The Buildable Square:

An Innovative Way to Protect Inland Wetlands and Reduce System Failures

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CONTENTS

INTRODUCTION

In 1972, Connecticut authorized municipalities to establish inland wetland agencies to protect the rivers, watercourses, and inland wetlands throughout the state.[1] The last fifty years have demonstrated that this legislation has done some good. But it has also revealed the degree to which wetlands have been consistently filled over time due to the pressures for development. In part this reflects the limited ability of commissions with no formal training and limited statutory authority to "say no" to wetlands impacts. In contrast to Connecticut, states like Vermont have solved this problem by assigning responsibility for wetland review and compliance to professionals at the state level. State management of wetlands has three primary benefits: 1) it relieves local governments from having to find volunteers to serve on inland wetlands commissions and, in some cases, staffing them, 2) it provides a more consistent and reliable method of protecting inland wetlands using professionals and 3) it eliminates the disparities in the enforcement of state regulations that should not exist but do on account of differences in capacity among the 169 municipalities in Connecticut.

Over the years, efforts have been made to improve the expertise of inland wetlands commission members. Since May 31, 1996, one member of an inland wetlands commission or its staff has been required to be trained.[2] This was an improvement over the previous years where no training requirements existed. However, it is unclear that training of one person is sufficient, especially on volunteer commissions where absences from meetings are common. Furthermore, the training program offered by the Connecticut Department of Energy and Environmental Protection (CTDEEP) is arguably too limited in scope to provide commissions with the information they need to make decisions on all applications.[3] These shortcomings raise questions about the quality and consistency of the decision-making process.

Commission expertise is not the only factor affecting the decision-making process. State agencies lack adequate staff to provide oversight, technical assistance, or compliance inspections of local government inland wetland commission practices. During the last forty years, CTDEEP wetland staff declined from over five professional employees in the early 1980s to only one today. Indeed, that person has recently been promoted to another position. The result is the state's wetland division is operating, in the best case, with limited staff.

In contrast, Connecticut's zoning commissions have begun to play an important role in protecting wetlands – and in some respects may have a greater impact in protecting wetlands than the state's inland wetlands commissions. The protection of wetlands through zoning has become more explicit with the adoption of buildable lot standards that exclude wetlands from the definition of a buildable lot

[1] Public Act 155, An Act Concerning Inland Wetlands and Watercourse, Approved May 19, 1972. Since municipalities were given until January 1, 1974 to exercise regulatory authority over wetlands before the Connecticut Department of Environmental Protection assumed authority, most municipal wetland regulation occurred just prior to or just after that deadline. For example, Thomaston, Connecticut initiated its inland wetland regulations many months after the January 1, 1974 deadline. This was not unusual given the novelty of this new authority.

[2] Public Act 96-157, An Act Concerning Wetland and Watercourses, Approved May 31, 1996.

[3] The online training course was inactive for many months last year and did not provide field experience or access to experts capable of fielding technical questions.

(the "minimum buildable lot", or MBL) or from what is called a "minimum buildable square" (MBS) or "minimum buildable rectangle" (MBR) that must fit within a building lot and be free of wetlands.

An MBS or MBR is now required by fifty-nine of the state's municipal zoning regulations. If the concept is recognized for its environmental, waste and drinking water planning, and lot design values, it could revolutionize inland wetlands protection. This study analyzes MBL and MBS/MBR practices in Connecticut and explains how the broader adoption of the latter could improve wetlands protections and, simultaneously, improve the predictability of the land development process. This study also reveals how the MBS/MBR concept could replace traditional minimum lot size requirements with a performance-based approach that ensures adequate land for siting homes, septic systems, and wells, while meeting traditional setback standards.

MANAGEMENT APPROACHES

A septic system that is to function within design parameters over the long term requires adequate land; historically, municipalities have sought to achieve this by prescribing minimum lot sizes in zoning, as well as setbacks from neighboring properties. However, with the recognition that certain types of land are incompatible with the safe, long-term performance of septic systems, some municipalities have expanded their lot sizes to exclude areas such as wetlands, watercourses, and land that is shallow to bedrock or has a high groundwater table from the definition of a buildable lot, creating the concept of a "minimum buildable lot" (MBL).

Other municipalities have taken a similar, but more focused approach, excluding such areas from a minimum buildable area (MBA) – generally a square or rectangle (MBS or MBR) – within each building lot, where proposed development – including a septic system – is to be placed, and which is the subject of this report.

The following sections review the science behind and the use of these approaches.

Minimum Lot Sizes

In 1989, the Connecticut Department of Environmental Protection (DEP) recommended at least a two-acre lot size to ensure the long-term sustainable use of septic systems.[4] At that time DEP acknowledged that under ideal conditions a lot in an unsewered area could be 0.6 acres. The DEP Water Compliance staff emphasized "... the majority of base natural resource conditions mitigate toward a density of less than one dwelling per acre." This guidance, which is designed to provide for the accommodation of a home, outbuildings, paved areas, septic tank, leaching field, reserve leaching field, and drinking water well, including separation distances[5] between wells and septic systems within a property and with neighboring properties, appears to underlie the broad uptake of two-acre zoning in areas in Connecticut without public water and sewer.

While the guidance was a step in the right direction, as noted above, the quality of land varies not only across the state but even within building lots. Indeed, recent evidence supports even larger lot sizes based on local conditions. For example, scientific studies have found that even two-acre lots may be too small to avoid water quality degradation in some areas. Excessive nitrates, bacteria, and viruses

[4] Connecticut Department of Environmental Protection, Water compliance Unit, Report for the Blue-Ribbon Commission on Housing, on the Land Required to Support Residential Development in Connecticut, May 1989.
[5] Greater distances between septic system leaching fields and watercourses or wetlands improve water quality.

have been found in surface waters when septic system densities increase in areas with highly permeable soils. An EPA study on septic system densities concluded water quality degradation occurs when there are more than 40 septic systems per square mile, which is equivalent to one septic system per 16 acres.[6] Similarly, a study conducted of the water quality in the Ipswich and Shawsheen River basins in Massachusetts found dissolved solids exceeded 10 to 15 mg/l when there were 100 houses per square mile – which represents about one septic system per 6.4 acres.[7] Water quality tracer studies were used to confirm the findings made by the U.S. Geological Survey study of the Ipswich and Shawsheen River basins.

The Connecticut public health code requires a fifty-foot setback for leaching fields from wetlands. However, highly porous soils require greater travel time separations than suggested by the "one size fits all" formula used by the code. Studies conducted by the U.S. Environmental Protection Agency (EPA) have demonstrated septic system effluent can travel more than 100 feet in highly permeable soils and, when leachate volumes are sufficiently large, result in the discharge of untreated leachate directly into wetlands or watercourses. Research conducted by the Massachusetts Alternative Septic System Test Center has found, "...most microorganisms survive longer at lower temperatures and high humidity. Sunlight will kill most microorganisms. Although viruses can survive in fresh water and sewage for up to 120 days, their survival length is typically less than 50 days. Bacteria have a shorter survival time (10-30 days), although research has found bacteria survival times of longer than 6 months and travel in the groundwater beyond 100 feet."[8] Under worst case conditions – which may obtain in parts of Connecticut – the code's requirements for a 21-day travel time for septic system leachate and a fifty-foot separation from watercourses do not ensure the proper attenuation of bacteria. The transport of leachate to surface water has long been recognized as a serious water quality issue by the EPA.

Ideally, septic systems should be sited to ensure safe, long-term functioning given local conditions. This could largely be achieved by updating the Connecticut public health code to require a 100-foot separation from wetlands (which would be consistent with the upland review areas adopted by 84% of Inland Wetland Agencies in the state). As noted earlier, the existing fifty feet is an inadequate setback standard for leaching fields where favorable hydraulic conductivity, coupled with highly permeable soils can make even 100-foot separations insufficient to attenuate wastewater pollutants. This is a particular concern for septic system leaching fields bordering wetlands that are a surface water supply.[9]

In the absence of state-level action in the form of a public health code update, some municipalities have stepped up to protect wetlands. Since inland wetland commissions cannot prohibit development in the upland review area, this responsibility falls to zoning commissions. With substantial variation,

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[6] Canter, Larry and Robert C. Knox, Evaluation of Septic Tank System Effects on Ground Water Quality, U.S. Environmental Protection Agency, September 1984, p. 2; Yates, Marylynn, Septic Tan Density and Ground-Water Contamination, Ground Water vol. 23, No. 5, September/October 1985, p. 588

[7] Morrill, George B. and Larry G Toler, Effect of Septic Tank Wastes on Quality of Water, Ipswich and Shawsheen River Basins, Massachusetts, Journal of Research, U.S. Geological Survey, Vol. 1, No. 1 January/February, 1973, pp. 117-120.

[8] Massachusetts Department of Environmental Protection, Massachusetts Clean Water Toolkit

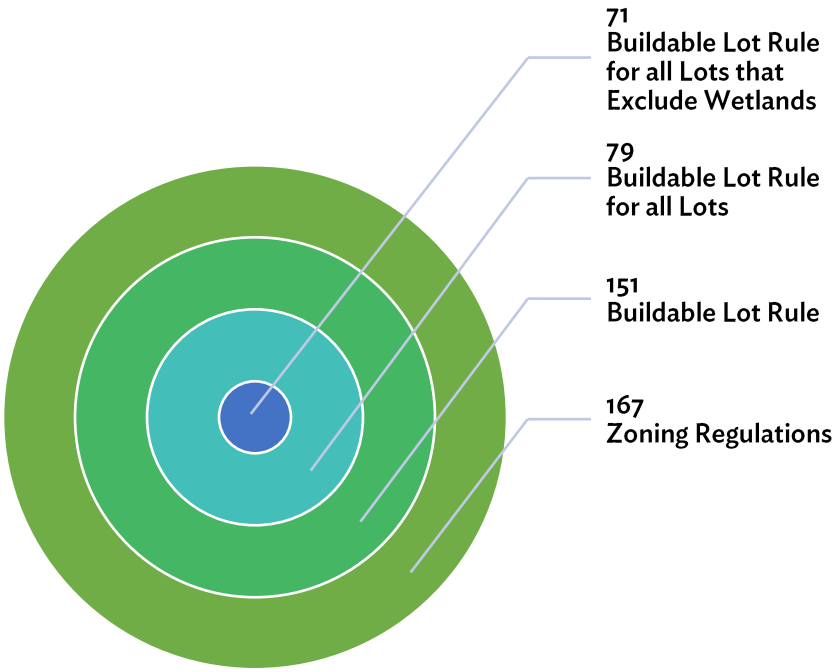
[9] The Commonwealth of Massachusetts requires twice the separation distance for leaching fields from "surface water supplies or tributaries thereto" compared to Connecticut. The Massachusetts DEP requires a 100-foot separation. In contrast, the Connecticut Department of Health requires a 100-foot separation from a public water supply reservoir but does not require any separation of leaching fields from tributaries leading into the reservoir. See 310 CMR 15.211 Minimum Setback Distances adopted in Massachusetts.

zoning commissions have sought to meet this challenge through the adoption of zoning regulations that exclude areas that are unsuitable for septic systems from the buildable lot or area.[10]

Buildable Land as a Best Management Practice

With this background, this paper reviews means of strengthening wetlands and water protection with minimum buildable land concepts. For those not familiar with these terms, minimum buildable lot (MBL) and minimum buildable area (MBA), which includes squares or rectangles (MBS or MBR), are concepts used by zoning commissions to exclude wetlands, floodplains, and steep slopes from all or some designated portion of a lot. Some municipalities also use the MBS or MBR to ensure lots are configured to avoid development of narrow strips of land that may meet the minimum lot size but are not wide enough to accommodate a septic system leaching field or even the footprint for a potential building. While the MBS/MBR have shape-fitting purposes, the value of these lot design tools is most relevant as a wetland protection strategy.

Figure 1. Number of Municipalities with Relevant Land Use Regulations: 2023



Minimum Buildable Lot (MBL)

The most popular of these zoning concepts is the minimum buildable lot (MBL). The MBL is used by 79 municipalities, on a townwide basis, to ensure an entire lot has sufficient land free and clear of environmental constraints so a septic system and drinking water well have the space needed to perform within their design parameters. Its use varies across the state with the greatest application of this tool in the suburban municipalities in the South Central and Northeast Council of Governments and the least acceptance within the Metropolitan and Southeastern Council of Governments (see Appendix H). Buildable lot regulations originated in part when the state public health code was revised

[10] WestCOG, *Flooding in Connecticut: A Status Report on Municipal Flood Prevention Standards: Strategies to Reduce Flooding and Address Water Quality Impacts*, Western Connecticut Council of Governments, 2021, p. 11. This report indicates Connecticut has the least protective setback standards for septic systems in New England.

on August 16, 1982 to require lots to have sufficient land for a reserve leaching field.[11] The other motivating factor was the 2009 Connecticut Supreme Court decision, *Cimino v. Zoning Board of Appeals.* That decision upheld the validity of buildable lot regulations as a valid use of the police powers.[12]

MBL standards vary across Connecticut. Of the 79 municipalities that have a buildable lot standard, seventy-one require the buildable lot to be free of wetlands.[13] Such a requirement avoids development on or near wetlands. It also helps to minimize the discharge of septic system leachate into wetlands.

Such MBLs also avoid situations where building lots turn out to be unbuildable. For instance, while the public health code requires septic systems to be at least fifty feet from wetlands or watercourses[14], the code has no direct bearing on the way land is subdivided. As a consequence, subdivision of land using traditional, wetland-unaware minimum lot sizes[15] can yield building lots that are unbuildable under the public health code. Building lots that are unbuildable due to the failure to account for unsuitable land – as is the case under traditional minimum lots sizes – create frustrations for municipal sanitarians and property owners. Insofar as the MBL eliminates wetlands from the definition of a building lot, it ensures there is suitable land for a septic tank, leaching field, and reserve leaching field. This decreases the work of the sanitarian and inland wetland commission and increases the probability that a building lot is buildable.

A review of the 167 municipalities with zoning revealed the primary development constraints considered in zoning are the presence of wetlands, 100-year floodplains, poorly drained soils, shallow to bedrock conditions, pre-existing utility easements, steep slopes, and proximity to watercourses. Seventeen Connecticut municipalities have established minimum buildable area standards that exclude wetlands, watercourses, floodplains, and steep slopes – the most problematic environmental constraints for development. These seventeen municipalities have adopted four key buildable lot restrictions as townwide standards prohibiting wetlands, floodplains, shallow to bedrock, and proximity to watercourses (see Table 3 and Appendix I).

Table 1: Buildable Land Criteria Applicable to Single Family Residential Development

#	Land Development Constraints	Number of Municipalities
1	Wetlands	71
2	Watercourses	59
3	Steep Slopes	48

[11] (State Department of Public Health Services, On Site Sewage Disposal Systems, with Design Flows of 5,000 gallons a day or less and Non-Discharging Toilet Systems, 1982, p. 20) Also, see NYT April 29, 1992, Beyond the Sewer Line, p. B-1 and Passive Solar Subdivision Design, A Planner's Guide, CNRRPA, 1980).
[12] Cimino v. Zoning Board of Appeals, 117 Conn App 569 (Conn App Ct 2009), decided October 13, 2009.
[13] In addition, there are eight political subdivisions, located in six Connecticut municipalities that have their own zoning regulations. Two of these political subdivisions – Gorton City and the Borough of Stonington exclude wetlands from development. Gorton City excludes wetlands from density calculations for multi-family development and the Borough of Stonington has a 25% deduction for wetlands and submerged coastal lands when calculating minimum buildable lot size. See Appendix F.
[14] Connecticut Public Health Code, On-site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems, January 2023.
[15] The traditional buildable lot definition is still used by several Connecticut municipalities that are more urban in character. See Appendix A.

#	Land Development Constraints	Number of Municipalities
4	Easements & Other Restrictions	38
5	Flood Hazard Zones	28
6	Bedrock & Ledge	13
7	Naturally Occurring Soils Close to Groundwater	10
8	Critical Coastal Resources	5
9	Narrow Strips of Land	5

Source: WestCOG analysis of the zoning regulations of the 167 municipalities with townwide buildable lot provisions applicable to all single-family residential development, May 2023.

Despite their advantages, MBL standards have not kept pace with scientific evidence of the need for larger land areas to ensure the long-term reliability of septic systems. As noted in this report, a fifty-foot separation between a leaching field and watercourse is insufficient for water quality protection.[16] Depending upon soil permeability, leachate volumes, and slopes, separation distances of over 100 feet may be required between watercourses and septic system leaching fields. Given the water quality impairment created by inadequate setbacks between leaching fields and wetlands and watercourses, this report reviews some of the best practices to avoid discharges of nitrogen, phosphorus, bacterial, and viral contaminants into Connecticut's surface water supplies.

Recognizing the water quality problems the current fifty-foot setback standard in the public health code can create, six towns (Lisbon, Lyme, Marlborough, Thompson, Tolland, and Waterford) have taken a more proactive approach. These towns have anticipated the need for greater septic system setbacks by excluding wetlands and the upland review area from the MBL. In excluding the upland review area, these municipalities have effectively adopted a 100-foot setback from wetlands and watercourses.[17] This innovative wetland protection approach is grounded in state law[18] and represents a significant step forward in wetland protection.

Most municipalities in Connecticut have not adopted an MBL standard, and those that have largely have adopted less effective strategies than the above-listed six municipalities. This suggests that training and education programs that familiarize commission members and town planners concerning the water quality benefits of excluding wetlands using the minimum buildable lot may be warranted.

Minimum Buildable Area (MBA)

There may be challenges to zoning regulations that establish setbacks or exclusions that effectively increase minimum lot size. During the last forty years, concerns have been raised that large lot zoning

[16] It is noteworthy that more intense and frequent rainfall events, caused by a changing climate, tend to increase discharges of pollutants from septic system leaching fields into the state's rivers and wetlands.
[17] Since the upland review area is 100 feet or more for 84% of Connecticut's municipalities, this approach doubles the separation distances between wetlands and septic systems compared to the public health code.
[18] Water protective setbacks are enabled by two provisions of the zoning statutes. Zoning regulations adopted pursuant to subsection (a) of this section shall: "(9) Be made with reasonable consideration for the protection of existing and potential public surface and ground drinking water supplies; and (10) In any municipality that is contiguous to or on a navigable waterway draining to Long Island Sound, (A) be made with reasonable consideration for the restoration and protection of the ecosystem and habitat of Long Island Sound; (B) be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris on Long Island Sound; and (C) provide that such municipality's zoning commission consider the environmental impact on Long Island Sound coastal resources, as defined in section 22a-93, of any proposal for development." See 8-2(b)2(9) of the Connecticut General Statutes.

may be used as an 'exclusionary' tool.[19] Municipalities that seek to protect wetlands and water quality through larger lot size requirements need to be able to justify such decisions based on the adverse public health and environmental impacts of excessive septic system densities in the watersheds involved.[20] Municipalities that exceed DEP's recommendation for a minimum two-acre lots should ensure that their standards are based on scientific evidence. Local requirements for lots larger than two acres may be formulated as traditional minimum lot sizes or they may be expressed through an MBL standard, which does not increase the minimum lot under the best-case scenario but may increase the average lot under normal conditions.

Perhaps the most important finding from the review of MBL regulations is the range of standards adopted across the state. The diversity of zoning approaches reflects a state public health code that is inadequate to provide for the safe, long-term functioning of septic systems and drinking water wells without environmental impairments as well as a lack of state land use restrictions on activities within the wetland buffer zone.[21] This zone, which is also known as the upland review area, is not equivalent to a required setback as might be found in a zoning regulation. It is solely an area where an inland wetland commission can determine if wetlands may be impacted by off-wetland activities. While most inland wetland agencies (84% of the 169 municipalities) have adopted a 100 foot or greater upland review area, all lack the authority to prohibit septic systems in the review area; without such authority, such regulation falls to local zoning commissions. As this report shows, zoning commissions have codified a wide variety of standards to reduce or avoid wetlands impacts; however, to date, few have adopted regulations that keep septic systems outside a 100-foot buffer zone.[22]

Minimum lot sizes increase the probability that development without impacts to wetlands is possible (since a larger building lot is likely to have more land that is not a wetland nor near one). In contrast, MBL standards expand each building lot until the minimum lot size can be met with only land that is suitable for development. While this can all but eliminate the risk of adverse wetlands impacts, it can also produce building lots that contain more developable land than is warranted to protect health and the environment and thus can effectively increase minimum lot size – potentially opening a municipality to charges of exclusionary zoning.

Perhaps in response to this concern, some municipalities have adopted minimum buildable area (MBA) standards. An MBA is created using logic similar to that of an MBL, i.e., exclusion of land that is unsuitable for development, but instead of applying to the entire lot, the MBA focuses on the footprint of future development (including separation distances and buffers). An MBA excludes wetlands not from an entire lot but only from that portion of the lot needed for the house, septic system, well, and wetland buffers. In doing so, an MBA regulation serves the twofold purpose of protecting the safe, long-term functioning of a septic system and protecting wetlands. Such an approach ensures that

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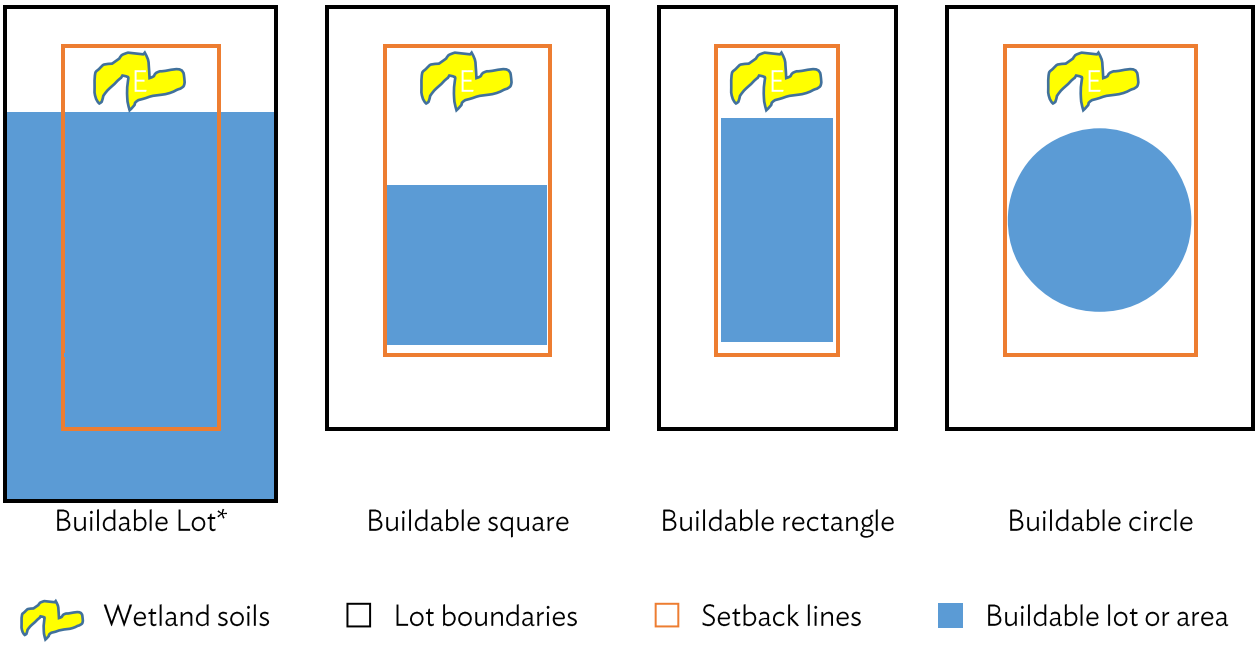
[19] Shortsleeve, Michelle, Challenging Growth Restrictive Zoning in Massachusetts on a Disparate Impact Theory, Boston University Public Interest Law Journal, April 1984, pp. 380-381.
[20] Morris; Madelyn, Mary Griffin, Regulatory Taking Claims in Massachusetts, Massachusetts Law Review, 1997, p. 240. In Massachusetts, efforts to protect wetlands have been favorably reviewed by the Massachusetts courts.
[21] For a detailed analysis of this issue see *The Case for Riparian Corridor Protections: Zoning Strategies to Reduce Pollution of Inland Waters and Resultant Hypoxia of Long Island Sound,* Western Connecticut Council of Governments, 2021.
[22] WestCOG, *The Case for Riparian Corridor Protections: Zoning Strategies to Reduce Pollution of Inland Waters and Resultant Hypoxia of Long Island Sound,* Western Connecticut Council of Governments, 2021. p. 23.

adequate, suitable land is available for development without the risk of increasing lot sizes beyond what is scientifically justified (which can occur with an MBL).

The development footprint in an MBA regulation can take various shapes; most common are the minimum building square, rectangle, and circle (MBS, MBR, and MBC, respectively; see Figure 2). The choice of shape is a matter of preference, although given that building lots tend to be rectangular, a rectangle is likely to be most space-efficient.

Figure 2. The Range of Buildable Land Approaches Used in Connecticut



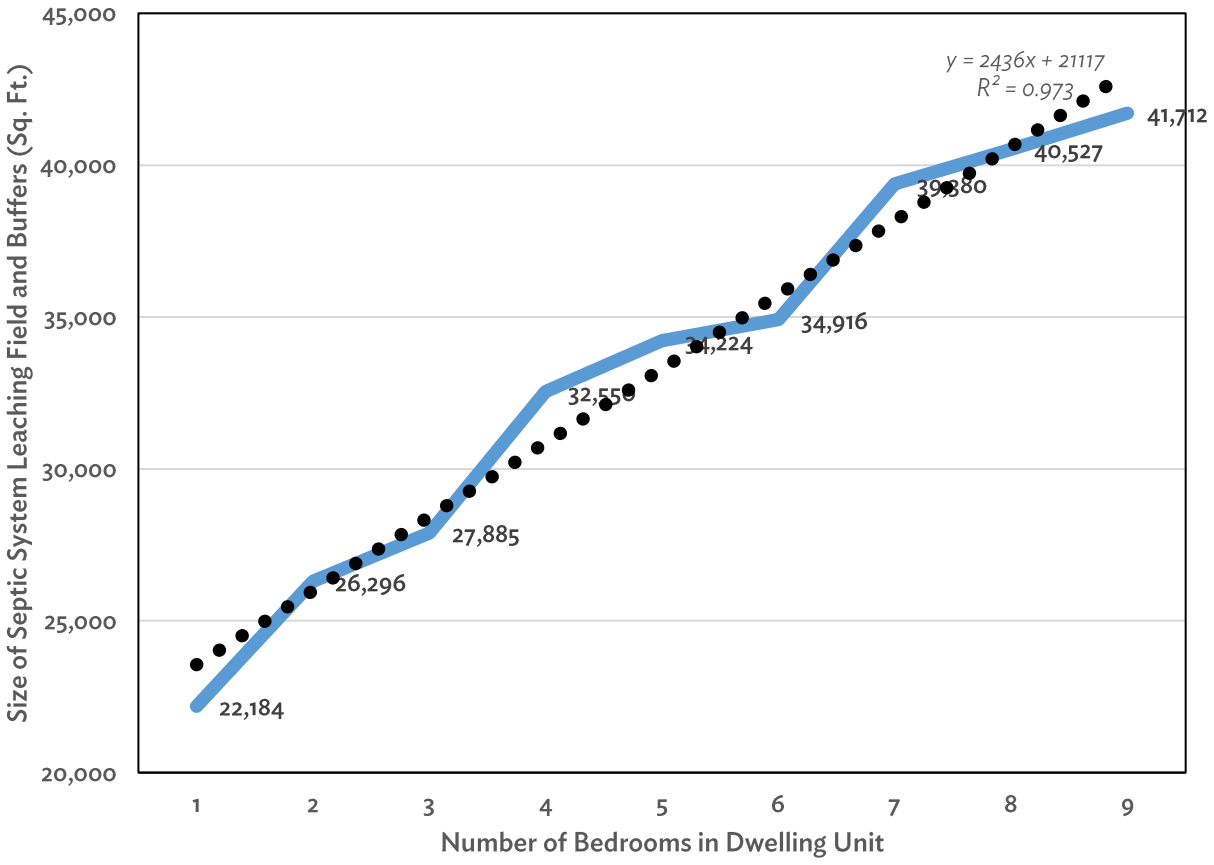
* In the example illustrated, the lot boundaries must be enlarged to meet a minimum buildable lot standard because of the presence of wetlands, which do not count toward MBL. In some municipalities, lot boundaries are not enlarged but rather shifted so that unbuildable land is outside of a building lot. In these cases, such land is often divided into a separate parcel, which may be conveyed to the municipality as "open space" (albeit often as a small, fragmented parcel, with no public access).
Note that all other factors are equal (e.g., home size, soil conditions) in the illustrations shown above.

As the size of septic tank, leaching field, and reserve leaching field required by the public health code will vary with the soil percolation rates, establishing a townwide minimum buildable area should be based on the use of a worst-case analysis that assumes full buildout allowed under the regulations. Using evidence-based standards in defining the MBA protects the environment and public health without unduly burdening property rights. From a planning perspective, a buildable lot should be capable of at least accommodating the wastewater discharges and drinking water demands associated with at least a three- or four-bedroom house based on the worst soil conditions that can be expected.

Alternatively, standards could be applied based on a sliding scale using the number of bedrooms as the standard for determining the size of the minimum buildable area. Such an approach could reflect the trend towards larger homes and ensure where larger homes are expected, each building lot has adequate suitable land for the additional septic demand. Conversely, such an approach could also allow borderline lots that are adequate for a one- or two-bedroom home but inadequate for a home with more bedrooms to be developed (see Figure 3).

Land requirements for a septic system and well derive from the Connecticut public health code.[23] For example, for a three-bedroom house located on the least favorable soils (i.e., soils with a 50-to-60-minute percolation rate), the leaching field will require at least 13,942 square feet of land. Another 13,942 square feet are needed for the reserve leaching field, septic tank and the land between the tank and the house. The public health code requires a ten-foot separation of the septic system from the building, a twenty-five-foot separation from storm drains and a seventy-five-foot separation from private wells withdrawing less than ten gallons per minute. Furthermore, septic systems must be at least twenty-five feet from a downgradient property line, fifty feet from a downgradient closed loop geothermal system, and fifty feet from a wetland or watercourse. Also significant are the buffer zones required from swimming pools, underground storage tanks, property lines, wetlands, and watercourses. These setbacks produce a minimum buildable area of approximately 28,000 square feet for a typical three-bedroom single family dwelling of 2,700 square feet (see Appendix B). A nine-bedroom house meeting these same public health code standards requires about 42,000 square feet to produce the minimum buildable area. However, where wetlands are not present and buffers are thus not required, the MBL for three- and nine-bedroom houses drops to 15,470 and 26,367 square feet respectively (Table 2).

Figure 3. Square feet Required for a Septic System and Buffers by Number of Bedrooms



[23] See Appendix J for a list of the worst-case factors that determine the size of the buildable square or rectangle.

These findings underscore the need for greater flexibility in the application of the MBL or MBA concepts than is found in current zoning regulations across Connecticut, which assume one home size. This analysis also suggests that minimum lot size requirements could be eliminated and be replaced with an MBA, coupled with traditional setback and impervious cover standards. Taking this approach, the size of a lot would be driven by the public health code and appropriate buffers to achieve setbacks from streets, wetlands, watercourses, and adjoining property. A performance approach for land development could also improve the transparency of the development potential for any given lot created through the subdivision process. Rather than approving subdivisions that merely identify lot dimensions, it would also be useful to identify the minimum buildable square or rectangle on the plot plan. This form of plot plan transparency could improve public understanding of the development potential for any given lot. Those purchasing a lot would then know if a three-bedroom or nine-bedroom dwelling could be built on a lot of interest. Based on percolation tests completed at the time of the subdivision approval, it would be easy to identify the minimum or maximum buildable square or rectangle.[24]

Table 2. Estimated Land to Comply with Public Health Code using Worst Case Soil Conditions for Three- and Nine-Bedroom Houses with and without Wetland Buffers

#	**Septic System & Water Well Components** (see Appendix B for plot plan diagram for a 3-bedroom house)	**Sq. Ft. needed** (leach field @ 51-60 perc rate/Min. & 3-bedroom house)	**Sq. Ft. needed** (leach field @ 51-60 perc rate/Min. & 9-bedroom house)
1a	Primary leach field with wetlands and other buffers	13,942 (84.5 x 165)	20,856 (1176 x 118.5)
2a	Reserve Leaching field with wetlands and other buffers	13,942 (84.5 x 165)	20,856 (1176 x 118.5)
3a	Sq. ft. of Land to meet public health code with wetlands & other buffers (1a +2a)	27,885	41,712
1b	Primary leach field without wetlands buffers	7,735 (59.5 x 130)	13,184 (93.5 x 141)
2b	Reserve Leaching field without wetlands buffers	7,735 (59.5 x 130)	13,184 (93.5 x 141)
3b	**Sq. ft. of Land to meet public health code without wetlands buffers (1b+2b)**	**15,470**	**26,367**

Table 3. Connecticut Health Code Square Footage for the Effective Leaching Area

Percolation Rate	**Square Feet of Required Effective Leaching Area (ELA)**			
(Minutes to Drop One Inch)	2-Bedroom Building	3-Bedroom Building	For Each Bedroom Above 3	
			Single Family	Multi-family
Less than 10.1	375	495	82.5	165
10.1-20.0	500	675	112.5	225

[24] The MBA concept could also be applied to lots that are currently considered unbuildable by zoning regulations provided the public health code allowed for one- or two-bedroom houses with suitable restrictions.

Percolation Rate	Square Feet of Required Effective Leaching Area (ELA)			
20.1-30.0	565	750	125	250
30.1-45.0	675	900	150	300
45.1-60.0	745	990	165	330

Source: On-site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems, Connecticut Public Health Code, 2018, p. 43

A 28,000 square foot buildable square is consistent with the separation distances and leaching field sizing requirements of the Connecticut Public Health Code (see Tables 1 and 2). For small lots (less than 15,000 square feet), this analysis suggests the entire lot should be free of wetlands, shallow to bedrock, and land with high groundwater levels, unless an advanced wastewater disposal system is feasible. Where zoning setback standards are sufficiently flexible, small lots may become buildable when advanced septic system technologies are authorized by the public health code (which tend to entail significantly higher upfront and ongoing costs). Indeed, small lot sizes of less than 15,000 square feet are inconsistent with the long-term functioning of a septic system and are generally now served by sewers. On large lots of one acre or more, generally a minimum buildable square or minimum buildable rectangle larger than about 28,000 square feet for a three-bedroom house is not warranted.

Note that the minimum lot size needed to fit the MBA may be larger since a buildable lot must also meet lot setbacks. Setbacks reduce the buildable area of lots. For example, under current zoning, 30.9% of a two-acre lot in Danbury and 59.7% of a two-acre lot in Weston are buildable after discounting front, side, and rear setbacks. Of the average large lot in Western Connecticut, 47.4% is developable after excluding setback areas from the minimum allowable lot (see Appendix E). Based on the need to meet setback standards for a two-acre lot and the minimum septic system footprint presented in Appendix B, a two-acre lot provides the minimum space for the long-term functioning of a septic system.

Some may question the value of setbacks. Where public sewers (and water) are not available, setbacks provide an important buffer between adjoining properties both of which are served by septic systems (and wells). This is particularly relevant when the minimum buildable square or rectangle are used to define where septic systems (and wells) should be sited. Several municipalities exclude front, side, and rear setbacks from the MBA, ensuring a buffer between adjoining septic systems (and wells).[25]

Impacts of Buildable Lot or Area Standards

What lessons can we take from the wide range of zoning regulations used to avoid development of lots containing wetlands? Have these initiatives reduced development of the state's wetlands? Have they minimized the workload imposed upon inland wetland agencies? A few observations can be made based on interviews with municipal planners.

First, municipalities that exclude wetlands and wetland buffer zones from the minimum buildable lot have simplified the rules for developers seeking to build. Whether a developer seeks to build a residential, commercial, or industrial facility, the MBL ensures wetlands and/or wetland buffers are not included in the developable portion of the lot. If all municipalities were directed to establish uniform townwide MBLs that exclude wetlands, there would be a reduction in the workload of inland wetland

[25] For example, Haddam's zoning regulations exclude front, side, and rear yards from the minimum buildable lot area.

commissions, as well as greater predictability for applicants.[26] While this is not a complete method of protecting wetlands, it provides an important first step.

Second, planning the subdivision of land to ensure developable lots are created is a critical way to protect wetlands. Yet 96 municipalities have not adopted this approach (see Appendix D for a list of municipalities that have adopted buildable lot standards that exclude wetlands). Arguably, the MBL achieves the intended purpose of ensuring a septic system leaching field and reserve field are capable of being sited on land free of wetlands. As discussed later in this report, the MBL concept also has other purposes including excluding watercourses, land within the 100-year floodplain, steep slopes, and land with shallow to bedrock conditions. These exclusions are not all driven by the public health code but have important wetland and water quality protection benefits.

Subdivision Land Planning Principles

With the array of zoning regulations to control the shape and buildability of lots, one might ask what are the best practices that are most effective in protecting wetlands without increasing development cost? One of the purposes of zoning is to protect health, safety, and general welfare.[27] With that in mind, how best can we distinguish the value of the minimum buildable area concept from the subsidiary concepts of minimum buildable lot and minimum buildable square or rectangle? There are distinct differences in the application of the minimum buildable lot compared to the other concepts. The MBL is primarily a tool used to optimize the design of land subject to subdivision. In contrast the other concepts have more specific purposes; 1) creating lot fitness standards so adequate space exits for a building within required front, rear and side yard setbacks; 2) ensuring sufficient space for septic systems and their leaching fields; and 3) excluding unbuildable land from areas dedicated to development.

The minimum buildable area, square, rectangle and circle are essentially different approaches to achieving the same three purposes mentioned above. From a more practical perspective, the minimum buildable rectangle tends to be the most flexible of the three lot design tools since most residential lots are rectangular in shape and most septic system leaching fields are generally designed in a rectangular format. With that minor caveat, the more important finding from this analysis of buildable land standards is that 96 municipalities in Connecticut (57% of all Connecticut municipalities with zoning) are not using this planning tool to protect wetlands. Many municipalities exclude wetland from the buildable lot definition but have not taken the next step of using the lot shaping benefits of the minimum buildable square or rectangle to create suitable sites for septic systems.

In contrast, 71 of the 79 municipalities with townwide buildable lot standards have recognized the benefit of excluding wetlands from their buildability standard. They have also adopted the concept of an MBA to effectively "polish" the macro level protections offered by the minimum buildable area rule. While these overlapping regulatory concepts may seem redundant, they offer important benefits for

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[26] Western Connecticut Council of Governments, *An Investigation of Inland Wetlands Commission Practices in Connecticut,* 2023.

[27] Among many purposes, Section 8-2 also authorizes commissions to "regulate, within the limits of such municipality: (A) The height, number of stories and size of buildings and other structures; (B) the percentage of the area of the lot that may be occupied; (C) the size of yards, courts and other open spaces; (D) the density of population and the location and use of buildings, structures and land for trade, industry, residence or other purposes, including water-dependent uses, as defined in section 22a-93; and (E) the height, size, location, brightness and illumination of advertising signs and billboards, except as provided in subsection (f) of this section."

wetland protection and septic system performance. The purpose of these supplementary lot size controls goes beyond the three purposes mentioned above by fine tuning the best locations within a lot for development.

Yet for all the value of the MBA, there has been a general failure to apply these principles uniformly across all land uses and zoning districts. Zoning commissions have the authority to establish different standards for each zoning district. Yet they must apply them uniformly within each district. However, there is no logical reason these planning tools should not be used on a town-wide basis even if their application may be slightly different in different zones. In effect, what appears to be happening is what is called "piecemeal incrementalism" rather than comprehensive revisions to zoning regulations that apply uniformly across all zoning districts.

The findings from this statewide review of buildable lot regulations indicate minimum buildable lots, are the most common means of establishing land areas free of wetlands and suitable for septic system leaching fields. These municipalities recognize the minimum land requirements needed for a building footprint and a septic system leaching field.

Table 4. Wetland Restrictions through Buildable Area Standards

Restriction	Number of municipalities
Minimum Buildable Area, Square, or Rectangle Uniformly Applied	27
Minimum Buildable Area, Square or Rectangle Varies by Zone	20
Minimum Buildable Area Equals Minimum Lot Size	12
Sub Total	59
Wetlands Restrictions not based on Buildable Area Standards[28]	12
Grand Total	**71**

Table 5. Size of Buildable Area Adopted by Municipalities Restricting Wetlands within the Designated Area: March 2023

Minimum Buildable Area (Sq. Ft. Lot Area)	Smallest Lot	Largest Lot
Under 15,000	14	1
15,000 to < 30000	24	13
30,0000 to <50,000	15	24
50,000 and above	6	21
Total	**59**	**59**

However, as can be seen in Tables 4 and 5, the minimum buildable areas vary widely across Connecticut. Municipalities that vary the minimum buildable land area (i.e., MBL, MBS, or MBR) by zone are using these tools without a direct nexus to septic system leaching requirements. Only about 28,000 square feet are needed to handle the land for a septic system designed for a three- or four-

[28] The twelve municipalities that exclude wetlands without using the MBS, MBR or MBC are Avon, Bethel, Bloomfield, Enfield, Kent, Morris, Stonington, Washington, Watertown, Westbrook, Weston and Westport. These municipalities rely on wetland deduction standards in determining minimum lot size.

bedroom dwelling. In essence, minimum buildable area standards may also be used for other purposes than protecting the long-term viability of septic systems. All 71 municipalities that have adopted the MBL or MBA exclude wetland soils from the buildable area (see Figure 1, p. 4).

Municipal Perspectives on Minimum Buildable Lots

In some respects, according to Ruthann Calabrese, East Windsor town planner, it is difficult to determine the benefits of the buildable lot as a tool for protecting wetlands. When zoning regulations exclude wetlands from the buildable lot calculations, as is the policy for seventy-one of the state's 167 municipalities with zoning, there is nothing to document concerning the avoided wetland impacts. Simply stated, it not possible to measure that which never occurred.[29] One of the limitations of buildable lot standards is that they do not regulate lots that existed prior to the adoption of a minimum buildable lot regulation. Many MBL regulations have been adopted in the post-2000 era and for this reason do not regulate non-conforming lots created prior to that time.

Carey Duques, Essex Land Use Official and Inland Wetlands Administrator, indicated non-conforming lots pre-dating the town's buildable lot standards would require approval from the inland wetland commission. Because of MBL standards there have been instances where wetlands have limited the feasibility of a septic system leaching field thereby requiring inland wetlands commission approval to proceed. Nevertheless, even these cases must adhere to the state public health code fifty-foot setback from wetlands. The lesson gained from the experience in Essex is that lots created since the MBL standard was adopted have dramatically reduced wetlands impacts.[30]

In Coventry, Eric Trott, Planning Director, indicated a Minimum Buildable Area (MBA) is established within each building lot. Regardless of the residential zone, each lot must have an MBA of at least 25,000 square feet (one residential zone requires a minimum lot size of 80,000 square feet and the other 40,000 square feet). That standard provides sufficient space to avoid wetlands, poor soils, and shallow to bedrock conditions within the designated MBA. Coventry's minimum buildable area regulations, crafted by attorney Mike Ziska, are intended to provide a sufficient wetland-free land area to ensure the long-term functioning of the septic system leaching and reserve leaching fields. Mr. Trott emphasized the critical importance of creating sufficient buildable land area within established lot sizes to ensure the long-term functioning of septic systems. Mr. Trott indicated the Public Health Code has gotten stricter over time and one of the benefits of a proactive MBA standard is to anticipate the ongoing revisions of the public health code aimed at improving surface and groundwater water quality.[31] In addition to ensuring the long-term functioning of septic systems, according to the Planning Director, the MBA has also been a valuable tool in limiting wetland impacts.

The MBA does not apply to existing lots of record created in Coventry in the mid-1980s. It only applies to new subdivisions, or lots created by right for the first split of land never previously subdivided. According to Mr. Trott, the MBA concept is a tool that has more relevance today than fifty years ago when there was much more land free of environmental constraints. Subdivisions created during the real estate boom of the 1970s through the 1990s consumed much of the best buildable land in Coventry. Based on extensive feedback from surveyors who have worked in Coventry for decades,

[29] Interview with Ruthann Calabrese, East Windsor Town Planner, February 23, 2023
[30] Interviews with Carey Duques, Essex land use official and Lisa Fasulo, Director of Health, Essex, CT, February 24, 2023
[31] Interview with Eric Trott, Coventry Planning Director, February 27, 2023

Coventry's planning director indicated "what we are dealing with now are soils and lots that have been passed over for decades and are now the only lands available for development. The challenge is finding ways to develop land that simply has too many environmental limitations for development."[32]

Similar to Mr. Trott's experience in Coventry, Demian Sorrentino, Planning Director for Colchester, believes the MBL concept is a useful tool to protect wetlands. However, he cautioned that some municipalities have used the MBL concept to decrease development densities. Rather than using the MBA to improve septic system performance or wetland protection, these municipalities have increased the minimum lot size. He indicated, from his experience as a professional engineer, some municipalities have also used the MBL concept to duplicate and in some cases go far beyond the public health code's sanitation standards. The result, he said, has been to increase the cost and timetable for development approvals. Like Mr. Trott, Mr. Sorrentino indicated the MBL has been very useful in avoiding development on marginal lands unsuitable for septic systems.[33]

The Planning and Zoning Commission for Union also serves as the town's inland wetland commission. On March 1, 2023, the commission discussed the benefits of their use of the Minimum Buildable Square (MBS) – a variant of the minimum buildable area concept – as a tool to reduce wetland impacts. The Commission's chairman, Lee Ann Fitzgerald, indicated Union is characterized by widespread wetlands and bedrock conditions that had previously been a challenge for the installation of septic systems. After the adoption of the MBS the commission members indicated there was a significant reduction in wetland impacts. Many of the commission members have served for thirty years or more and saw the long-term benefits of the MBS. Similarly, the chairman said the MBS has significantly reduced wetland impacts as well as accelerating the review and approval process.[34] The commission member's assessment is consistent with the statement of purpose established for the MBS concept in the Union zoning regulations as follows:

> *"The following standards and limitations are intended to promote the purposes described in Section 1.01 of these regulations and, more specifically, to facilitate development and to preclude post-development problems, such as septic system failures, by assuring that each lot approved for development contains an adequate area of dry, usable land."*[35]

Union's standards for conforming lots provide insights into the commission's desire to avoid wetland impacts. Those standards state:

> *"Each lot must contain a square or rectangular land area (the Critical Area:) having (i) no side less than 125 feet in length; (ii) unless a different area is specifically prescribed elsewhere in these regulations, an area equal to the greater of (A) 21,780 square feet, or (B) twice the area to be covered by buildings, structures, parking lots, or other impervious surfaces; (iii) existing slopes not exceeding twenty percent (20%); (iv) no wetland areas or watercourses; and (v) approved driveway access."*[36]

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[32] Interview with Eric Trott, Coventry Planning Director, February 27, 2023.
[33] Interview with Demian Sorrentino, Colchester Planning Director, February 27, 2023
[34]Interview with the Union Planning and Zoning Commission, March 1, 2023.
[35] Union, Connecticut Zoning Regulations, Section 2.08.01 Statement of Purpose, p. 25
[36] Union, Connecticut Zoning Regulations, Section 2.08.02 Standards for Conforming Lots, p. 25.

With a minimum required lot size of 3 acres for Union's rural residential zone, the requirement that 21,780 square feet of that lot be free of wetlands is a very reasonable approach to forestall development conflicts in the future. One of the advantages of the approach taken in Union is the use of a wetland-free square or rectangle in existing lot size standards rather than requiring the entire lot to be wetland free. The latter approach simply forces the creation of larger lots. In the case of Union that approach might have resulted in a 4-acre lot in the 3-acre zone if the minimum buildable area was declared identical to the minimum lot size. Making the MBA identical to the minimum lot size is the approach taken by twelve municipalities in Connecticut for their largest lot zones. While this approach will certainly help protect wetlands, it is not based on the minimum land area needs. The amount of land needed for the building footprint, septic system primary and reserve leaching fields, and parking and driveway needs does not require three acres even after side, rear, and front yard setbacks are considered. Municipalities that require the entire minimum lot size to be free of wetlands may have objectives beyond enabling a functioning septic system and drinking water well.

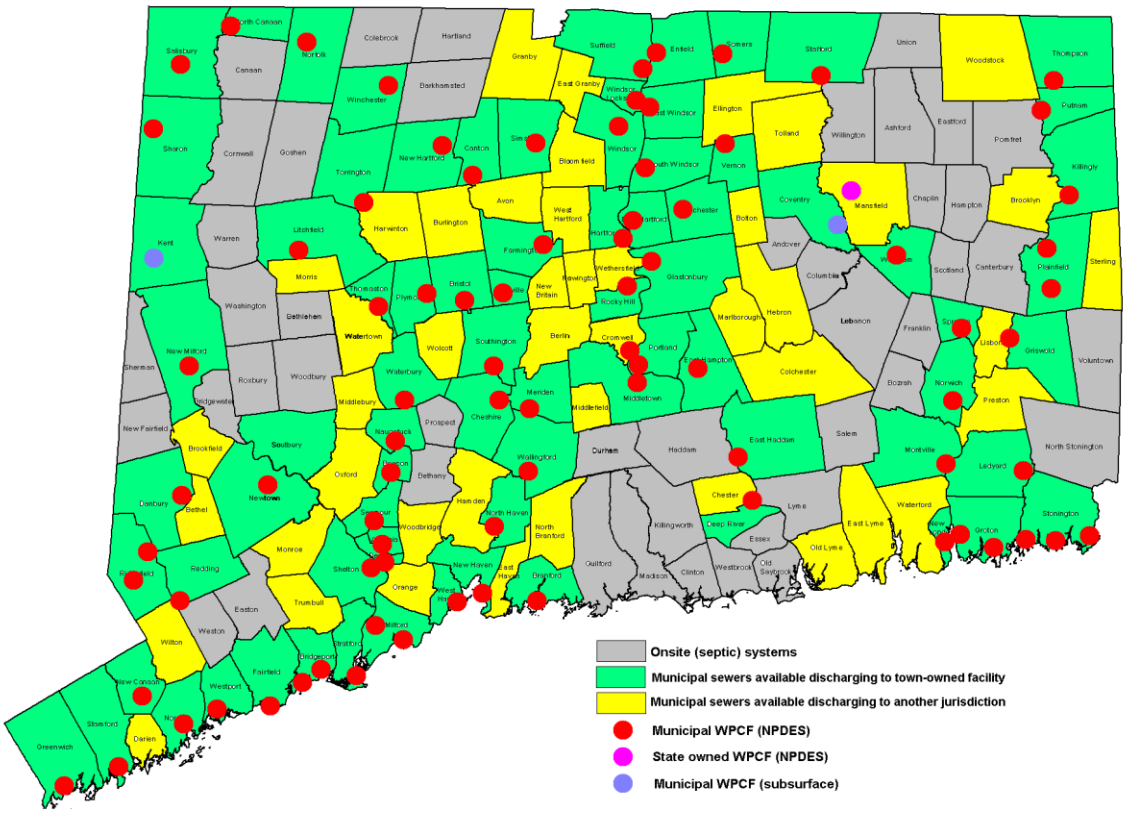
Based on the principles of creating least cost housing and consistent with the adoption of reasonable standards for protecting the public health, safety and general welfare, minimum buildable areas, squares, or rectangles represent a more precise and evidence-based approach to wetland protection. The prudent approach for long term septic system performance is not to increase the size of the minimum lot unless current zoning standards for lot size are inadequate to achieve septic system and well siting objectives. For municipalities without public sewers minimum lot sizes of at least two acres have been recommended by the Connecticut Department of Environmental Protection. For those that already have two-acre zoning, or even three- or four-acre zoning, a more precise approach is to adopt a minimum buildable square using the approach taken by the Union and Coventry Planning and Zoning Commissions. A septic system including its primary and reserve leaching field for a 1,500-gallon tank can be accommodated within approximately 28,000 square feet including typical building, parking, driveway, and accessory structures footprints, assuming suitable terrain and soil (see Appendix B).

For large lots of 2 acres or more, there is no reason to require lots to be larger than the minimum lot size simply to avoid wetlands. (Exceptions to this scenario would be areas with poor soil or soil that fails to meet public health code percolation rates, shallow bedrock, or a high water table}.[37] Since creating buildable lots is a function of subdivision regulations, land developers simply must establish lots that contain sufficient area within the minimum lot size established by the zoning regulations. In those instances where wetlands or other constraints prohibit achieving a minimum buildable area, this land must be declared unbuildable. Indeed, this is the approach taken in Glastonbury's zoning regulations for planned area developments:

> *"Where lands proposed for a Planned Area Development contain Unbuildable Property, the number of dwelling units shall be limited to the number of dwelling units allowed per acre of Buildable Property."*[38]

[37] It is noteworthy that several Connecticut municipalities have adopted soil-based zoning for this reason. Washington and Woodbury are examples of this very precise approach of aligning land capabilities for septic systems with soil types. See discussion on soil-based zoning in later section of this report.
[38] Town of Glastonbury Building Zone Regulations, Amended May 20, 2022, Planned Area Development Zone, Section 4.1.2.3(c) p. 55.

Figure 4: Connecticut Municipalities Exclusively Relying on Septic Systems



Workflow Efficiencies

If all municipalities adopt a minimum buildable area or buildable lot regulation it would be theoretically feasible to assign inland wetland review functions to a multi-town or regional organization. The residual workload left by a statewide use of the MBL or MBA in all 169 municipalities would be limited to hardship cases affecting approved lots pre-dating the adoption of these concepts. A recent WestCOG study of inland wetlands commissions in Connecticut found municipalities using the minimum buildable square tool had a 33% lower workload compared to similar municipalities that have not adopted this tool.[39] When the MBL or MBA are coupled with a greater emphasis on informal review of wetlands development proposals before a formal wetlands permit application, there is a far greater opportunity to minimize wetland development in Connecticut.

The approach discussed so far could benefit from that adopted by Vermont. Vermont does not allow local governments to review or administer inland wetland regulations. That is the exclusive responsibility of the State's Agency for Natural Resources. Vermont also established three classes of wetlands and, based on these classifications, requires a 100-foot buffer zone for significant wetlands (Classes I and II) and a fifty-foot buffer for Class III wetlands. Unlike Connecticut, Vermont requires a review of the functions and values of wetland to determine the functional values and level of protection each wetland deserves. Unlike Connecticut, where there are no distinctions made based on

[39] Western Connecticut Council of Governments, *An Investigation of Inland Wetlands Commission Practices in Connecticut,* 2023.

functions and values, Vermont provides stronger protections for the most valuable wetlands. Specifically, Vermont restricts the use of wetland permits for the highest quality wetlands. Vermont's recently adopted wetland regulations state:

> *"Activity in a Class I or Class II wetland or its associated buffer zone is prohibited unless it is an allowed use or authorized by a permit, conditional use determination or order issued by the Secretary. The Secretary may impose any conditions in such a permit that are deemed necessary to achieve the purposes of these rules. The Secretary may issue a permit authorizing an activity occurring within a Class I wetland only to meet a compelling public need to protect public health or safety. A permit issued under these rules shall not relieve any person of the responsibility to comply with all other applicable federal, state or local laws."*[40]

The Vermont regulatory approach uses state level professionals to manage the process. In contrast, Connecticut has not invested the resources or staff to achieve a state managed approach to wetland protection. This may change if the public recognizes the failure of the state's regulatory approach. However, in the years ahead local governments can play an important role in wetland protection by adopting the MBL or MBA regulations. The benefits of this approach are threefold; 1) planning simplifies the development of land when precise buildable lot standards exist; 2) impacts to wetland are dramatically reduced and 3) water quality impacts to rivers and streams will be reduced as well.

ADDITIONAL OPTIONS

Variations on Minimum Buildable Standards

Targeted Applications of Buildable Lot Standards

Fifty-three municipalities in Connecticut have restricted the use of a minimum buildable area to one or two zones such as for elderly or affordable housing, multi-family housing, cluster development, open space subdivisions or areas without public sewers or public water (see Appendix C). Instead of adopting a MBL or MBA as a townwide standard these fifty-three municipalities have applied it to special types of housing other than single family dwellings. The logic for this approach is perhaps more a function of piece meal regulatory reform than a concern for unique land development issues associated with these housing concepts. However, district specific applications of the MBL may also reflect the existence of non-sewered areas within municipalities served by sewers. There are forty-four municipalities that exclusively rely on septic systems for wastewater treatment and many more that have portions of their municipality not hooked up to public sewers (see Figure 1).

In contrast to the use of the minimum buildable lot as a tool to regulate housing, it has not been widely applied to commercial or industrial development. In part, this may reflect differences in how proposals for commercial and industrial development are received. It also reflects the existence of sewer services in the industrial zones of many municipalities. This finding requires further study to determine why some municipalities have limited the MBL and MBA to special classes of residential development but have not applied it to commercial or industrial zoned land. Ninety-six of the state's 167 municipalities with zoning have excluded commercial or industrial zones from the minimum buildable lot concept. From an environmental perspective, the concept of buildability should be adopted townwide – especially where public water or public sewer service are not available. In contrast, urban municipalities

[40] Vermont Wetland Rules, Section 9 permits, effective February 10, 2023.

with sewer and water service are not constrained by the land requirements for septic systems. Nevertheless, even municipalities with public water and sewer service must consider wetlands, floodplains, steep slopes, and coastal zone management requirements (where applicable). In areas with public sewer and water buildable lot standards still provide an important tool to protect wetlands in areas of any given municipality that have not yet been subdivided.

Wetlands Deductions

Note that twenty-one municipalities in Connecticut have MBL or MBA requirements that do not prohibit but merely restrict inland wetlands on a developable lot. Rather than a deduction of 100% of the wetlands found on site from the calculation of the minimum buildable lot, these municipalities allow some wetlands based on discounting procedures. The deductions in lot size or buildable square vary; two municipalities deduct 75% of the wetlands from the buildable lot calculation; twelve municipalities deduct 25% or less of the wetlands; four municipalities deduct 35 to 50% of the wetlands; and three municipalities vary wetland calculations based on the zone or the quantity of wetland acreage on the site (see Appendix G).

These wetland discount formulas do not imply wetland development is allowed. It merely means they are tolerated in closer proximity to development. These wetland exclusion or discount factors do not trump the Connecticut Public Health Code. Regardless of local zoning setback standards, septic systems must be at least fifty feet away from wetlands or watercourses. Yet the public health code does not have authority to set lot size standards. Nor does it have exclusive authority to establish setback standards. Planning and zoning commissions also have the authority to establish setback standards if they are no less restrictive than the public health code and can justify its standards based on water quality considerations as authorized by Section 8-2(b)2(9) of the Connecticut General Statutes.[41]

Wetland Variances

There are instances where a building lot meets minimum lot size and front, side, and rear setbacks but is undevelopable simply because the lot is bisected by a river or wetlands near the street frontage. To develop the rear portion of the lot would require bridge access or the installation of a culvert or wetlands filling project to make use of land that is otherwise inaccessible. This can be addressed by expanding the responsibilities of the zoning board of appeals to include responsibility for reviewing buildable lot variances within the constraints established by the Connecticut Supreme Court. The court affirmed that buildable lot standards cannot be varied by the zoning board of appeals. The Court held, "A parcel that was not approved as a buildable lot has never been held to be one of the specified conditions that a variance may be validly used to resolve."[42] But what happens when that constraint is removed by the municipal inland wetland commission? When the zoning regulations limit the amount of wetlands allowed on a buildable lot but the inland wetlands commission authorizes the wetland to be filled, is this still an unbuildable lot?

Buildable lot variances should only apply to those approved by the IWC. For example, if a road or bridge crossing is required to create access over a wetland or its buffer zone, a previously non-buildable lot could be developed if the IWC grants the necessary permit to do so. This circumscribed

[41] Connecticut General Assembly, An Concerning the Protection of Public Water Supplies, Public Act 85-279, 1985.
[42] Cimino v. Zoning Board of Appeals, 117 Conn App 569 (Conn App Ct 2009), decided October 13, 2009

ZBA authority requires prior approval by the inland wetland commission to enable the ZBA to address what is no longer a non-buildable lot. The MBL or MBA regulation may not be modified by the ZBA according to the Connecticut Supreme Court. For this reason, the MBL or MBA concepts can only be activated when a lot is no longer inaccessible due to an inland wetland commission ruling allowing wetland impacts. However, accessibility by itself does not establish buildability. The land in the rear of a lot bisected by a wetland must still meet the required MBL or MBA to comply as a buildable lot, where these rules exist. These types of wetland impacts – caused by lots bisected by wetlands – are expected to be relatively infrequent events.

In practice, lots of record will be the most likely to require a ZBA variance based on a prior referral from the inland wetland commission. Lots created by a zoning commission after adoption of a MBL or MBA should not exist in a perfect world where a subdivision is properly designed to zoning standards and climate change has not altered the hydrology or soil characteristics of the approved development. If the subdivision of land complies with the MBL or MBA standard the net result should be a dramatic reduction in the workload of inland wetland agencies.

Septic Maintenance Requirements

Septic system leaching fields will not operate forever. A study done by the Connecticut Agricultural Experiment Station in 1974 found the half-life of a septic system leaching field was 27 years.[43] This means that half fail by the 27th year and the remaining half will have a 50% failure rate over the next 27 years. The findings from that study underscore the need for a reserve leaching field for all development relying on septic systems for wastewater disposal. As previously mentioned, buildable lots of 2 acres or more that exclude wetlands ensure the primary and reserve leaching fields function properly into the future. These lots also provide greater spatial separation between septic system effluent and wetlands and surface waters. The pollution caused by improperly installed septic systems or those operated without proper maintenance are difficult to correct when there is limited governmental oversight.

While septic systems should be pumped out on a three-to-five-year cycle, many homeowners are unaware of this maintenance responsibility. The result is that leaching fields will clog up and stop functioning. Absent meaningful regulatory reform, the minimum buildable square or rectangle achieves the twofold benefit of reducing wetland impacts and water pollution. Traditional buildable lot standards only consider front, side, and rear setbacks without addressing environmental constraints to development.[44] Yet even the traditional buildable lot provides environmental benefits when side, rear, and front yard setbacks increase the separation between adjoining septic systems and nearby wetlands and streams.

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[43] Hill, D.E., C.R. Frink, Longevity of Septic Systems in Connecticut Soils, Connecticut Agricultural Experiment Station, Bulletin 747, June 1974.pp. 12, 19-20

[44] Prior to 1982, traditional buildable lot requirements meant a lot must comply with front, side and rear yard setbacks. The concept that a lot was not buildable due to environmental constraints – steep slopes, wetlands, shallow to bedrock, floodplains, etc. – only emerged after 1) the enactment of Public Act 155, An Act Concerning Inland Wetlands and Watercourses, in 1972, 2) the revision of the Connecticut Public Health Code in 1982 and 3) the passage of the Flood Disaster Protection Act of 1973 which made flood insurance mandatory under the National Flood Insurance Program. Indeed, despite these environmental drivers affecting what are now generally referenced as buildable lot standards, there are still two urban municipalities that continue to define a buildable lot by the traditional requirement that all side, rear and front yard setbacks can be met.

Reforms that institute and normalize septic system inspection and maintenance can provide important public health and environmental benefits on lots (generally undersized) that were developed prior to the advent of evidence-based regulation.

Soil-Based Zoning

An alternative approach to the "one size fits all" strategy for creating minimum district-wide lot sizes is the adoption of soil-based zoning. This approach limits the density of development based on the underlying soils in each district. Using this approach seven municipalities (Bridgewater, Deep River, Kent, Killingworth, Sharon, Washington, and Woodbury) established zoning districts commensurate with the carrying capacities of the soils. Ideally, municipalities that have taken this approach have determined the long-term densities of septic systems within each watershed. Siting septic systems that use soil-based zoning minimizes water quality degradation attributable to excessive discharge of phosphorus and nitrogen. These seven municipalities also have defined wetlands as an unbuildable lot factor. (Note that soil-based zoning is not a substitute for the use of the minimum buildable area planning tools. Even zones created using soil-based zoning must consider the gamut of soil types that may exist in any given subdivision – including wetland soil conditions. Soil-based zoning is a macro-scale planning tool whereas the MBL and MBA concepts are micro-scale planning tools.)

While soil-based zoning does not eliminate all water contamination – other sources of nitrogen include the use of fertilizers and food grinders in kitchens – it represents an important tool to reduce water contamination. Studies by the U.S. Geologic Survey have confirmed the water quality benefits of reduced densities in areas served by septic systems.[45] In this context, soil-based zoning reduces overall septic system densities but must still depend on site planning tools when evaluating the buildable lot characteristics of any given development proposal.

Note that soil-based zoning can be applied to manage all types of development, not just single-family residential or multi-family development.

CONCLUSION

Protecting wetlands requires a commitment to planning the shape and location of buildable lots. This does not happen by accident. Well-designed subdivision regulations can create a template for wetland- free lots or wetland-free minimum buildable squares or rectangles. These planning tools not only protect wetlands and water quality, but they also ensure septic system leaching fields can be installed in locations suitable for permanent use. In the last 100 years, the science of protecting groundwater and surface water quality has demonstrated the need for improved septic system design and maintenance standards. The evidence identified in this study establishes the minimum land use needs for long lasting septic systems. Based on that consideration, and other land development needs, at least two acres of buildable land is the minimum required which includes land for the septic system and that required to meet setback standards. This study has also determined that at least six tenths of an acre of land must be available for a septic system and the reserve leaching field to meet the wastewater demands for a three-bedroom dwelling unit. Furthermore, this study determined that flexible application of buildable area or buildable square tools should vary by the number of bedrooms.

[45] Ragone, S. E., B. G. Katz, G. E. Kimmel, and J. B. Lindner, Nitrogen in Ground Water and Surface Water From Sewered and Unsewered Areas, Nassau County, Long Island, New York, U.S. Geological Survey, 1980, p. 1; Persky, James, The Relation of Groundwater Quality to Housing Density, U.S. Geological Survey, 1986, p. 1

By taking this approach, zoning commissions can adopt a useful technique for improving the siting of septic systems. Instead of a "one size fits all" approach, a buildable square that varies by the number of bedrooms is better aligned with the goals of the Connecticut Public Health Code.

Yet minimum lot size is not driven only by the land use needs for a septic system in areas without public sewers. Traditional setback requirements for the front, side and rear yards can consume 50% or more of the minimum lot size in large lot zones. One space consuming factor influencing lot size is the required separation distance between a septic system and the drinking water well. Similarly, septic tanks must be setback from buildings as well as from wetland and watercourses. Additional space requirements apply to the building footprint, the footprint of driveways and accessory structures (e.g., swimming pools, ground mounted photovoltaic systems, underground storage tanks for heating oil or propane) and land available for gardens, open space, and flower beds.

The minimum buildable square or rectangle also represents an important tool for protecting wetlands and should be used universally where sewer services are not available. The benefits are threefold; 1) there will be fewer failing septic systems, 2) there will be fewer cases where wetlands are disturbed and 3) over the long term there is a strong case for regionalizing the inland wetland commission function, or improving the professional credentials of those managing wetlands, to reduce the workload placed on volunteers. The economics of regionalization or the use of licensed wetland professionals are quite favorable and would improve the review process – especially if it is supported by revised inland wetlands and watercourse legislation.

Consistency with the Regional Plan of Development

The Western Connecticut Council of Governments unanimously endorsed the infrastructure goals and policies of the 2020-2030 Regional Plan of Development that include renewable sewer avoidance policies. The three policies listed below are intended to assist municipal governments with the development of sewer avoidance and wetland protection policies using the concept of the minimum buildable area.

2020-2030 Sewer Avoidance Goals and Policies

1. Employ sewer avoidance strategies in areas where failing septic systems pose a clear and present danger to public water supplies, public recreational water bodies, and public groundwater supplies.
2. Identify appropriate community sewer systems for areas with failing septic systems where such systems cannot be cost effectively repaired.
3. Adopt more sophisticated buildable lot standards within zoning regulations for those municipalities where septic system failures have been endemic.

Strategies and Next Steps

With over 50 years of local efforts to protect wetlands in Western Connecticut, there are significant benefit to the ecology of the region and to the development of least cost housing by encouraging more sophisticated applications of the buildable lot concept for new development.

Goal 1: Employ sewer avoidance strategies in areas where failing septic systems pose a clear and present danger to public water supplies, public recreational water bodies, and public groundwater supplies.

Strategy 1: Develop minimum buildable square or rectangle concepts consistent with meeting public health code spatial requirements for septic systems.

Strategy 2: Encourage municipalities to establish increased setbacks for septic systems from waterbodies and public water supplies to achieve water quality protection standards and reduce hypoxia in Long Island Sound consistent with the directives of Public Act 21-29.

Strategy 3: Establish minimum lot size standards in non-sewered areas consistent with soil types, slopes, depth to groundwater and shallow to bedrock conditions. Consider soil-based zoning strategies like those adopted by Washington and Woodbury.

Strategy 4: As an alternative to strategy 3 above, develop model zoning regulations that eliminate the minimum lot size concept altogether. Taking this approach, develop performance standards based on the minimum buildable square or rectangle consistent with public health code driven land area requirements supplemented by traditional property line setbacks, and impervious cover standards.

Goal 2: Identify appropriate community sewer systems for areas with failing septic systems where such systems cannot be cost effectively repaired.

Strategy 1: Identify the range of community sewer system options allowed by the Connecticut Public Health Code and the Connecticut Department of Energy and Environmental Protection and evaluate the relative costs and benefits of the options available.

Goal 3: Adopt more sophisticated buildable lot standards within zoning regulations for those municipalities where septic system failures have been endemic.

Strategy 1: Develop a model regulation for a buildable square or buildable rectangle planning tool to simplify the siting of septic system leaching fields.

Strategy 2: Encourage municipalities to adopt a townwide approach to the use of minimum buildable area, minimum buildable square or rectangle concepts to ensure environmental protection is applied to all land including commercial and industrial users.

APPENDICES

Appendix A: Examples of Buildable Lot Regulations Used in Connecticut

A. East Lyme, Connecticut
B. Sprague, Connecticut
C. Old Lyme, Connecticut
D. Lebanon, Connecticut
E. Orange, Connecticut
F. Fairfield, Connecticut
G. Derby, Connecticut
H. Groton, Connecticut

A. *Buildable Lot Area Regulation Adopted By East Lyme Planning and Zoning Commission*

LOT SIZE – Lot size shall be as specified for each district. In addition, all lots created after 8/11/1999 in the RU-40 and RU-80 Districts that are to be served by on-site septic systems shall meet minimum area of buildable land requirements. The term "minimum area of buildable land" is hereby defined to mean a parcel of land which contains at least 20,000 square feet of contiguous land meeting all of the following criteria:

A. Such minimum area of buildable land shall be capable of containing within its boundaries a parallelogram with side lengths of no less than 100 ft. on a side and no angles less than 75 degrees.

B. Such minimum area of buildable land shall not include any land determined to be inland wetlands or tidal wetlands as defined by the Connecticut General Statutes.

C. No more than 20% of such minimum area of buildable land shall be comprised of topography exceeding a 25% slope in grade as measured in 40-foot increments throughout the minimum area of buildable land.

D. A total of no more than 25% of such minimum area of buildable land shall be encumbered by easements including, but not limited to, easements for vehicular access, drainage and utilities. There are no limits for conservation easements.

E. Such minimum area of buildable land may include land within required setback areas.

F. A zoning compliance chart shall accompany each lot.

G. Lots within a conservation by design subdivision are excluded from this section.

B. *Buildable Lot Conservation Subdivisions adopted by Sprague Planning and Zoning Commission*

Any lot within a Conservation Subdivision with reduced lot area shall contain a minimum contiguous area of no less than the minimum lot area as required through separating distances as specified under the State of Connecticut Public Health Code as may be amended, and contain no land defined as unbuildable under these regulations. All lots served by a private, on-site subsurface sewage disposal system shall be designed to accommodate construction of a four-bedroom house.

Any lot within a Conservation Subdivision into which open space is incorporated by way of conservation easement, shall exceed the minimum lot area requirement for that zone by a minimum of 100%, and contain no land defined as unbuildable under these regulations.

C. *Minimum Buildable Area Regulations Adopted by Old Lyme Planning and Zoning Commission*

Minimum Area of Buildable Land.

In order to reduce the threat of pollution to the surface and ground waters of the Town and to protect the public health and safety of present and future residents, no Lot as defined in Section 3 of these Regulations (hereinafter in this Section 8.4 called a "Lot") shall, after June 15, 1990, be created by the division of any Lot or Parcel, unless such resulting Lot(s) contains a Minimum Area of Buildable Land as defined in Section 8.4.a, provided, however, that this restriction shall not apply to new Lots created in any Waterfront Business District. Lots created on or prior to June 15, 1990, shall not be subject to the restrictions of this Section. The following are applicable to requirements for Minimum Area of Buildable Land:

[Amended Effective 4/3/95 and 3-7-08]

a. Definition. The term "Minimum Area of Buildable Land" is hereby defined to mean an area within a Lot ("the MABL Area") which contains at least 30,000 square feet of contiguous land which meets all of the following criteria:

(i) The MABL Area shall be capable of containing within its boundaries a piece of land in the shape of a square no less than 125 feet long on a side;

(ii) The MABL Area shall not include any land determined by a certified soils scientist to be Inland Wetlands, Watercourses, or Tidal Wetlands or any land located in a Special Flood Hazard Area as identified on the latest Flood Insurance Rate Map [2 year flood reference removed effective 6-1-11];

(iii) No more than 15% of the MABL Area shall be comprised of topography exceeding a 20% slope in grade as measured in 40-foot increments throughout the Area;

(iv) The MABL Area shall not include any land having ground water higher than 18 inches below the undisturbed ground surface as determined by mottling or seasonal high water, whichever is higher; [This subsection amended effective January 1, 1996, and 3-7-08]

(v) The MABL Area shall not include any land where soil test holes indicate the presence of ledge rock located within 24 inches below the undisturbed ground surface; [This subsection amended effective January 1, 1996, and 3-7-08]

(vi) A total of no more than 10% of the MABL Area shall be encumbered by Easements, including, but not limited to, Easements for vehicular access, drainage and utilities; and,

(vii) The MABL Area may include land within Required Yard areas.

D. *Buildable Lot Regulations Adopted by the Lebanon Planning and Zoning Commission*

5.4 MINIMUM BUILDABLE AREA CRITERIA

a. Purpose

In order to carry out the purposes described in Section 1.1 of these regulations; assure that a suitable area of buildable land exists to accommodate structures, open space, well, septic system, driveway, yard area and/or other improvements; ensure the ability of on-site septic systems to function indefinitely; and to facilitate appropriate development, the standards contained in this section shall apply to each lot or parcel of land to be approved for any development or use in any zone which will

utilize an on-site septic system, except that the minimum buildable area criteria shall not apply to lots that are part of a Conservation Subdivision Development (amended 8/25/08).

b. Standards

1) Each lot or parcel shall contain:

a) A minimum contiguous "buildable area" of 60,000 square feet free of wetland soil types, waterbodies and watercourses, as defined by Connecticut General Statutes, for the basic 2-acre building lot required for a 1-family dwelling as shown in 5.2 of these regulations. Where other lot sizes are required by these regulations the formula that will apply is that the minimum buildable area shall be 75% of the minimum acreage requirement and the minimum width of this buildable area shall be 90% of the minimum width requirement for the lot.

b) Such "buildable area" shall be a rectangle no less than 180 feet wide at any point (effective 8/1/06).

c) A special permit, granted by the Commission in accordance with section 7.6 of these regulations shall be required where more than 20% of the "buildable area" of a lot contains slopes in excess of 20%.

d) This amendment shall be applied only to lots created or approved on or after October 13, 1987.

e) Dwellings or other principal structures must be sited within the buildable area, or located on the lot in such a way that wetlands or wetland areas do not separate the structure from the buildable area.

f) The "buildable area" shall contain no utility easements, conservation easements, drainage easements or any other easement which significantly limits the use of the lot from those permitted (effective 1/2/04).

E. Buildable Lot Regulations Adopted by the Orange Planning and Zoning Commission

LOT AREA AND SHAPE — In determining compliance with minimum lot area and shape requirements of these Regulations, land subject to conservation easements, sight easements and easements for drainage facilities, sanitary sewer facilities, public utility distribution lines and underground public utilities may be included, but no right-of-way for a street or highway, easement of vehicular access, private right-of-way for vehicles or easement for above ground public utility transmission lines may be included for compliance with minimum lot area and shape. The following are also applicable in determining compliance: [Amended 2-17-2004]

Area consisting of wetlands and watercourses, including ponds and lakes: Shall not be used for compliance with more than 10% of the minimum lot area requirement specified in the district.

a) Shall not be used for compliance with more than 10% of the required minimum shape consisting of a square with the minimum dimension specified in the district.

(b) In a residence district shall be excluded from lot area in determining eligible square footage of all building and other structures on the lot and eligible ground coverage by buildings and other structures on the lot.

(c) (1) Area consisting of slopes in excess of 25% grade, greater than 1,000 square feet, at predevelopment conditions:

Shall not be used for compliance with the minimum Lot area requirement specified in the district.

a) Shall not be used for compliance with the required minimum shape consisting of a square with the minimum dimension specified in the district; and

(b) In a residence district shall be excluded from lot area in determining eligible square footage of all building and other structures on the lot and eligible ground coverage by buildings and other structures on the lot.

(c) Land in two or more zoning districts may be used to satisfy a minimum lot area requirement provided that the requirement of the district requiring the largest lot area is met, but no land in a Residence District shall be used to satisfy a minimum lot area requirement or minimum lot shape requirement in any other district.

F. *Buildable Lot Regulations adopted by the Fairfield Planning and Zoning Commission*

Lot Area and Shape: In determining compliance with the minimum lot area and shape requirements of the Zoning Regulations, land subject to underground easements may be included, but no street or highway, easement for vehicles or easement for above ground public utilities (other than utility easements serving a private residence) may be included. The area of any portion of a lot which has a width of less than 50 percent of the minimum lot square width in the District in which it is located shall not be included in the lot area calculation. This provision is not intended to exclude the area between two intersecting property lines that meet at an angle equal to or greater than sixty (60) degrees. All contributing portions of a lot for purposes of minimum lot area shall be contiguous, meaning that no contributing area of a lot shall be separated by non-contributing areas of the lot. The area of the minimum square required on each lot shall be exclusive of wetlands, watercourses, conservation easements, or any other restriction other than setbacks which would prevent actual house construction within the square.

G. *Buildable Area Regulations Adopted by the Derby Planning and Zoning Commission*

BUILDABLE AREA -- The area of a lot remaining after the minimum yard and open space requirements of the Zoning Ordinance have been met. (See Figure 20, Buildable Area Regulations Graphic Adopted by the Derby Planning and Zoning Commission).

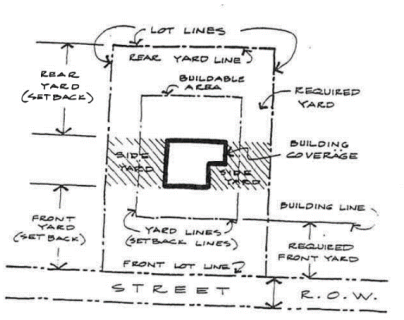
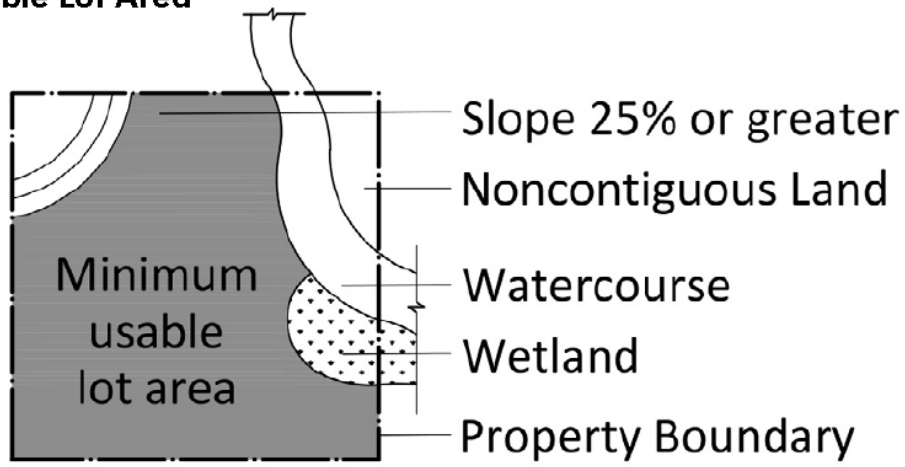


Figure 20

H. Minimum Buildable Lot Area and Graphics Adopted by Groton Planning and Zoning Commission

1. **Septic System**: All components of on-site septic systems, including septic reserve areas, must be located 100 feet from the edge of any sensitive Water Resource Protection District (WRPD) surface waters and their directly adjacent wetlands.

Minimum Useable Lot Area



Building Coverage Regulations Graphic Adopted by the Wilton Planning and Zoning Commission

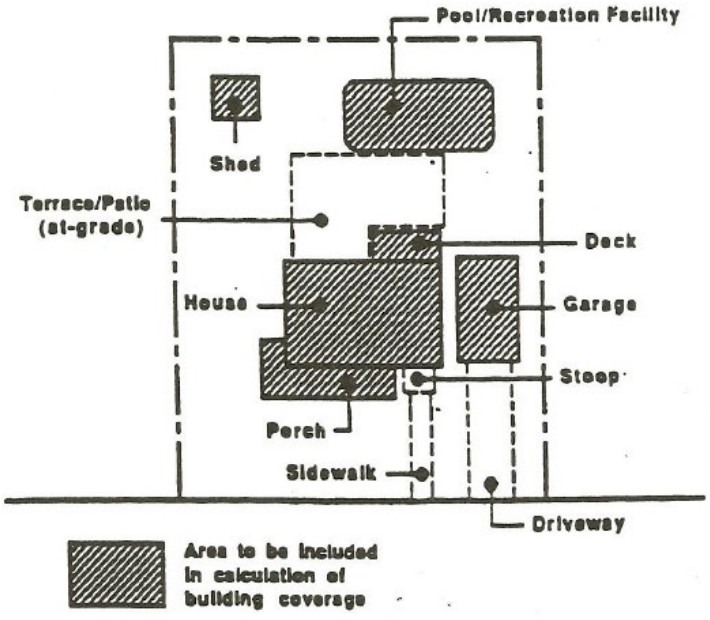
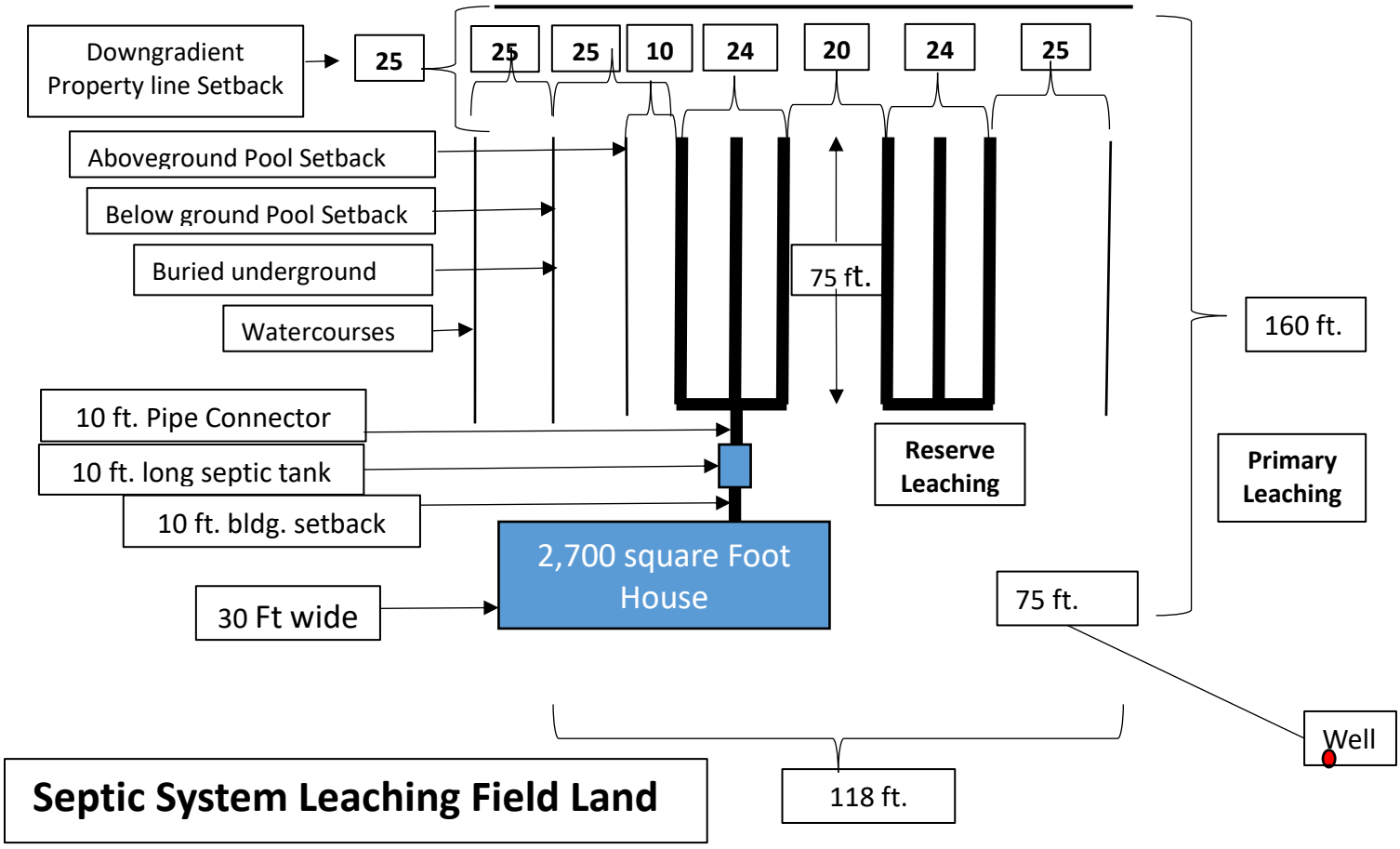


FIGURE A-2: BUILDING COVERAGE

Appendix B: Schematic of Septic System Dimensional Requirements for Three Bedroom House



Appendix C: Buildable Lot Standards for Specific Development: Excluding Wetlands

Land Code	Type of Development	Number of Municipalities
	Residential Development Applications	
1	Adult and Retirement Zones	5
1	Affordable housing & Housing Opportunity Zones	3
1	Multi-Family Development	3
1	Residential Zones	20
1	Single and Multi-family Housing	1
	Subdivision Applications	
2	Cluster Subdivision	1
2	Cluster Development	3
2	Conservation Subdivisions and Open Space Development	8
	Environmental Protection Applications	
3	Watershed Zones	1
3	Riparian Corridor	1
	Commercial and Mixed-Use Development	
4	Mixed Use Development	1
4	Planned Area Development	1
4	Special Permit Uses	1
	Areas without Public Sewer Service	
5	Non-Sewered areas	4
	Grand Total	**53**

Appendix D: Municipalities with Buildable Lot Criteria for Wetlands

Municipalities Where Wetland Exclusion Applies to all Lots Governed by Buildable Lot Standards:

Ansonia	East Windsor	Middlebury	Thomaston
Avon	Ellington	Morris	Thompson
Beacon Falls	Enfield	New Haven	Tolland
Berlin	Essex	New Milford	Union
Bethany	Fairfield	Newtown	Vernon
Bethel	Goshen	North Branford	Voluntown
Bloomfield	Granby	Old Saybrook	Wallingford
Bolton	Haddam	Orange	Warren
Branford	Hamden	Oxford	Washington
Bridgewater	Hampton	Pomfret	Watertown
Burlington	Hartland	Preston	West Haven
Chaplin	Kent	Redding	Westbrook
Colchester	Killingworth	Roxbury	Weston
Columbia	Lebanon	Scotland	Westport
Cornwall	Lisbon	Southbury	Willington
Coventry	Lyme	Stafford	Winchester
Deep River	Madison	Sterling	Windham
East Haven	Marlborough	Stonington	
Grand Total	**71**		
No Wetland Exclusion	**96**		

Appendix E: Developable Land after Setbacks in Largest and Smallest Lot Zones

Developable Land in Smallest Lot Zones after Exclusion of Land within Setbacks (sq. ft. and ft.)

Municipality	Minimum Area (sq ft)	Minimum Width	Minimum Depth (ft)	Front Yard	Side Yard	Rear Yard	Usable Area After Setbacks	Percent of Lot Usable
Bethel	10,000	80	125	20	5	35	4,900	49.0%
Bridgewater	87,120	150	581	50	25	40	49,080	56.3%
Brookfield	7,000	50	140	20	10	10	3,300	47.1%
Danbury	8,000	50	160	20	8	35	3,570	44.6%
Darien	8,712	60	145	25	8	25	4,189	48.1%
Greenwich	7,500	60	125	25	7.5	25	3,375	45.0%
New Canaan	15,000	75	200	25	8	25	8,850	59.0%
New Fairfield	43,560	125	348	40	20	50	21,971	50.4%
New Milford	5,000	40	125	10	5	20	2,850	57.0%
Newtown	21,780	100	218	35	20	20	9,768	44.8%
Norwalk	5,000	50	100	30	6	15	2,090	41.8%
Redding	21,780	100	218	40	15	30	10,346	47.5%
Ridgefield	7,500	50	150	25	8	8	3,978	53.0%
Sherman	80,000	200	400	50	25	25	48,750	60.9%
Stamford	5,000	50	100	20	6	30	1,900	38.0%
Weston	87,120	170	512	10	30	30	51,972	59.7%
Westport	5,000	50	100	30	6	6	2,432	48.6%
Wilton	43,560	150	290	40	30	40	18,936	43.5%
Average	**26,035**	**89**	**224**	**29**	**13**	**26**	**14,014**	**49.7%**

Developable Land in Largest Lot Zones after Exclusion of Land within Setbacks (sq. ft. and ft.)

	Minimum Area (sq ft)	Minimum width	Minimum Depth (ft)	Front Yard	Side Yard	Rear Yard	Usable Area After Setbacks	Percent of Lot Usable
Bethel	80,000	160	500	50	25	40	45,100	56.4%
Bridgewater	174,240	250	697	75	50	50	85,794	49.2%
Brookfield	100,000	200	500	50	50	50	40,000	40.0%
Danbury	80,000	125	640	50	40	40	24,750	30.9%
Darien	87,120	200	436	50	35	50	43,628	50.1%
Greenwich	174,240	200	871	75	50	75	72,120	41.4%
New Canaan	174,240	350	498	50	50	50	99,457	57.1%
New Fairfield	87,120	155	562	75	35	60	36,300	41.7%
New Milford	160,000	200	800	100	60	80	49,600	31.0%
Newtown	130,680	275	475	50	40	50	73,164	56.0%
Norwalk	43,560	150	290	40	30	15	21,186	48.6%
Redding	174,200	300	581	60	50	60	92,133	52.9%
Ridgefield	130,680	200	653	50	50	50	55,340	42.3%
Sherman	160,000	250	640	50	40	40	93,500	58.4%
Stamford	130,680	200	653	60	35	70	68,042	52.1%
Weston	87,120	170	512	10	30	30	51,972	59.7%
Westport	87,120	200	436	50	50	50	33,560	38.5%
Wilton	87,120	200	436	50	40	50	40,272	46.2%
Average	**119,340**	**210**	**566**	**55**	**42**	**51**	**56,995**	**47.4%**

Appendix F: Buildable Lot Regulations Adopted by Municipal Subdivisions: 2023

County	Political Subdivisions (Cities, Boroughs, and Districts) with Zoning Regulations	Municipality in which Political Subdivision is Located	Have Buildable Lot regulations excluding wetlands?	Application of Buildable Lot Standard?
Litchfield	Borough of Bantam	Litchfield	No	
Windham	Danielson	Killingly	No	
Middlesex	Borough of Fenwick	Old Saybrook	No	
New London	Groton City	Groton	Yes	Multi-Family development
New London	Groton Long Point	Groton	No	
New London	Jewett City	Griswold	No	
New London	Noank Fire District	Groton	No	
New London	Borough of Stonington	Stonington	Yes	All Subdivisions

Appendix G: Minimum Buildable Lot Standards for Wetlands Using Discount Formulas

Minimum Buildable Lot Standards Excluding Wetlands Based on Discount Formulas: Connecticut Municipalities with Townwide Standards

Wallingford	VBZ	Stafford	50%	Middlebury	25%
Hartland	MCBA	Westbrook	35%	Weston	20%
Stonington	DOWO	Killingworth	25%	Westport	20%
East Haven	75%	Morris	25%	Southbury	15%
Fairfield	75%	Redding	25%	Watertown	15%
Bloomfield	50%	Beacon Falls	25%	Orange	10%
Enfield	50%	Berlin	25%	North Haven	10%

DOWO = Depend on wetlands on site
VBZ = Varies by zone. Wallingford has 20 zones with a 20% wetland discount on buildable land and three zones with 35%, 40%, and 50% discounts
MCBA = Minimum Contiguous Buildable Acreage of ¾ Acre

Stonington Zoning Regulation Approach

Percent of Regulated Inland Wetland on Site	Percent of Regulated Inland Wetland Area Countable for Density Calculations
Less than or equal to 10	90
11 - 24	75
25 - 40	60
41 - 60	40
61 - 75	30
76 -100	25

Appendix H: Buildable Lot Rules Excluding Wetlands by Planning Region

Buildable Lot Zoning Regulations Including Those Excluding Wetlands that Apply Townwide: by Council of Governments Region: May 2023

Planning Region	Munis. in Region	Munis. with Townwide Buildable Lot Regs.	Munis. with Townwide Buildable Lot Regs. Excluding Wetlands	% of Munis. with Townwide Buildable Lot Regs.	% of Munis. with Townwide Buildable Lot Regs. Excluding Wetlands
Capitol Region	38	17	15	44.7%	39.5%
Greater Bridgeport	6	1	1	16.7%	16.7%
Lower CT River Valley	17	9	7	52.9%	41.2%
Naugatuck Valley	19	8	7	42.1%	36.8%
Northeastern	16	8	8	50.0%	50.0%
Northwest Hills	21	10	10	47.6%	47.6%
South Central	15	10	10	66.7%	66.7%
Southeastern	19	7	6	36.8%	31.6%
Western	18	9	7	50.0%	38.9%
Grand Total	**169**	**79**	**71**	**46.7%**	**42.0%**

Note: Eastford and Bethlehem do not have zoning. Eastford is in the Northeastern COG and Bethlehem is in the Naugatuck Valley COG. Source: WestCOG staff analysis of the zoning regulations in the 167 municipalities with zoning.

Appendix I: Buildable Lot Exclusion Criteria Adopted by Municipalities

Y = criterion is local regulations
(blank) = criterion is not in local regulations

Municipality	Wetlands	Watercourses	Steep Slopes	Flood Hazard Zones	Easements	Bedrock & Ledge	Natural Soils Close to Groundwater	Narrow Strip of Land	Critical Coastal Resources
Ansonia	Y	Y	Y		Y				
Avon	Y	Y	Y						
Beacon Falls	Y	Y	Y		Y				
Berlin	Y	Y							
Bethany	Y	Y	Y		Y				
Bethel	Y	Y	Y						
Bloomfield	Y	Y	Y	Y	Y			Y	
Bolton	Y	Y							
Branford	Y		Y		Y				Y
Bridgewater	Y	Y		Y					
Burlington	Y	Y	Y	Y					
Chaplin	Y	Y	Y	Y		Y		Y	
Colchester	Y	Y	Y	Y	Y	Y			
Columbia	Y	Y	Y	Y	Y				
Cornwall	Y	Y	Y		Y				
Coventry	Y	Y	Y			Y	Y		
Danbury		Y			Y				
Deep River	Y	Y		Y			Y		
Derby									
Durham					Y		Y		
East Hampton									
East Haven	Y	Y	Y		Y				
East Windsor	Y	Y	Y	Y					
Ellington	Y	Y	Y	Y					
Enfield	Y		Y	Y					
Essex	Y	Y	Y						
Fairfield	Y	Y		Y	Y			Y	
Franklin			Y				Y		
Goshen	Y						Y		
Granby	Y	Y	Y						
Greenwich									
Haddam	Y	Y	Y	Y	Y				
Hamden	Y		Y						
Hampton	Y	Y			Y				
Hartland	Y						Y		
Kent	Y								
Killingworth	Y	Y	Y	Y		Y	Y		
Lebanon	Y	Y	Y		Y		Y		
Lisbon	Y	Y	Y	Y	Y	Y			
Lyme	Y	Y		Y		Y	Y		Y

Municipality	Wetlands	Watercourses	Steep Slopes	Flood Hazard Zones	Easements	Bedrock & Ledge	Natural Soils Close to Groundwater	Narrow Strip of Land	Critical Coastal Resources
Madison	Y	Y	Y						
Marlborough	Y	Y	Y	Y					
Middlebury	Y	Y			Y				
Morris	Y	Y			Y				
New Haven	Y	Y		Y					Y
New Milford	Y	Y	Y		Y			Y	
Newtown	Y	Y	Y	Y					
North Branford	Y	Y			Y				
Old Saybrook	Y		Y	Y	Y	Y	Y		
Orange	Y	Y	Y		Y				
Oxford	Y		Y		Y				
Pomfret	Y	Y	Y	Y	Y	Y			
Preston	Y	Y	Y						
Redding	Y	Y		Y	Y			Y	
Roxbury	Y								
Scotland	Y		Y		Y				
Simsbury		Y							
Southbury	Y	Y			Y				
Stafford	Y		Y	Y	Y				
Sterling	Y	Y	Y	Y	Y	Y			
Stonington	Y	Y							Y
Thomaston	Y	Y	Y						
Thompson	Y	Y	Y	Y	Y	Y			
Tolland	Y	Y	Y		Y	Y			
Union	Y	Y	Y						
Vernon	Y		Y	Y					
Voluntown	Y	Y	Y	Y	Y	Y			
Wallingford	Y	Y	Y		Y				
Warren	Y	Y	Y		Y				
Washington	Y								
Watertown	Y	Y			Y				
West Hartford									
West Haven	Y			Y	Y				
Westbrook	Y	Y							Y
Weston	Y	Y			Y				
Westport	Y	Y	Y		Y				
Willington	Y	Y							
Winchester	Y	Y	Y	Y					
Windham	Y	Y	Y			Y			
Total (yes)	**71**	**59**	**48**	**28**	**38**	**13**	**10**	**5**	**5**

Appendix J: Worst Case Factors Influencing the Buildable Square or Rectangle Size

Percolation Rate	The percolation rate used in this analysis assumes the worst case of 45.1 to 60 minutes for the leachate to drop one inch. Using the 45.1 to 60 minute percolation rate doubles the effective leachate area required compared to a site where leachate drops one inch in 10.1 minutes or less in an hour.
Setbacks for Pools, tanks & accessory Bldgs.	The analysis assumes that leaching field setbacks will be needed over the long term for the potential installation of aboveground (10 ft.) or below ground swimming pools (25 ft.), underground storage tank (25 ft.), or accessory buildings (10 ft.). Not being able to install these amenities diminishes the long term value of the property.
Property Line Setbacks	The sewage tank and reserve leaching field area must be 10 feet from the property line. In addition, the leaching field must be 25 feet from the downgradient property line.
Wetland & Watercourse Buffer Setbacks	The Public health Code requires a 50 foot setback from wetlands and watercourses. This is not a worst case analysis based on scientific evidence indicating a 100 feet setback provides greater water quality protections than the 50 foot setback. Under a worst case analysis wetland buffers would be required on three of the four sides of the septic system. Worst case analysis assumes that a standard buildable square should be effective for use in any residential zone using one specific lot size across that zone. Many municipalities vary the minimum buildable square based on the minimum lot size for each distinctly different residential zone but fail to vary it within the residential zones even though there may be variations in wetlands, steep slopes and other soil related impediments to development.
Water Well Setback	The Public Health Code requires a 75 foot setback from the leaching field when water withdrawal rates are less than 10 gallons per minutes (GPM). When the percolation rate is less than one minute per inch and the leaching field is less than eight (8) feet above ledge the distance must be doubled. For practical purposes, virtually all single family residences will only require a 75 foot setback from the leaching field. However, dwellings that use 10 to 50 GPM require a 150 foot setback. This analysis assumes a 75 foot setback – reflecting the most probable worst case scenario.
Closed Loop Geothermal Setback if not downgradient	The Public Health Code requires Closed loop geothermal systems to be 50 feet from a leaching field when the geothermal system is downgradient. Otherwise, the closed loop geothermal systems can be 25 feet from the leaching field. With the increased focus on renewable forms of energy, it is expected geothermal energy will be more commonly used in future years.

Appendix K. Suggested Readings

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