the public. Complaints about the public process were not just limited to advertising but also about how meetings were organized.

Many of the citizens we spoke to felt they were not given adequate time to speak. One citizen detailed a meeting where solar was listed as a discussion item on the agenda; however, the item was only discussed for ten minutes and roughly forty people who wanted to make a public comment ran out of time to do so. Another citizen felt they needed to get involved a few months before they were notified in

order to have their opinions truly heard. Another overwhelming opinion on public meetings surrounding solar development was that many of the citizens believed developers should be required to hold additional public meetings besides simply attending government mandated ones. They also believed that developers and the town could be more proactive in notifying abutters about potential projects. However, this comment connected back to a previous point in the section above about how town governments have a challenge in being proactive when they are unsure about the willingness of citizens to participate in the solar planning process when they are not directly impacted by solar development yet.

Citizens' concerns over solar development can be grouped into two broad topic categories: environmental concerns and community concerns. Environmental concerns range from the impacts to storm-water management, the clear cutting of trees, and the possible destruction of animal habitats. Community concerns include impacts on their property value, the character of the town, and how the community could benefit from solar.

Every citizen we spoke to expressed concerns over the practice of clear cutting in solar development. More than one citizen claimed solar development is not green because it requires so many trees to be cut down. Many wondered why developers are not seeking out project sites where trees do not need to be cut down. Brownfields, rooftops, parking lots, and industrial areas were all considered to be more ideal sites for solar development. One citizen expressed concern that the full consequences of tree removal are not being

taken into effect. They claimed the lookout on top of Adams Farm has become windier since the solar arrays were installed as the trees that were previously there had operated as a natural windbreak. Another citizen was concerned that the removal of trees as part of the Secret Lake solar project would affect the natural lighting of the neighborhood.

Many citizens believed that solar development should not be allowed in areas zoned as residential.

A common community concern amongst the citizens overall was the impact solar panels might have on citizens' private property values. Every citizen we spoke to believed that solar panels that were visible from their property would have an adverse effect on their property's value. Much of this concern was rooted in the industrial look of the solar panels. Many citizens believed that solar development should not be allowed in areas zoned as residential. This opinion presents as a challenge for Athol since a majority of the town is zoned for single family residential housing. An alternative approach that might be worthy of exploring to tackle this concern is requiring solar development in residential districts to obtain a special permit that entails more stringent requirements than solar development in non-residential areas. These requirements would be specifically developed to protect the property values and property rights of abutters.

Another community concern expressed was how solar development bene-

fits the community. Many citizens believed that solar development has no benefits for the community as a whole but just for the property owners and the developers economically. Citizens were also especially perturbed because many of the solar development companies active in Athol are not local or even from the New England area. While having a local developer would not be enough to relieve this concern, it would make the solar development projects more palatable. One citizen, on the other hand, did believe that the community benefited from lower electricity costs created by solar development. They believed that increasing regulation of solar energy/development would likely result in higher electricity prices and wondered how much other citizens would be willing to pay to have regulated solar energy.

Other than concerns about the benefits the community receives from solar, another common concern about solar development's effects on the community was its incompatibility with the rural character of Athol. While every citizen defined rural character differently, many of them agreed on what should be excluded from the term. Industrial land uses were universally seen as being incompatible with rural character and should be limited to very specific areas in the town. Solar panels were almost universally categorized as being industrial land usage. One citizen expressed that unmonitored solar development could leave Athol in the situation as the oil fields of Texas or as another citizen had said, solar development is like fracking in Colorado.

While most of the citizens' opinions on solar development were negative, there was one area where citizens were overwhelmingly positive, which was how

solar can help local businesses. A few local farms in Athol as well as in the neighboring town of Orange were financially struggling. The payments from leasing their land to solar developers had allowed these businesses to stay afloat. While some citizens were upset that the solar arrays had a visual impact on these businesses, most were simply happy they were able to stay in business.

Land Trust Community

We interviewed four members of the land trust community that were active in Athol. These members represented Mount Grace Land Conservation Trust, The Trustees of Reservations, and Mass Audubon. When asked about the unreasonable restrictions clause of Chapter 40A Section 3 and the actions Athol and other towns were taking to regulate solar energy, responses were divided. Representatives from Mount Grace, a land trust focused on conservation and preservation, all believed the unreasonable clause is more flexible than is currently being interpreted and that almost every town in Massachusetts could be doing more to exercise their power to protect public health, safety, or welfare. The representative of the Trustees of Reservations with whom we spoke believed that towns can certainly enhance their regulations and restrictions, but without clear rulings as to what counts as being reasonable, towns should remain on the side of caution, especially for towns with limited budgets to defend themselves from legal action.

The representative of Mass Audubon, who was directly involved in solar zoning issues, believed most towns currently have reasonable levels of regulation

Almost every town in Massachusetts could be doing more to exercise their power to protect public health, safety, or welfare.

but could expand on them slightly. Restrictions on size, location, slope, and other regulations to limit impacts on the natural and built environments would likely be found reasonable. However, restrictions on the type of array used or the equipment used to build an array would most likely be found unreasonable as individuals within town governments are not experts on solar development.

A common concern among all three land trusts groups was the use of greenfield sites for solar instead of brownfields, which the Planning Board had also mentioned. They lamented the use of farm and agricultural land for solar arrays instead of for local agriculture. Farmland is a common solar development target site since many small farms in the state experience financial difficulties, and farmers would be willing to lease out their land to resolve such financial difficulties. They found this especially distressing as the state, though its SMART program, had essentially subsidized the buying out of many of these struggling farms. Even mixed-use programs, such as solar arrays that can be put into pastures where animals can still graze or placed into a working cranberry bog, were met with skepticism from the land trust community. They were concerned because there has been little to no research on the effects of these programs. The use of forest land was also deeply problem-

atic for the Land Trust representatives to whom we spoke. Forests provide multiple services or benefits such as a source of timber, a recreational destination, a flood mitigation area, and a carbon sink all at once if properly managed. Solar arrays, in contrast, can only be single or dual use, designed in such a way that animals can graze underneath them. Siting solar arrays on brownfield sites, rooftops or even parking lots in developed areas was seen by the land trust groups as a more practical way to balance conservation and energy needs in the state.

Solar Developers

The two solar developers we spoke to had vastly different views on solar energy and solar development in comparison to the other stakeholders as they have a vested interest in ensuring their solar development projects remain unhindered. The developers we spoke to had experience working with Athol. The most obvious frustration observed was with National Grid. As mentioned before, National Grid's electricity infrastructure in the region is almost at capacity. This had affected every developer working in Central and Western Massachusetts to various degrees, but the issues with National Grid were not just limited to the delay in project progress. Solar developers also need to pay for the infrastructure upgrades that National Grid has to make.

In the 2016 case *Engie Gas & LNG LLC v. Department of Public Utilities (DPU)*, the Massachusetts Supreme Court ruled that infrastructure upgrades to the electric grid caused by increased generation of electricity must be paid for by the companies generating this excess electricity and

not the utility distribution companies. The court's ruling was based on two factors. First, utility distribution companies cannot be mandated to pay for upgrades necessitated by another company's actions. Second, if a utility distribution company was to pay for these upgrades, the cost would then fall solely onto the consumers of that utility distribution company. This is important as these consumers will have no choice in which utility distribution company they purchase electricity from, making them essentially consumers in a captive market.

Protecting consumers in captive markets has long been an important aspect of government policy, especially when it comes to utilities. Utilities have been regulated at the federal level since the passage of the Public Utilities Holding Company Act of 1935, which placed limits on how much utilities can charge their consumers. While the solar developers we interviewed did not want to put the cost burden of upgrades on National Grid's consumers, they felt that placing the burden solely on them was unjust. In their opinions, these infrastructure upgrades should have happened long ago and the need for them now stems from the utility's failure to properly follow technological trends in energy development and invest in infrastructure upgrades.

Developers also echoed the Planning Board's complaints about NIMBYism, particularly in regards to public meeting attendance and to their own outreach efforts. Both developers conducted outreach pertaining to their projects, both before and after submitting their site review plans to the Planning Board. While many of the attendees of the meetings were

those that were directly affected, in many other cases, the meetings held by developers were only attended by curious citizens while abutters and citizens directly affected waited until the official town meetings to present their objections and attempt to derail the project. This phenomenon frustrated the developers as they are usu-

Developers as they are usually more than willing to accommodate abutters' and other citizens' concerns if they can

ally more than willing to accommodate abutters' and other citizens' concerns if they can, even going beyond requests for screening. One project, in particular, that did not occur in Athol was highlighted as having increased its setbacks well beyond the legal requirements and decreased the array size to ensure abutters would not be able to see the solar arrays.

One developer expressed frustration at concerns he views as hypocritical such as having many abutters objecting to clear-cutting trees for solar development but not for housing development. According to this developer, "solar is temporary and low impact," suggesting that lands that are used for solar development can be repurposed after a certain period if a landowner decides the solar array is no longer something they want to invest in whereas the same situation cannot be with housing development. They also believe solar development is also more of a net benefit than with new housing or commercial development. The municipality can receive payments in the form of impact fees or development agreements from the beginning and then collect commercial taxes

throughout the entire lifespan of the solar array project. In addition to these payments, the municipality does not have to spend any money on additional infrastructure as they would with commercial or residential development.

Moreover, the developer suggested that solar is usually more beneficial ecologically than what it was built on. In their experiences, solar arrays have usually been built on land that has not been properly managed, resulting in net ecological benefits from development. Because solar development is held to such strict standards, stormwater management is generally better after the array is placed. Even when solar development requires clear cutting, the overall ecological benefits are usually positive. Both developers claimed solar arrays lower carbon emissions and do more to combat climate change than the trees that were removed. This developer we spoke to had striven to replace first generation of shrub forests, and, even on a smaller scale, generally planted their arrays with local flora as well as pollinator friendly plants. While this one solar developer cannot represent the industry as a whole, they do serve as a great example of how solar development can be done environmentally responsibly.

Both developers responded to the idea of developing solar arrays on brownfields sites in the same way: while it makes sense from an idealistic perspective, it is hardly a pragmatic solution. Brownfield development can consist of many issues when it comes to solar development, and the most ideal brownfields have already been developed. A common brownfield site suggested for solar development are landfills as solar panels could not possi-

bly harm the visual appearance of a landfill. However, landfills often settle—as the trash decomposes the surface of the landfill shifts. If a landfill settles too much, it can break the rack mount the solar panels are attached to. This could then possibly require the whole solar array to be rebuilt. Because of the financial risks associated with brownfield development and lack of incentives available through the SMART program, brownfields are not sites prioritized or favored by developers for solar development.

Overall, there was some consensus among our interviewees that are not part of the solar developer group. However, it was clear that each stakeholder group has different views on how solar can be responsibly developed in Athol and the surrounding region. The land trusts and Planning Board both saw the economic benefits solar can have in the region but were concerned about how the placement of arrays will affect those living nearby. The citizens, on the other hand, believed that large scale solar development is a threat to their way of life and will fundamentally change the character of the place they live. The land trusts and citizens were also especially concerned with the environmental impacts of solar development, especially with the clear cutting of large areas of trees and believed such activities should be banned. The Planning Board was worried that any restriction they impose could be deemed unreasonable. What is “unreasonable” was also a point of contention with developers and citizens.

If we were to integrate every single group’s recommendations for solar development, solar development would become completely infeasible in Athol, which is

something the Planning Board would like to avoid but would likely make some of the citizens happy. In fact, one citizen called for a complete moratoria on solar development in the town. This would likely be found unreasonable in court based on the ruling in the 1979 case, *City of Boca Raton v. Boca Villas Corp*, which sets the national precedent on moratoria. It is our hope that our recommended changes will adequately address every groups' concerns to an acceptable degree and, if adopted, will encourage responsible solar development in Athol well into the future.

GIS Analysis

Our GIS maps had explored various spatial, environmental, and geographical information that had helped our team develop a framework for making spatial decisions regarding recommendations for siting of solar facilities, which ultimately connects back to our research question: *How can Athol identify and prioritize ideal sites for solar array development based on the various considerations expressed by the community?* Some criteria we assessed were not appropriate for mapping which we will cover those before moving on to our maps.



(Source: Ukraine Open For Business. January 25, 2019. <https://open4business.com.ua/tiu-canada-plans-to-to-buy-solar-power-plants-in-ukraine-odesa-region/>)

Solar panels are sensitive to temperature. Specifically, they are negatively impacted by high temperatures (Honsberg and Bowden 2019). Rising heat can pose a problem for rooftop solar panels but not ground-mounted solar array projects because air flows through the gaps between the solar panels and the ground. Overall, Athol's Northeastern climate is ideal for building ground-mounted solar arrays. Thanks to the favorable climate, the team concluded that conditions of temperature will not be a significant consideration in choosing the ideal location for solar arrays.

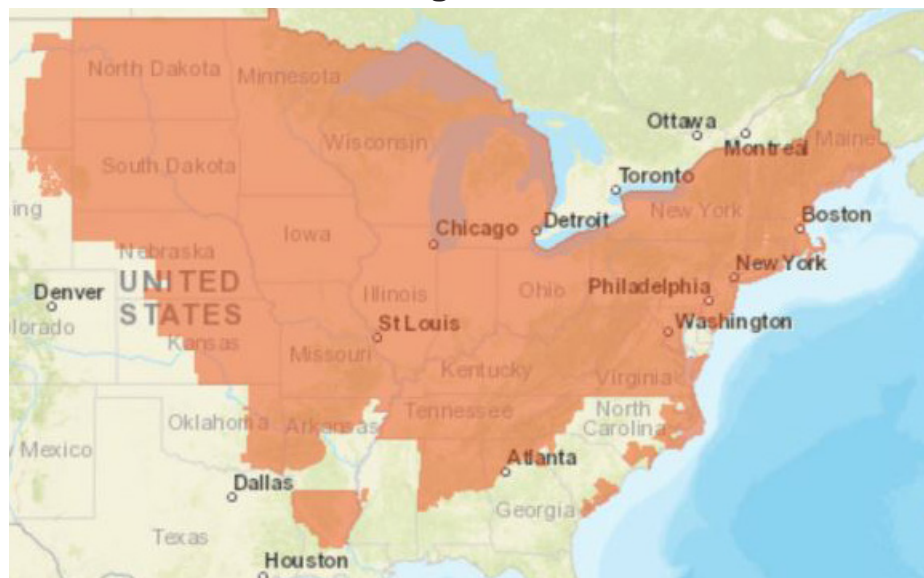
The only species threatened in the Town of Athol is the northern long-eared bat (IPaC: Explore Location 2019). They hibernate in caves and mines in the winter and swarm in surrounding wooded areas in autumn. During late spring and summer, they roost and forage in upland forests (U.S.Fish & Wildlife Service Endangered Species 2018). This species of



(Source: Ann Froschauer, USFWS. October 29, 2018. <https://www.fws.gov/Midwest/endangered/mammals/nleb/index.html>)

bats is not exclusive to Athol or the New England area. They are spread widely across North America. The team decided that this endangered animal would not be an additional condition that the Town of Athol needs to account for when choosing sites for solar development because solar development projects would not be imposing on the bats' habitat areas in the caves and mines. However, if Athol decided to allow for wide scale clear cutting of forests, then additional attention would be required by the Planning Board to determine whether or not these bats could be negatively impacted and what are the possible strategies to mitigate those impacts.

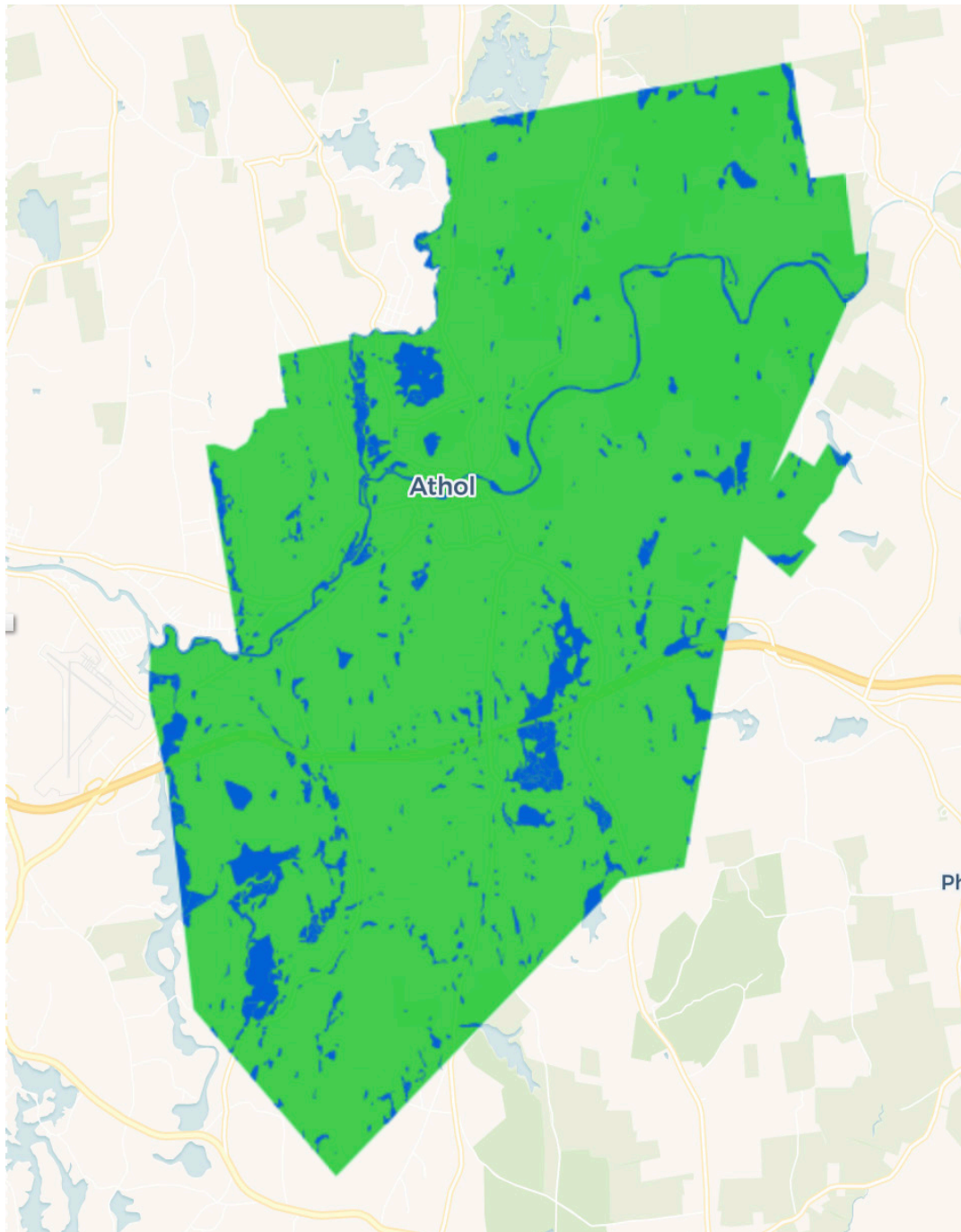
Northern Long Eared Bat Habitat



(Data Source: U.S. Fish and Wildlife Service Endangered Species.)

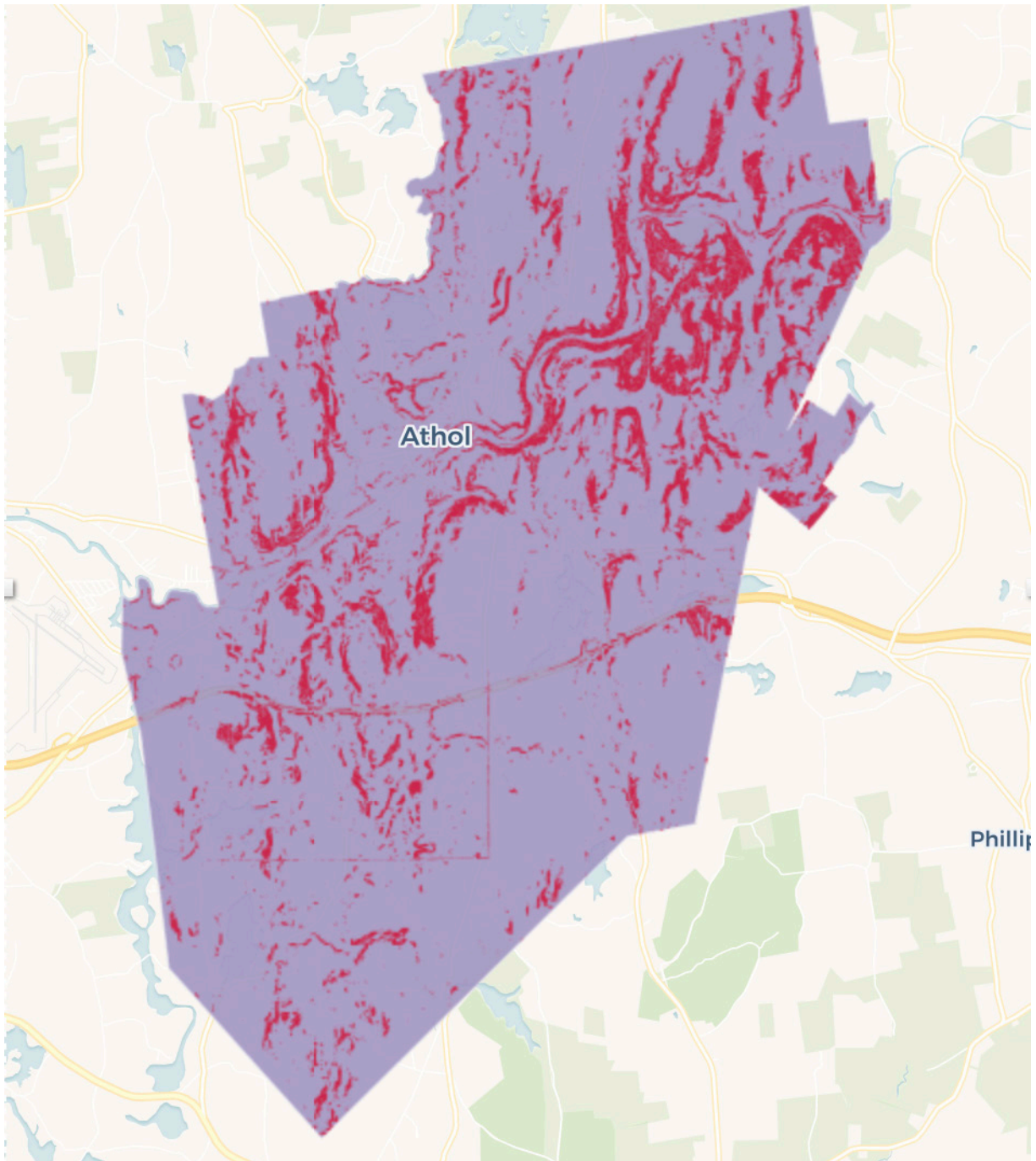
In Map 1, the blue areas are wetlands and the green area are not. Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year (EPA 2018). Wetlands are protected under state law in Massachusetts by the Wetlands Protection Act, which prohibits most development in and around wetlands while also heavily regulates other types of development. For these reasons, we suggest restricting solar development in and around wetlands.

Map 1 Wetlands



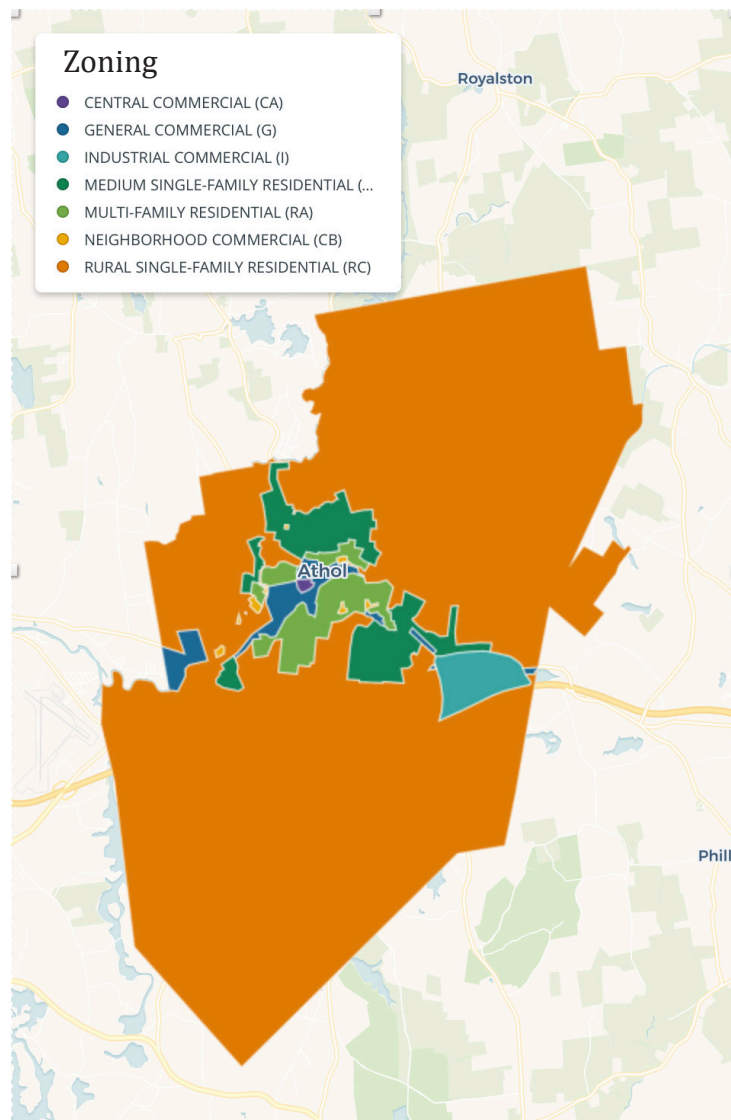
In Map 2, the red areas are slopes with elevation grades of more than 10% and the grey areas are slopes with less than a 10% grade. Slopes with grades higher than 10% are particularly vulnerable to soil erosion when subject to intensive ground development. Soil erosion can lead to increased stormwater runoff and a higher chance of mudslides (Mass.gov 2017). For these reasons, it is recommended that potential solar development projects avoid areas of steep slopes.

Map 2 Steep Slopes



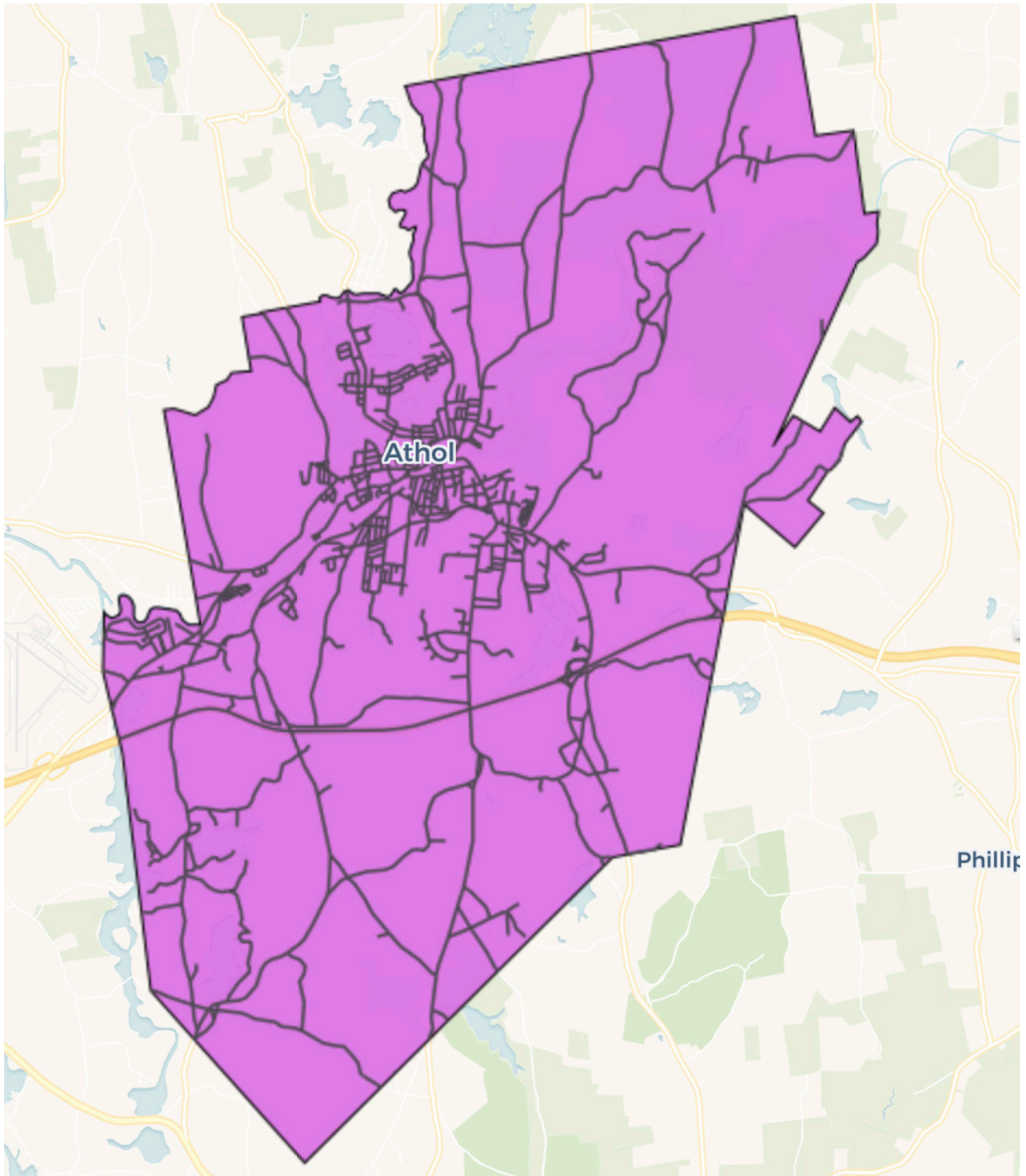
Map 3 shows how the Town of Athol is currently zoned and its land uses. As shown, most of the town is zoned rural single-family residential, and the downtown central area is zoned mostly commercial, medium single-family residential, and multi-family residential. Based on our stakeholder interviews with the Planning Board and residents of Athol, the town did not want to see solar development in its downtown and residential areas. Most residents suggested placing solar development only in industrial zones. However, in Map 3, Athol currently only has one district that is zoned industrial commercial. The industrial commercial zone currently has the North Quabbin Commons/Market Basket development located there already while also containing a wetland and a reservoir, which indicate that it would be environmentally infeasible if we were to further impose solar development in this zoning district. Thus, the team would recommend the Planning Board and solar developers focus on other zoning districts as potential solar sites.

Map 3 Zoning



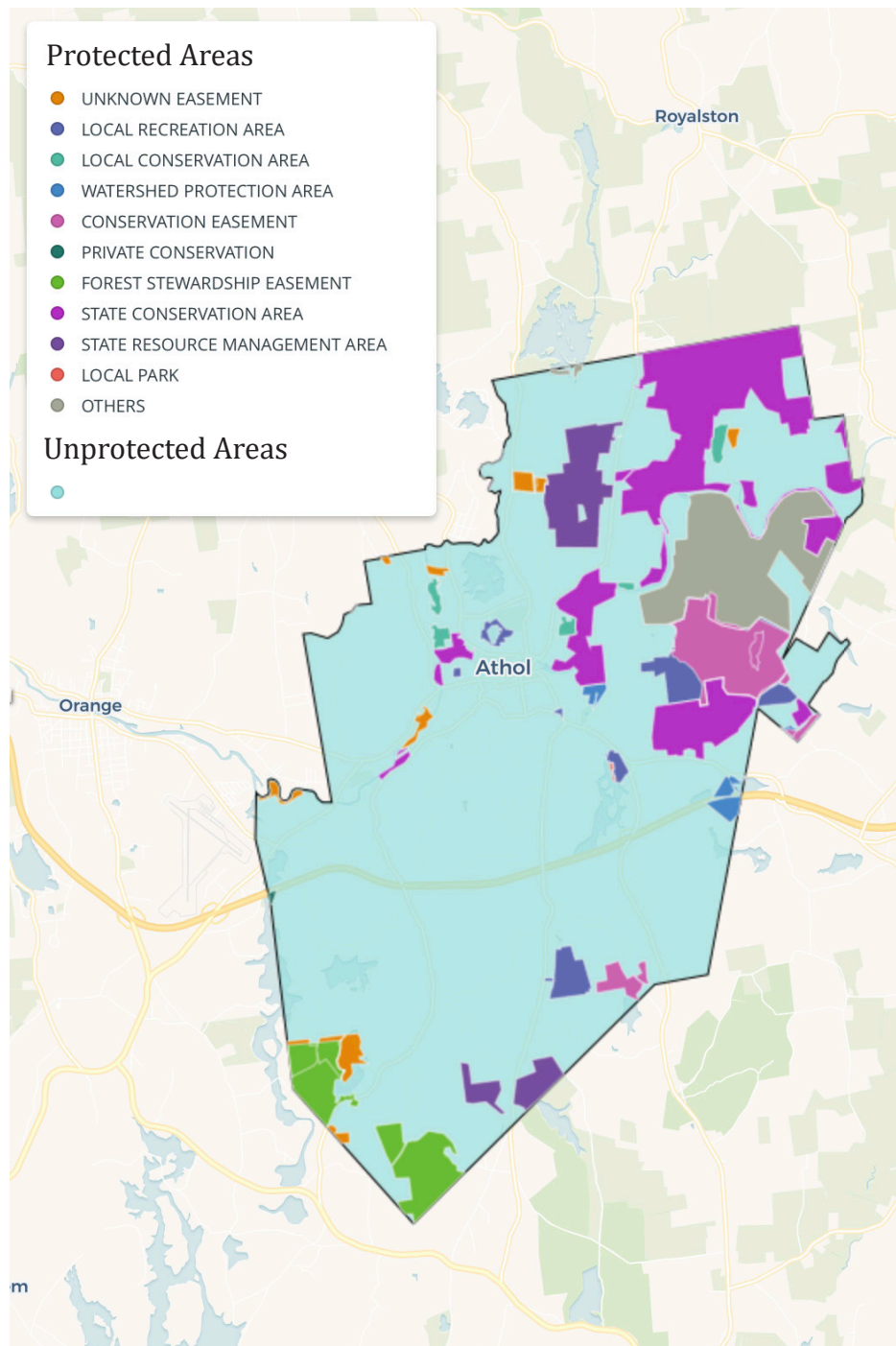
Map 4 illustrates the current road infrastructure in the Town of Athol . Our team suggests that solar array projects should be located close to roads, allowing for unhindered access for property owners and lower maintenance and transportation costs. However, they should also be located far away enough from the roads to minimize any potential visual impacts on town residents.

Map 4 Roads



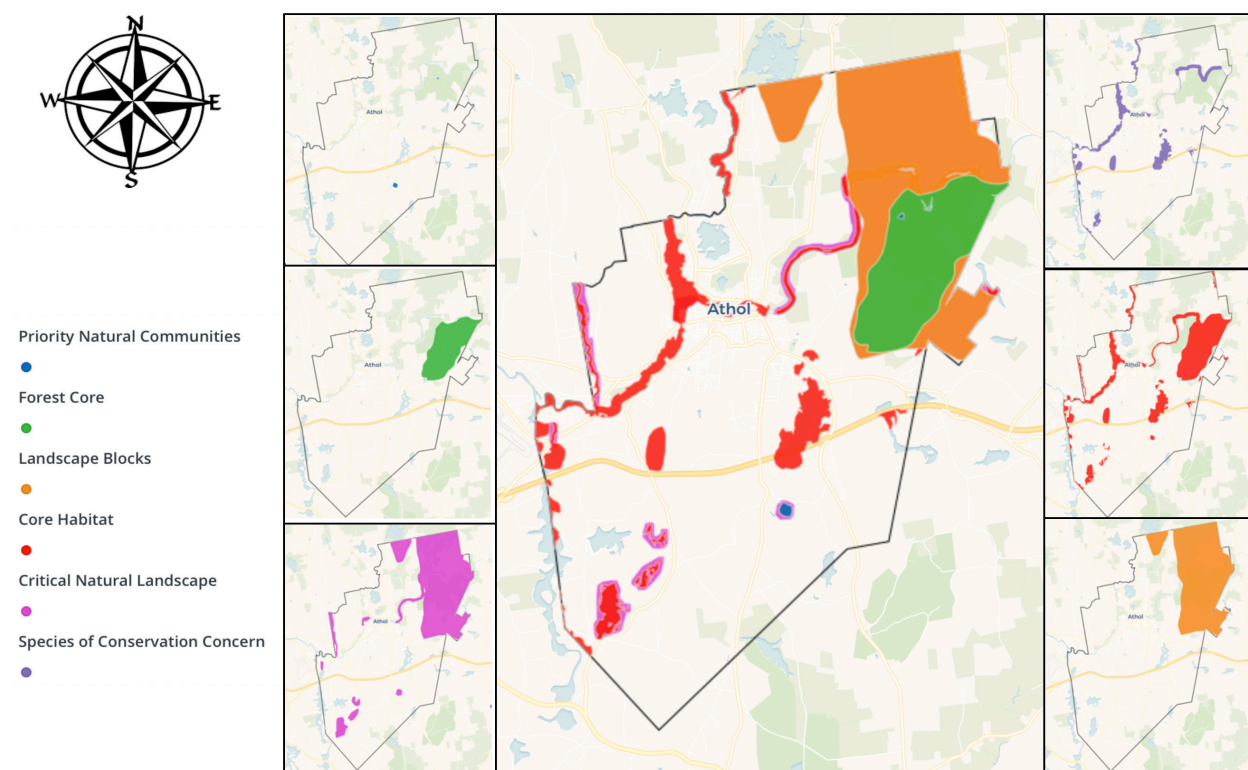
Map 5 highlights the protected areas within Athol. A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values (IUCN Protected Areas 2018). Development occurring in protected areas is illegal due to the environmental and ecological impacts that could be inflicted on animal species' and people's livelihoods.

Map 5 Protected Areas



In Map 6, we had found GIS data that addresses environmental concerns and mapped out habitat areas. This data came from OLIVER, an online mapping tool developed by MassGIS. This map shows six kinds of environmental data including Priority Natural Communities, Forest Core, Landscape Blocks, Core Habitat, Critical Natural Landscape, and Species of Conservation Concern.

Map 6 Enviornmental Concerns



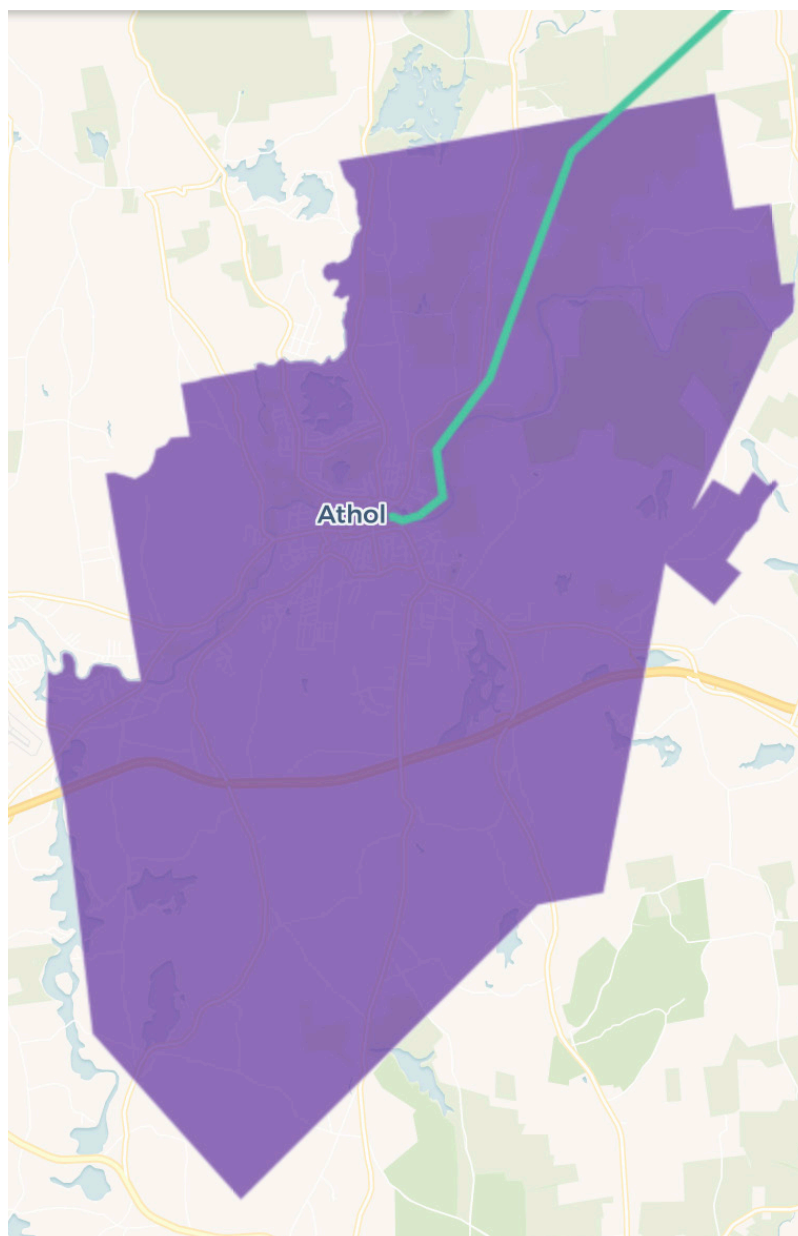
Core habitat is critical to the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth. Critical Natural Landscape provides habitat for wide-ranging native species, support intact ecological processes, maintain connectivity among habitats, and enhance ecological resilience. Forest Core are, defined by MassGIS, as large, intact forests that are least impacted by roads and development, providing critical habitat for numerous woodland species. Landscape Blocks are large areas of intact natural vegetation, consisting of contiguous forests, wetlands, rivers, lakes, and ponds, as well as coastal habitats such as barrier beaches and salt marshes.

Species of Conservation Concern is a dataset in MassGIS, Oliver which consists of the combined footprint of all species listed under the Massachusetts Endangered Species Act with all non-listed species present in the State Wildlife Action Plan. The Priority Natural Communities is a dataset consists of various communities with biodiversity conservation interest in the state of Massachusetts. The data is based on records of natural communities maintained in the Natural Heritage and Endangered Species Program (NHESP) database that classify and delineate natural communities by analyzing their respective landscape data. Definitions of the environmental data can also be found in the Glossary in the Appendices.

Based on our stakeholder interviews with the Planning Board and residents of Athol, we observed that the town was extremely concerned about the environmental impacts solar can have. We suggest the areas noted in this map are those not suitable for solar development.

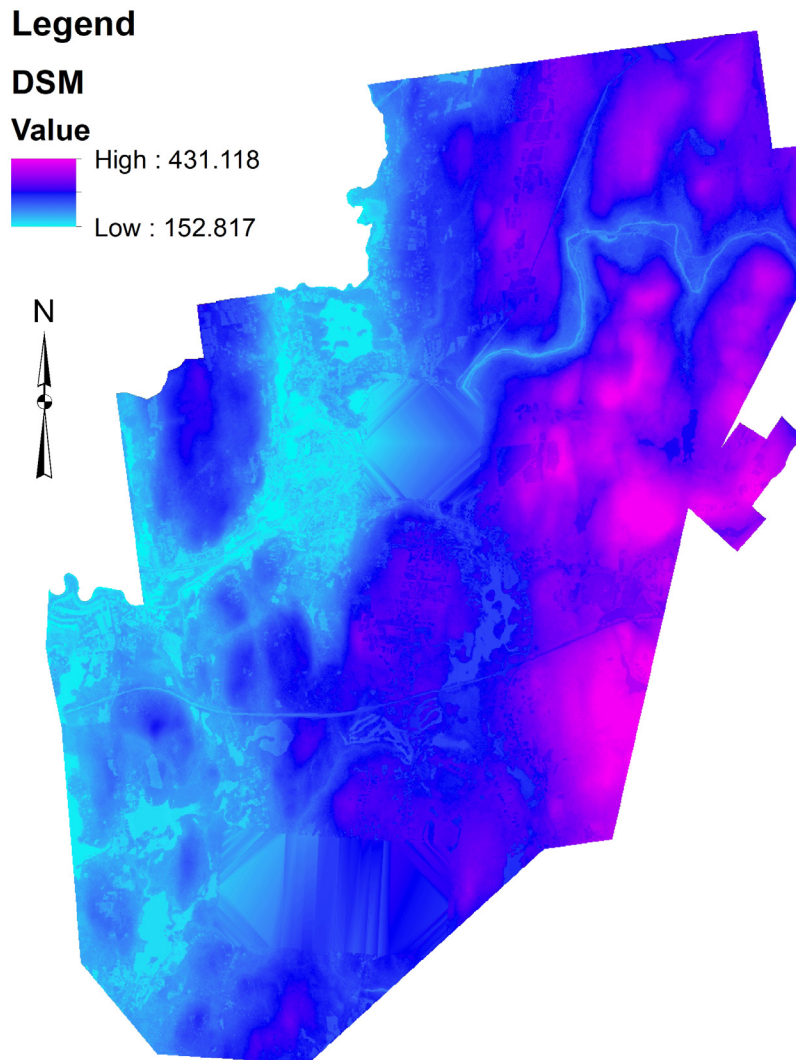
Map 7 shows the only transmission line in the Town of Athol in its northern part. Access to high-voltage transmission lines is essential for the development of solar projects as transmission lines are what move the electricity generated from solar panels to where it will then be consumed. Building transmission lines would increase cost and the longer the transmission line, the more power would be lost during the transfer (Inside Energy 2015). Locating potential solar array sites closer to main transmission line as much as possible would be beneficial for power efficiency.

Map 7 Transmission Line



Map 8 is a digital surface model (DSM), an elevation model that takes into account present features of the earth's surface, which includes the heights of trees, buildings, and any structures that are raised off the ground. In this DSM map of Athol, higher elevations are represented in pink, medium elevations are represented in dark blue, and the lowest elevations are represented in light blue. Solar arrays developed in higher elevation areas would have a higher visual impact as they will be visible from areas of lower elevations.

Map 8 DSM

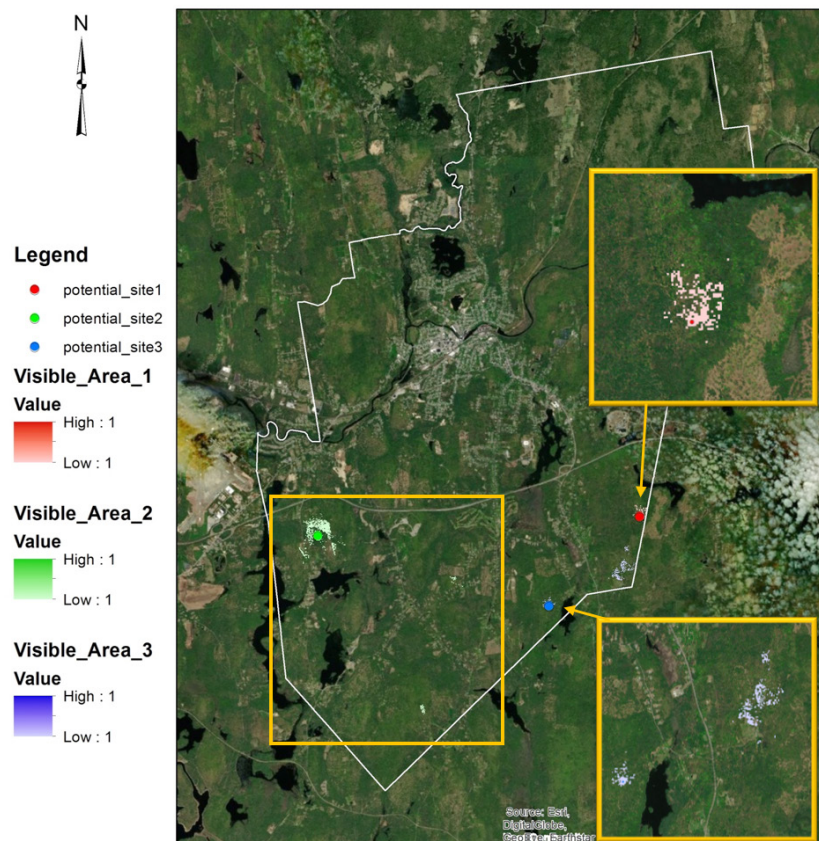


One might argue that the higher elevations may get better sun exposure and therefore be more energy efficient for solar as it will generate more electricity. However, elevation levels, in reality, do not have an effect on the energy efficiency of solar arrays because the important determinant of energy efficient for solar is sun exposure. Higher elevation areas and lower elevation areas are capable of generating similar electricity levels if we were take into consideration sun exposure.

Thus, since elevation levels do not impact energy efficiency and our team are interested in mitigating potential negative visual impacts of solar, we suggest that solar development be focused on the southwestern portion of Athol where areas of lowest elevation are located.

In Map 9, we were able to use the DSM from the previous section and a specialized GIS tool in ArcMap to model sites where potential solar arrays would be visible. This viewshed analysis tool allows a user to select a location and, using the elevation data from DSM, then highlights areas from which that location can be visibly seen. This tool allows for effective investigation of the visual impacts potential developments may have on the surrounding community before any permitting/approval processes and construction can begin. The map above shows three potential sites selected by our team and the visibility of these sites if solar arrays were to be located there. Potential sites are not limited to just these three selected locations. This map is meant to be an example expressing how the environmental and visual impacts of solar arrays could be minimized, address the community's concerns, satisfy the

Map 9 Potential Sites and Visable Areas



community's sustainable energy goals, while also efficiently maximize energy output. We believe that any solar development proposed in Athol should utilize this tool and form of analysis.

In conclusion, we had included as many influential factors as we could based on our stakeholder interviews, bylaw review, and available data sources. We acknowledge that there may be other factors that we had not include into our analysis due to limitations in time and resources. Nevertheless, the advantages of combining GIS and MCDM model were sufficient to helping our team develop a broader and more comprehensive analysis to finding out the suitable and unsuitable areas for solar development in the town and further contribute to the strengthening of Athol's solar bylaw.



RECOMMENDATIONS

Bylaw Changes & Potential Sites

Our team categorized our proposed recommendations for changes to the town's solar bylaw into the following three areas: high priority, medium priority, and low priority. The criteria for what constituted high, medium, and low were determined by combining our three methods: solar bylaw review, stakeholder interviews, and GIS mapping. Recommended changes of high priority were ones frequently observed in other communities' solar bylaws, revealed by various stakeholders as being important or lacking in the town that require immediate attention, and analyzed through GIS mapping as being feasible metrics or regulations to be accomplished through the town's solar bylaw. On the other hand, recommended changes of low priority were ones mentioned only in a few communities' solar bylaws, pointed out by various stakeholder groups as further considerations to reflect upon if relevant to the town, and did not require GIS analysis to evaluate their applicability to the solar bylaw. Lastly, recommended changes of medium priority were those that were outlined in other communities' solar bylaws more than a handful of occasions, disclosed through our stakeholder interviews as being important but could be incorporated at a later date, and may or may not involve additional GIS analysis for assessing spatial and geographical significance.

Amendments to Solar Zoning Bylaw:

- a. High Priority – proposed amendments that the Field Project Team believes are essential to upholding the goals of the community
- b. Medium Priority – proposed amendments that the Field Project Team believes are worth exploring when considering the goals of the community
- c. Low Priority – proposed amendments that the Field Project Team believes are relevant but minor to upholding the goals of the community

In Athol's current solar bylaw, the Permit Granting Authority for solar development projects is the Planning Board, which is different from the assignment of the Special Permit Granting Authority (SPGA). In Section 1.2.6.2 of Athol's Zoning Bylaw, the Zoning Board of Appeals (ZBA) would be the SPGA unless explicitly authorized otherwise in the Zoning Bylaw, which meant that, by default, the ZBA is the SPGA for solar development projects. At the time of our team's recommendation writing, the Planning Board, in part of an effort to make all solar projects approved by special permit only, had begun to put forth a proposal to explicitly identify the Planning Board as the SPGA for solar projects by modifying Section 3.24.3 in its current solar bylaw. In the Model Solar Bylaw that our team developed, Section

3.24.3 as well as all other language throughout were updated from Permit Granting Authority to Special Permit Granting Authority to reflect this new proposed change.

The table on the following pages provides an overview of the recommended changes according to their priority level. More detailed language, requirements, standards, and references about the recommended changes can be found in the Model Solar Bylaw in the Appendices section.

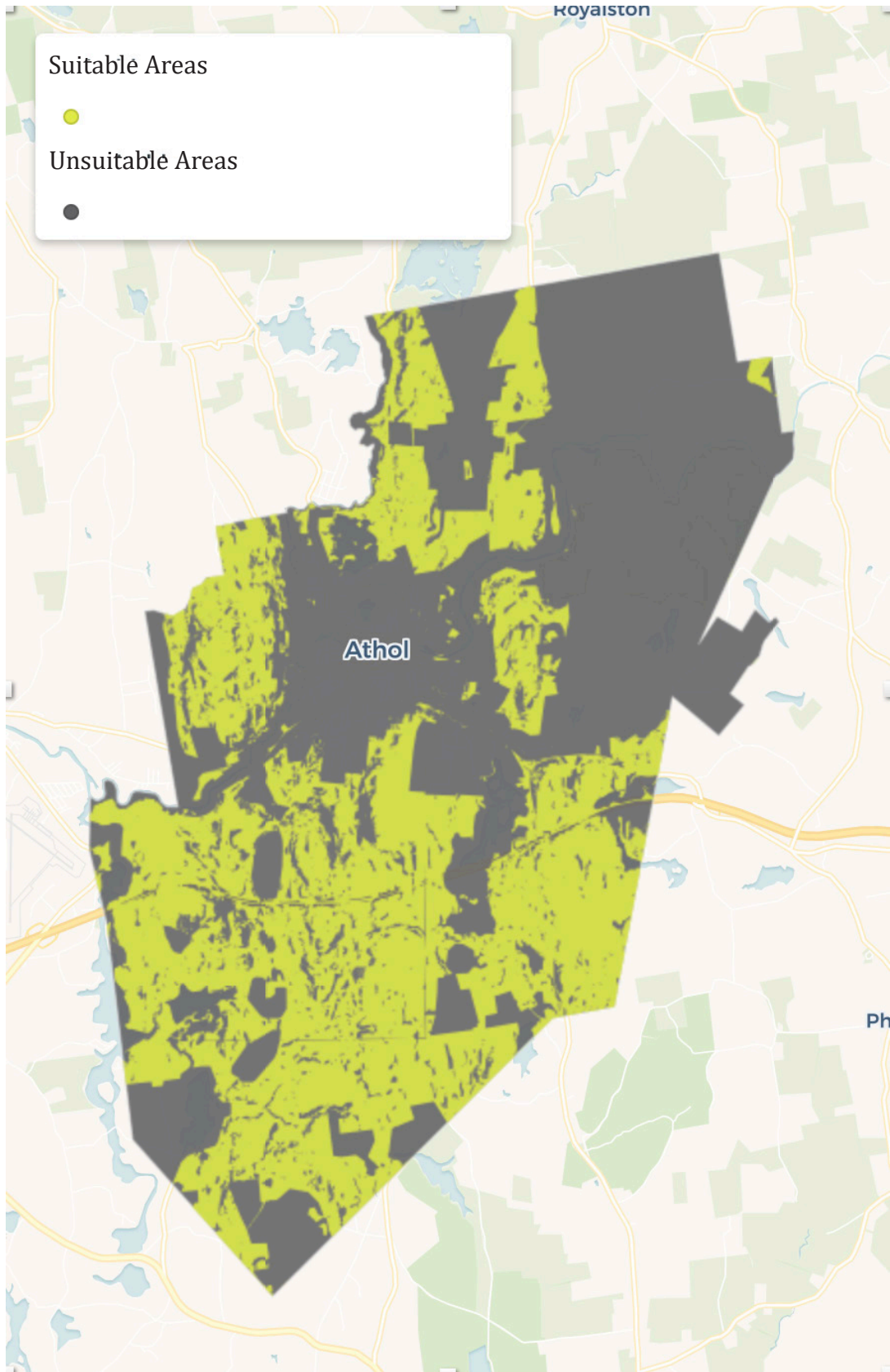
Table 3. Overview of Recommended Changes	
Priority Level	Description of Recommended Changes
High Priority	<p>Add to Purpose and Intent section:</p> <ul style="list-style-type: none"> • Balance the rights of landowners to use their land with the corresponding right of abutting and neighboring landowners • Retain the natural beauty, aesthetic appeal, historic value and scenic attraction of the Town for both residents and tourists <p>Incorporate revised language on Applicability section from Model Solar Bylaw to Athol's current solar bylaw</p> <p>Add to General section: All plans and maps submitted to the Planning Board shall be prepared, stamped, and signed by a Professional Engineer and Landscape Architect</p> <p>Additional required documents to be submitted to the Planning Board regarding the proposed solar development project:</p> <ul style="list-style-type: none"> • A public outreach plan conducted by applicant • A glare analysis and proposed mitigation • Locations of farmland soils, by type, and plans to protect, maintain, and/or restore those soils • Viewshed Analysis • Stormwater Management Plan • Visual and Habitat Mitigation Plan • Existing and proposed photographs from at least four perspectives specified by the SPGA, including from the nearest residential structures and of the area(s) that are most publicly visible

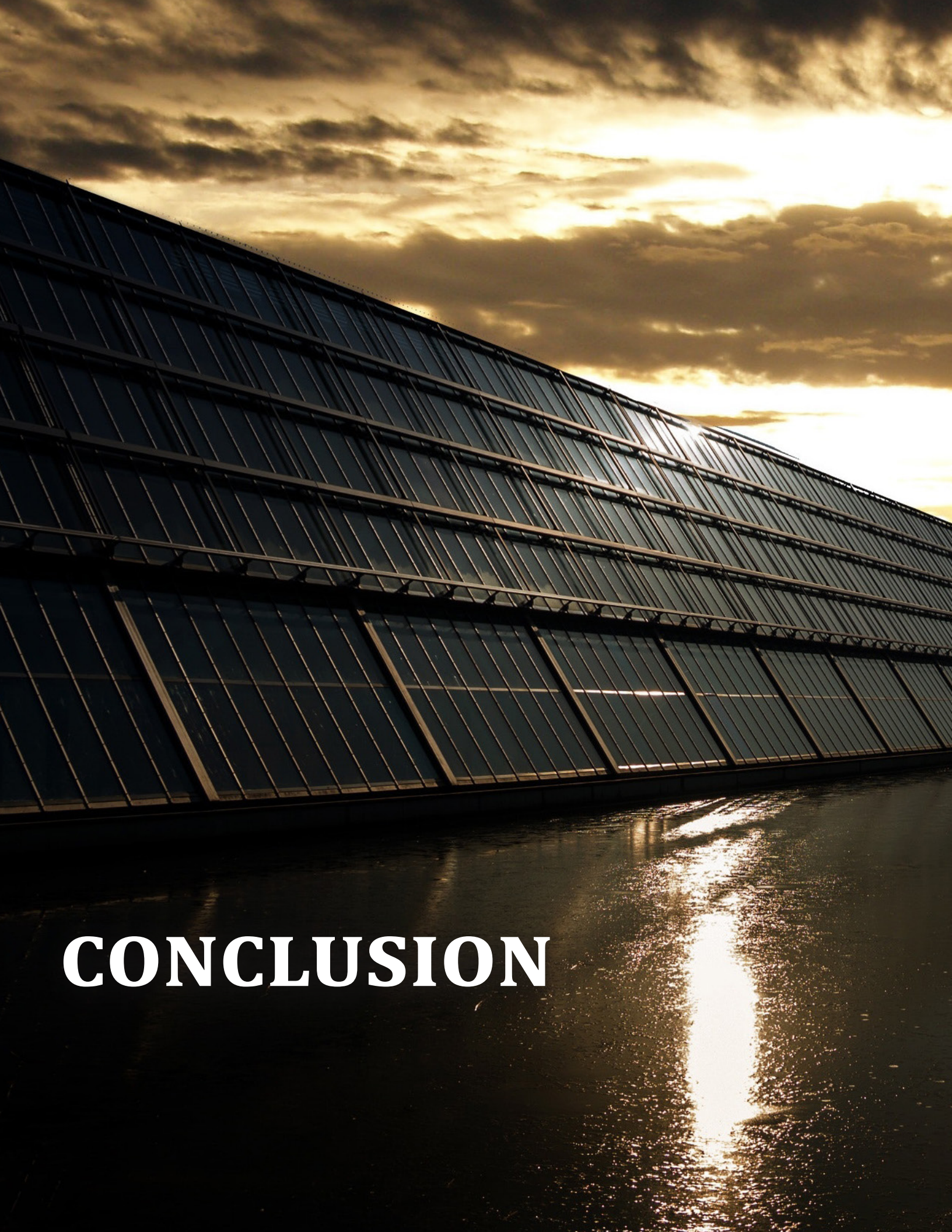
Medium Priority	<p>Add to Applicability section:</p> <ul style="list-style-type: none"> • Installations are prohibited on hilltops and ridge lines, as well as any hillsides where they will be visible when completed from any public ways or neighboring properties, or could be considered to alter the scenic beauty of the hillside <p>Add to Compliance with Laws, Bylaws, and Regulations section:</p> <ul style="list-style-type: none"> • The requirement of a pre-application conference between the town's planning staff and the applicant <p>Additional required documents to be submitted to the Planning Board regarding the proposed solar development project:</p> <ul style="list-style-type: none"> • Property lines and physical features for the project site including Location of all existing trail networks and woods roads in the project area, and Location of all existing and proposed roads by which construction materials and equipment will be delivered to site • Locations of Permanently Protected Open Space, Priority Habitat Areas, Floodplains, and Wetlands as defined by Natural Heritage and Endangered Species Program (NHESP) • Sight Line Representations • Landscape Plan and Erosion and Sedimentation Control Plan • (If applicable) Locations of all known, mapped or suspected Native American archeological sites or sites of Native American ceremonial activity <p>Add to Lighting section:</p> <ul style="list-style-type: none"> • Fixtures shall be "dark sky" compliant and meet International Dark Sky FSA certification requirements, and lighting shall not be kept on all night and will be shut off at a time determined by the Special Permit Granting Authority <p>Create Hazardous Materials section</p> <p>Create Access Roads section</p> <p>Create Stormwater Management Evaluations section</p> <p>Incorporate revised language on Severability section from Model Solar Bylaw to Athol's current solar bylaw</p>
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Low Priority	<p>Additional required documents to be submitted to the Planning Board regarding the proposed solar development project:</p> <ul style="list-style-type: none"> • List of all chemicals, including cleaners, that will be used on the site whether to clean solar panels and equipment, or otherwise • A copy of interconnection agreement with the utility company that operates the electrical grid where the installation is to be located • Documentation by an acoustical engineer of the noise levels projected to be caused by the installation • A plan for the provision of water needed for fire protection, as well as other fire control measures <p>Create Noise section</p> <p>Signage section:</p> <ul style="list-style-type: none"> • Add: Freestanding signs are prohibited. Signs will be affixed to buildings or fencing and shall comply with Section 3.9, Sign Regulations. • Remove: Educational signs providing information about solar photovoltaic panels and the benefits of renewable energy. <p>(If applicable) Add to section on Applicability:</p> <ul style="list-style-type: none"> • No ground-mounted solar photovoltaic installation of any size shall be installed in violation of covenants created by a Homeowner's Association, Condo Association, or other neighborhood governing structure that applies to a grouping of parcels of residential land <p>Create Height section</p>
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Map 10, on the following page, shows the suitable and unsuitable areas for implementing future solar array projects. It was generated by using data from the previous maps on slope, wetlands, land use and zoning, local and state protected area, and environmental concerns. The areas in grey are indicating that placing solar development there would violate one or more of the criteria, and the areas in light yellow are indicating that placing solar development there would not violate any of the evaluations analyzed above and could be taken into consideration as potential sites for future solar projects.

Map 10 Suitable and Unsuitable Sites





CONCLUSION

Summary of Findings

We sought to answer our two research questions: what are innovative zoning bylaw criteria being utilized by other Massachusetts communities, and how might Athol utilize these, and how can Athol identify and prioritize ideal sites for solar array development based on the various considerations expressed by the community? Our Field Project Team believes our list of recommendations developed from our three research methods answer these questions.

By drawing on almost one third of the towns in Massachusetts, we believe we have included a majority of the innovative and exceptional techniques being used in Massachusetts to ensure responsible solar development. Our recommended changes to Athol's solar zoning bylaw were grouped into low, medium, and high priority areas. Recommended changes specifically target landscaping, screening, environmental, and wildlife concerns as well as issues of visual impact such as scenic view disruption. By adopting the suggested changes, our team feels that many of Athol's most significant gaps in their current bylaw would be addressed and be better representing of the wishes of the town.

We also believe that the MCDM model we used for GIS analysis, combined with an appropriate community outreach effort by the

town, would allow Athol to properly identify areas within the town that serve as opportunities for solar development. Moreover, by utilizing the visualization tools and siting techniques presented in this report, Athol can address the environmental, social, physical, and visual concerns of the community that comes with each new solar development.

Next Steps

Due to limitations in time and resources, there were areas of research our team was unable to further explore which would have been beneficial to the town's planning and development. There were also other areas that were outside the scope of this report. Firstly, the limited research regarding impacts solar development has on the social, environmental, and economic aspects of rural or suburban towns is an area that is worthy of further inquiry as to inform our team of how to best balance between community interests to preserve the character of the town with growing investment in solar development in the region as a whole. Secondly, approaches that could help further expand and strengthen the town's communication platforms to bring together more stakeholders was an area of research outside of our scope of work but would have been helpful to informing not just the team of the various positions and opinions citizens have on solar development but

also to informing the Planning Board of the desires of community members and their vision for how they would like their town to be planned for.

Thirdly, as we had mentioned previously, our GIS analysis and mapping could have incorporated more data inputs and more factors in order to generate a more in-depth framework for determining solar siting requirements, which is an area in need of additional research and discussion. Lastly, through our research, our team had noticed that state incentives, particularly regarding the state's SMART program, often do not take into consideration municipalities' concerns and specific circumstances as they relate to the growing renewable energy movement. It would be an area worthy of further inquiry for our team to look into the designing of such state incentives and where there are areas for improvements to occur so that these programs can be opportunities where greater local community growth can take place.

Broader Implications

Our Field Project Team aimed to help the Town of Athol develop a comprehensive and sensitive solar zoning bylaw that allow the community to better meet its goals. We hope that these recommendations will be seriously considered and eventually integrated into the town's solar zoning bylaw. We believe that our analysis could be beneficial not just to the Town of Athol but also

to other municipalities as they go through the process of developing, strengthening, and evaluating their solar bylaws. Additionally, our GIS and MCDM model has broader usages and implications that could be applied to not just to solar development but can also to conducting analysis for development regarding renewable energy overall.

What our team had learned throughout this process as well as the publication of this report would be a starting point for other researchers, planners, and policy-makers to use in support of encouraging responsible solar development that take into account the needs and desires of community members, economic development, and local community growth.



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SUB.FLD.
1
ARRAY
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APPENDICES

Glossary

This glossary is comprised of words, phrases, and other key terms that are important to define when trying to understand the scope of our research.

1. Abutter
 - a. A land owner whose property is adjacent to a proposed or active development.
2. Appurtenant Structure
 - a. Any structure separate from the main building. For example a detached garage is an appurtenant structure to a house.
3. Brown Field or Brownfield
 - a. A site for potential development that has previously had some form of development on it. Usually refers to sites that have either real or perceived forms of environmental contamination from past development
4. Buffer
 - a. A boarder of a set width created around an area of interest with the express purpose of protecting that area from negative effects.
5. Captive Markets
 - a. A business market where consumers have no choice, or extremely limited, over their provider of a service. This gives the provider undue market power and the ability to set their own rates.
6. Core habitat
 - a. Core habitat is critical to the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth.
7. Critical habitats
 - a. Defined by the U.S. Fish & Wildlife Service Endangered Species Program, critical habitat areas are specific geographic areas that contain features essential to the conservation of an endangered or threatened species and that may require special management and protection.
8. Critical Natural Landscape
 - a. Critical Natural Landscape provides habitat for wide-ranging native species, support intact ecological processes, maintain connectivity among habitats, and enhance ecological resilience.
9. Digital Surface Model (DSM)
 - a. In a LiDAR system, pulses of light travel to the ground. When the pulse of light bounces off its target and returns to the sensor, it gives the range (a variable

distance) to the Earth. In the end, LiDAR delivers a massive point cloud filled of varying elevation values. But height can come from the top of buildings, tree canopy, power lines and other features. A DSM captures the natural and built features on the Earth's surface.

10. Development Agreements

- a. A voluntary contract between a municipality and either a landowner and a developer that details the obligations between both parties and how a specific area of land is to be developed.

11. Fencing

- a. The construction of fences in order to properly screen a development area to minimize its visual impact on the surrounding area.

12. Forest Core

- a. Defined by MassGIS, Forest Core identifies large, intact forests that are least impacted by roads and development, providing critical habitat for numerous woodland species.

13. GIS (Geographic Information Systems/Science)

- a. A branch of data analysis rooted in the science of Geography which allows for the analysis and mapping of data over space. It can also refer to the specific software used in this type of analysis.

14. Green Field or Greenfield

- a. A site for potential development that has had no previous development

15. Landscape Blocks

- a. Landscape Blocks are large areas of intact natural vegetation, consisting of contiguous forests, wetlands, rivers, lakes, and ponds, as well as coastal habitats such as barrier beaches and salt marshes. Pastures and power-line rights-of-way, which are less intensively altered than most developed areas, were also included since they provide habitat and connectivity for many species.

16. Large Ground-Mounted Solar Array

- a. Solar energy systems that are mounted to the ground instead of rooftops or other pre-existing structures. What constitutes a large array is subject to interpretation with some municipalities defining size based on power generated and others basing it on the land area the array occupies.

17. LiDAR

- a. A surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor.

18. NIMBY and NIMBYism

- a. Not In My BackYard, refers to citizens who object to specific developments



when that development will affect them but would not object to this same development somewhere else. NIMBY refers to individual citizens and NIMBYism refers to the view point overall.

19. Raster

- a. In its simplest form, a raster consists of a matrix of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing information, such as temperature. Rasters are digital aerial photographs, imagery from satellites, digital pictures, or even scanned maps.

20. Screening

- a. Refers to vegetation, fences, berms, and other objects and landscaping methods that remove an installation from view of public roads, public ways, abutting properties, residential buildings, or other significant districts.

21. Setback

- a. A regulation that moves development a set distance back from property lines or other areas of interest to mitigate negative effects.

22. Site Plan Review

- a. A step of the local government review where the possible impacts and final design of a development is assessed and reviewed in order to arrive at final design meets all requirements laid out by the municipality in their zoning.

23. Solar Energy

- a. Energy created by harnessing the heat energy of the sun and converting it into electricity.

24. Solar Photovoltaic Array

- a. Solar energy systems that use conductive materials to convert heat energy from the sun into electricity directly.

25. Special Permit Granting Authority

- a. Special Permit Granting Authority includes the board of selectmen, city council, board of appeals, planning board, or zoning administrators as designated by zoning ordinance or bylaw for the issuance of special permits.

26. Special Permit

- a. Land uses that are allowed within a specific zoning district that are not by-right. These uses require a detailed government review before a permit is issued.

27. Species of Conservation Concern

- a. Dataset in MassGIS, Oliver on the combined footprint of all species listed under the Massachusetts Endangered Species Act with all non-listed species present in the State Wildlife Action Plan. Individual species information is not identified in this data.

28. The Priority Natural Communities

- a. Dataset consists of various communities with biodiversity conservation interest in the state of Massachusetts. The data is based on records of natural communities maintained in the Natural Heritage & Endangered Species Program (NHESP) database that classify and delineate natural communities by analyzing their respective landscape data.

29. Viewshed

- a. The geographical area that is visible from a certain point, includes all areas that is within line of sight. Areas that are either beyond the horizon or obstructed by other objects are not included in the viewshed.

30. Wetlands Delineation

- a. A thorough investigation of a development area to determine exactly where wetlands are present. The final product of a delineation is a map of wetland areas with the appropriate buffers.

31. Wetlands

- a. Defined by the EPA as “an area where water covers the soil or is present at or near the surface.” There are various types of wetlands, but all wetlands are protected at the federal level by the EPA. Wetlands are also protected at the state level in Massachusetts by the Department of Environmental Protection and the Department of Ecological Restoration.

32. Zoning Bylaw

- a. A local ordinance or regulation made specifically to control the use of land as part of a towns zoning code.

33. Zoning By-right

- a. A by-right use is a land use that is allowed within a specific zoning district without the need of detailed government review before a permit is issued. These land uses are said to be “zoned by-right.

34. Zoning

- a. A series of regulations implemented by a municipality to control the land use within that municipality. Zoning will generally divide a municipality into specialized districts that each have specific land uses they allow

Interview Materials

Interview Protocol

Solar Developers

1. Can you briefly state:
 - a. Your name and position?
 - i. How long have you served in that capacity?
 - b. Which projects in Athol were you involved with?
 - i. Can you describe that experience?
2. Can you describe if there were any impacts of solar development on the local economy?
 - a. What payments does the municipality receive, if any?
3. Has your firm conducted any additional community outreach outside of the normal public hearing process?
 - a. If so, what were the results?
 - b. What would you say is the most common concern about solar development among members of the public?
4. What makes an ideal site for solar development, beyond raw physical properties?
 - a. Do you review towns' bylaws before selecting a site or does selecting an appropriate site come first?
 - i. What does your process for site selection look like? What are the steps?
 - b. When picking between multiple projects, does having a successful project, or at least one with minimal complications from the community, make you more likely to pursue additional future projects in that community?
 - i. Even if that site is less desirable from a physical standpoint?
5. What is your firm's standard procedure for a solar array proposal?
 - a. Is there any work or communication done with the town before you officially submit a proposal, or does the process begin with that submission?
6. Are abutters' concerns to your proposed projects often what you expected them to be?
 - a. How do you work to address abutters' concerns?
 - b. How often do abutters have concerns or are those usually concerns you've seen before?

7. Is there or has there been conflicts between community interests with your firm's business interests?
 - a. Is there a specific process for balancing those conflicts or does your firm handle them on a more case by case basis?
 - b. What actions does your firm take, if any, to get community input while planning for the solar projects?
 - c. Have you noticed a common concern among community members between different projects? If so, what was it?
8. What is your experience working with National Grid?
 - a. How would you describe your relationship working for them?
 - b. Has the National Grid's capacity constraints in Athol affected your project in the area?
9. What solar project have you worked on was the most effective?
 - a. What made this site more effective?
 - b. How could these factors be implemented in other sites?
10. What solar project have you worked on was the least effective?
 - a. What made this site ineffective?
 - b. What have you learned from this site?
11. Briefly describe your thoughts on the state's SMART program?
 - a. Do you feel this program improves on the renewable portfolio standard or worsens the state's renewable energy program?
 - b. Would you support changes to have solar array development more favorable for brownfields and previously developed properties versus greenfield sites? As well as parking lot canopy solar arrays?
12. Currently the state in Title VII, Chapter 40A, Section 3 requires that "No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare." What regulations do you think a solar bylaw could impose before they become "unreasonable"?
 - a. Do you think any regulations on solar energy should be considered necessary to protected health, safety, and welfare?
13. How you think the implementation of solar farms would influence the biodiversity? How can we minimize the negative impact?
14. Is there anything we haven't asked about that you think we should?
 - a. (Alternatively) Is there anything you think we should know that we haven't asked about?

Interview Protocol
Municipal Contacts

1. Can you briefly state:
 - a. Your name and position?
 - i. How long have you served the community?
 - b. What is your experience with solar development?
 - i. Which projects were you involved in in your community?
2. Can you describe the local economy in your community?
 - a. What are the major business contributors to the local economy?
 - b. How has solar development affected the local economy?
 - c. Has the development of solar energy in your community brought permanent jobs to the area?
 - i. Do you think creating a job training program related to solar energy would be beneficial to the town?
3. To the best of your knowledge, has any local outreach been done by your town to assess residents' opinion of solar development?
 - a. If so, when was it conducted and what were its results?
 - b. What would you say is the most common concern among members of the public?
4. What is the standard procedure for a solar array proposal?
 - a. How many citizens usually show up to a public hearing about a solar array?
 - i. Is this more or less than public hearings on other subjects?
 - b. Is there any work or communication done with developers before they officially submit a proposal, or does the process begin with that submission?
5. What are your current personal views on solar development?
 - a. Have your views on commercial solar arrays change since development in the town?
 - i. If so, how?
 1. Either from concerns of abutters or your own reviews?
 2. Which project(s) affected your views?
6. What is your long-term vision for solar development in your community?
 - a. How is this vision affected by the power limits of National Grid's substation?
 - b. Has regionality played any part in shaping your vision?
 - i. How do you think solar energy will continue to develop in the region?

7. Which site in your community do you think was the most effective?
 - a. What made this site more effective?
 - b. How could these factors be implemented in other sites?
8. Which site in your community do you think was the least effective?
 - a. What made this site ineffective?
 - b. What have you learned from this site?
9. Briefly describe your thoughts on the state's SMART program?
 - a. Do you feel this program improves the renewable portfolio standard or worsens the state's renewable energy program?
10. What do you feel is the biggest challenge to improve siting: local zoning or state credit program structure? Or are both equally challenging?
11. Currently, the state in Title VII, Chapter 40A, Section 3 requires that "No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare." What regulations do you think a solar bylaw could impose before they become "unreasonable"?
 - a. Do you think any regulations on solar energy should be considered necessary to protected health, safety, and welfare?
12. Is there anything we haven't asked about that you think we should?
 - a. (Alternatively) Is there anything you think we should know that we haven't asked about?

Interview Protocol

Town of Athol Board of Planning and Community Development

1. Can you briefly state:
 - a. Your name and position?
 - i. How long have you served on the board?
 - b. Past experience with solar development?
 - i. Which projects were you involved in in Athol?
2. Can you describe the local economy in this community?
 - a. What are the major business contributors to the local economy?
 - b. How has solar development affected the local economy?
 - c. Has the development of solar energy in Athol brought permanent jobs to the area?
 - i. Do you think creating a job training program related to solar energy would be beneficial to the town?
3. To the best of your knowledge, has any local outreach been done by the town to assess the opinion of Athol's citizens to solar development?
 - a. If so, when was it conducted and what were its results?
 - b. What would you say is the most common concern among members of the public?
4. What is the standard procedure for a solar array proposal?
 - a. How many citizens usually show up to a public hearing about a solar array project?
 - i. Is this more or less than public hearings on other subjects?
 - b. Is there any work done with developers before they officially submit a site plan proposal, or does the process begin with that submission?
5. What are your current personal views on solar development?
 - a. Have your views on commercial solar arrays change since the Town experienced growing solar development?
 - i. If so, how?
 - b. Has any project that has come before the Board changed the way you view solar array projects?
 - i. Either from concerns from abutters or your own review of the proposal?
 - ii. If so, which project affected your views?
6. What are your long-term visions for solar development in Athol?
 - a. Is this vision affected by the power limits of National Grid's substation?

- b. Has regionality played any part in shaping your vision?
 - i. How do you think solar energy will continue to develop in the region?
- 7. Which project site in Athol do you think was the most effective?
 - a. What made this site more effective?
 - b. How could these factors be implemented in other sites?
- 8. Which project site in Athol do you think was the least effective?
 - a. What made this site ineffective?
 - b. What have you learned from this site?
- 9. Briefly describe your thoughts on the state's SMART program?
 - a. Do you feel this program improves on the renewable portfolio standard or worsens the state's renewable energy program?
- 10. What do you feel is the biggest challenge to improve siting: local zoning or state credit program structure? Or are both equally challenging?
- 11. Currently, the state in Title VII, Chapter 40A, Section 3 requires that "No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare." What regulations do you think a solar bylaw could impose before they become "unreasonable"?
 - a. Do you think any regulations on solar energy should be considered necessary in order to protect health, safety, and welfare?
 - b. Tourism is said to be important to the local economy of the town. Do you think that protections designed to ensure continuous tourism should qualify as protecting the town's welfare?
- 12. Currently, the Athol solar zoning bylaw reads "Subject to the requirements of this by-law, ground-mounted solar photovoltaic installations shall be permitted in all zoning districts." Should solar zoning be limited in certain zoning districts?
 - a. Would limiting solar development in specific districts be seen by the state as unreasonable regulations?
 - b. What are your thoughts on planning for future solar development by imposing overlay districts based on community interests, environmental concerns, and the physical requirements of solar developments?
- 13. In our conversations with Eric and Dave, we have heard that rural character is important to Athol but, while reviewing the town's bylaw, we struggled with defining the term. So, how would you define Athol's Rural Character?
 - a. How is this rural character important to the town?
- 14. Is there anything we haven't asked about that you think we should?
 - a. (Alternatively) Is there anything you think we should know that we haven't asked about?

Interview Protocol
Abutters, Landowners, and Concerned Citizens

1. Can you briefly state:
 - a. Your name and previous experience(s) with solar development?
 - b. Which projects in your community were you involved with?
 - i. Can you describe that experience?
2. Can you describe the local economy in your community?
 - a. What are the major business contributors to the local economy?
 - b. How has solar development affected the local economy?
 - c. Has the development of solar energy in your community brought permanent jobs to the area?
 - i. Do you think creating a job training program related to solar energy would be beneficial to the community?
3. Were you aware of the local zoning requirements regarding solar development?
4. Have you been involved directly in support or in opposition of any specific solar projects in your community?
5. Have you ever been contacted as part of community outreach by either the municipality or the solar developer?
 - a. If so, please describe the experience?
 - b. Have you ever attended a public meeting or hearing about solar development?
 - c. What would you say is the most common concern about solar development among members of the public?
6. What were/are your concerns about solar development as it relates to you or your land?
 - a. What concerns you the most? The least?
 - b. Do you conduct research on the impacts of solar development? If so, how?
 - c. Which solar sites affected you the most?
 - i. Were there any unexpected consequences?
 - d. If you could do the process over again, what would you want to happen?
7. Do you think there is a conflict between community interests and business interests?
 - a. If yes, how should community interests and business interests be balanced?
 - i. What should the process of balancing these interests look like?

8. What is the most effective solar project that you have experience with?
 - a. What made this site effective?
 - b. How could these factors be implemented in other sites?
9. What is the least effective solar project that you have experience with?
 - a. What made this site ineffective?
 - b. What have you learned from this site?
10. What qualifies as an effective or successful solar site to you?
 - a. Besides high power generation and low cost, what else should be used to measure the effectiveness of a solar project?
11. Do you feel your concerns were properly addressed by both the municipality and the solar developers?
 - a. If not, what improvements could be made here?
12. What changes would you like to see to the solar siting process?
13. (Optional) Are you familiar with the state's SMART program or the renewable portfolio standard?
 - a. If so, can you briefly describe your thoughts on the state's SMART program?
 - b. Do you feel this program improves on the renewable portfolio standard or worsens the state's renewable energy program?
 - c. Would you support changes to have solar development more favorable for brownfields (define) and other previously developed properties versus greenfield (define) sites? As well as parking lot canopy solar arrays?
14. (Optional) Currently, the state in Title VII, Chapter 40A, Section 3 requires that "No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare." What regulations do you think a solar bylaw could impose before they become "unreasonable"?
 - a. Do you think any regulations on solar energy should be considered necessary to protected health, safety, and welfare?
15. (If the interviewee is from Athol) In our conversations with the Board of Planning and Community Development, we have heard that rural character is important to Athol. However, while reviewing the town's bylaw, struggled with defining the term. How would you define Athol's rural character?
 - a. How is this rural character important to the town?
16. Is there anything we haven't asked about that you think we should?
 - a. (Alternatively) Is there anything you think we should know that we haven't asked about?

List of Bylaws Reviewed

- Town of Acton Solar Bylaw (December 2018)
- Town of Adams Solar Bylaw (June 18, 2018)
- Town of Alford Solar Bylaw (July 16, 2002)
- Town of Ashburnham Solar Bylaw (May 6, 2014)
- Town of Ashfield Solar Bylaw (September 29, 2011)
- Town of Auburn Solar Bylaw (October 23, 2018)
- Town of Ayer Solar Bylaw (October 22, 2018)
- Town of Barre Solar Bylaw (June 20, 2017)
- Town of Becket Solar Bylaw (January 19, 2016)
- Town of Belchertown Solar Bylaw (May 14, 2018)
- Town of Berlin Solar Bylaw (January 16, 2019)
- Town of Bernardston Solar bylaw (June 6, 2018)
- Town of Blackstone Solar Bylaw (May 27, 2008)
- Town of Blandford Solar Bylaw (June 27, 2018)
- Town of Boylston Solar Bylaw (May 7, 2018)
- Town of Brimfield Solar Bylaw (May 2017)
- Town of Buckland Solar Bylaw (May 9, 2018)
- Town of Cheshire Solar Bylaw (November 12, 2015)
- Town of Chester Solar Bylaw (September 26, 2011)
- Town of Chesterfield Solar Bylaw (January 31, 2012)
- Town of Colrain Solar Bylaw (May 8, 2018)
- Town of Concord Solar Bylaw (2018)
- Town of Conway Solar Bylaw (October 30, 2017)
- Town of Dalton Solar Bylaw (May 2, 2016)
- Town of Deerfield Solar Bylaw (April 30, 2018)
- Town of Dudley Solar Bylaw (October 29, 2018)
- Town of East Longmeadow Solar Bylaw (n..d.)
- Town of Egremont Solar Bylaw (May 5, 2015)
- Town of Erving Solar Bylaw (April 26, 2018)
- Town of Falmouth Solar Overlay District Bylaw (February 21, 2019)
- Town of Gill Solar Bylaw (April 2012)
- Town of Goshen Solar Bylaw (March 10, 2018)
- Town of Granby Solar Bylaw (March 10, 2014)

- Town of Granville Solar Bylaw (May 2016)
- Town of Great Barrington Solar Bylaw (May 1, 2017)
- Town of Greenfield Solar Bylaw (March 20, 2019)
- Town of Hadley Solar Bylaw (May 3, 2018)
- Town of Hampden Solar Bylaw (October 24, 2016)
- Town of Hardwick Solar Bylaw (June 16, 2018)
- Town of Heath Solar Bylaw (May 11, 2013)
- Town of Hinsdale Solar Bylaw (April 2011)
- Town of Hubbardston Solar Bylaw (June 5, 2018)
- Town of Huntington Solar Bylaw (May 26, 2015)
- Town of Leicester Solar Bylaw (October 30, 2018)
- Town of Leverett Solar Bylaw (April 2017)
- Town of Longmeadow Solar Bylaw (November 7, 2017)
- Town of Ludlow Solar Bylaw (October 1, 2018)
- Town of Lunenburg Solar Bylaw (November 30, 2018)
- Town of Middlefield Solar Bylaw (April 4, 2018)
- Town of Milford Solar Bylaw (October 15, 2018)
- Town of Millbury Solar Bylaw (May 1, 2018)
- Town of Millville Solar Bylaw (May 14, 2018)
- Town of Monson Solar Bylaw (2013)
- Town of Montague Solar Bylaw (February 19, 2019)
- Town of Monterey Solar Bylaw (May 6, 2017)
- Town of New Braintree Solar Bylaw (2010)
- Town of New Marlborough Solar Bylaw (May 7, 2018)
- Town of New Salem Solar Bylaw (December 3, 2012)
- Town of North Brookfield Solar Bylaw (May 11, 2018)
- Town of Northbridge Solar Bylaw (May 1, 2018)
- Town of Northfield Solar Bylaw (August 24, 2017)
- Town of Oakham Solar Bylaw (August 26, 2008)
- Town of Orange Solar Bylaw Draft
- Town of Paxton Solar Bylaw (May 1, 2018)
- Town of Pelham Solar Bylaw (2018)
- Town of Petersham Solar Bylaw (June 4, 2018)
- Town of Phillipston Solar Bylaw (May 9, 2018)
- Town of Plainfield Solar Bylaw (July 22, 2016)
- Town of Raynham Solar Bylaw (n.d.)

- Town of Richmond Solar Bylaw (October 30, 2018)
- Town of Rowe Solar Bylaw (n.d.)
- Town of Royalston Solar Bylaw (April 10, 2015)
- Town of Sandisfield Solar Bylaw (May 16, 2009)
- Town of Sheffield Solar Bylaw (June 2018)
- Town of Shelburne Solar Bylaw (May 1, 2018)
- Town of Shirley Solar Bylaw (May 14, 2018)
- Town of Shrewsbury Solar Bylaw (October 22, 2018)
- Town of Shutesbury Solar Bylaw (May 5, 2018)
- Town of South Hadley Solar Bylaw (n.d.)
- Town of Southampton Solar Bylaw (December 31, 2014)
- Town of Southborough Solar Bylaw (May 22, 2018)
- Town of Southwick Solar Bylaw (May 15, 2018)
- Town of Spencer Solar Bylaw (November 16, 2017)
- Town of Stockbridge Solar Bylaw (September 24, 2018)
- Town of Sturbridge Solar Bylaw (October 29, 2017)
- Town of Sunderland Solar Bylaw (April 2017)
- Town of Sutton Solar Bylaw and Solar Overlay District Bylaw (October 16, 2017)
- Town of Tyringham Solar Bylaw (August 2017)
- Town of Upton Solar Bylaw (2017)
- Town of Wales Solar Bylaw (January 30, 2019)
- Town of Ware Solar Bylaw (November 13, 2017)
- Town of Warren Solar Bylaw (May 8, 2018)
- Town of Warwick Solar Bylaw (September 22, 2014)
- Town of Webster Solar Bylaw (June 25, 2018)
- Town of Wendell Solar Bylaw (May 2016)
- Town of Westborough Solar Bylaw (March 18, 2017)
- Town of Westhampton Solar Bylaw (May 2018)
- Town of Westminster Solar Bylaw (November 27, 2018)
- Town of Whately Solar Bylaw (June 4, 2018)
- Town of Wilbraham Solar Bylaw (August 2018)
- Town of Williamsburg Solar Bylaw (July 15, 2016)
- Town of Winchendon Solar Bylaw (May 15, 2017)
- Town of Windsor Solar Bylaw (August 7, 2018)
- Town of Worthington Solar Bylaw (May 6, 2017)

Model Bylaw

3.24 Ground-Mounted Solar Photovoltaic Installations

3.24.1 Purpose and Intent

The purpose and intent of this bylaw is to provide standards for the placement, design, construction, operation, monitoring, modification and removal of ground-mounted solar photovoltaic installations which address public safety, minimize impacts on scenic, natural and historic resources, and, in the case of large-scale commercial installations, to provide adequate financial assurance for the eventual decommissioning of such installations.¹

The provisions set forth in this section shall apply to the construction, operation, maintenance and/or repair, and environmental effects of ground-mounted solar photovoltaic installations.²

This bylaw aims to balance the rights of landowners to use their land with the corresponding right of abutting and neighboring landowners to live without undue disturbance from noise, traffic, lighting, signage, smoke, fumes, dust, odor, glare, or stormwater runoff.³

To maintain the character of the Town of Athol as a small New England village, this bylaw aims to retain the natural beauty, aesthetic appeal, historic value and scenic attraction of the Town for both residents and tourists.⁴

3.24.2 Applicability

The Planning Board shall permit no building or use that is injurious, noxious, offensive, or detrimental to the surrounding neighborhood.⁵

Installations shall not create a nuisance which is discernible from other properties by virtue of noise, vibration, smoke, dust, odors, heat, glare, unsightliness or other nuisances as determined by the Planning Board.⁶ w

1 Towns that share similar purpose and intent section: Adams, Athol, Ayer, Barre, Boylston, Concord, Falmouth, Great Barrington, Lunenburg, Monterey, New Marlborough, Sandisfield, Sheffield, Shirley, Stockbridge, and Windsor

2 Town of Athol Solar Bylaw

3 Referenced Town of Pelham

4 Referenced Town of Warwick

5 Referenced Town of Boylston

6 Referenced Town of Richmond and Southborough

This bylaw does not pertain to solar photovoltaic panels installed on residential, industrial or commercial structures. Those installations are subject to the State Building Code.⁷

This bylaw applies to ground-mounted solar photovoltaic installations greater than 5,000 gross square feet proposed to be constructed after the effective date of this bylaw and subject to the requirements of this bylaw, large-scale ground-mounted solar photovoltaic installations may be permitted in all Zoning Districts subject to a Special Permit from the Athol Board of Planning and Community Development, pursuant to meeting the Special Permit Criteria and Procedures below.⁸

This bylaw also pertains to physical modifications that materially alter the type, configuration, or size of these installations or related equipment.⁹

Installations must be issued a Special Permit by the Planning Board prior to construction, installation or modification as provided in this section.¹⁰

Installations are prohibited on hilltops and ridge lines, as well as any hillsides where they will be visible when completed from any public ways or neighboring properties, or could be considered to alter the scenic beauty of the hillside.¹¹

3.24.3 Special Permit Granting Authority (SPGA)

The Board of Planning and Community Development shall be the Special Permit Granting Authority for ground-mounted solar photovoltaic installations. In addition to the findings required in Section 1.2.6.2, the Special Permit Granting Authority must also find that the proposal does not contravene the purposes of this section. Ground-mounted solar photovoltaic Special Permit applications shall be filed in accordance with the Board of Planning and Community Development Filing Requirements & Fees.”¹²

The Planning Board may impose any additional conditions upon its granting of site plan review approval deemed necessary to achieve the purpose of this bylaw.¹³

3.24.4 Definitions

Solar array

Large scale ground mounted solar array

Zoning Bylaw

-
- | | |
|----|--------------------------------|
| 7 | Town of Athol |
| 8 | Town of Athol |
| 9 | Town of Athol |
| 10 | Referenced Town of Sunderland |
| 11 | Referenced Town of Bernardston |
| 12 | Town of Athol |
| 13 | Referenced Town of Westminster |

Planning Board

Special Permit Granting Authority

Setback

Buffer

Screening

3.24.5 General Requirements

The following requirements shall apply to all ground-mounted solar photovoltaic installations.

3.24.5.1 Compliance with Laws, Bylaws, and Regulations

The construction and operation of all ground-mounted solar photovoltaic installations shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and fixtures forming part of a ground-mounted solar photovoltaic installation shall be constructed in accordance with the State Building Code.¹⁴

Pre-Application Conference: The applicant is required to meet with the planning staff to conduct a pre-application session to discuss the project, process, waivers, and submittal requirements and proposed management practices for siting, construction, screening, reducing the visual contrast, operation and maintenance of the installation.¹⁵ The applicant shall pay the cost of providing notice of the public meeting to consider the proposed development agreement.

3.24.5.2 Building Permit and Building Inspection

No ground-mounted solar photovoltaic installation shall be constructed, installed or modified as provided in this section without first obtaining a building permit.¹⁶

3.24.5.3 Fees

The application for a building permit for a ground-mounted solar photovoltaic installation must be accompanied by the fee required for a building permit.¹⁷

14 Town of Athol

15 Referenced Town of Shelburne

16 Town of Athol

17 Town of Athol

3.24.5.4 Site Plan Review Process and Requirements

All ground-mounted solar photovoltaic installations shall undergo site plan review by the Permit Granting Authority prior to construction, installation or modification as provided in this section as well as section 3.17.13, MCOD Site Plan Review and section 3.18, Site Plan Review, as applicable.¹⁸

3.24.5.4.1 General

All plans and maps shall be prepared, stamped, and signed by a Professional Engineer and Landscape Architect licensed to practice in the Commonwealth of Massachusetts.¹⁹

1.1.1.1.2 Required Documents

A. A Site Plan showing:

- a. Name, address, phone number and signature of the applicant, as well as all co-proponents or property owners, if any;
- b. The name, contact information and signature of any agents representing the applicant;
- c. Name, address, and contact information for proposed system installer;
- d. Blueprints or drawings of the solar photovoltaic installation signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system and any potential shading from nearby structures;
- e. Property lines and physical features for the project site including:
 - i. Map of adjacent properties and land uses.²⁰
 - ii. Location of all existing trail networks and woods roads in the project area.²¹
 - iii. Location of all existing and proposed roads by which construction materials and equipment will be delivered to site.²²

18 Town of Athol

19 Town of Athol

20 Referenced Town of Greenfield

21 Referenced Town of Greenfield

22 Referenced Towns of Cheshire, East Longmeadow, New Marlborough, and Spencer

- iv. Location, footprint, height and use of all existing and proposed buildings or structures, including boundaries, walkways, service areas, parking spaces, loading areas, fences and screening.²³
 - f. One or three line electrical diagram detailing the solar photovoltaic installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;
 - g. Documentation of the major system components to be used, including the PV panels, mounting system, and inverter;
 - h. Locations of Permanently Protected Open Space, Priority Habitat Areas, Floodplains, Wetlands, and BioMap2 Critical Natural Landscape Core Habitat²⁴;
 - i. The location of on-site wetlands and other areas subject to control under the Massachusetts Wetlands Protection Act, Chapter 131 of Section 40 in Massachusetts General Law including regulatory buffer zones or setbacks from resource areas. On-site resources shall be flagged and surveyed by qualified professionals²⁵; and,
 - j. Sight line representation: A sight line representation shall be conducted by a Professional Landscape Architect drawing from any portion of public road or public way within 300 feet or within sight of the installation that would have the clearest view of the proposed facility, and from the closest side of each residential building (viewpoint) within 300 feet or in sight of the most visible point of the installation. Each sight line shall be depicted both in a site plan and elevation drawings. The sight lines must include all intervening trees, buildings and other applicable objects.²⁶
- B. Site Control Plan. (see also section 3.24.7)
- C. Zoning district designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose).

23 Town of Athol Site Plan Review Bylaw

24 Referenced Towns of Alford, Blandford, Cheshire, Falmouth, Lunenburg, Monterey, Paxton, Shirley, and Spencer

25 Town of Athol Site Plan Review Bylaw

26 Referenced Towns of Adams and Shirley

- D. List of all chemicals, including cleaners, that will be used on the site whether to clean solar panels and equipment, or otherwise.²⁷
- E. An Operation and Maintenance Plan. (see also section 3.24.8)
- F. Proof of liability insurance at an amount approved by the Permit Granting Authority.
- G. Description of financial surety. (see also section 3.24.15)
- H. Public Outreach Plan, including a project development timeline, how the project proponent will meet the required site plan review, and what are the notification procedures and otherwise to inform abutters and the community.²⁸ At least one public meeting shall be held in Athol regarding the proposed development project and shall not exceed ninety (90) days before submitting the site plan review application.
- I. Landscape Plan and Erosion and Sedimentation Control Plan signed by a Professional Landscape Architect licensed to practice in the Commonwealth of Massachusetts.²⁹ (see also section 3.24.9.9)
- J. A glare analysis and proposed mitigation, if any, to minimize the impact of glare on affected properties.³⁰
- K. Existing and proposed photographs from at least four perspectives specified by the SPGA, including from the nearest residential structures and of the area(s) that are most publicly visible, with technical explanation of how visualization was produced. Each sight line shall be illustrated in color photographs of what can currently be seen from any public way within 300 feet and/or within sight of the installation. Each of the existing condition photographs shall have the proposed installation superimposed on it to show what will be seen from public roads if the installation is built.³¹
- L. A copy of interconnection agreement with the utility company that operates the electrical grid where the installation is to be located.³²
- M. Documentation by an acoustical engineer of the noise levels projected to be caused by the installation.³³

27 Referenced Town of Barre

28 Referenced Towns of Alford, Falmouth, Granville, Oakham, Tyngham, Wales, and Windsor

29 Referenced Towns of Adams, Chester, Buckland, New Braintree, and Webster

30 Referenced Towns of Hardwick, North Brookfield, Sturbridge, and Warren

31 Referenced Towns of Orange and Shirley

32 Referenced Towns of Shewsbury and Spencer

33 Referenced Towns of Spencer and Winchendon

- N. Locations of farmland soils, by type, and plans to protect, maintain, and/or restore those soils.³⁴
- O. Viewshed Analysis regarding the proposed large-scale solar photovoltaic installation and its relation to surrounding properties.³⁵
- P. Visual and Habitat Mitigation Plan. (see also section 3.24.10.4)
- Q. Stormwater Management Plan. (see also section 3.24.9.7)
- R. Locations of all known, mapped or suspected Native American archeological sites or sites of Native American ceremonial activity.³⁶

3.24.6 Utility Notification³⁷

No ground-mounted solar photovoltaic installation shall be constructed until evidence has been given to the Permit Granting Authority that the utility company that operates the electrical grid where the installation is to be located has been informed of the solar photovoltaic installation applicant's intent to install an interconnected customer-owned generator. Off-grid systems shall be exempt from this requirement.

3.24.7 Site Control³⁸

An applicant shall be required to submit documentation which includes actual or prospective access and control of the project site to allow for construction and operation of the proposed solar photovoltaic installation.

3.24.8 Operation and Maintenance Plan³⁹

An applicant shall be required to submit a plan for the operation and maintenance of the ground-mounted solar photovoltaic installation, which includes measures for maintaining safe access to the installation, storm water controls, as well as general procedures for operational maintenance of the installation.

3.24.9 Design Standards

3.24.9.1 Dimension and Density Requirements

3.24.9.1.1 Setbacks

For ground-mounted solar photovoltaic installations, front, side and rear setbacks must observe all yard requirements applicable to the principal structure as defined in Section 2.6, Intensity of Use Schedule, for all zoning districts. The Special Permit Granting Authority may

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- 34 Referenced Town of Great Barrington
 - 35 Referenced Town of New Marlborough
 - 36 Referenced Town of Shutesbury
 - 37 Town of Athol
 - 38 Town of Athol
 - 39 Town of Athol

increase these setbacks in these districts if they determine it to be appropriate based on project and site-specific considerations, such as solar array type, topography, tree cover, etc., to allow for consideration of factors that may mitigate glare and other impacts to abutters, e.g. topography, tree cover, solar array technology, etc., which may reduce visual impacts, or written consent of the affected abutter(s). For ground-mounted solar photovoltaic installations in all zoning districts, front, side, and rear setbacks are all required to be at least 75 feet.

3.24.9.1.1 Appurtenant Structures⁴⁰

All appurtenant structures to ground-mounted solar photovoltaic installations shall be subject to reasonable regulations concerning the bulk and height of structures, lot area, setbacks, open space, parking and building coverage requirements. All such appurtenant structures, including but not limited to, equipment shelters, storage facilities, transformers, and substations, shall be architecturally compatible with each other. Structures shall be screened from view by vegetation approved by the Special Permit Granting Authority and/or joined or clustered to avoid adverse visual impacts.

3.24.9.1.1 Height

The height of ground-mounted solar photovoltaic installations shall be determined by the Special Permit Granting Authority.

Height of the gap between the ground and the bottom of the installation shall be designed to minimize impacts on wildlife movements.

3.24.9.2 Fencing

Ground-mounted solar photovoltaic installations will be enclosed by fencing. Any fencing shall be designed to minimize impacts on wildlife movements and aesthetics. Accordingly, such fencing is to leave a gap between the ground and the bottom of the fencing, the height to be determined by the Special Permit Granting Authority. Further, such fencing is to be of a color and texture so as to blend into the background.⁴¹

Security fences will be installed no closer to the property line than the setback required for a principal building. The site and its fencing shall be screened by buffering vegetation from general view from the surrounding ground level.⁴²

40 Town of Athol

41 Referenced Town of South Hadley

42 Referenced Town of Montague

3.24.9.3 Size/Acreage

Ground-mounted solar photovoltaic installations shall only be permitted on lots larger than 5 acres in all zoning districts.

3.24.9.4 Lighting

Lighting of solar photovoltaic installations shall be consistent with local, state and federal law. Lighting of the solar electric installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.⁴³

In addition, such fixtures shall be “dark sky” compliant and meet International Dark Sky FSA certification requirements. The owner/operator shall be responsible for maintenance of lighting systems. Light source is completely shielded from direct view from neighboring properties or streets.⁴⁴ Lighting shall not be kept on all night and will be shut off at a time determined by the Special Permit Granting Authority unless there is an emergency or is required for safety purposes.⁴⁵

1.1.1.5 Signage

Freestanding signs are prohibited. Signs will be affixed to buildings or fencing and shall comply with Section 3.9, Sign Regulations. The following signs shall be required:

- A. Those necessary to identify the owner, provide a 24-hour emergency contact phone number, and warnings of any danger.

Solar photovoltaic installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar photovoltaic installation.⁴⁶

3.24.9.6 Utility Connections

To the extent feasible, all network connections and power lines, to and from the facility, shall be placed underground.⁴⁷ If underground placement is infeasible based on soil conditions, shape, and topography of the site, the utility provider shall require network connections and power lines be subject to section 3.24.10.4 (Visual Impact) guidelines.

43 Town of Athol

44 Referenced Town of Auburn

45 Referenced Town of Buckland

46 Town of Athol

47 Referenced Town of Montague

3.24.9.7 Design Siting Criteria for Agriculture of Existing Open Space Locations⁴⁸

In consideration of approving ground-mounted solar photovoltaic installations on land that is in agricultural use, prime agricultural farmland, or other pervious open space locations, the Planning Board has developed the following design criteria in siting such installations:

- A. No removal of all field soils;
- B. Existing leveled field areas left as is without disturbance;
- C. Where soils need to be leveled and smoothed, such as filling potholes or leveling, this shall be done with minimal overall impact with all displaced soils returned to the areas affected;
- D. ballasts, screw-type, or post driven pilings and other acceptable minimal soil impact methods that do not require footings or other permanent penetration of soils for mounting are required, unless the need for such can be demonstrated;
- E. Any soil penetrations that may be required for providing system foundations necessary for additional structural loading or for providing system trenching necessary for electrical routing shall be done with minimal soils disturbance, with any displaced soils to be temporary and recovered and returned after penetration and trenching work is completed;
- F. No concrete or asphalt in the mounting area other than ballasts or other code required surfaces, such as transformer or electric gear pads;
- G. Address existing and potential soil and water resource concerns within the Landscape Plan and Erosion and Sedimentation Plan to ensure the installation does not disturb an existing soil and water conservation plan or to avoid creating a negative impact to soil and water conservation best management practices, such as stimulating erosion or water run-off conditions;
- H. Limited use of geotextile fabrics; and maintain vegetative cover to prevent soil erosion.

3.24.9.8 Land Clearing, Soil Erosion, and Habitat Impacts

The Massachusetts Department of Energy Resources strongly discourages locating solar photovoltaic installations on sites that would require extensive tree cutting because of the important water management, cooling, and

climate benefits trees naturally possess.⁴⁹ Therefore, clearing of natural vegetation shall be limited to what is absolutely necessary determined by the Planning Board, Conservation Commission, Department of Public Works, and the developer for the construction, operation and maintenance of the ground-mounted solar photovoltaic installation or otherwise prescribed by applicable laws, regulations, and bylaws.

Installations shall be designed and constructed to protect and optimize the maintenance of wildlife corridors and trail networks. Where these paths may be impacted, plans are required to show alternative trail alignments and wildlife corridors to be constructed by the applicant, although no rights of public access may be established hereunder.⁵⁰ The installation design shall minimize fragmentation of open space areas and shall avoid permanently protected open space. The installation shall also be located in a manner that does not have significant negative impacts on rare species in the vicinity.⁵¹

Applicant shall be required to submit a Landscape Plan and Erosion and Sedimentation Control Plan signed by a Professional Landscape Architect licensed to practice in the Commonwealth of Massachusetts.⁵² The plan shall include:

- A. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, screening vegetation or structures;
- B. The woody and herbaceous vegetative stabilization and management techniques to be used within and adjacent to the stormwater impact area;
- C. Temporary or permanent access roads;
- D. Grading;
- E. Exterior lighting and screening of structures;
- F. Type and location of vegetation proposed to screen the installation including appurtenant structures from public ways and adjacent properties.

3.24.9.9 Landscaping and Screening

Such plantings shall use native plants and a mix of deciduous and evergreen species and may be located within the setback area. The species mix and depth of screening shall be determined by the Planning Board during site plan review based on site specific conditions with existing natural vegetation

49 Referenced Town of Oakham

50 Referenced Town of Hadley

51 Town of Athol

52 Referenced Towns of Adams, Chester, Buckland, New Braintree, and Webster

being used to the greatest extent possible.⁵³

Plants shall be placed in mixed groupings of varying length and width, be a mix of evergreen and deciduous species, and be planted at varying spacing from a minimum of three (3) feet to a maximum of fifteen (15) feet. The Tree Warden may impose or alter any condition within this section deemed necessary to achieve the purpose of this bylaw.⁵⁴

Suggested Plant Species List⁵⁵:

- A. Evergreen Trees: Fir, hemlock, larch, pine, spruce
- B. Deciduous Trees: Aspen, basswood, birch, elm, hornbeam, locust, maple, oak, sycamore, willow
- C. Shrubs: Alder, chokeberry, dogwood, elderberry, hawthorn, lilac, serviceberry, spicebush, sumac, viburnum, winterberry, witch-hazel

3.24.10 Public Safety and Environmental Welfare Standards

3.24.10.1 Emergency Services

The applicant shall provide a copy of the project summary, electrical schematic, and site plan to the Fire Chief and Emergency Medical Services. The applicant shall cooperate with local emergency services in developing an emergency response plan. All means of shutting down the solar photovoltaic installation shall be clearly marked in the plan. The applicant shall identify an official representative for public inquiries throughout the life of the installation.

A plan will be drawn up for the provision of water needed for fire protection, as well as other fire control measures.⁵⁶

3.24.10.2 Hazardous Materials

No hazardous materials or waste shall be discharged on the site of any ground-mounted solar photovoltaic installation. If any hazardous materials or wastes are to be used on site, there shall be provisions for full containment of such materials or waste.⁵⁷

53 Town of Athol

54 Referenced Town of Ashfield

55 Referenced Town of Ashfield

56 Referenced Towns of Brimfield and Lunenburg

57 Town of Athol Wireless Telecommunication Facilities Bylaw



- A. No pesticides or defoliants may be used on the site without prior approval of the Conservation Commission Special Permit Granting Authority.⁵⁸
- B. Herbicides may not be used to control vegetation at the ground-mounted solar photovoltaic installation.⁵⁹
- C. Material Safety Data Sheets for the system components will be provided at the discretion of the Special Permit Granting Authority.⁶⁰
- D. The Department of Public Works must be given full notice before any hazardous materials need to be transported off-site. The route must be approved by the Department before any hazardous materials leave the installation site.⁶¹

3.24.10.3 Noise

The decibel level will be decided at the discretion of the Special Permit Granting Authority based on the noise analysis conducted by an acoustical engineer during the site plan review process.

3.24.10.4 Visual Impact

Visual impacts of the installation on its immediate abutters and nearby neighborhood shall be sufficiently mitigated through appropriate design, landscaping, fences, berms, etc.⁶²

Ground-mounted solar photovoltaic installations shall be screened year round from all adjoining properties in all zoning districts and from public and private ways.⁶³

The applicant shall submit documentation of the location of all installations, including parking lots, storage facilities, network connections, power lines or other outdoor service areas, should be completely screened from any residence, downtown Athol, or public way by using topography, tree lines, and/or vegetation, as determined by the Special Permit Granting Authority during all seasons of the year.⁶⁴

58 Referenced Town of Barre
 59 Town of Athol
 60 Referenced Town of Wales and Warren
 61 Referenced Town of Shirley
 62 Referenced Town of Leicester
 63 Referenced Town of Hubbardston
 64 Referenced Towns of New Braintree and Spencer

The applicant also be required to submit a Visual and Habitat Mitigation Plan to the Planning Board for the purpose of lessening the visual impact while creating viable wildlife habitat⁶⁵:

- A. A planting plan including the types, sizes and locations of plant materials to be used. It shall reasonably mitigate the visual impact and habitat loss of the project. The plan will be proportional to the impact on the existing habitat and be in consideration of adjacent roads and residential properties⁶⁶;
- B. Views of the site from all off-site abutting properties indicating what will be seen prior to construction, immediately after construction is completed with no plantings in place, after construction with all plantings in place and at two, five and 10 years after construction with all plantings still in place (indicating normal anticipated growth).⁶⁷
- C. The species mix and depth of screening shall be determined by the Planning Board during the Site Plan Review based on site specific conditions with existing natural vegetation being used to the greatest extent possible;
- D. Vegetation shall consist of varieties native to the area;
- E. All plantings will be maintained to insure survival to maturity;
- F. The site will be monitored, and an action plan developed, to control plants on the Massachusetts prohibited plant list;
- G. Seeding within the installation should consist of a mix of wild-life-friendly perennial herbaceous forbs and grasses that are native to the eastern U.S., to support pollinators and wildlife.

3.24.10.5 Access Roads

Access roads shall be planned and constructed in consultation with the Department of Public Works in order to minimize grading, stormwater/run-off control, removal of stone walls or trees and to minimize impacts to environmental, wetlands, or historic resources.⁶⁸

3.24.10.6 Stormwater Management Plan

This plan must be submitted with the stamp and signature of a Registered Professional Engineer (PE) who is licensed in the Commonwealth of Massa-

65 Referenced Town of Orange
66 Referenced Towns of Ludlow and Southwick
67 Referenced Town of Barre
68 Referenced Town of Shelburne

chusetts. The Stormwater Management Plan shall fully describe the project in drawings, narrative, and calculations. It shall include⁶⁹:

- A. The site's existing and proposed topography;
- B. All areas of the site designated as open space;
- C. A description and delineation of existing stormwater conveyances, impoundments, environmental resources on or adjacent to the site into which stormwater flows;
- D. A delineation of 100-year flood plains, if applicable;
- E. Estimated seasonal high groundwater elevation in areas to be used for stormwater retention, detention, or infiltration;
- F. Existing and proposed vegetation and ground surfaces with runoff coefficients for each;
- G. A drainage area map showing pre- and post-construction watershed boundaries, drainage area and stormwater flow paths, including municipal drainage system flows, at a scale that enables verification of supporting calculations;
- H. A recharge analysis that calculates pre- and post-construction annual groundwater recharge rates on the parcel;
- I. A description and drawings of all components of the proposed stormwater management system;
- J. Soils information from test pits performed at the location of proposed Stormwater Management facilities, including soil descriptions, depth to seasonal high groundwater and depth to bedrock. Soils information will be based on site test pits logged by a Massachusetts Certified Soil Evaluator.

3.24.11 Installing, Monitoring, Maintaining, and Modifying

3.24.11.1 Installation Conditions

If the owner/operator of the installation were to create a staging area for materials, including the delivery of installation equipment, a plan of removal must be provided prior to the construction of the installation. Equipment and materials used for construction must be fully removed by date put forth by the Special Permit Granting Authority.⁷⁰

69 Referenced Town of Orange

70 Referenced Town of Spencer

3.24.11.2 Monitoring Conditions

3.24.11.2.1 Annual Reporting⁷¹

The Annual Report, which certifies compliance with the zoning and building requirements of this bylaw and the approved site plan, shall be submitted to the Board of Selectmen, Planning Board, Fire Chief, Emergency Medical Services, Building Inspector, and Conservation Commission no later than 45 days after the end of the calendar year. The Annual Report shall also provide information on the maintenance completed during the course of the year, the amount of electricity generated by the facility, up-to-date color photographs of the installation and surrounding roads and buildings, the amount of surety available for decommissioning, and anything else deemed appropriate by the Special Permit Granting Authority.

3.24.11.2.2 On-Site Visits⁷²

The Planning Board shall require, as a part of the review, on-site visits led by the Planning Board and its designee, which may include representatives from other boards, departments, and commissions, during the application process. In addition, the Planning Board may, once obtaining permission from the owner/operator of the installation, conduct any necessary on-site visits from time to time, as determined by the Planning Board, following the date of completion.

3.24.11.2.2 Stormwater Management Evaluations⁷³

Quarterly inspections of the construction of stormwater management devices shall be conducted by the Town, utilizing a professional engineer or landscape architect approved by the Planning Board and paid for by the applicant, pursuant to Section 53G of Chapter 44 in Massachusetts General Law if deemed necessary by the Board. Written reports shall include: the inspection date and location; evaluation of compliance with the Special Permit; any variations from approved construction specifications or violations of the Stormwater Management Plan. At minimum, inspections shall include:

- A. Initial site inspection, prior to approval of any plan;
- B. Inspection of site erosion controls;

71 Referenced Towns of Auburn, East Longmeadow, Hubbardston, Monterey, North Brookfield, Petersham, and Shirley

72 Referenced Towns of Adams and Barre

73 Referenced Town of Orange

- C. Inspection of stormwater management devices prior to backfilling of any underground drainage or stormwater conveyance structures;
- D. Evaluation of the system within 24 hours of a 0.25" rain or the occurrence of runoff from snowfall sufficient to cause a discharge;
- E. Final inspection to verify as-built features.

3.24.11.3 Maintenance Conditions⁷⁴

The applicant shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures. Site access shall be maintained to a level acceptable to the Fire Chief and Emergency Medical Services. The applicant shall be responsible for the cost of maintaining the solar photovoltaic installation and any access road(s), unless accepted as a public way.

3.24.11.4 Modification Conditions⁷⁵

All material modifications to a solar photovoltaic installation made after issuance of the required building permit shall require approval by the Permit Granting Authority. A change to the specifications of any of the equipment installed at the site shall be considered a material modification. A change of the supplier for any of the equipment installed at the site shall not be considered a material modification.

3.24.12 Segmentation⁷⁶

The Planning Board shall not approve any application for solar installation projects where individual parcels and/or multiple parcels of land are held in common ownership (including ownership by related or jointly controlled persons or entities) with the intent to segment project phases. All phases of a project shall be considered as part of a single development project if located either on a single parcel or contiguous parcels of land that are held in common ownership. No such installation shall be segmented or broken into separate ownerships so as to avoid the special permit requirements within this bylaw.

3.24.13 Decommissioning and Removal⁷⁷

Any ground-mounted solar photovoltaic installation which has reached the end of its useful life or has been abandoned consistent with Section 3.24.12.2 of this bylaw shall be removed. The applicant shall physically remove the installation no more

74 Town of Athol

75 Town of Athol

76 Referenced Towns of Falmouth and Framingham's Land Disturbance Bylaw

77 Town of Athol

than 150 days after the date of discontinued operations. The applicant shall notify the town building inspector by certified mail of the proposed date of discontinued operations and plans for removal.

Decommissioning consists of:

- A. Physical removal of all ground-mounted solar photovoltaic installations, structures, equipment, and transmission lines from the site;
- B. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations;
- C. Stabilization or re-vegetation of the site as necessary to minimize erosion. The Permit Granting Authority may allow the applicant to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

3.24.14 Abandonment⁷⁸

Absent notice of a proposed date of decommissioning or written notice of extenuating circumstances, the solar photovoltaic installation shall be considered abandoned when it fails to operate for more than six months without the written consent of the building inspector. If the applicant fails to remove the installation in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town may enter the property and physically remove all equipment and structures that comprise the ground-mounted solar photovoltaic installation.

3.24.15 Financial Surety⁷⁹

The applicant shall provide a form of surety, either through an escrow account, bond or otherwise, to cover the cost of removal in the event the town must remove the installation and remediate the landscape, in an amount and form determined to be reasonable by the Permit Granting Authority, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the Permit Granting Authority. Such surety shall be held by the Town Treasurer and have either an automatic renewal date clause or no expiration date. Such surety will not be required for municipally- or state-owned facilities. The applicant shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.

78 Town of Athol

79 Town of Athol

3.24.16 Rules and Regulations⁸⁰

The Planning Board may adopt, and from time to time amend, Rules and Regulations consistent with the provisions of this bylaw and G.L. c. 40A and other provisions of the General Laws, including the Subdivision Rules and Regulations of Town of Athol, Massachusetts, and shall file a copy of said Rules and Regulations with the Town Clerk. Said Rules and Regulations may provide for an application fee schedule for ground-mounted solar photovoltaic installation application submittals and methods for calculating the financial surety required under Section 3.24.15.

3.24.17 Independent Consultants⁸¹

Planning Board reserves the right under Section 53G of Chapter 44 in Massachusetts General Law to hire independent third party consultants for technical review and the applicant shall be paying the fee for such services.

3.24.18 Indemnification⁸²

The owner/operator shall indemnify and hold harmless the Town of Athol and/or any of its citizens from any and all liabilities, losses and/or damages, including reasonable attorney fees, resulting from the failure of the owner/operator to comply with the terms of this bylaw and/or negligence in the operations and maintenance of any structures built in accordance with it.

3.24.19 Severability

If any section, phrase, sentence, or portion of this bylaw is for any reason held invalid or unconstitutional by a court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions thereof.

80 Town of Athol

81 Referenced Towns of Alford, Cheshire, Dalton, East Longmeadow, Egremont, Hinsdale, Monterey, New Marlborough, Oakham, Sandisfield, Sheffield, Upton, Wales, and Westborough

82 Referenced Town of Auburn

Athol Solar Zoning Bylaw Assessment

**Urban and Environmental Policy and Planning
Field Projects 2019**

By Elisabeth Kellam, Lina Xie, Brian Froeb, Yuehui “Aurora” Li

