



2024 MALSCCE Convention

The Evolution of Our Profession



Boxboro Regency Hotel & Conference Center

242 Adams Place, Boxborough, MA 01719

Friday and Saturday, March 1 & 2, 2024

7:00 AM - 10:00 PM Friday

7:00 AM - 1:30 PM Saturday

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Letter of Welcome

The Evolution of Our Profession

The Cape Cod Chapter welcomes you to the 2024 MALSCCE Convention! This year's organizing theme is *The Evolution of Our Profession*. As all employers and aging professionals (I hate to admit it but myself included) continue to struggle with recruitment, retaining staff, and project demands, it's hard for business leaders, seasoned PLSs, survey technicians, and others working in the field of land surveying to take advantage of MALSCCE's professional development opportunities. Thank you for taking time out of your schedules to attend this year's convention, which I hope will be a successful one!

When I first became a member of MALSCCE I viewed it as an invaluable resource that still remains with me today. The many connections that I have made throughout the years as a MALSCCE member continue to provide me with resources that have greatly benefited my career as a land surveyor. I encourage all of you to emphasize the importance of being involved to your staff and colleagues.

We have some relevant sessions for you to attend. As always, please take time to visit the vendors that have come to provide insight into the new advancements of technology and the tools that we use as their continued commitment to our profession is often underappreciated. Be sure to cast your votes in the 2024 MALSCCE Plan and Field Notes Contests. Join us for the convention's Reception and Auction to Benefit the MALSCCE Education Trust and take advantage of the other opportunities to network with your peers.

Thank you to my convention cochair Paul Campbell and other Convention Planning Committee members Mark Annis and Brian Koczela, the Cape Cod Chapter, Rich Keenan, and Michelle Monette for their support and hard work!

Sincerely,



Todd Chapman, PLS, CFS
MALSCCE Cape Cod Chapter President

2024 MALSCCE Convention

Schedule of Events

Friday, March 1, 2024

7:00 AM - 4:30 PM

Registration Desk Open

Promenade

7:50 AM - 8:00 AM

Opening Remarks

Todd M. Chapman, PLS, CFS, Tighe & Bond, MALSCCE Cape Cod Chapter President

The Parade Room

8:00 AM - 4:00 PM

2024 MALSCCE Plan and Field Notes Contests

The Parade Room

8:00 AM - 4:30 PM

Convention Exhibit Open

The Parade Room

8:00 AM - 9:00 AM

Session 1A: MA DCR – Flood Hazard Management Program

Joy Duperault, CFM, State NFIP Coordinator/Director, Flood Hazard Management Program, Massachusetts Department of Conservation & Recreation (DCR)

Federal Room

8:00 AM - 9:00 AM

Session 1B: Progressing from a Survey Technician to Professional Land Surveyor

Sponsored by the MALSCCE Eastern Massachusetts Chapter William "Terry" McGovern, PLS, Project Manager, Zenith Land Surveyors LLC, and Adjunct Faculty, Benjamin Franklin Cummings Institute of Technology

Colonial Room

9:00 AM - 9:15 AM

Break

The Parade Room

9:15 AM - 10:30 AM

General Session: A Guide to the Practice of Architecture, Engineering, and Land Surveying in Massachusetts

Moderator: Paul S. Campbell, PE, PLS, Principal Owner, CHESSE Engineering, LLC and MALSCCE Vice President

Presenters: Kenneth Anderson, PLS, Owner, Anderson Surveys, Inc., and Member, Massachusetts Board of Professional Engineers and Land Surveyors and Paul S. Campbell, PE, PLS, Principal Owner, CHESSE Engineering, LLC and MALSCCE Vice President Azuanuka O. Etoniru, PE, PLS, President, E.T. Engineering Enterprises, Inc. and Secretary, Massachusetts Board of Professional Engineers and Land Surveyors

Colonial Room

10:30 AM - 12:15 PM

General Session: MALSCCE Proprietors' Council Panel Discussion

Moderator: Michael A. Clifford, PLS, Principal, DGT Associates, MALSCCE Proprietors' Council Chair

Featured Panelists: Kenneth Conte, PLS, Principal, Beals and Thomas, Inc.; Paul R. Foley, PLS, President, Feldman Geospatial; Brian E. Koczela, PLS, Owner/Manager, BEK Associates

Federal Room

12:15 PM - 1:45 PM

Lunch, MALSCCE Annual Meeting and Awards Presentations

Presiding: Kenneth Conte, PLS, Principal, Beals and Thomas, Inc., MALSCCE President

The Parade Room

1:45 PM - 3:45 PM

General Session: Convention Exhibits & Exhibitor Demonstrations

Sponsored by the MALSCCE Western Massachusetts Chapter

The Parade Room & Outdoors

1:45 PM - 2:45 PM

Breakout Session: North East Surveying Societies Meeting

Moderator: Kenneth Conte, PLS, Principal, Beals and Thomas, Inc., MALSCCE President

Colonial Room

3:45 PM - 4:00 PM

Break

The Parade Room

4:00 PM - 5:00 PM

Session 5A: Various Types of Boundaries in Massachusetts Property, Land Use, and Environmental Law, Where They Are, and How They Change

Gregor I. McGregor, Esq., Founding Partner, McGregor Legere & Stevens PC

Federal Room

4:00 PM - 6:00 PM

Session 5B: Integrating Small Unmanned Airborne Systems (sUAS) Into a Geospatial Business

Sponsored by the MALSCCE Central Massachusetts Chapter

Joseph V.R. Paiva, PhD, PS, PE, CEO, Chief of Curriculum Development, GeoLearn, LLC

Colonial Room

5:00 PM - 5:15 PM

Break (Track A Session Attendees)

The Parade Room

5:15 PM - 5:45 PM

Session 6A: Promoting Careers in Land Surveying

David P. Prince, PLS, Vice President Survey Services, WSP USA, MALSCCE Public Awareness Committee Chair

Federal Room

6:00 PM - 7:00 PM

MALSCCE Education Trust Benefit Auction/Reception

Terrace Bar

7:00 PM - 7:30 PM

Break

7:30 PM - 8:30 PM

Dinner

Federal Room

8:30 PM - 9:30 PM

Beer Tasting

Featuring a selection of beers from Moon Hill Brewing Co.

Federal Room

Saturday, March 2, 2024

7:00 AM - 2:00 PM

Registration Desk Open

Promenade

7:00 AM - 8:00 AM

MALSCCE Board of Directors Breakfast Meeting

Presiding: Kenneth Conte, PLS, Principal, Beals and Thomas, Inc., MALSCCE President

Federal Room

8:00 AM - 10:00 AM

General Session: Business Aspects in the Profession of Land Surveying

Joseph V.R. Paiva, PhD, PS, PE, CEO, Chief of Curriculum Development, GeoLearn, LLC

Colonial Room

8:00 AM - 10:00 AM

Fundamentals of Surveying Exam Refresher Course

Clark R. Donkin, PLS, District Survey Supervisor, MassDOT Highway Division

Cotillion Room

10:00 AM - 10:30 AM

Break

Federal Room

10:30 AM - 12:30 PM

General Session: Business Aspects in the Profession of Land Surveying (Continued)

Colonial Room

10:30 AM - 12:30 PM

Fundamentals of Surveying Exam Refresher Course (Continued)

Cotillion Room

12:30 PM - 1:30 PM

Lunch

Federal Room

1:30 PM - 3:30 PM

Fundamentals of Surveying Exam Refresher Course (Continued)

Cotillion Room

3:30 PM - 3:45 PM

FS Refresher Course Attendee Break

Promenade

3:30 PM - 5:30 PM

Fundamentals of Surveying Exam Refresher Course (Continued)

Cotillion Room



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2024 MALSCCE Convention

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Bluesky Geospatial Ltd.

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Shaun Vincent: 413/655 1458, shaun.vincent@bluesky-world.com

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Phone: 603/296-2376

Rick Ladd: 603/296-2376, rladd@cadnetservices.com

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Todd Carlson: 617/852-0246, tcarlson@carlsonsw.com

Founded in 1983, Carlson Software Inc. specializes in CAD design software, field data collection, and machine control products for the land surveying, civil engineering, and construction industries worldwide, providing one-source technology solutions from data collection to design to construction. Carlson Software's dedication to customer service is unique in the industry.

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Franklin Cummings Tech offers professional land surveying courses online and in the evenings to accommodate working adults. We offer two courses each semester, and courses confer college credits. If you are looking to become a registered Professional Land Surveyor in Massachusetts, our program may be a great fit!

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Mike Miller: 484/725-9707, mmiller@keypre.com

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2024 MALSCCE Convention

Friday, March 1, 2024

Featured Sessions

7:50 AM – 8:00 AM

Opening Remarks



Todd M. Chapman, PLS, CFS, Senior Project Manager, Tighe & Bond, MALSCCE Cape Cod Chapter President and MALSCCE Convention Planning Committee Co-chair

Todd M. Chapman is a senior project manager at Tighe & Bond. He is experienced in all aspects of land surveying, and his experience includes deed and plan research and preparing subdivision plans, Approval Not Required plans, Land Court petition plans, certified plot plans, and condominium plans for recording at Registries of Deeds and/or for filing with the Massachusetts Land Court.

8:00 AM – 9:00 AM

Concurrent Session 1A: MA DCR – Flood Hazard Management Program

During this session, you'll learn about the Massachusetts Department of Conservation & Recreation's Flood Hazard Management Program (FHMP) and the technical assistance FHMP staff can provide to surveyors. Massachusetts' higher floodplain management standards, typical violations seen during the Community Assistance Visit process, deficiencies commonly seen on Elevation Certificates, how to find the local Flood Plain Administrator, and current FEMA progress on Massachusetts maps are some of the matters Joy will discuss.



Joy Duperault, CFM, State NFIP Coordinator/Director, Flood Hazard Management Program, Massachusetts Department of Conservation & Recreation (DCR)

Joy is the director of the Commonwealth's Flood Hazard Management Program, overseeing the implementation of the National Flood Insurance Program (NFIP) in coordination with more than 340 NFIP communities in Massachusetts. Her responsibilities include coordination with other state agencies and organizations on state and local floodplain management issues, as well as technical assistance and training for local officials. She's been a Certified Floodplain Manager since 2009 and is a co-chair for the national Association of State Flood Plain Managers' Flood Mitigation Committee. Joy was formerly the state NFIP coordinator and deputy state hazard mitigation officer for the State of Florida, where she resided for 40 years before returning home to New England.

8:00 AM – 9:00 AM

Concurrent Session 1B: Progressing from a Survey Technician to Professional Land Surveyor

Sponsored by the MALSCCE Eastern Massachusetts Chapter

This session features a discussion of the educational requirements to become a registered professional land surveyor as well as required education and training within the profession as a whole. Topics include what makes land surveying as a profession different from other engineering professions, the variety of knowledge required and how that knowledge has been traditionally acquired, and how changing technology and business practices have changed the role of the surveyor. How training in the surveying industry differs from other traditional courses of study and opportunities to provide training and education that fit the profession will also be discussed.



William "Terry" McGovern, PLS, Project Manager, Zenith Land Surveyors LLC, and Adjunct Faculty, Benjamin Franklin Cummings Institute of Technology

Mr. McGovern is a registered land surveyor and state certified soil evaluator with over 35 years of experience in project management and performing boundary, topographic, pre-engineering, construction, and as built surveys. Mr. McGovern has also been design engineer for a wide variety of projects including design, permitting and construction of single family homes, commercial and industrial sites, residential and commercial subdivisions and municipal projects including roadway and utility projects. Mr. McGovern obtained professional registration as a land surveyor and certification as a soil evaluator in 1997.

9:15 AM – 10:30 AM

General Session: Professional Practice – A Guide to the Practice of Architecture, Engineering, and Land Surveying in Massachusetts

Don't miss this opportunity to hear two members of the Massachusetts Board of Professional Engineers and Land Surveyors present and answer questions about the recently updated guide titled Professional Practice – A Guide to the Practice of

Architecture, Engineering, and Land Surveying in Massachusetts and related matters. The Massachusetts boards of licensure for the professions assembled this guide to assist licensees in understanding their professional responsibilities as architects, professional engineers, or professional land surveyors, and to direct them to sources of information that can help answer questions arising in day-to-day practice of their profession.



Moderator: Paul S. Campbell, PE, PLS, Owner, CHESSE Engineering, and MALSCCE Convention Planning Committee Co-chair

Paul Campbell, PE, PLS, is the owner and operator of CHESSE Engineering, a land surveying and civil engineering firm specializing in land development. Paul Campbell has a bachelor's degree in civil engineering from Northeastern University, a master's degree in public administration from Clark University, and has worked 20+ years in the private and public sectors.



Kenneth Anderson, PLS, Owner, Anderson Surveys, Inc., and Member, Massachusetts Board of Professional Engineers and Land Surveyors

Licensed in 1983, Ken is fully qualified as an expert witness in boundary law disputes and has been retained by clients to act as an expert witness in Land Court and Superior Court. He has also been retained to act as an expert witness by the Commonwealth of Massachusetts Division of Professional Licensure for the Board of Registration of Professional Engineers and Land Surveyors. Ken is a former adjunct professor at Wentworth Institute of Technology, past president of the Massachusetts Association of Land Surveyors and Civil Engineers, and he was a trustee of The Engineering Center Education Trust for over ten years. In February 2020 Governor Baker appointed him to the Board of Registration of Professional Engineers and Professional Land Surveyors.



Azuanuka O. Etoniru, PE, PLS, President, E.T. Engineering Enterprises, Inc. and Secretary, Massachusetts Board of Professional Engineers and Land Surveyors

Azu Etoniru is a registered professional engineer and a registered professional land surveyor in the Commonwealth of Massachusetts and also maintains engineering record in the civil engineering discipline with the National Council of Examiners for Engineering and Surveying. He also is a licensed soil evaluator and title V system inspector in Massachusetts. Azu came to the United States at the age of nineteen years old to study civil engineering at Northeastern University where he earned a Bachelor of Science degree in civil engineering in 1979; a Master of Science degree in economic policy and planning in 1980; and a Master of Science degree in civil engineering in 1984. Following his academic training, Azu worked as a project manager in both the public and private sector until 1988 when he formed E. T. Engineering Enterprises, Inc. His vision has been guided by an insatiable appetite and love for civil engineering and land surveying that has continued to manifest itself over the past quarter century.

10:30 AM – 12:15 PM

General Session: MALSCCE Proprietors' Council Panel Discussion

This MALSCCE Proprietors' Council-sponsored session features panelists from a cross-section of companies engaged in land surveying answering questions from the moderator and audience as they share their views on the evolving nature of a land surveying business and the need to adjust to this changing business environment. Join what should prove to be a lively and insightful 90-minute discussion. Learn how you can cope with business trends impacting the land surveying profession.



Moderator: Michael A. Clifford, PLS, Principal, DGT Associates and MALSCCE Proprietors' Council Chair

Mike, a co-founder and principal-in-charge at DGT Associates, is a licensed Professional Land Surveyor in Massachusetts and Rhode Island. With over 30 years of experience in surveying and engineering, Mike has worked on a variety of urban development and infrastructure projects in the Greater Boston area – including the historic harbor line mapping, the Central Artery and Ted Williams Tunnel projects. Mike believes that the integration of cutting-edge technologies with the traditions of the past can thrust surveying and engineering into the 21st century.

Panelists:



Kenneth Conte, PLS, Principal, Beals and Thomas, Inc., and MALSCCE President

Ken Conte is the discipline leader of the survey department at Beals + Thomas and manages some of the firm's largest survey projects. He has over 35 years of experience performing and overseeing boundary, topographic, bathymetric, and construction surveys for the public and private sector clients. Ken provides professional land surveying services for site development and subdivision plans, roadway improvement plans, utility infrastructure plans, boundary and retracement surveys, title insurance surveys, and as-built surveys.



Paul R. Foley, PLS, President, Feldman Geospatial

As President of Feldman Geospatial, Paul Foley is responsible for the financial success of the firm, company proficiency, and executing the company strategy and vision. Having worked in the industry for over 25 years, Paul's depth of experience and unique perspective have been instrumental to Feldman's growth. Under Paul's direction, Feldman has been responsible for the construction engineering of several major Boston projects, namely, Millennium Tower in Downtown Crossing, One Dalton in Back Bay, Boston South Station Tower, and Encore Boston Harbor in Everett, MA. His work experience also includes Boston's "Big Dig" and survey work as far away as New Jersey, Maryland, Ireland, and the United Kingdom.



Brian E. Koczela, PLS, Owner and Manager, BEK Associates

Brian graduated in 1982 with a B.S. degree in forest land management from the University of New Hampshire. He has been a land surveyor since 1986, from working on small house lots to managing the day-to-day survey needs of the \$330 million Manchester Street Station power plant project in Providence, RI for Bechtel Construction Company. In 1996 Brian opened the door of BEK Associates and has been providing professional services to clients in Massachusetts, New York & Vermont ever since.

1:45 PM – 3:45 PM

General Session: Convention Exhibits & Exhibitor Demonstrations

Sponsored by the MALSC Western Massachusetts Chapter

During this two-hour general session, you'll have many opportunities to visit our convention exhibitors and learn about the technologies and services they offer. You can also take in as many of the live product/service demonstrations occurring during the session as you like. These demonstrations will be occurring simultaneously with groups of attendees rotating between demonstrations every 15 minutes.

4:00 PM – 5:00 PM

Concurrent Session 5A: Various Types of Boundaries in Massachusetts Property, Land Use, and Environmental Law, Where They Are, and How They Change

This presentation is a fresh look at some traditional and modern Massachusetts laws and legal doctrines about the many kinds of boundaries, especially concerning water, that surveyors, civil engineers, real estate clients, and their legal counsel deal with in plans, titles, transactions, permitting, and litigation. Mr. McGregor slices the subject differently from the usual approach, explaining how law-related boundaries are determined, how they are subject to change, and why not to be surprised when they morph or move.



Gregor I. McGregor, Esq., Founding Partner, McGregor Legere & Stevens PC

Gregor I. McGregor is the founder of the Boston-based environmental law firm McGregor Legere & Stevens, PC. The firm handles environmental law, land use, energy, climate, real estate matters, and related litigation. Prior to entering private practice in 1975, Mr. McGregor was an assistant attorney general and the first chief of the Division of Environmental Protection in Massachusetts. Mr. McGregor's cases in court have broken new ground in environmental impact statements, wetland and floodplain protection, hazardous waste liability, land preservation and taxation, home rule powers for cities and towns, enforcement and contempt remedies, eminent domain, Article 97 and other open space protections, and the constitutional doctrine of "taking without compensation."

4:00 PM – 6:00 PM

Concurrent Session 5B: Integrating Small Unmanned Airborne Systems (sUAS) Into a Geospatial Business

Sponsored by the MALSC Central Massachusetts Chapter

Unmanned Airborne Systems (sometimes called drones) have become quite popular. They can be a real asset in many businesses that do surveying, mapping and other geospatial activities. However, the integration of such technology requires a lot of planning and forethought to evaluate the business potential that arises from providing services and products that are based on the use of this technology. During this session, you will learn about the types of UAS, the applications and potential new customer areas possible with UAS, company operations and management of personnel that must be integrated into the business before using UAS, the photogrammetric differences with UAS as compared to conventional photogrammetry and how the FAA is regulating the process of flying a UAS.



Joseph V. R. Paiva, PhD, PS, PE, CEO, Chief of Curriculum Development, GeoLearn LLC

Dr. Joseph V. R. Paiva, is principal and CEO of GeoLearn, LLC (www.geo-learn.com), an online provider of professional and technician education since February 2014. He also works as a consultant to lawyers, surveyors and engineers, and international developers, manufacturers and distributors of instrumentation and other geomatics tools, as well being a writer and speaker. Joe is an expert on instrumentation and field techniques for eliminating blunders and improving accuracy. He teaches students in undergraduate courses on the basics and advanced methods of surveying measurement, taking the principles of errors analysis into account. He enjoys speaking with surveying practitioners in an informal manner and taking ad hoc questions as they arise during his presentations.

5:15 PM – 5:45 PM

Concurrent Session 6A: Promoting Careers in Land Surveying

With the number of licensed professional surveyors in Massachusetts decreasing year after year, all MALSCE members must work to attract the next generation of surveyors to the profession! Learn how under David Prince’s leadership members of the reformed MALSCE Public Awareness Committee are promoting careers in land surveying to students and have plans to exhibit at an upcoming annual conference of high school guidance counselors. David will preview MALSCE’s surveying career slide deck and discuss how committee members have used this and equipment demonstrations to encourage students to think about pursuing a career in land surveying. Learn how you can build on their endeavors by taking advantage of David’s experience and approach to conduct your own school visit and promote the value of a career in your chosen profession.



David Prince, PLS, Vice President Survey Services, WSP, and MALSCE Public Awareness Committee Chair

David is a multi-state licensed land surveyor with 30 years’ experience. David, who possesses an associate’s degree in land surveying from Paul Smith’s College (’90) and a bachelor’s degree in survey engineering from Ferris State University (’93), currently holds the position of New England Survey Manager for WSP USA Inc. David has spent the past 25 years with WSP working out of their NH Office but managing and overseeing projects throughout the New England/New York Region.

2024 MALSCCE Convention

Saturday, March 2, 2024

Featured Sessions

8:00 AM – 12:30 PM

General Session: Business Aspects in the Profession of Land Surveying

Many times, in the process of describing what land surveying is, surveyors, clients of surveyors and even licensing boards focus on the technical aspects of doing this extremely specific activity. Rarely is thought given to the fact that this activity is done as part of a business agreement. This session will focus on the business aspects of land surveying that every surveyor, whether business owner, executive officer, senior manager, or supervisor should know. Topics include: legal business structures; insurance issues; internal organizational structures; training team members in technical and business topics; managing the team as real people; incorporating public and customer relationships; marketing; agreements and contracts; fees, retainers, and collections; quality assurance, quality control, and continuous quality improvement; managing the beginning, middle, and end of the relationship with the customer during the course of a survey job; and many more. Specific examples or templates will be presented that participants can adapt for their own use.



Joseph V. R. Paiva, PhD, PS, PE, CEO, Chief of Curriculum Development, GeoLearn LLC

Dr. Joseph V. R. Paiva, is principal and CEO of GeoLearn, LLC (www.geo-learn.com), an online provider of professional and technician education since February 2014. He also works as a consultant to lawyers, surveyors and engineers, and international developers, manufacturers and distributors of instrumentation and other geomatics tools, as well being a writer and speaker. Joe is an expert on instrumentation and field techniques for eliminating blunders and improving accuracy. He teaches students in undergraduate courses on the basics and advanced methods of surveying measurement, taking the principles of errors analysis into account. He enjoys speaking with surveying practitioners in an informal manner and taking ad hoc questions as they arise during his presentations.

8:00 AM – 5:30 PM

Separate Session: Spring 2024 MALSCCE Fundamentals of Surveying Refresher Course

MALSCCE is offering a Fundamentals of Surveying Exam Refresher Course to help participants prepare to take the Fundamentals of Surveying (FS) Exam. This separate course features an eight-hour review of the knowledge areas you are likely to be tested on during the FS Exam. Utilizing two practice exams and other attendee handouts, course instructor Clark Donkin, PLS, will discuss general information, water boundaries, survey math, and other relevant topics.

Clark R. Donkin, PLS, District Survey Supervisor, MassDOT Highway Division

Clark has worked in surveying for about 45 years. Since graduating from the University of New Brunswick in 1985 with a Bachelor of Science in Surveying Engineering, he has been employed in both the private and public sectors performing or managing survey services. Clark has been involved with the Refresher Course program since the late 1990s and covered the FS exam preparation material for almost two decades. He is licensed in MA (active) and NY (inactive). His fields of expertise are cadastral surveying, geodetic surveying, and tunneling/deformation surveys.

2024 MALSCCE Convention

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2024 MALSCCE Convention

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2024 MALSCPE Convention

PDH Tracking Sheet

Name: _____
Organization Name: _____
Address: _____
City/State/Zip: _____

(All PDHs for MA unless otherwise listed.)

Friday, March 1, 2024	
<input type="checkbox"/> Session 1A: MA DCR – Flood Hazard Management Program	1 PDH
<input type="checkbox"/> Session 1B: Progressing from a Survey Technician to Professional Land Surveyor	1 PDH
<input type="checkbox"/> General Session: A Guide to the Practice of Architecture, Engineering, and Land Surveying in Massachusetts	1.5 PDHs
<input type="checkbox"/> General Session: MALSCPE Proprietors' Council Panel Discussion	1.5 PDHs
<input type="checkbox"/> General Session: Convention Exhibits & Exhibitor Demonstrations	2 PDHs
<input type="checkbox"/> Session 5A: Various Types of Boundaries in Massachusetts Property, Land Use, and Environmental Law, Where They Are, and How They Change	1 PDH
<input type="checkbox"/> Session 5B: Integrating Small Unmanned Airborne Systems (sUAS) Into a Geospatial Business	2 PDHs
<input type="checkbox"/> Session 6A: Promoting Careers in Land Surveying	0.75 PDH
Saturday, March 2, 2024	
<input type="checkbox"/> General Session: Business Aspects in the Profession of Land Surveying	4 PDHs

Do not return this form. Keep it for your records.

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MALSCE Certified Floodplain Surveyor (CFS) Training

Flood Hazard Management Program
MA Dept. of Conservation & Recreation
March 1, 2024

1

Flood Hazard Management Program (FHMP)

- State Coordinating Agency for the National Flood Insurance Program (NFIP)
- Offers technical assistance and training to NFIP communities and others:
 - Community officials
 - Design professionals
 - Surveyors
 - Builders
 - Realtors
 - Property owners, general public
- Coordinates with other state agencies on floodplain development and flood mitigation: CZM, DEP, MEPA, MEMA, etc.

2

Technical Assistance to Surveyors

- Assistance with mapping
 - Current effective mapping
 - Preliminary mapping
 - Historic mapping
- Letters of Map Change
 - LOMA
 - LOMR
 - CLOMA, CLOMR
 - LOMR-F, CLOMR-F
- Regulation interpretation, guidance support
- Elevation certificates
- Floodproofing certificates

3

FEMA Technical Bulletins

TB No.	Title (Date)	Synopsis
1	<i>Openings in Foundation Walls and Walls of Enclosures Below Elevated Buildings in Special Flood Hazard Areas (2008)</i>	Guidance on the NFIP requirements for openings on exterior walls and walls of enclosures below elevated buildings in Zones A, AE, A1-A30, AR, AO, and AH.
2	<i>Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas (2008)</i>	Guidance on the NFIP requirements on the use of flood damage-resistant construction materials in building components below the BFE in SFHAs (both Zones A and V).
3	<i>Non-Residential Floodproofing - Requirements and Certification for Buildings Located in Special Flood Hazard Areas (1993)</i>	Guidance on the NFIP requirements concerning substantially impermeable construction and the re-quired certification for dry floodproofed non-residential buildings with lowest floors below the BFE in Zones A, AE, A1-A30, AR, AO, and AH.
4	<i>Elevator Installation for Buildings Located in Special Flood Hazard Areas (2019)</i>	Guidance on the NFIP requirements for elevator machinery and equipment that serve buildings and on the installation of elevators below the BFE in SFHAs (both Zones A and V).
5	<i>Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas (2008)</i>	Guidance on NFIP requirements concerning obstructions to floodwaters beneath elevated buildings and on building sites in Coastal High Hazard Areas (Zones V, VE, and V1-V30).
6	<i>Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas (1993)</i>	Guidance on the NFIP requirements for below-grade parking garages beneath non-residential buildings located in Zones A, AE, A1-A30, AR, AO, and AH.
7	<i>Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas (1993)</i>	Guidance on the NFIP requirements concerning measures referred to as "wet floodproofing" applied to certain types of structures in Zones A, AE, A1-A30, AR, AO, and AH.
8	<i>Corrosion Protection for Metal Connectors and Fasteners in Coastal Areas (2019)</i>	Why maintaining the load paths in buildings is important and the important role that the proper corrosion protection of metal connectors and fasteners has in ensuring that buildings in coastal areas are adequately anchored and connected to resist floods and high wind events.
9	<i>Design and Construction Guidance for Breakaway Walls Below Elevated Buildings Located in Coastal High Hazard Areas (2008)</i>	Prescriptive, simplified, and performance-based design approaches to meeting NFIP requirements in the design and construction of wood-framed breakaway walls beneath elevated buildings in Coastal High Hazard Areas (Zones V, VE, and V1-V30).
10	<i>Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding (2001)</i>	Regulatory and technical guidance on ensuring that the construction of the following buildings are reasonably safe from flooding: buildings with various types of foundations, including basements, in areas that have been proposed to be removed from the SFHA through the placement of fill and in areas near the SFHA.
11	<i>Crawspace Construction for Buildings Located in Special Flood Hazard Areas (2001)</i>	Interim guidance on minimum NFIP requirements and best practices for crawspace construction, including requirements for below-grade crawspace construction that may extend 1 or 2 feet below grade.

4

MA higher standards for new construction

MA Statewide Building Code, 9th Edition

- Freeboard Requirement
 - 2 feet in V zones
 - 1 foot in A zones
- Certified Plans
 - Required in both A zones and V zones
- Protection of Mechanicals & Equipment
 - Elevation required in V zones
- Elevation of Lateral Additions*
 - Required for non-substantial improvements in V zones
- Coastal Dune Standards
- Substantial Repair of Foundation

DEP Wetlands Protection Act

- 1:1 Compensatory storage required
- No rise permitted**

* Guidance sheet available
** Explanation needed

5

Building Code Citations for Higher Standards

- | | |
|------------------|---------------------------------------|
| • R105.3.1.1.1.1 | Substantial Repair of a Foundation |
| • R322.1.4 | Establishing the DFE (Freeboard) |
| • R322.1.6 | Protection of M&E |
| • R322.1.11 | Construction Documents |
| • R322.3.2 (6) | Lateral Additions in V Zones (not SI) |
| • R322.4 | Coastal Dunes |
| | Appendix G Base Code |

6

Typical Violations

Administrative Violations

- No stamped plans
- No certified elevations*
- Substantial improvement not documented

Physical Violations

- Improper hydrostatic openings
- Below-grade crawlspaces
- Full basements
- M&E not elevated; ductwork too low

7

Common Deficiencies on Elevation Certificates

Wrong diagram selected

Sections left blank

Wrong base flood elevation entered

Surveyed elevations not in tenths

Section A8, A9 not filled when applicable

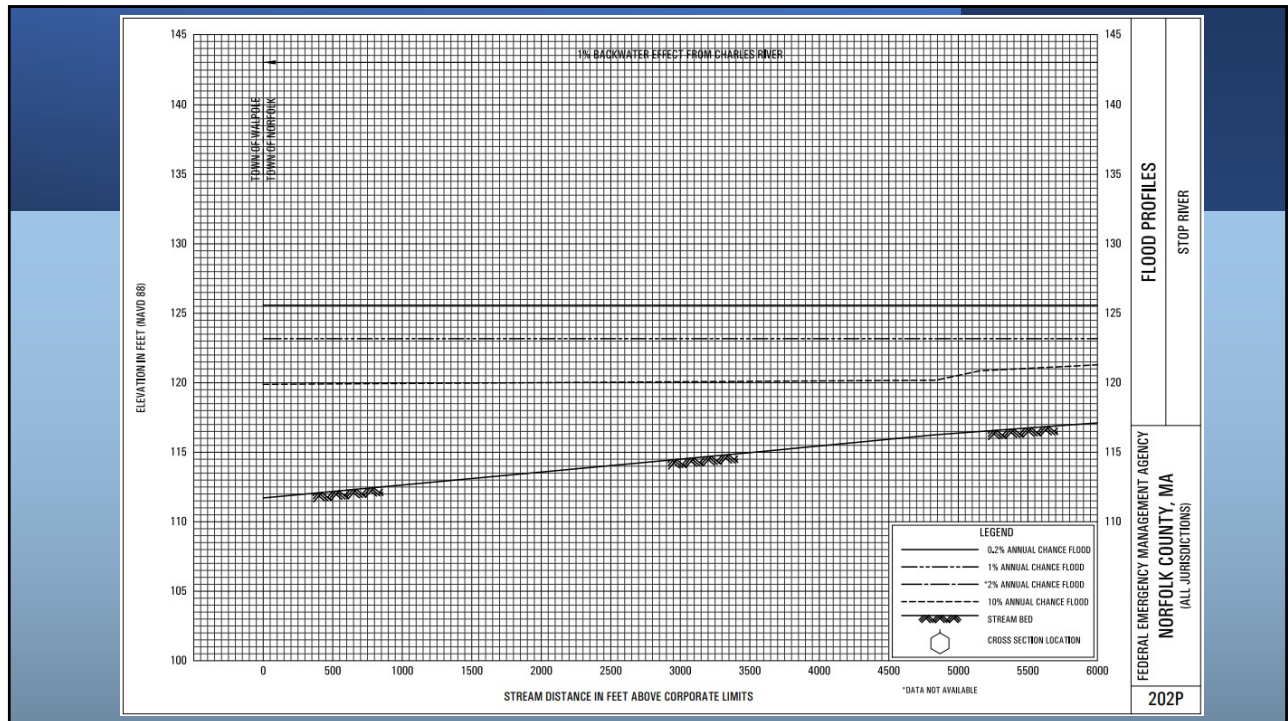
A8 = crawlspace enclosure
A9 = attached garage

- Section A9 filled out when not applicable

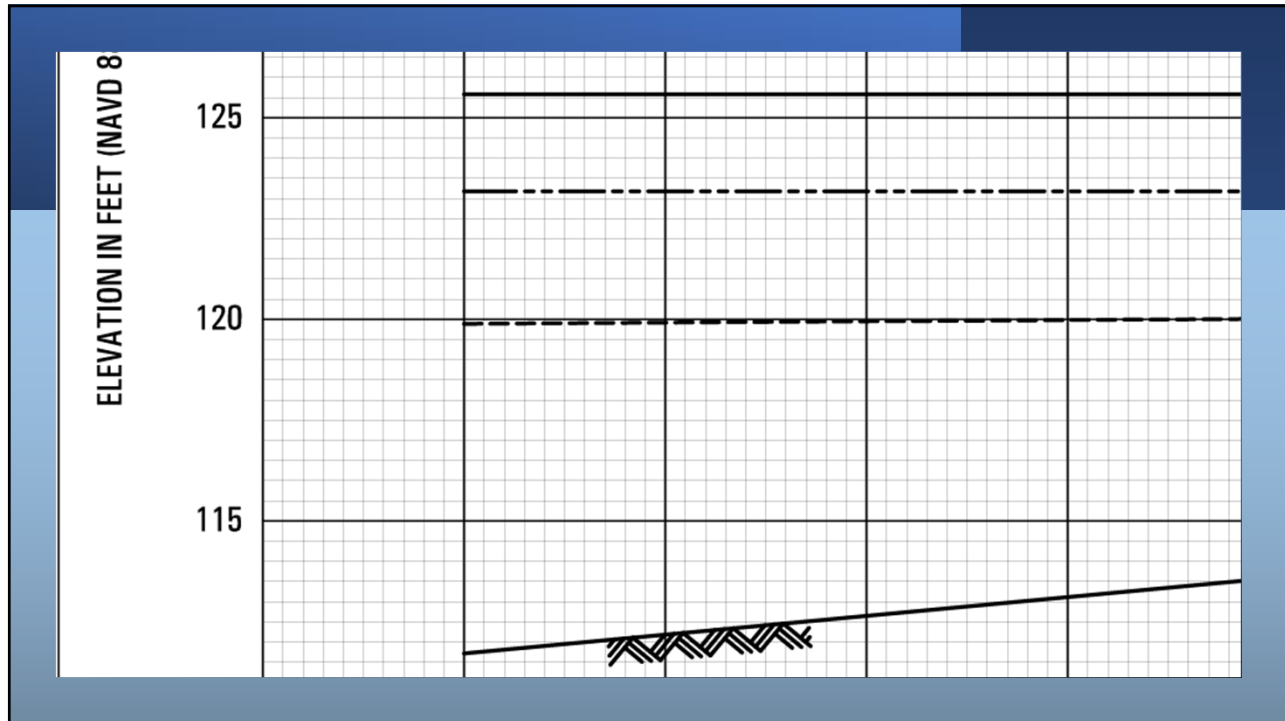
8



9



10



11

Finding the Local Floodplain Administrator

- Many communities don't have an FPA identified
- Should be identified in local regs (usually Zoning)
- Very often Building Official, but could be
 - Conservation Agent
 - Planner
 - Engineer
 - Town Manager
- Call us!

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CRS Communities in Massachusetts

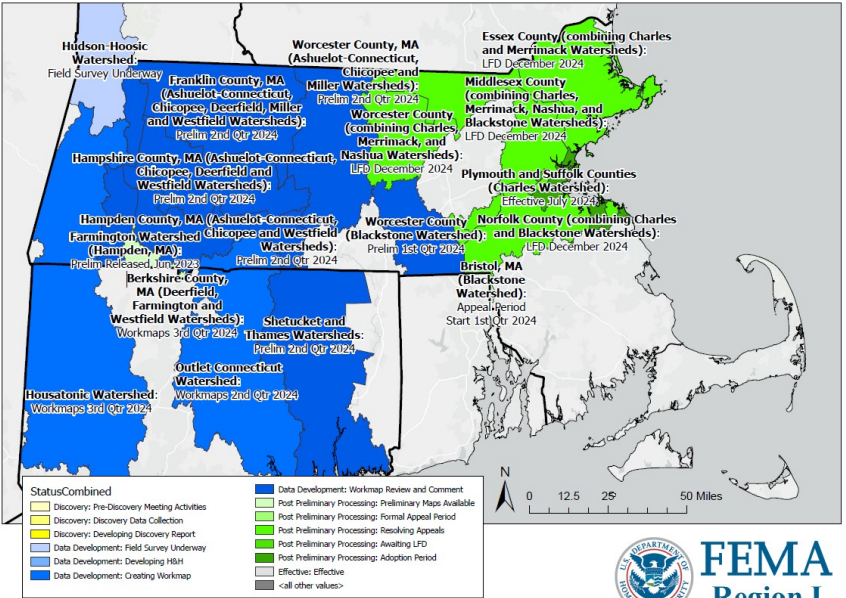
Braintree 7	Norton 9
Brewster 8	Orleans 7
Cambridge 9	Plymouth 9
Chatham 7	Provincetown 8
Eastham 8	Quincy 7
Harwich 7	Salisbury 8
Haverhill 9	Sandwich 7
Hull 7	Scituate 7
Marshfield 7	Wellfleet 7
Mashpee 7	Winchester 6
Northampton 8	Worcester 7

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FEMA Mapping Updates Underway

Region 1 Active Studies in MA

This map is provided for planning purposes only. Any dates shown on the map are projected and are subject to change. Map produced on 1/24/2024



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Status of Studies by Watershed

Close to Effective	In Progress	No current study
Charles	Middle Connecticut	Middle Hudson
Merrimack	Connecticut	Concord
Nashua	Lower Connecticut	Narragansett
Blackstone	Miller	Cape Cod
	Chicopee	Quinebaug
	Westfield	
	Deerfield	
	Farmington	
	Housatonic	
	Hudson-Hoosic	

15

Studies are performed by HUC 8 watersheds but are published by county

Hydrologic Unit Codes (HUCs) Explained

Watersheds are delineated by USGS using a nationwide system based on surface hydrologic features. This system divides the country into 22 regions (2-digit), 245 subregions (4-digit), 405 basins (6-digit), ~2,400 subbasins (8-digit), ~19,000 watersheds (10-digit), and ~105,000 subwatersheds (12-digit).

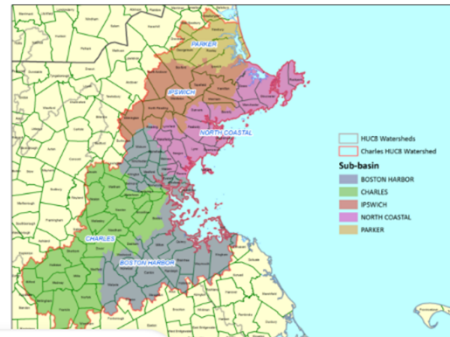
A hierarchical hydrologic unit code (HUC) consisting of 2 additional digits for each level in the hydrologic unit system is used to identify any hydrologic area (see [Federal Standards and Procedures for the National Watershed Boundary Dataset](#)).

A complete list of Hydrologic Unit codes, descriptions, names, and drainage areas can be found in the [United States Geological Survey Water-Supply Paper 2294](#), entitled "Hydrologic Unit Maps".

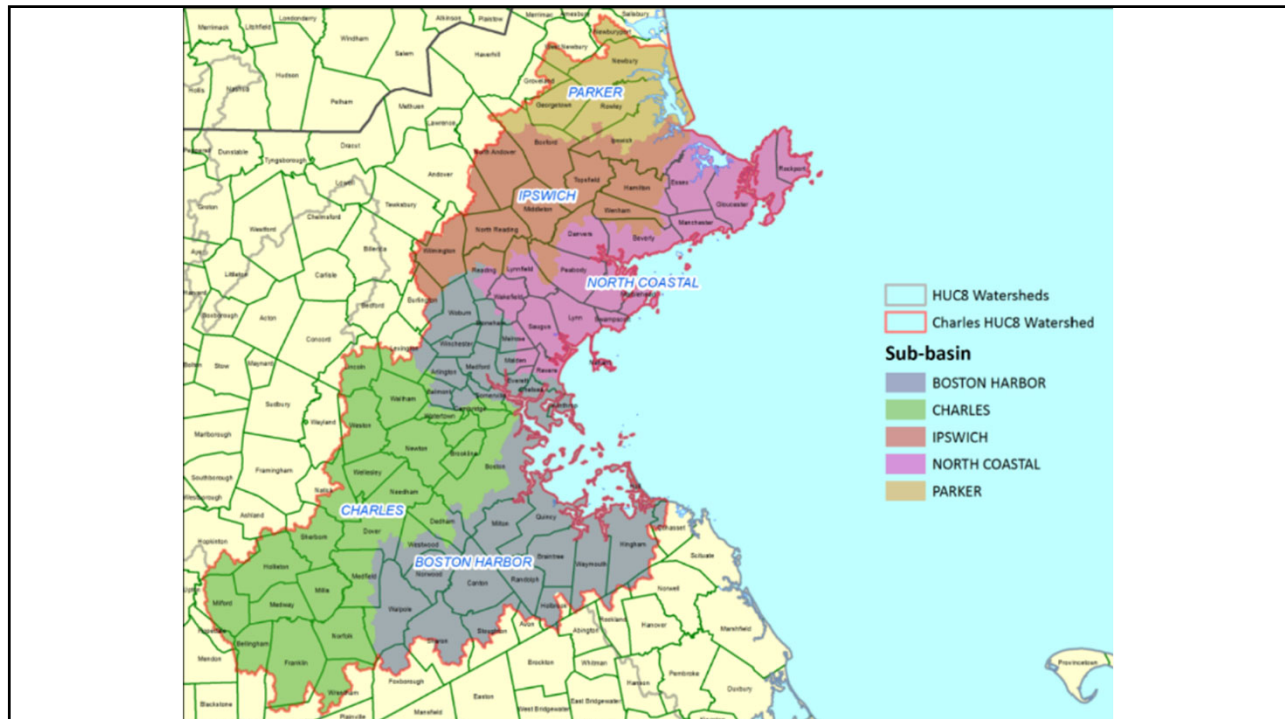
16

Charles Watershed Communities

- The entire Charles Watershed study area contains or touches:
 - 6 counties in MA
 - 98 towns & cities
 - 2,729 total stream miles
 - Around 3.1 million residents



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Summary of Timeline

Discovery

Work Maps

Preliminary FIRM and FIS

Appeal Period

Letter of Final Determination

Maps Effective

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Why the mapped floodplain boundaries may be different

Detailed Studies

- Improvements in hydrologic or hydraulic analyses
- New topography data, new aerial imagery
- New or modified bridges, culverts, dams
- Stream channel changes

Redelineation (no change to BFE)

- New topography data, new aerial imagery

Zone A (no BFE)

- New approximate models, topography and imagery

20

Viewing Preliminary Mapping

- Using the Map Service Center
- Using the Flood Map Changes Viewer

FEMA Flood Map Service Center: Search All Products


Choose one of the three search options below and optionally enter a posting date range.


Jurisdiction	Jurisdiction Name	Product ID ?
State <input type="text" value="MASSACHUSETTS"/>	Jurisdiction Name or FEMA ID <input type="text"/>	Product ID <input type="text"/>
County <input type="text" value="MIDDLESEX COUNTY"/>	<small>(Ex. Fairfax County-wide or 51059C)</small>	<small>(Ex. Panel Number, LOMC Case Number)</small>
Community <input type="text" value="LINCOLN, TOWN OF"/>		

21


Search Results for LINCOLN, TOWN OF

Click [subscribe](#) to receive email notifications when products are updated. If you are a person with a disability, are blind, or have low vision, and need assistance, please contact a [map specialist](#).

 Effective Products (26) [?](#)

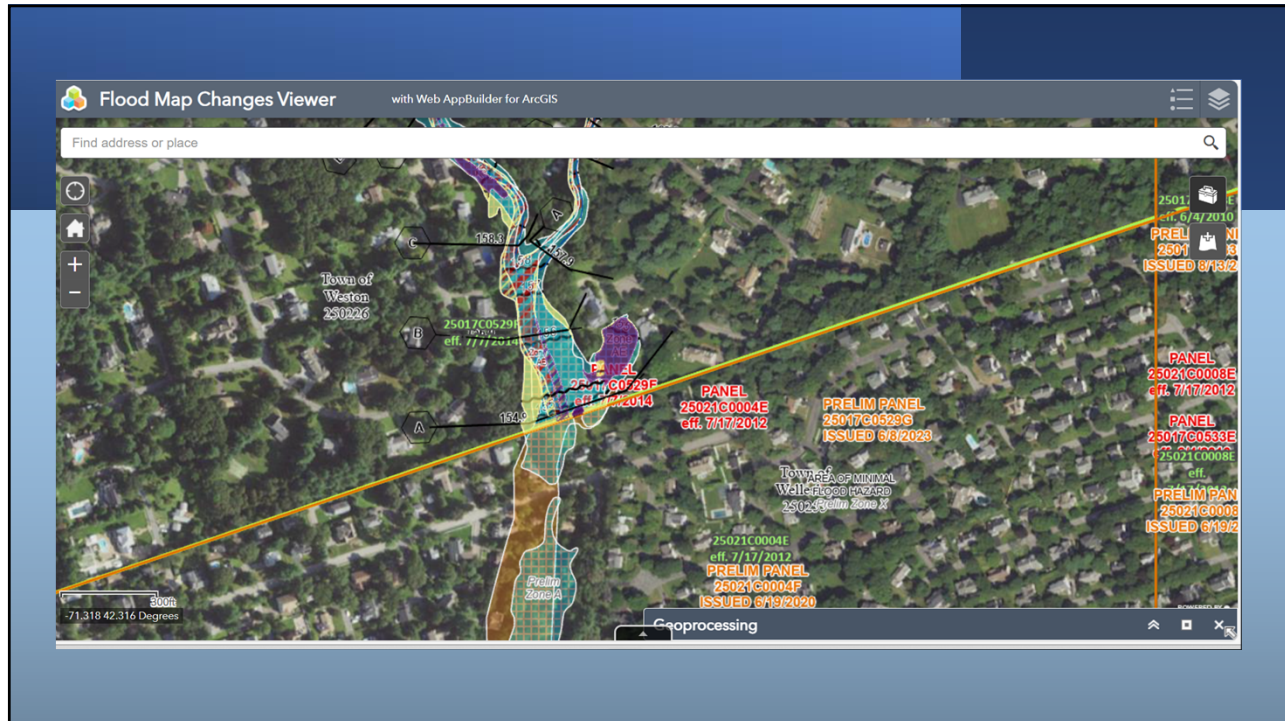
 Preliminary Products (225) [?](#)

 Pending Product (0) [?](#)

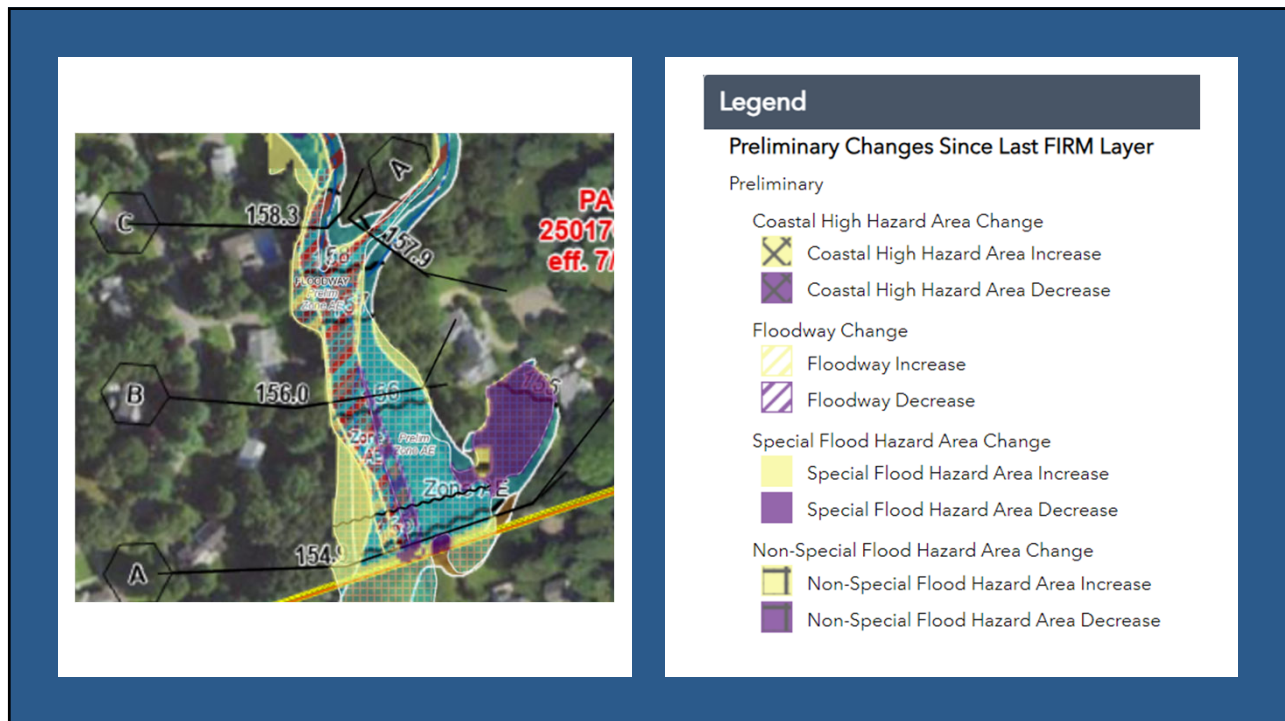
 Historic Products (42) [?](#)

 Flood Risk Products (3) [?](#)

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23



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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS

Educational Requirements for the Professional Land Surveyor and Surveying Profession “From Survey Technician to Registration”

A look at educational programs and training for all levels
of the surveying profession

William (Terry) McGovern, P.L.S.
Adjunct Professor Franklin Cummings Institute of
Technology
Practicing Land Surveyor- South Shore

1

MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Professional Land Surveyor shall mean a
person who has been duly registered as a
Land Surveyor by the Massachusetts
Board of Registration for Professional
Engineers and Professional Land
Surveyors and who holds a current License
to practice.

From 250 CMR 2.09 Definitions

2

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Surveyor-in-training means a person who has qualified for, taken and passed, the NCEES FS Exam, and is certified by the Board as meeting the requirements of M.G.L. c. 112, §§ 81J(3)(c) or (d).

2

From 250 CMR 2.09 Definitions

3

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Who else?

Competent field personnel who bring value to their companies and employers.

From my definitions of how things work

4

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How do we arrive in the profession?

Referral

Trying something different / want change

Attracted by variety of task

Enjoy being outdoors

FAMILY (business)

Apprenticeship (college job thru friend)

Transition from something similar (forestry)

Ex-military

5

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Rare that someone comes out of high
school with the goal of being a land
surveyor. (Really, really rare...)

Civil engineering

Architecture

Environmental Engineering

All have 4 year Bachelor's Degree

Requirements for Registration*

(250 CMR 3.04 (4) Table I)

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Professional Land Surveyor

Education	Experience	In Charge Experience
A Bachelor of Science Degree in Land Surveying.	4 Years	3 Years
A Bachelor of Science Degree in Civil Engineering including or in addition to at least 18 credit hours of Board-approved courses in land surveying	4 Years	3 Years
A foreign degree in Land Surveying or Civil Engineering	4 Years	3 Years

250 CMR 3.04 (4) Table II land Surveying Application Requirements

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Professional Land Surveyor

Education	Experience	In Charge Experience
Two or more years of formal education comprised of at least 60 semester credit hours of which at least 18 credit hours are Board-approved land surveying courses and 12 credit hours of Board-approved higher mathematics and applied science courses.	6 Years	4 Years

250 CMR 3.04 (4) Table II land Surveying Application Requirements

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Professional Land Surveyor

Education	Experience	In Charge Experience
No education requirement, however undergraduate study in a Board-approved surveying curriculum may be considered as surveying Work Experience on an equivalent full-time basis up to a maximum of 2 years.	12 Years	6 Years

250 CMR 3.04 (4) Table II land Surveying Application Requirements

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Professional Land Surveyor

Education	Experience	In Charge Experience
No education requirement, however undergraduate study in a Board-approved surveying curriculum may be considered as surveying Work Experience on an equivalent full-time basis up to a maximum of 2 years.	20 Years	10 Years

250 CMR 3.04 (4) Table II land Surveying Application Requirements

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Back to our incoming professionals

Referral

Trying something different / want change

Attracted by variety of task

Enjoy being outdoors

FAMILY (business)

Apprenticeship (college job thru friend)

Transition from something similar (forestry)

Ex-military

11

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How do we align our incoming personnel
with the training requirements and goals?

Assessment

Math skills

Attention to detail

Able to process information

Able to communicate information

Observational skills

Professionalism

Take pride in their work

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Land Surveying as a Profession

Math and Technical skills
Legal knowledge
Ability to Interact with Public and Clients
Business Knowledge
Some historical aptitude or appreciation

We'll take each one of these in turn

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Math and Technical skills

Heavy emphasis on Trigonometry and Geometry, majority of our work is based on angular measurements, coordinates and areas.

Error propagation and analysis, statistical analysis

Lots of conversions / formulas

Geometric Areas and Volumes

Curvature and Refraction, understanding GPS, (physics)

Positional Geometry, 3D Location, Coordinates

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Math and Technical skills

Most "Pre-Calculus" college courses that cover Algebra and Trigonometry will provide the basic math skills necessary.

More math is obviously better. Higher functions now with understanding more complex technology

Don't have to have gotten an A on Differential Equations....unless you want to take apart Satellite signals by using them.

Rest is application of the math concepts.

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Math and Technical skills

Most survey courses teach the applications of math skills as they apply to the profession.

Bearings and Azimuths (angular)
Horizontal Distance Measurement
(conversions)
Coordinate Geometry
Horizontal and Vertical Curves
Areas and Volumes

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Math and Technical skills

Higher order functions in Surveying

Georeferenced coordinate systems and satellite coordinates.

Precise mapping and scaling on Earth's surface.

Ellipsoid and Geoid models of Earth's surface.

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Legal Knowledge

Understanding conveyances (deeds)

Basics of Land Law, real property ownership and use, legal rights of owners

Accepted methods of gathering and analyzing evidence of older boundaries.

Surveyor's role in boundary determination and placement on the ground

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Legal Knowledge

These topics and all of the legal aspects area of surveying is more specialized knowledge.

Generally only taught through classes targeted for the profession.

Ongoing seminars sponsored by MALSCE

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Legal Knowledge

Unlike math skills, understanding legal concepts and laws of evidence can take years of experience (which is why there an experience requirement in the registration process)

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Legal Knowledge

The legal knowledge and experience is exactly what separates “Survey Technicians” from Registered Professional Land Surveyors.

Not to slight Survey Technicians in any way.

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Legal Knowledge

The Registered Professional Land Surveyor is the one who makes the call regarding boundary determination based on the Laws of Evidence, their experience and expertise at assembling the facts and information into a case for where the true boundary is located on the ground.

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Survey Technicians

Very valuable in many ways:

Relied upon to bring in complete data on job sites.
Relied on to make good observations and notes to pass on regarding the project and work taking place.
Relied on to perform accurate layout in all types of conditions.

Can blend various technologies together to create the total picture of a site, i.e. use of drones, laser scanning along with conventional total stations, levels, etc.

They are the “boots on the ground” making it happen!

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Survey Technicians

They apply the fundamental techniques of surveying to acquire data in the field and turn it into plans and other usable data.

Make accurate and precise measurements to locate and determine boundary lines.

Understand how all of the equipment works, responsible for maintenance, calibration, adjustments.

Often responsible for deed and plan research and putting it all together, compiling and indexing the documents obtained. Analyzing and comparing record info.

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Advanced Survey Technicians

Be able to explain to clients the scope of work and the results. (What, my line is over *there*? Yes...um...)

Interact with abutters (wow, your German Shephard is really handsome....good boy....uh...)

Interact with town, county and state officials

Interact with attorneys, architects, engineers and other members of a team

Represent clients in front of Town Boards (Planning, Zoning, Conservation)

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Advanced Survey Technicians

Historical Aptitude and Appreciation

Tracing history of a property

Following back chains of title and being able to understand what is going on around the subject parcel

Using historical atlases, maps, aerial photos

Being able to decipher old written street layouts

Appreciation of the history of a site or area, appreciation of earlier survey techniques and practices

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Professionals

Fulfilled the professional requirements

Have the experience in using the Laws of Evidence to make the determination

Realize that they are responsible for final work products

Realize that they are held to the “higher standard” of professional registration

Having the experience to guide and be responsible for employees

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Professionals

Business Knowledge

Client contracts

Regulations and permitting processes

Capitalization of business

How to maximize efficiency in work flow

Business accounting, human resources, compliance laws

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Training in the Profession

Mostly by “apprenticeship” form of training

Work your way up the ladder (traditionally)

Rod Man to Instrument Operator to Party Chief to
Surveyor in Training to Registered Land Surveyor

Technology changes make the ladder approach obsolete

Use of robotic total stations, GPS, Laser scanners,
Drones mean more individuals equipped with better
technology – result is a ‘one person field crew’

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Training in the Profession

Now need more training in a shorter, compressed period
of time.

Need more “cross training” of personnel with more varied
projects

Historically – a ‘boundary” crew, a “topo” crew, a “layout”
crew, a “level run” crew

Again, current technology allows you to perform many of
these tasks simultaneously.

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Training in the Profession

What are the opportunities for training?

Exposure to different tasks, “learning curve” still have a business to run.

Company training sessions internal and external

Formal class training with college credits (U Maine, Franklin)

On line and in person classes

Most programs now have the class sessions on line with labs conducted in person or via intern assignment

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Back to the educational requirements

To reach professional status and registration college credits necessary

To become better in the profession college classes help immensely and provide a foundation of knowledge

Seminars also helpful and informative

Vendor training (Carlson, Leica, MTS, others)

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Heresy

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Cross training and exposure

Drafting plans (person in the field sees the site, why not draft it instead of handing of to a CAD person?)

Interacting with engineers (easier if you are in a multi-discipline firm, survey-only firms would have difficulty)

Exposure to permitting and project approval process

Develop an appreciation for where work goes and what the results are of all of the field work.

Set aside traditional roles occasionally to provide variety and growth opportunity

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Ongoing education

Eventually there will be a requirement for continuing education (soil evaluators have it)

Training on new technology and software (point cloud, image processing, drone surveys, etc.)

Changing laws and regulations, policies

Updated industry standards, models, such as Geoid modeling, mapping standards.

FEMA, MEHA, MALSCE and other seminars

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Benefits of Training and Education

More productive employees!

Think of the Patriots emphasis on versatility..the more knowledge they have about other aspects of the job the more work can be accomplished.

More engaged employees!

They are eager to use that training and knowledge.
As a rule surveyors take a lot of pride in the quality of heir work, our profession depends on it, so

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS

Benefits of Training and Education

More loyal employees!

Knowing that a company is interested in investing in their employees future and is willing to train them provides a sense of worth and belief that the company wants them to grow and be a part of their future.

More professional employees!

With training and education, overall work force becomes more proficient, leading to better business growth and opportunities.

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS

Benefits of Training and Education

Even for those who have less/no desire to become “registered” content to be “survey technicians”

Still may want to learn, honestly just may not want the greater responsibility

Investing in their training, learning shows that we as leaders want them to grow in their roles, find new ways to look at their jobs, add variety, add knowledge.

Not just be the “dump the file and run” people

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS

Formal Education

Programs:

University of Maine Orono
Bachelor's Degree
Certificate Program
Intermediate programs

Franklin Cummings Institute of Technology
Certificate Program

Others – Boundary Law classes, Basic Surveying classes

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
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Formal Education

Programs:

U Mass Lowell / Amherst, URI, U Conn
Some surveying / Geomatics courses

Bristol Community College
Legal Aspects Course

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS**

How to Grow Future Candidates

Reaching out to high schools and vocational schools

“Trig Star” program

DGT – Visits to schools

Reaching out to veterans – National Guard

Similar professions or degrees (forestry) that are compatible

Being ready to train those candidates who come from “other occupations” where the majority of our surveyors come from

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**MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS**

What does the profession offer?

Very wide variety of work / projects, no two are ever the same

Use of latest technologies, scanning, drone surveys, etc. “play with the cool toys”

Learn interesting things about each site, each project

See how it all fits together through to completion

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MASSACHUSETTS ASSOCIATION OF LAND SURVEYORS
AND CIVIL ENGINEERS

Summary

Identifying candidates that may become good surveyors regardless of background and experience

Steering them into a training program

Identify their goals and how they can best achieve them
Align with company goals

Creating training program or opportunities if none presently exist.

Train NOW! The future isn't going to wait, loss of work, fall behind in technology, opportunities for business.

250 CMR: BOARD OF REGISTRATION OF PROFESSIONAL
ENGINEERS AND LAND SURVEYORS

250 CMR 5.00: PROFESSIONAL PRACTICE

Section

- 5.01: Scope of Practice
- 5.02: Professional Conduct
- 5.03: Professional Seal
- 5.04: Direct Charge and Supervision
- 5.05: Business Entities
- 5.06: License Renewal
- 5.07: Reinstatement of Lapsed License
- 5.08: Use of Title Engineer or Land Surveyor
- 5.09: Professional and Moral Character

5.01: Scope of Practice

All engineering work and all land surveying work is considered work of a professional nature and shall be performed in conformance with 250 CMR unless such work falls within an exemption set forth in M.G.L. c. 112, § 81R. Consistent with M.G.L. c. 112, § 81D, 250 CMR 5.00 does not apply to work performed by persons who operate, maintain or install machinery or equipment, or to persons licensed as engineers under M.G.L. c. 146.

- (1) Engineering work may be performed only by a Professional Engineer or under the Direct Charge and Supervision of a Professional Engineer as described in 250 CMR 5.04.
- (2) Land surveying work may be performed only by Professional Land Surveyor or under the Direct Charge and Supervision of a Professional Land Surveyor as described in 250 CMR 5.04.
 - (a) A Professional Engineer qualified in the Branch of civil engineering may also perform land surveying incidental to his or her engineering work relative to locating or relocating any of the Fixed-works embraced within the practice of civil engineering, but excluding the determination of property lines.
 - (b) The delineation of existing or proposed structures, features or Boundaries relative to property lines requires the determination of property lines and therefore must be performed by a Professional Land Surveyor.
- (3) Engineering Registrants must restrict engineering practice to areas of competence based upon their education and experience qualifications.
- (4) Land Surveying Registrants must restrict land surveying practice to areas of competence based upon their education and experience qualifications.

5.02: Professional Conduct

Each Professional Engineer and Professional Land Surveyor has an ethical duty to the public, the profession, and his or her clients.

In order to protect the health, property, and welfare of the public and to establish and maintain a high standard of integrity and practice in the professions of engineering and land surveying, the following Rules of Professional Conduct and all other applicable provisions of 250 CMR shall be binding on every Professional Engineer and Professional Land Surveyor. Failure to comply with 250 CMR, including the rules of professional responsibility in 250 CMR 5.02(1) through (5), or M.G.L. c. 112, §§ 61 to 65E and §§ 81D to 81T may constitute grounds for disciplinary action against the Registrant.

- (1) Responsibility. A Registrant shall hold paramount the health, property and welfare of the public in the performance of the Registrant's professional duties.
 - (a) If the professional judgment of any Registrant is overruled under circumstances where the health, property or welfare of the public may be endangered, that Registrant shall notify the Registrant's employer, client or such other authority as may be appropriate.

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5.02: continued

- (b) A Registrant shall provide professional services that are truthful, based upon independent professional judgment, founded upon adequate knowledge of the issues, and based upon competence in the subject matter.
- (c) A Registrant shall approve, sign or seal only those Instruments of Service that conform to 250 CMR and generally accepted engineering and land surveying standards.
- (d) A Registrant shall not reveal facts, data or information obtained in a professional capacity, without the prior consent of the Registrant's employer except as authorized or required by law or regulation.
- (e) A Registrant shall not permit the use of the Registrant's name or firm name nor associate in business ventures with any person or firm which the Registrant may have reason to believe is engaging in fraudulent or dishonest business or professional practices.
- (f) A Registrant shall provide the Board with any information and assistance the Board may deem necessary for the investigation/prosecution of complaints filed with the Board.
- (g) A Registrant shall provide the Board with honest and objective responses on Reference Questionnaires regarding an applicant's qualifications for registration.
- (h) A Registrant shall provide written notification to other Registrants in the event of substantial disagreement with the work of the other. When appropriate, both Registrants shall investigate and attempt to resolve the disagreement collaboratively. The notified Registrant is required to respond in a timely manner to the Registrant giving notice.
- (i) A Registrant shall not act in a manner or engage in a practice that brings discredit on the honor or dignity of the profession of engineering or land surveying.

(2) Competency.

- (a) A Registrant shall practice only in areas of competence for which the Registrant is qualified by education and experience.
- (b) A Registrant may accept work outside of his or her Licensed Branch of practice only to the extent that such services are restricted to areas of expertise for which the Registrant is qualified by education and experience to perform.
- (c) A Registrant shall not take responsibility for work the Registrant is not competent by education or experience to perform, even if such work generally falls within a Branch in which said Registrant is registered.
- (d) In the event that a Registrant practices outside his or her Licensed Branch of practice, the Registrant must be prepared to demonstrate to the Board's satisfaction his or her competence in that additional Branch of practice. Demonstration of competence to the Board shall include at a minimum records of specific education and experience obtained by the Registrant in that additional Branch of practice.
- (e) A Registrant may affix the Registrant's Signature or seal only on Instruments of Service prepared by the Registrant or prepared under the Registrant's Direct Charge and Supervision.
- (f) A Registrant shall stay current with theoretical, technological and practical developments within the Registrant's profession and maintain personal competency for acceptable practice throughout the Registrant's career.

(3) Public Statements. A Registrant shall issue public statements only in an objective and truthful manner.

- (a) A Registrant shall issue no professional testimony that is inspired or paid for by interested parties unless the Registrant explicitly identifies the interested parties on whose behalf the Registrant is speaking and reveals any interest such parties have in the matters.
- (b) A Registrant shall not attempt to injure, maliciously or falsely, the professional reputation, prospects, practice, or employment of other Registrants.

(4) Conflicts of Interest. A Registrant shall act professionally for each employer or client as a faithful agent and shall avoid conflicts of interest, or the appearance of conflicts of interests.

- (a) A Registrant shall make full prior disclosures to the Registrant's employers or clients of potential conflicts of interest or other circumstances which could influence or appear to influence the Registrant's judgment or the quality of their services. The Registrant bears responsibility for maintaining documentation of compliance with this requirement.

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5.02: continued

(b) A Registrant shall not accept compensation, financial or otherwise, from more than one party for concurrent services on the same project unless the circumstances are fully disclosed in writing to all interested parties.

(c) A Registrant shall not solicit or accept compensation, financial or otherwise, directly or indirectly, from contractors, vendors or other parties in connection with work for employers or clients for which the Registrant is responsible.

(5) Solicitation and Compensation. A Registrant shall avoid improper solicitation of professional employment.

(a) A Registrant shall not falsify or permit misrepresentation of the Registrant's own academic or professional qualifications, or those of the Registrant's associates.

(b) A Registrant may be disciplined for being found in violation of the state ethics law by the State Ethics Commission.

(c) A Registrant may request, propose or accept contracts for professional services on a contingent basis only under circumstances in which the Registrant's professional judgment would not be compromised and the contingency agreement is in writing and complies with 250 CMR 5.02(5)(e).

(d) Regardless of the negotiated compensation, the Registrant must provide services that comply with accepted professional standards.

(e) A Registrant shall establish clear and unambiguous contractual arrangements with clients. At a minimum, contractual arrangements must state a description of the proposed work, fees and expenses to be paid, and schedule for completion.

5.03: Professional Seal

(1) Format.

(a) Each person registered as a Professional Engineer in the Commonwealth shall use a professional seal that conforms to the designs approved and made available by the Board. The seal shall contain the following words: "Commonwealth of Massachusetts", the Registrant's name, the Registrant's registration number, and the words "Professional Engineer" and may include one's Licensed Branch.

(b) Each person registered as a Professional Land Surveyor in the Commonwealth shall use a professional seal that conforms to the designs approved and made available by the Board. The seal shall contain the following words: "Commonwealth of Massachusetts", the Registrant's name, the Registrant's registration number, and the words "Professional Land Surveyor".

(2) The seal must be a symbol or image in the form of a rubber stamp, embossed seal or digitized seal (computer generated image), or other form approved by the Board. The outside diameter of the depicted image must be approximately one and one half inches.

(3) A Registrant shall affix his or her seal only to Instruments of Service produced by the Registrant personally or under the Registrant's Direct Charge and Supervision, except as provided in 250 CMR 5.03(4).

(4) A Registrant may review and adopt work started by or under another Registrant's Direct Charge and Supervision provided the adopting Registrant has performed a detailed and thoroughly documented review and will assume complete responsibility for the work of that previous Registrant.

(5) Under no circumstances shall a Registrant adopt the Work Products developed by unregistered persons who themselves were not working under the Direct Charge and Supervision of a Registrant.

(6) Any document bearing the Registrant's seal must also be appropriately dated and signed with either a legible hand written Signature adjacent to (not obscuring) the seal or a properly encrypted digital Signature, in compliance with 250 CMR .

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5.03: continued

- (7) The Registrant shall not affix his or her seal to stickers, decals, cards, stationery, advertising, or any other such material.
- (8) The Registrant must take reasonable steps to prevent the Registrant's seal or digital Signature encryption key from being lost, stolen or out of the Registrant's personal possession or control.
- (9) The Registrant shall not allow another person to use the Registrant's seal or digital Signature encryption key.
- (10) A Registrant whose License has lapsed shall not use his or her professional seal.
- (11) When a digital Signature is applied to an Instrument of Service, it must have an electronic authentication process attached to it that is uniquely associated with the Registrant, can be authenticated by the recipient, and is uniquely linked to the underlying documents in a manner that will invalidate the digital Signature if any part of the document is changed.
- (12) A Registrant is responsible for all work on any plan that bears the Registrant's professional seal unless the Registrant expressly and properly limits the Registrant's responsibility as set forth in 250 CMR 5.03(13).
- (13) If a Registrant does not take responsibility for all of the work on an Instrument of Service, the Registrant shall add any suitable comments near, but not through the seal to limit their responsibility. Such comments might limit responsibility to such things as electrical design, structural design, property boundaries, a specified portion of the document, or a specified change.
- (14) A Registrant may assume responsibility for coordination of an entire project and sign and seal the Instruments of Service for the entire project, provided that the Instruments of Service for each technical segment are signed and sealed by the qualified Registrant who either prepared or directly supervised the preparation of said technical segment.
- (15) A Registrant shall sign, date and seal instruments of service prepared by the Registrant, when those documents are filed with public authorities. If the Instrument of Service is a set of printed plans, each sheet must be individually signed and sealed and appropriately dated, unless otherwise authorized by statute.

5.04: Direct Charge and Supervision

A Registrant must exercise Direct Charge and Supervision over those persons assisting in the preparation of Instruments of Service. Direct Charge and Supervision requires at a minimum that:

- (1) the Registrant exercised unambiguous decision-making authority with respect to the preparation of the Instruments of Service he or she sealed and signed, without interference or undue influence from any other individual or entity;
- (2) the persons assisting in the preparation of the Instruments of Service were subordinates reporting directly to the Registrant rather than through some other person or entity capable of subverting the Registrant's direction;
- (3) the Registrant had the freedom and authority to assign personnel, and to employ appropriate technologies and equipment for the preparation of Instruments of Service;
- (4) the Registrant exercised due care in assigning tasks to persons assisting in the preparation of Instruments of Service based upon the Registrant's knowledge of each person's expertise, knowledge and skill levels;

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5.04: continued

- (5) the Registrant has a verifiable written record establishing that contributing work provided by unlicensed individuals was subject to regular and continuing Direct Charge and Supervision throughout the development process;
- (6) the work performed by unlicensed individuals does not include approval of final designs or decisions; and
- (7) the persons assisting the Registrant preparing the Instruments of Service had continuous access to and guidance from the Registrant throughout the development process.

5.05: Business Entities

A Business Entity may provide or offer to provide engineering or surveying services only if a registered engineer or land surveyor has management responsibility for that part of the business. In this context, such Registrant is referred to as the Registrant-in-charge.

The relationship between the Business Entity and the Registrant-in-charge must be characterized by the following:

- (1) the Registrant-in-charge or a Registrant in his or her charge exercises Direct Charge and Supervision as set forth in 250 CMR 5.04; and
- (2) the Registrant-in-charge is an active participant in the contracting, reporting, publishing, scheduling, *etc.* of professional services being offered by the Business Entity.

5.06: License Renewal

A Registrant is responsible for maintaining his or her License to practice in good standing by renewing the License as required by M.G.L. c. 112, § 81N and 250 CMR 5.06, by providing all information required by the Board, and by maintaining generally acceptable ethical, professional and business practices. This responsibility cannot be delegated to others. Practice under a License that has not been properly renewed is considered the unlicensed Practice of Engineering or Practice of Land surveying and may result in disciplinary action.

- (1) A License is valid for a period ending June 30th of the next even-numbered year and requires renewal at that time. A License that is not renewed on or before the June 30th expiration date shall lapse.
- (2) A Registrant shall apply for renewal of his or her License on or before the date the License will lapse. To apply for renewal of a License, a Registrant shall submit to the Board a completed License renewal application on a form prescribed by the Board and shall pay such fees for renewal of that License as may be established by the Executive Office of Administration and Finance pursuant to M.G.L. c. 7, § 3B.
- (3) As a condition for renewal of his or her License, a Registrant must submit to the Board satisfactory proof that the Registrant is in compliance with statutory and regulatory requirements specified by the Board, including but not limited to, M.G.L. c. 62C, § 47A and § 49A, and 250 CMR 5.09.
- (4) It is the responsibility of each Registrant to notify the Board of any changes in his or her address of record as well as to know the status of his or her License.
- (5) Failure to receive renewal notification from the Board does not excuse the Registrant from responsibility for timely renewal.
- (6) A Registrant with a lapsed License is no longer permitted to practice engineering or land surveying in the Commonwealth and the use of the Registrant's seal is prohibited.

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5.06: continued

(7) A License may be renewed within two years of lapsing provided a renewal form is submitted along with the required fees, including the late fee.

(8) A License cannot be renewed if it has lapsed for more than two years. After the first two years, the former Registrant must file for reinstatement pursuant to 250 CMR 5.07.

5.07: Reinstatement of Lapsed License

An individual whose License has lapsed for more than two years may apply for reinstatement of his or her License by:

(1) Submitting a properly completed Reinstatement Application Form with the applicable filing fee;

(2) Demonstrating to the Board's satisfaction that nothing has occurred during the lapsed period which would justify the revocation of the Registrant's License under the provisions of M.G.L. c. 112, § 81P or any other applicable law;

(3) Demonstrating to the Board's satisfaction that the Registrant meets the current requirements for registration, which may include an oral interview/exam, submission of documentation, and the required written examinations; and

(4) Paying applicable late fees and renewal fees for missed licensing cycles as required by the Director of the Division of Professional Licensure.

5.08: Use of Title Engineer or Land Surveyor

No person, other than a Registrant holding a current License to practice in the applicable profession, shall advertise or hold themselves out as either a Professional Engineer or a Professional Land Surveyor, or use any other title to imply that they are qualified to practice engineering or land surveying in the Commonwealth, or in any other way hold themselves out as able to perform any of the Licensed Branches of engineering or land surveying.

250 CMR 5.08 shall not prohibit a person who is not registered/Licensed in Massachusetts but who holds a current License to practice in another state or Jurisdiction and who declares or otherwise qualifies his or her title in a manner that does not imply that the person is qualified to practice in Massachusetts (*e.g.*, "Professional Engineer, Kansas" would be acceptable).

5.09: Professional and Moral Character

(1) A Registrant shall provide the Board with written notification of any disciplinary action or restriction on practice imposed against any professional License, registration, certificate, or permit held by the Registrant by the applicable governmental authority of any state, territory or political subdivision of the United States or any foreign jurisdiction. Such notice must be received by the Board within 30 days of the effective date of said discipline or restriction.

(2) A Registrant shall provide the Board with written notification of the Registrant's conviction of any crime, including any misdemeanor or felony, other than a routine traffic violation, made by a court or any other adverse action by any state or federal agency. Such notice must be received by the Board within 30 days of said conviction or adverse action. Records of compliance with 250 CMR 5.09(2) shall be exhibited to the Board upon demand.

(3) For the purposes of 250 CMR 5.09(2), the term "conviction" means any of the following:

- (a) a final judgment entered after a jury verdict of guilty or a judicial finding of guilty;
- (b) a plea of guilty;
- (c) a plea of *nolo contendere* (no contest); or
- (d) any other plea or finding which is treated by the court as a plea or finding of guilty.

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5.09: continued

The standards in 250 CMR 5.09(3)(a) through (d) shall apply regardless of the law of the jurisdiction in which the disposition occurred.

REGULATORY AUTHORITY

250 CMR 5.00: M.G.L. c. 112, §§84D through 81T.

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NON-TEXT PAGE

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250 CMR 6.00: LAND SURVEYING PROCEDURES AND STANDARDS

Section

6.01: Elements Common to All Survey Work

6.02: Survey Work Affecting Property Rights

All land surveying work is considered work of a professional nature and shall be performed in conformance with 250 CMR 6.00, commonly accepted standards of care and 250 CMR 5.00: *Professional Practice*.

The provisions of 250 CMR 6.00 shall be the minimum required for all surveys and shall take precedence over the less restrictive standards of other authorities or sources.

6.01: Elements Common to All Survey Work

250 CMR 6.00 describes requirements common to all types of survey work, including but not limited to such surveys as Boundary, topographic, construction layout, title insurance, and mortgage surveys.

(1) Presumptions.

(a) When engaged to provide Work Products, surveyors are presumed to be familiar with other generally accepted standards of care (e.g., *National Map Accuracy Standards*, *Land Title Survey Standards*, land court standards) associated with that type of work and the surveyor's Work Products shall comply with those additional standards to the extent that such standards do not conflict with the provisions of 250 CMR.

(b) When integrating mapping products provided by others, such as photogrammetric mapping, LiDAR mapping, geographic information systems data layers and hydrographic mapping, the surveyor is presumed to have exercised due care in evaluating the provider's qualifications, establishing the product's conformance with mapping standards, and performing sufficient independent conformance checks.

(2) Measurements.

(a) Linear measurements shall be expressed in terms of the US Survey Foot or the Meter.

(b) The intended purpose of a Work Product shall dictate the accuracy and precision of the field measurements, the measuring equipment used and the manner of its use.

(c) Appropriate corrections shall be applied to measurements to minimize or eliminate systematic errors.

(d) Redundant observations shall be used to analyze Control measurements and when practical other measurement data, to assess the magnitude of errors associated with those measurements and to determine if the distributions of those errors are within acceptable tolerances.

(e) After elimination of blunders and a determination that the remaining errors are within acceptable tolerances, the survey Control shall be appropriately adjusted such that it conforms to known geometric conditions or other known constraints.

(f) For large and/or complex Control networks, the preferred method of analysis and adjustment shall be the statistically rigorous method of least-squares.

(3) Calibration.

(a) Measuring equipment must be calibrated to insure it continues to meet or exceed manufacturers' specifications and is capable of producing results in conformance with these standards.

(b) The timing of device Calibrations must be such that it can be demonstrated that the device was capable of performing up to the standards of 250 CMR 6.01(3) and manufacturers' specifications at the time the survey was performed.

(c) Appropriate calibration methods shall be employed that include the personnel who normally use the equipment and the accessory devices normally used with the equipment. These methods shall employ redundant measurement techniques capable of developing statistical tests, rather than simple direct comparisons.

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6.01: continued

(d) Records of compliance with 250 CMR 6.00 shall be exhibited to the Board upon demand.

(4) Horizontal and Vertical Datums.

(a) Horizontal directions shall be tied to some known meridian. When magnetic meridians are used, the date and location where the meridian was observed must be provided.

(b) Horizontal coordinates, when provided, must be referenced to monuments or known and reproducible horizontal datums. The preferred horizontal datum is the Massachusetts Coordinate System North American Datum (NAD).

(c) Elevations, when provided, shall be referenced to a known vertical datum or to an assumed datum for which two monuments (bench marks) have been established. The preferred vertical datum is the current national vertical datum.

(d) Horizontal and vertical Control surveys for construction layout work shall be tied to all Boundary, easement or Regulatory Lines affecting the location of existing or proposed Fixed-works.

(5) Work Products. All deliverable Work Products depicting the survey shall contain the following types of information, except when the only Work Product delivered is on-the-ground markings:

(a) The client's name, the record owner's name, and location of the surveyed premises.

(b) The surveyor's full name, firm name, business address, seal, Signature, the date of the Work Product and, when appropriate, a revision date.

(c) Measured quantities shall be shown to a number of significant digits consistent with the accuracy and procedures used to obtain the measurements and appropriate for the item being described.

(d) The Work Product shall identify the survey's meridian by symbol, note its origin and orient the Work Product such that north is generally pointing in an upward direction.

(e) The Work Product shall provide ratio and graphic bar scales.

(f) When surveys are tied to an existing coordinate system, provide the basis for the ties and, if applicable, the combined scale factor needed to convert the reported distances back to ground measurements.

(g) Identify sources and techniques used to develop the mapping information shown, such as contours, site features, utilities, floodplains, wetlands, *etc.*

(h) For information obtained from a specific data layer in a geographic information system, land information system or mapping system, the survey Work Product shall identify the source and positional accuracy of features and/or attributes obtained from said layer.

(i) The standard for positional information shown on a survey or other Work Product shall meet the appropriate national map accuracy standard for the compilation scale of the Work Product.

(6) Archival Requirements. The surveyor shall maintain supporting documentation sufficient to demonstrate compliance with 250 CMR and to substantiate their findings in response to lawful inquiries long enough to meet applicable legal and regulatory requirements.

6.02: Survey Work Affecting Property Rights

250 CMR 6.02 describes those additional requirements applicable to all survey work associated with Boundary lines that affect property rights, existing or proposed, such as property lines, lease lines, easement lines, Jurisdictional Lines, Regulatory Lines, including the horizontal and vertical Control necessary to establish such lines.

Additionally, 250 CMR 6.02 applies to the marking or remarking of said lines on-the-ground and those Work Products that relate natural or manmade features to such lines.

(1) Precedence. To the extent that 250 CMR 6.02 may reiterate key aspects of the Laws of Evidence, the intent of 250 CMR 6.02 is to emphasize those aspects of the law, not to create a new standard that would modify or supersede the Laws of Evidence.

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6.02: continued

(2) Presumptions.

- (a) Surveyors are presumed to know the Laws of Evidence pertaining to the location of lines and are presumed to follow the Laws of Evidence when reproducing lines or creating new lines.
- (b) Based upon equivalent bodies of Evidence and equivalent treatment of that Evidence, that Evidence should lead each surveyor to substantially equivalent determinations.
- (c) When a surveyor agrees to locate a written conveyance, the surveyor also agrees to locate the conveyance in accordance with the laws regulating the interpretations of written conveyances.
- (d) When new lines are being defined, those lines are presumed to be tied to Original Lines and/or original monuments authenticated in accordance with the Laws of Evidence.
- (e) Historical documents that created Original Lines are presumed to have been based upon a survey, whether or not the survey was of a professional nature or was prepared by a lay person.
- (f) When the development of a Work Product is based upon a prior survey, the resulting Work Product is presumed to comply with the provisions of these standards, regardless of the standard of care associated with the prior survey.

(3) Research. Record Evidence of public sources and known private sources shall be examined to sufficient depth and scope such that the surveyor is convinced:

- (a) The current description of the subject property and all abutting properties have been identified and acquired.
- (b) The plats and surveys describing the subject property and abutting properties have been identified and acquired.
- (c) The Operative Document that created each line or point on the subject property, or the best available Evidence of that document, has been identified and acquired.
- (d) Conflicting descriptions describing the common lines of the subject property and the abutting property have been identified and investigated.
- (e) Scrivener's errors describing the subject property and the abutting properties have been identified and investigated.
- (f) Appurtenances and/or encumbrances have been investigated when discovered through normal research procedures.
- (g) The source and validity of Regulatory Lines affecting the subject property have been investigated, when applicable.

(4) Fieldwork. Physical Evidence shall be investigated to a sufficient depth and scope such that the surveyor is convinced:

- (a) The physical Evidence necessary to base a conclusion has been identified and located.
- (b) Any recognizable Evidence of occupation (*e.g.*, fences) has been identified and located at intervals sufficient to delineate the directions and distances of the primary lines and angles.
- (c) The visible appurtenances and encumbrances to the subject property have been identified and located.
- (d) Apparent encroachments onto the subject property or onto adjacent properties have been identified and located.
- (e) Natural and manmade features crossing, near or within the subject property, that help identify the surveyed lines, have been identified and located.

(5) Computations and Analysis. In performing the analysis of the record and physical Evidence, the surveyor shall:

- (a) Make interpretations of the record and physical Evidence and draw conclusions based upon the Laws of Evidence.
- (b) Evaluate and use the Evidence based upon the original creating units of measurement, not in terms of modern units of measurements, unless a contrary intent is indicated by the Laws of Evidence.
- (c) Assign no more weight or dignity to one recited point of a prior survey than any other recited point, unless a contrary intent is indicated by the survey.
- (d) Test the mathematical integrity of record Evidence and use the results in a manner consistent with the Laws of Evidence.

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6.02: continued

- (e) Use computer software products responsibly by carefully examining output and making appropriate checks.
 - (f) Consider parol Evidence whenever the collected Evidence is insufficient to draw a conclusion and, when relied upon, consider obtaining affidavits.
- (6) Monumentation. Lines shall be marked on-the-ground such that, in combination with the monuments recovered:
- (a) Sufficient monuments exist to enable future surveyors to reliably reproduce the lines as surveyed, even if some of the referenced monuments are compromised over time. Referencing coordinates are not a substitute for setting physical monuments.
 - (b) The size, composition and material of newly set monuments shall:
 - 1. Be sufficient to minimize the likelihood of disturbance due to acts by mankind or natural causes;
 - 2. Be stable enough to adequately meet the accuracy standards of the survey;
 - 3. Have a life expectancy of 25 years or more under normal circumstances;
 - 4. Be detectable using generally employed surveying techniques; and
 - 5. Be identifiable, with reasonable certainty, as having been set by a surveyor.
- (7) Work Products. In addition to those elements common to all survey Work Products noted in 250 CMR 6.01, the following additional requirements are applicable to all Work Products classified under 250 CMR 6.02:
- (a) Identify the current record owner of the subject parcel and all abutting parcels thereto by title reference.
 - (b) Delineate both directly and indirectly measured quantities describing surveyed lines and points with significant figure and decimal place values appropriate to commonly accepted accuracy requirements for such surveys and to provide an adequate means of accurately reproducing said lines or points.
 - (c) Report the area of each surveyed parcel in appropriate units of measure and number of significant digits to express the value accurately.
 - (d) Reference other pertinent surveys of record describing the subject premises and any abutting premises.
 - (e) Provide references to the key Evidence used to base conclusions.
 - (f) Delineate any Evidence of occupation material to the owner's title.
 - (g) Delineate visible Evidence of apparent appurtenances and encumbrances.
 - (h) Delineate visible Evidence of apparent encroachments by abutters onto the subject property and by the owner of the subject property onto adjoining properties.
 - (i) Clearly distinguish between monuments found and monuments set along with their physical composition and description, which includes their mathematical relationship to the property.
 - (j) Provide sufficient course and distance redundancy to allow testing for mathematical correctness for the outbounds of the subject property and each parcel contained within the subject property.
 - (k) Report the actual observed measurements (either directly and/or indirectly) that describe the Evidence appearing on the survey and parenthetically show record measurements for comparison, when appropriate.
 - (l) Provide a vicinity map or reference the subject property to well-known geographic features, such as street intersections, rivers, or railroads.
 - (m) Show the location of objects (*e.g.*, streams, fences, structures) that are informative as to the general location of the boundaries of the property.

REGULATORY AUTHORITY

250 CMR 6.00: M.G.L. c. 112, §§ 81D through 81T; c. 13, §45.



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**BOARD OF REGISTRATION OF PROFESSIONAL ENGINEERS
AND LAND SURVEYORS ADVISORY**

Approved April 28, 2022
Updated November 17, 2022

The purpose of this advisory is to clarify tasks that may be performed by Professional Land Surveyors (“PLS”) and Professional Engineers qualified in the Branch of civil engineering (“PE (Civil)”) in the Commonwealth of Massachusetts.

This advisory issued by the Board of Registration of Professional Engineers and Land Surveyors (“Board”) seeks to clarify which common tasks are properly performed by the respective professions. Please note that this list is not exhaustive of tasks that may be performed by either profession. Further, please review all footnotes for any applicable limitations on the performance of any task by Professional Land Surveyors and Professional Engineers (Civil).

Nothing in this advisory shall be construed to waive or modify any applicable provisions of law or regulation or other obligations. It seeks only to provide guidance to licensees and the general public as to different tasks that may be performed by Professional Land Surveyors and Professional Engineers (Civil). The Board may modify this advisory periodically based upon any changes in the professions.

<u>Task</u>	<u>PLS</u>	<u>PE (Civil)</u>
Boundary Line Survey ¹	Yes	No
Topographic Survey	Yes	Yes ²
Survey Control	Yes	No
Hydrographic Survey	Yes	Yes ²
Property Descriptions	Yes	No
Drainage Design	No	Yes



Construction Layout	Yes	Yes ³
Soil Evaluation for Septic System Design	Yes ⁴	Yes ⁴
Septic System Design	No	Yes
Highway Design	No	Yes ⁵
Subdivision Design	Yes ⁶	Yes ⁵
Utility Service Design	No	Yes
Condominium Site and Unit Plan	Yes ⁷	Yes ⁷
As-Built Survey	Yes	Yes ⁸
FEMA Elevation Certificates	Yes	Yes

¹ Per 250 CMR 2.09(3), a Boundary is “a legal demarcation between real property title or rights and includes but is not limited to proposed or existing property lines, Regulatory Lines, lease lines, easement lines, and Jurisdictional Lines.”

² Professional Engineers (Civil) shall not perform a topographic or hydrographic survey if there is mapping which requires survey ground control; there is mapping that must comply with the Land Surveying Procedures and Standards set forth in 250 CMR 6.00 et. seq.; or if there are existing or proposed structures, features or Boundaries shown relative to property lines. All topographic surveys related to or featuring land boundaries or property lines must be performed by a Professional Land Surveyor.

³ Professional Engineers (Civil) performing construction layouts must ensure that their work is in compliance with 250 CMR 5.01(2) and may not perform work that is related to the determination of property lines. “A Professional Engineer qualified in the Branch of civil engineering may also perform land surveying incidental to his or her engineering work relative to locating or relocating any of the Fixed-works embraced within the practice of civil engineering, but excluding the determination of property lines.” 250 CMR 5.01(2)(a). “The delineation of existing or proposed structures, features or Boundaries relative to property lines requires the determination of property lines and therefore must be performed by a Professional Land Surveyor.” 250 CMR 5.01(2)(b). See also M.G.L. c. 112, § 81D.

⁴ Both Professional Land Surveyors and Professional Engineers must meet the criteria outlined in 310 CMR 15.017 to be approved as a Soil Evaluator prior to engaging in Soil Evaluations for Septic System Designs.

⁵ Survey work which includes, but is not limited to, Boundary lines, lot lines, street lines, right of way lines, easement lines, and record plans, must be prepared by a Professional Land Surveyor.

⁶ Grading, utility, and drainage design shall be prepared by a Professional Engineer.

⁷ The condominium site plan must be prepared by a Professional Land Surveyor. Unit plans may be prepared by a Professional Engineer (Civil).

⁸ Professional Engineers (Civil) preparing as-built surveys must ensure that their work is performed in compliance with 250 CMR 5.01(2)(a) and 250 CMR 5.01(2)(b). Pursuant to said regulations, “[a] Professional Engineer qualified in the Branch of civil engineering may also perform land surveying incidental to his or her engineering work relative to locating or relocating any of the Fixed-works embraced within the practice of civil engineering, but excluding the determination of property lines. The delineation of existing or proposed structures, features or Boundaries relative to property lines requires the determination of property lines and therefore must be performed by a Professional Land Surveyor.” For further guidance, please see Board FAQ: [Can a Professional Engineer \(PE\) certify a site plan or an as-built plan which references and/or utilizes a property line determination that was previously completed by a Professional Land Surveyor \(PLS\)?](#)



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Board of Registration of Professional Engineers and Land Surveyors
Advisory on the Use of Job Titles that include the term "Engineer" or "Surveyor"

In response to questions received from the engineering and land surveying business community, the Board of Registration of Professional Engineers and Land Surveyors ("the Board") issues this advisory opinion on the use of engineering or land surveying job titles by unlicensed individuals working within the engineering and land surveying business community.

Massachusetts state law prohibits an individual who is not licensed as a professional engineer in the Commonwealth from using a job title which implies to the public that the individual is capable of performing engineering services. See M.G. L. c. 112, §§ 81D, 81T. Similarly, state law prohibits an individual who is not licensed as a professional land surveyor in the Commonwealth from using a job title which implies to the public that the individual is capable of practicing land surveying. These laws are implemented by Section 5.08 of Board regulations which states the following:

5.08: Use of Title Engineer or Land Surveyor

No person, other than a Registrant holding a current License to practice in the applicable profession, shall advertise or hold themselves out as either a Professional Engineer or a Professional Land Surveyor, or use any other title to imply that they are qualified to practice engineering or land surveying in the Commonwealth, or in any other way hold themselves out as able to perform any of the Licensed Branches of engineering or land surveying.

For companies that offer engineering or land surveying services to the public, a job title that includes the term "engineer" or "surveyor" implies to the public that the individual holding that job title is qualified to perform engineering or surveying work without supervision and therefore requires licensure by the Board. See Opinion of the Attorney General, dated August 12, 1965 & Opinion of the Attorney General dated March 9, 1971. For this reason, the Board cautions against engineering or land surveying firms allowing unlicensed employees to hold themselves out to the public as a "Civil Engineer," "Electrical Engineer," "Graduate Engineer/Surveyor," "Project Engineer," or "Associate Engineer/Surveyor." If the Board



receives a complaint about a title being used by an unlicensed employee in an engineering or land surveying firm, the Board would consider whether there is clear notice to the public that the unlicensed individual is not qualified to provide unsupervised engineering or land surveying services. If the title contains the term “engineer” or “surveyor” and is used in a manner that could mislead or deceive the public into believing that the unlicensed individual is qualified to practice engineering or surveying, the Board may initiate disciplinary proceedings against the unlicensed individual and his or her employer.

There are a few statutory exemptions to the general rule that the job title “engineer” or “surveyor” requires licensure by the Board.

Exemptions to general rule that use of the term “engineer” or “surveyor” in job title requires licensure as a professional engineer:

The individual is licensed as a 1st, 2nd or 3rd class Engineer by the Boiler & Pressure Vessel Licensing Program under M.G.L. c. 146, and uses the title Engineer as authorized by that licensing law.

The individual holds a certificate as an Engineer-In-Training/Surveyor-In-Training issued by the Board and uses the title “Engineer-In-Training”/”Surveyor-In-Training.”

The individual is an employee of a manufacturing company and is lawfully performing engineering work under the Manufacturing Exemption in G.L. c. 112, s. 81R.

The individual is licensed in another state and lawfully practicing with a Temporary Permit or clearly qualifies his or her title in a manner that makes clear the individual’s states of licensure. G.L. c. 112, s. 81R(b) and (c) and 250 CMR 5.08.

The individual is using “engineer” or “surveyor” in a manner which makes clear that the individual is not qualified to practice engineering without supervision. For example, under certain circumstances, the titles “apprentice engineer” or “junior engineer” would not imply to the public that the holder of that title is capable of independently practicing engineering and therefore may be permissible.

As stated above, this advisory is issued in response to questions received from members of the engineering and land surveying business community. Nothing in this advisory shall be construed to waive or modify any applicable provision of law or regulation. In addition, advisory opinions may be rescinded or modified by the Board at any time.

Boundaries in Massachusetts Property, Land Use, and Environmental Law, Where They Are, and How they Change

GREGOR I. MCGREGOR, ESQ.

MCGREGOR & LEGERE, PC¹

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This is a fresh look at some traditional and modern Massachusetts doctrines and laws about the various kinds of boundaries which real estate clients and their counsel deal with in titles, transactions, permitting, and litigation, but sliced differently on how they are determined, how they are subject to change, and how not to be surprised when they morph or move.

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¹ The author thanks Ayah Badran, J.D. student at Vermont Law School and law clerk at the firm for a semester in practice, for her assistance in the preparation of these materials.

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Boundaries in Massachusetts Property, Land Use, and Environmental Law, Where They Are, and How they Change

GREGOR I. MCGREGOR, ESQ.

I. BOUNDARIES AT THE WATER'S EDGE

A. Ownership of Coastlines

“The waters and the land under them beyond the line of private ownership are held by the State, both as owner of the fee and as repository of sovereign power, with a perfect right of control in the interest of the public.” *Home of Aged Women v. Commonwealth*, 202 Mass. 422, 427 (1909). The Commonwealth may create land below the low water line, and the title of that land belongs to the Commonwealth, with no remedy available in damages for the adjacent littoral owner. *Id.* However, that does not mean that whenever the Commonwealth creates new surface land, by filling in the subsurface flats, title to such land is invariably in the Commonwealth. *Michaelson v. Silver Beach Imp. Ass’n, Inc.*, 342 Mass. 251 (1961).

The Commonwealth controls the navigable tide waters and land under them “for all useful purposes, the principal of which . . . (are) navigation and the fisheries.” *Id.* at 256 (citing *Commonwealth v. City of Roxbury*, 75 Mass. 451, 483 (1857)). The *Michaelson* court notes that this doctrine is not unlimited; in order for the Commonwealth to have the right to ownership, the works creating the new surface land must be related to the Commonwealth’s traditional powers in the waters. *Id.* at 256 (citing *Home of Aged Women v. Commonwealth*, 202 Mass. at 435).

Title by grant from the colony or the Commonwealth, if not built upon, is subject to the authority of the legislature “for the protection of the harbors and of the public right of navigation.” *City of Boston v. Richardson*, 105 Mass. 351, 362 (1870).

When the boundary of a littoral owner’s property is modified by accretion or reliction, generally the “line of ownership follows the changing water line,” meaning that the littoral property owner acquires title to the land that has been added by accretion or reliction. *Allen v. Wood*, 256 Mas. 343, 349 (1926); *Burke v. Commonwealth*, 283 Mass. 63, 68 (1933). It does not matter whether the littoral increase happens from natural causes, or from natural and artificial causes, the land that forms gradually and imperceptibly is still owned by the littoral property owner. *Adams v. Frothingham*, 3 Mass. 352, 363 (1807); *See also St. Clair County v. Lovington*, 90 U.S. 46, 66 (stating that whether the flow of the water is natural or affected by artificial means is immaterial, so long as the proximate cause was the deposits made by water). The exception to this is in cases where the littoral owners themselves were the cause of the formation; in such cases the property owner does not gain ownership of such land. *See Michaelson v. Silver Beach Imp. Ass’n, Inc.*, 342 Mass. 251, 254 (1961) (citing *Adams v. Frothingham*, 3 Mass. 352, 363 (1807); *County of St. Clair v. Lovington*, 90 U.S. 46 (1874)).

B. Accretion, Avulsion & Reliction: Boundaries Changed by Natural and Unnatural Processes

Accretion

Accretion is the process by which an area of land is increased by the gradual deposit of soil due to the action of a river, lake, sea or other body of water. In *Allen v. Wood*, 256 Mass. 343, 349 (1926), the court referred to “accretion” as “when the line between water and land bordering thereon is changed by the gradual deposit of alluvial soil upon the margin of the water.” The added soil is called “alluvion”. See *Inhabitants of Deerfield v. Arms*, 34 Mass. (Pick) 41 (1835) (stating that where land is formed by alluvion . . . by slow and imperceptible accretion, it is the property of the owner of the adjoining land.)

The test for what is considered “gradual and imperceptible” is that though the witnesses may see from time to time that progress has been made, they could not perceive it while the process was going on.” *St. Clair County v. Lovington*, 90 U.S. 46, 68 (1874). *Bergh v. Hines* established the well-settled authority for the proposition that littoral boundaries are not fixed because natural processes of accretion or erosion change them, and . . . easements, stated to run with such a boundary, ordinarily will follow the naturally changing line”; against the recognition of moveable landward boundaries of littoral property owners; artificial accretion not a recognized method of changing littoral boundaries. 44 Mass. App. Ct. 590, 592 (1998).

If the accretion forms simultaneously on several littoral properties, the rights of each owner are determined by equitable division – giving each property the same proportion of waterfront as it would have had absent the accretion. *Burke v. Commonwealth*, 283 Mass. 63, 67 (1933); *Allen v. Wood*, 256 Mass. 343, 256 (1926).

Reliction

Previously referred to as dereliction, is the process by which land is uncovered or exposed by gradually receding water. See *St. Clair County v. Lovington*, 90 U.S. 46, 67 (1874); See also *Jefferis v. East Omaha Land Co.*, 134 U.S. 178 (1890) (citing to *Rex v. Lord Yarborough*, 3 Barn. & C. 91).

Avulsion

The process by which there is a sudden and perceptible change in the location of a body of water, either covering or uncovering land. If soil is added or removed very rapidly rather than gradually, where the land is covered or uncovered by a sudden and perceptible change in the shoreline, the boundary line remains the same and title is left as it was before the change. See *State of Nebraska v. State of Iowa*, 143 U.S. 359 (1892) (citing *Trustees of Hopkins Academy v. Dickinson*, 63 Mass. 544 (1852) and several other state supreme court cases¹).

In *Stop the Beach Renourishment, Inc. v. Florida Dept. of Env'tl. Prot.*, the Court describes accretions as “additions of alluvion (sand, sediment, or other deposits) to waterfront land,” and relictions as “lands once covered by water that become dry when the water recedes.” 560 U.S. 702 (2010) (holding that Florida Supreme Court did not engage in unconstitutional taking of littoral property owner’s rights to future accretions by upholding the State’s decision to restore eroded beach by filling in submerged land). It notes that in order for an addition to dry land to

¹ *Buttenuh v. Bridge Co.*, 123 Ill. 535 (1888); *Hagan v. Campbell*, 8 Port. 9 (1838); *Murray v. Sermon*, 1 Hawks 56 (1820).

qualify as an accretion (it uses this term to refer to both accretions and relictions collectively), “it must have occurred gradually and imperceptibly . . . so slowly that one could not see the change occurring, though over time the difference became apparent.” *Id.* at 708 (citing to *County of St. Clair v. Lovington*, 23 Wall. 46, 66–67, (1874)). It also defines avulsion, as a “sudden or perceptible loss or addition to land by the action of the water or a sudden change in the bed of a lake or the course of a stream.” *Id.* (citing *Board of Trustees of Internal Improvement Trust Fund v. Sand Key Assoc., Ltd.*, 512 So.2d 934, 936 (Fla.1987)).

C. Great Ponds and Rivers: Boundaries of Freshwater Bodies²

The applicability of long-established littoral ownership rules to Great Ponds is still an open question. *Kubic v. Audette Babcock*, 2019 WL 267907 (Jan. 17, 2019) (citing *Opinion of Justices to Senate*, 474 Mass. 1201, 1207 (2016)). The court notes that the SJC in the OOI observed: “The natural water lines of a great pond, as with other bodies of water, may of course change over time as a result of natural events including accretion or reliction. This would seem to be especially true in cases of coastal ponds, where the contours of the coastlines, beaches and ponds will be affected by storms, rises in sea level, and other forces. The question then becomes whether the boundaries of the littoral property on great ponds change along with these natural changes in the water lines. It is a question that raises important and complex competing principles of private property law and the Commonwealth's protection of the public trust that were not addressed in the *Lorusso* case, [*Lorusso v. Acapesket Improv. Ass'n*, 408 Mass. 772 (1990)].” The court in that case declined to decide this issue in its resolution of the case before it.

“Accretions to land bounding a river *or* the sea belong to the owner of the adjoining land.” *Allen v. Wood*, 256 Mass. 343, 349 (1926). In apportioning accretions on non-navigable river frontage, the division of frontage is made with the goal of giving each property holder relatively the same proportion of their ownership of the new river line as they had in the old river line. *See Id.* at 349-350 (1926) (citing *Deerfield v. Arms*, 34 Mass. 41 (1835)).

D. Conveyance by Deeds: Boundaries on Ways, Walls, Fences, Watercourses or Other Monuments

“Every instrument passing title to real estate abutting a way, whether public or private, watercourse, wall, fence or other similar linear monument, shall be construed to include any fee interest of the grantor in such way, watercourse or monument, unless (a) the grantor retains other real estate abutting such way, watercourse or monument, in which case, (i) if the retained real estate is on the same side, the division line between the land granted and the land retained shall be continued into such way, watercourse or monument as far as the grantor owns, or (ii) if the retained real estate is on the other side of such way, watercourse or monument between the division lines extended, the title conveyed shall be to the center line of such way, watercourse or monument as far as the grantor owns, or (b) the instrument evidences a different intent by an express exception or reservation and not alone by bounding by a side line.” M.G.L. c. 183, § 58.

In *Paulick v. Wellfleet Conservation Trust*, the court held that the petitioners in the case had registerable title to the accreted upland associated with their lots, noting that the grantees through the language in their deeds had essentially conveyed the moveable boundaries. 2012 WL 5288169 (Oct. 24, 2012).

² See section VII covering Great Ponds on the definition and categorization of Great Ponds.

II. LEGAL RIGHTS OF RIPARIAN AND LITTORAL OWNERS

A. Riparian

A riparian owner, as part of the ownership of the land, has the right to have the natural flow of a stream come to their land and to make such use of the water as is reasonable with respect to similar rights of all other riparian owners. *See Elliot v. Fitchburg Railroad*, 64 Mass. 191, 193 (1852); *See also Stratton v. Mt. Hermon Boys' School*, 216 Mass. 83, 85 (1913) (stating that “the use of water flowing in a stream is common to all riparian owners and each must exercise this common right so as not essentially to interfere with an equally beneficial enjoyment of the common right by his fellow riparian owners. Such use may result in some diminution, obstruction or change in the natural flow of the stream, but the interference cannot exceed that which arises from reasonable conduct in light of all circumstances having due regard to the exercise of the common right by other riparian owners.”).

This doctrine of “reasonable use” applies equally to both upper and lower riparian property owners against each other. *Taft v. Bridgeton Worsted Co.*, 237 Mass. 385, 389 (1921). The definition of “reasonable” in the context of riparian water use depends on a number of factors related to the interests of the users in balance with the interests of other riparian owners. *See Stratton v. Mt. Hermon Boys' School*, 216 Mass. 83, 85 (1913) (“What is reasonable and just use of flowing water is dependent upon the state of civilization, the development of the mechanical and engineering art, climatic conditions, the customs of the neighborhood and the other varying circumstances of each case.”)

Riparian property owners may not make unreasonable use of water, by obstructing or diverting it, as they are subject to liability to other riparian property owners who would suffer damage from such actions. *Elliot v. Fitchburg Railroad*, 64 Mass. 191, 196 (1852). Unreasonable use also includes pollution if that injures the riparian property of another. *Parker v. American Woolen Co.*, 195 Mass. 591, 600 (1907).

Riparian rights, on watercourses that are navigable, are subject to “navigation servitudes” held by the federal government. *Amory v. Commonwealth*, 321 Mass. 240, 246 (1947) (“Federal government possess(es) plenary control over all navigable streams in the interest of interstate commerce and has full authority to control the flow in navigable streams and, for the protection of these streams, to control the flow of their tributaries.”); *See also St. Anthony Falls Water-Power Co. v. Board of Water Com'rs*, 168 U.S. 349 (1897).

If property is only on one side, the right to use the riparian water body extends to the middle thread of that body. *Holyoke Co. v. Lyman*, 82 U.S. (15 Wall.) 500 (1872).

B. Littoral

In *Woods v. Brimm*, the Superior Court noted that there are few Massachusetts cases that directly address littoral rights. 27 Mass. L. Rptr. 389 (2010) (citing *Lummis v. Lilly*, 385 Mass. 41, 45 (1982)). In *Lummis*, the SJC stated that the “jurisprudence on the rule governing littoral rights is not abundant,” and noted that of the case law that does address the rights of littoral property owners, it is usually within the context of the public interest in private littoral rights. *Lummis v. Lilly*, 385 Mass. 41, 45 (1982) (citations omitted). The SJC, in *Lummis*, extended the reasonable use doctrine to the context of littoral ownership rights. *See Id.*³

³ See also section III. B. on the reasonable use doctrine for caselaw extending reasonable use to the littoral rights context.

III. RIGHTS TO DIVERT WATER AND WATER FLOW

A. Traditional Common Enemy Doctrine

In cases of artificial channeling of surface water, the traditional rule was that liability depended on whether “the defendant caused surface water, which might otherwise have been absorbed or have flowed elsewhere, to be artificially channeled and discharged on the plaintiff’s land in a place and quantity sufficient to entitle the plaintiff to relief.” Liability was established based on the construction of the drainage channels, not based on the amount of water discharged, and recovery of damages depended on whether the injury suffered was more than inconsequential. *See Jacobs v. Pine Manor College*, 399 Mass. 411, 415-416 (1987) (citing *Kapayanis v. Fishbein*, 344 Mass. 86, 87 (1962); *Kuklinska v. Maplewood Homes, Inc.*, 336 Mass. 489, 493 (1957)).

B. Reasonable Use

New doctrine of “reasonable use” now governs water diversion cases. In *Tucker v. Badoian*, the court stated that only harmful interferences with surface water flow that are unreasonable can form the basis of liability. 367 Mass. 907, 917 (1978). What is considered reasonable is a question of fact for the fact finder’s determination, but the court provided a number of factors relevant to the determination, including the amount of harm, the foreseeability of the harm, the purpose and motive of the possessor, among several other relevant factors. *Id.*

The reasonable use doctrine applies to both draining of water onto land and preventing the drainage of water from land. *Von Henneberg v. Generazio*, 403 Mass. 519, 525 (1988).

The reasonable use doctrine has been extended to the context of rights of littoral ownership. *See e.g. Lummis v. Lilly*, 385 Mass. 41 (1982) (extending reasonable use doctrine to the installation and maintenance of a stone groin on oceanfront property); *See also Backman v. Lilly*, No. 116033, 1992 WL 12151916 (Mass. Land. Ct. May 29, 1992) (deciding that the installation and maintenance of groin along oceanfront property was a considered a reasonable use).

IV. EASEMENTS: BOUNDARIES BY DEEDS AND RELOCATION

A. Deed of Rights & More

Where an easement arises by grant and not by prescription, and is not limited in its scope by the terms of the grant, it is available for the reasonable uses to which the dominant estate may be devoted.” *Parsons v. New York, N.H & H.R. Co.*, 216 Mass. 269 (1913).

“It is well established that an ‘easement is not to be limited to such use as seemed likely to be made about the time of the conveyances which created it. In the absence of express limitations, . . . a general right of way obtained by grant may be used for such purposes as are reasonably necessary to the full enjoyment of the premises to which the right of way is appurtenant.” *Tehan v. Security Natl. Bank of Springfield*, 340 Mass. 176, 182 (1959).

A dominant estate holder’s full enjoyment of a right of way includes “the right to enter upon the servient estate on which no actual way has been prepared and constructed and to make such changes therein as will reasonably adapt it to the purposes of a way.” *Walker v. E. William & Merrill C. Nutting*, 302 Mass. 535, 543 (1939) (citing to *Sullivan v. Donohoe*, 287 Mass. 265 (1934); *Guillet v. Livernois*, 297 Mass. 337 (1937)).

It also includes the right to “make reasonable repairs and improvements to the right of way.” *Chatham Conservation Foundation, Inc. v. Farber*, 56 Mass. App. Ct. 584 (2002) (citing *Guillet v. Livernois*, 297 Mass. 337, 340 (1937)).

B. Reasonable Relocation of Easements

It was well recognized for some time that in Massachusetts law, once the location of an easement has been fixed, it could not be changed by either the holder of the easement or the owner of the servient estate without the other’s consent.⁴ The parties could agree to relocation of the easement and the substitution with a new location for the old one, either expressly or implicitly, such as when one party uses a new location or route and the other party tacitly accepts.⁵ This rule of no unilateral relocation applied whether the easement was created expressly, by implication, or by prescription.

However, in 2004, Massachusetts abandoned this long-established no unilateral relocation rule, and adopted the approach which permits the owner of a servient estate to change the location of an easement without the consent of the easement holder, subject to certain limitations. *M.P.M. Builders, LLC v. Dwyer*, 442 Mass. 87, 88, 91 (2004). This decision adopted the Restatement of Property, Third (Servitudes) §4.8(3) rule, which provides:

Unless expressly denied by the terms of an easement, . . . the owner of the servient estate is entitled to make reasonable changes in the location or dimension of an easement, at the servient owner’s expense, to permit normal use or development of the servient estate, but only if the changes do not

- (a) Significantly lessen the utility of the easement,
- (b) Increase the burdens on the owner of the easement in its use and enjoyment, or
- (c) Frustrate the purpose for which the easement was created.⁶

This rule of reasonable relocation applies only when there is no express prohibition against relocation of the easement in the instrument that created it. *M.P.M. Builders, LLC v. Dwyer*, 442 Mass. at 91. The court also required that, if the easement holder and the owner of the servient estate are unable to reach agreement as to the relocation of the easement, the servient estate owner must seek a declaration from the court that the proposed changes meet the criteria of the rule. *Id.* at 93. The servient estate owner may not resort to self-help remedies but must seek a declaratory judgment before making any alterations. *Id.*

⁴ *Smith v. Lee*, 14 Gray (80 Mass) 473, 480 (1860); *Bannon v. Angier*, 84 Mass. 128, 129 (1861) (abrogated by, *M.P.M. Builders, LLC v. Dwyer*, 442 Mass. 87 (2004)); *Naumkeag Steam Cotton Co. v. American Glue Co.*, 244 Mass. 506, 508 (1923); *Davis v. Sikes*, 254 Mass. 540, 546 (1926) (abrogated by, *M.P.M. Builders, LLC v. Dwyer*, 442 Mass. 87 (2004)); *Anderson v. De Vries*, 326 Mass. 127, 132 (1950) (abrogated by, *M.P.M. Builders, LLC v. Dwyer*, 442 Mass. 87 (2004)).

⁵ *Byrne v. Savoie*, 225 Mass. 338, 340 (1916); *Boston Consol. Gas Co. v. Oakes*, 279 Mass. 230, 237 (1932); *Desotell v. Szczygiel*, 338 Mass. 153, 158 (1958); *Proulx v. D'Urso*, 60 Mass. App. Ct. 701, 705 (2004).

⁶ See also *Carlin v. Cohen*, 73 Mass. App. Ct. 106, 110-112 (2008) (if either party requests judge to reconsider issue whether maintenance of relocated easement would be more burdensome to easement holder to maintain, case would be reconsidered and judge may impose on owner of servient estate increased costs of maintenance caused by relocation that are not de minimis); *Martin v. Simmons Properties, LLC*, 467 Mass. 1, 21-22 (2014) (although dominant owner had right under easement to discharge water into two specified storm drains, servient owner was not required to restore drains after he had covered them because servient owner had placed drains elsewhere on property and there was no evidence that existing drains would be inadequate to handle runoff from dominant owner's lot or from any building that might be constructed on dominant owner's lot).

C. Easements by Prescription and Adverse Possession

Prescriptive Easements

A party may obtain a prescriptive easement through twenty or more years of uninterrupted, open, notorious, and adverse use of another's land. G.L. c. 187, § 2. "The extent of an easement arising by prescription, unlike an easement by grant, is fixed by the use through which it was created." *Lawless v. Trumbull*, 343 Mass. 561, 562 (1962) (See also *Baldwin v. B. & M.R.R.*, 181 Mass. 166, 168 (1902); *Smith v. City of Gloucester*, 201 Mass. 337 (1909), where the Court stated that "the right gained by prescription is limited to the use which brought the prescriptive right into existence.") Courts have allowed that "some latitude . . . in variation of the use is permitted," but "the variations in use cannot be substantial; they must be consistent with the general pattern formed by the adverse use." *Lawless*, 343 Mass. at 563. Indeed, "in the law of easements, a mutation is not within the scope of normal development." *Glenn v. Poole*, 12 Mass. App. Ct. 292, 295 (1981). Furthermore, "unreasonably broad and substantial changes in . . . adverse use cannot be justified except by continuing that substantial use for a new prescriptive period." *O'Brien v. Hamilton*, 15 Mass. App. Ct. 960, 962 (1983). Substantial changes in use "may be found to overload the easement." *Id.*

Adverse Possession

The elements of adverse possession are:

1. Actual use

Adverse possession of another's land must be "actual," meaning that the possessor must make some physical use or occupation of the land just as the average owner of similar property would use and enjoy it. *Shaw v. Solari*, 8 Mass. App. Ct. 151, 156-57 (1979). Such activities may include erection of a fence,⁷ clearing the land, planting a lawn, and placing a structure on the land,⁸ or cultivating the land.⁹ Of course, the nature and extent of the occupancy required to establish a right by adverse possession will vary with the character of the land, the purposes for which the land is adapted, and the uses to which it is put. *LaChance v. First Nat'l Bank & Trust Co. of Greenfield*, 201 Mass. 488, 490 (1938).

2. Open and Notorious

Acquisition of title by adverse possession requires the use of the land to be open and notorious in order to "secure to the owner a fair chance of protecting himself." *Foot v. Bauman*, 333 Mass 214, 217 (1955). Use of the land is open if it is made without attempted concealment, and it is notorious if it is known to persons who could reasonably be expected to notify the owner if he maintained a reasonable degree of supervision over his premises – actual knowledge by the owner of the use is not necessary.

⁷ *Shaw v. Solari*, 8 Mass. App. Ct. 151 (1979).

⁸ *Lyon v. Parkinson*, 330 Mass 374 (1953).

⁹ *Collins v. Cabral*, 348 Mass 797 (1965).

3. Exclusive Possession

An adverse possessor, to gain title, must hold the property to the exclusion of everyone else, rightfully or wrongfully. *Ottavia v. Savarese*, 339 Mass. 330 (1959). In particular, the possession must not be shared with the disseised owner. *Norcross v. Widgery*, 2 Tyng (2 Mass.) 506 (1807).

4. Continuous Possession

The adverse possessor of land must occupy it continuously for 20 years. *Town of Nantucket v. Mitchell*, 271 Mas 62 (1930). This means that there should be no significant break or interruption in the continuous possession of the land for the statutory period. *Shoer v. Daffe*, 337 Mass. 420 (1958). If there is an interruption, there can be no acquisition of title by adverse possession. *Old South Society v. Wainwright*, 156 Mass. 115 (1892). If the acts of possession are occasional or intermittent or equivocal, there is insufficient continuity; *Parker v. Parker*, 1 Allen (83 Mass.) 245 (1861); *Kershaw v. Zecchini*, 342 Mass 318 (1961) yet, when land is normally used for seasonal activities, such use is sufficiently continual. *Lebel v. Nelson*, 29 Mass. App. Ct. 300 (1990).

“Tacking” is the concept that allows the requirement of continuous possession for 20 years to be met by adding together the periods of possession by successive occupiers. *Frost v. Courtis*, 172 Mass 401 (1899); *Wishart v. McKnight*, 178 Mass. 356, 360-362 (1901); *Luce v. parsons*, 192 Mass. 8, 12 (1906).

5. Adverse Use

The key to adverse possession is that the possessor’s use of the land must be adverse or hostile to the true owner, meaning without the permission of the owner. If the true owner gives permission to use his land, there can be no adverse possession. *Kendall v. Selvaggio*, 413 Mass. 619 (1992). However, an owner who know of the possessor’s use and acquiesces or tacitly agrees to it may lose title to the possessor by adverse possession. *Sargent v. Ballard*, 9 Pick. (26 Mass.) 251, 254 (1830). See *Begg v. Ganson*, 32 Mass. App. Ct. 217, 219-221 (1993) (stable operator’s violation of agreement with owners for continued use of property, by erecting extension of stable and opening public riding stable, did not convert his use from permissive to adverse).

M.G.L. c. 260 § 21 provides that “An action for the recovery of land shall be commenced, or an entry made thereon, only within twenty years after the right of action or of entry first accrued, or within twenty years after the demandant or the person making the entry, or those under whom they claim, have been seized or possessed of the premises.” Adverse possession is the expiration of the statute of limitations on an action to recover the land. It should be noted that in order to perfect title, person who acquired property through adverse possession should bring a claim against the true landowner to quiet title, and after succeeding in such claim, record the court decree to and register title to the property.¹⁰

¹⁰ See John H. Perten, *Adverse Possession*, in *Real Estate Title Practice in Massachusetts* (MCLE, 3rd ed. 2017).

Recent Cases

In *Miller v. Abramson*, the Court of Appeals ruled that the Miller's had acquired, by adverse possession, a disputed property from the Abramsons. 95 Mass. App. Ct. 828 (2019). The court focused on the character of the use and that of the size and vegetation of the surrounding land and in finding adverse possession, concluding that the evidence indicated that the Millers had used the disputed area "precisely as the average owner of a similar property would use it in a suburban neighborhood populated with single family homes." *Id.* at 834.

In *Mancini v. Spatacular, LLC*, the Appeals Court ruled that Mancini had acquired through adverse possession land adjoining her property from Spatacular who was the title holder of those properties. 95 Mass. App. Ct. 836 (2019). Most notably, the Appeals Court stated that the test for adverse possession focuses on the "degree of control exercised" by the possessors. *Id.* at 841-42 (citing *Shaw v. Solari*, 8 Mass. App. Ct. 151 (1979)). It also further noted that most importantly, the intensity and nature of the use required to demonstrate the requisite level of control is context-driven, "the actual use and enjoyment of the property as the average owner of similar property would use and enjoy it, so that people residing in the neighborhood would be justified in regarding the possessor as exercising the exclusive dominion and control incident to ownership, establishes adverse possession in the absence of evidence that his possession is under a license or tenancy." *Shaw v. Solari*, 8 Mass. App. Ct. 151, 156-57 (1979).

In *Barnett v. Myerow*, a case addressing longstanding dispute between neighbors on a beach parcel in Edgartown, Martha's Vineyard, over rights on the beach parcel – plaintiff was the upland owner, and the defendant owned the beachfront. 95 Mass. App. Ct. 730 (2019). Plaintiffs claimed that because the waterfront owners had knowledge that they claimed title in all of the beach, then their use of any one portion of the beach was sufficient to put them on notice for use of the entire beach area in question. The court rejected this argument, and supported this rejection with the established legal principle that a prescriptive easement only extends to the area actually used, and that intermittent and irregular use is insufficient to meet the plaintiffs burden of proving an easement by prescription. *Id.* at 740-42. (citing to *Boothroyd v. Bogartz*, 68 Mass. App. Ct. 40 (2007); *Hoyt v. Kennedy*, 170 Mass. 54 (1898)).

Trustees of 3-5 Harvard Road Condominium v. Tam, 2018 WL 6053034 No. 16MISC000662 (Nov 19, 2018). A residence and a commercial condominium occupied in part by a day-care facility shared a poorly delineated boundary in a densely populated neighborhood between Coolidge Corner and Brookline Village. The plaintiff sought a claim to title by adverse possession to a narrow, pie-shaped strip of land running adjacent to their rear yard on land in the record ownership of the defendant. The court held that, except for a small area occupied by a shed, adverse possession claim failed where based on non-exclusive use of land by children attending day care center and for various random and infrequent leaf raking and other activities, including hanging of wet clothing to which the owner of the property objected.

JPM Development, LLC v. Nemetz, 2018 WL 5905128 No. 17MISC000558 (Nov 8, 2018). JPM Development sued Nemetz, claiming that appurtenant to its property is a six-foot drainage easement across the Nemetzes' abutting properties. The court entered in favor of JPM Development a prescriptive easement to allow drainage of stormwater across downhill property.

Putney v. O'Brien, 2018 WL 6183338 No. 14MISC488153 (Nov 27, 2018). Plaintiffs sought a declaration that they had a prescriptive easement to continue draining surface water onto defendants' neighboring property via an existing drainage system which outlets through a pipe in the stone wall which separates the two parties' properties. Based on duration of adverse use, prescriptive easement established to drain naturally accumulating surface water, but not water from basement sump pump, roof gutters, or swimming pool, onto neighbor's land.

V. DOCTRINE OF MERGER: BOUNDARIES CHANGED BY CIRCUMSTANCES OF OWNERSHIP

The doctrine of merger holds that adjacent lots will be treated as held in common ownership for zoning purposes, even if title to the lots is held in different forms, if the same owner “could have used his adjoining land to avoid or diminish the nonconformity.” See *Murphy v. Board of Appeal of Billerica*, No. 195-P-551 (Feb. 18, 2020) (citing *Planning Bd. Of Norwell v. Serena*, 406 Mass. 1008, 1009 (1990)); See also *Sorenti v. Board of Appeals of Wellesley*, 345 Mass. 348 (1963).

In *Murphy v. Board of Appeals of Billerica*, the Appeals court affirmed a decision of the Land Court in a case that applied the doctrine of merger. Murphy claimed that the land in question continued to have grandfather protection, and that the ZBA had erred in upholding a denial of a building permit due to the inadequate size of the lot. When the land had become non-conforming, there was a more generous zoning provision in place that protected the property from the application of the merger doctrine. Years later, the anti-merger provision was eliminated. Despite this change, the landowner claimed that the protection from merger continued, but the ZBA and Land Court disagreed. The Appeals court affirmed, holding that the lots had in fact merged, notwithstanding the “creative” forms of ownership in the property which the plaintiff had created.

VI. WETLAND RESOURCE BOUNDARIES

A. Wetlands Protection Act

M.G.L. c. 131, §40, along with MassDEP regulations 310 CMR §§ 10.01-99 pursuant to the Act, set out a comprehensive scheme of protection for wetlands and land bordering waters, by specifically governing activity that entails the “removal, filling, dredging, or alteration of wetlands and lands bordering waters.”

Municipal laws, in the form of wetland protection ordinances or bylaws, may offer more stringent protection of wetlands and other natural resource areas than the WPA does. 310 CMR 10.01(2) (“nothing contained in 310 CMR 10.00 should be construed as preempting or precluding more stringent protection of wetlands or other natural resource areas by local by-law, ordinance or regulation”); See also *Golden v. Selectmen of Falmouth*, 358 Mass. 519, 526 (1970) (stating that the Act “establishes minimum Statewide standards leaving local communities free to adopt more stringent controls”).

B. Definitions

MassDEP regulations lay out key definitions, including definitions for a list of “resource areas” that fall within the jurisdiction of the WPA and an administrative zone, something in the nature of a setback, around some of them. 310 CMR 10.00.

Bordering Vegetated Wetlands

BVWs are defined as “freshwater wetlands which border on creeks, rivers, streams, ponds, and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs.

Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants.” 310 CMR 10.55(2)(a).

“Fresh water” wetlands are defined to include “wet meadows, marshes, swamps, bogs, areas where groundwater, flowing or standing surface water or ice provide a significant part of the supporting substrate for a plant community for at least five months of they year; emergent and submergent plant communities in inland waters; and that portion of any bank which touches any inland waters.” M.G.L. ch. 131 § 40.

The boundary of a BVW is the “line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist. Wetland indicator plants shall include but not necessarily limited to those plant species identified in the Act. Wetland indicator plants are also those classified in the indicator categories of Facultative, Facultative+, Facultative Wetland-, Facultative Wetland, Facultative Wetland+, or Obligate Wetland in the National List of Plant Species That Occur in Wetlands: Massachusetts (Fish & Wildlife Service, U.S. Department of the Interior, 1988) or plants exhibiting physiological or morphological adaptations to life in saturated or inundated conditions. 310 CMR 10.55.

Buffer Zone

“The area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a).” 310 CMR 10.04. The areas that are subject to the protection of a buffer zone include “(a)ny bank, freshwater wetland, any coastal wetland, any beach, any dune, any flat, any marsh, or any swamp bordering on the ocean, any estuary, any creek, any river, any stream, any pond, or any lake.” 310 CMR 10.02(1)(a).

Bordering Land Subject to Flooding

Bordering land subject to flooding (BLSF) is “an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland.” 310 CMR 10.57(2)(a)(1).

The boundary of BLSF is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm. The boundary is determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed under the National Flood Insurance Program (NFIP, currently administered by the Federal Emergency Management Agency, successor to the U.S. Department of Housing and Urban Development); boundaries determined using this method are presumed to be accurate, a presumption which is rebuttable and may be overcome only by credible evidence from a registered professional engineer or other professional competent in such matters. 310 CMR 10.57(2)(a)(3).

Where NFIP Profile data is unavailable, the boundary of BLSF shall be the maximum lateral extent of flood water which has been observed or recorded. In the event of a conflict, the issuing authority may require the applicant to determine the boundary of BLSF by engineering calculations which shall be:

- a. based upon a design storm of seven inches of precipitation in 24 hours (i. e., a Type III Rainfall, as defined by the U.S. Soil Conservation Service);

- b. based upon the standard methodologies set forth in U.S. Soil Conservation Service Technical Release No. 55, Urban Hydrology for Small Watersheds and Section 4 of the U.S. Soil Conservation Service, National Engineering Hydrology Handbook, and
- c. prepared by a registered professional engineer or other professional competent in such matters. 310 CMR 10.57(2)(a)(3).

The boundary of the ten-year floodplain is the estimated maximum lateral extent of the flood water which will theoretically result from the statistical ten-year frequency storm. 310 CMR 10.57(2)(a)(4).

Note: Riverfront Areas and Land Subject to Flooding do not have buffer zones associated with them. *See* M.G.L. ch. 131, § 40.

Land Subject to Coastal Storm Flowage

Land subject to “any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater.” 310 CMR 10.04.

Land Subject to Flooding

310 CMR 10.04 provides that the definition for land subject to flooding is provided in 310 CMR 10.57(2), provided in Section VI B 3 above.

Vernal Pools

“Confined basin depressions which, at least in most years, hold water for a minimum of two continuous months during the spring and/or summer, and which are free of adult fish populations, as well as the area within 100 feet of the mean annual boundaries of such depressions, to the extent that such habitat is within an Area Subject to Protection under M.G.L. c. 131, § 40 as specified in 310 CMR 10.02(1).¹¹

Riverfront Area

The term “River” means a “natural flowing body of water that empties to any ocean, lake, or other river and which flows throughout the year.” M.G.L. ch. 131, § 40.

Riverfront are is the land that is “situated between a river's mean annual high-water line and a parallel line located two hundred feet away, measured outward horizontally from the river's mean annual high-water line.” M.G.L. ch. 131, § 40.

Riverfront areas do not apply to “any mosquito control work done under the provisions of clause (36) of section five of chapter forty, of chapter two hundred and fifty-two or of any special act or to forest harvesting conducted in accordance with a cutting plan approved by the department of environmental management, under the provisions of sections forty to forty-six, inclusive, of chapter one hundred and thirty-two; and shall not include any area beyond one hundred feet of river's mean annual high water mark: in which maintenance of drainage and flooding systems of cranberry bogs occurs; in which agricultural land use or aquacultural use occur; to construction,

¹¹ Thus protected if within another resource area.

expansion, repair, maintenance or other work on piers, docks, wharves, boat houses, coastal engineering structures, landings, and all other structures and activities subject to licensing or permitting under chapter ninety-one and its regulations; provided that such structures and activities shall remain subject to statutory and regulatory requirements under chapter ninety-one and section forty of chapter one hundred and thirty-one or is the site of any project authorized by special act prior to January first, nineteen hundred and seventy-three.” M.G.L. ch. 131, § 40.

The “riverfront area boundary line” is the line “located at the outside edge of the riverfront area. M.G.L. ch. 131, § 40.

VII. WATERS OF THE UNITED STATES: CHANGING FEDERAL BOUNDARIES

The Navigable Waters Protection Rule: Definition of “Waters of the United States.”¹²

A. Purpose, Background and Overview

Generally “aims to restore and maintain the integrity of the nation’s waters while preserving traditional sovereignty.” Stated Purpose is to “improve clarity” of what is and what is not considered jurisdictional under federal navigable water, and to “improve predictability” allowing for economic growth to move forward.

Waters of the United States (WOTUS) is a threshold term in the Federal Clean Water Act (CWA or the Act). It establishes the scope of federal jurisdiction under the Act. CWA regulatory programs address navigable waters, defined in the statute as the “waters of the United States, including the territorial seas.”

The reform involves a two-step process arising from Executive order. Step one, repeals 2015 Rule and recodifies prior regulations. Step two, the WOTUS Rule, revises the definition of WOTUS, replacing the 2019 rule.

B. Four Categories of WOTUS

1. Territorial seas and traditional navigable waters (defined in paragraph (a)(1) of the rule)

The category of “waters of the United States” defined in (a)(1) includes “territorial seas, and water which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide.” The territorial seas are defined as “the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles. and waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide. The agencies have not changed their interpretation of traditional navigable waters in this rule.¹³

¹² The pre-publication version of the final Navigable Waters Protection Rule is located at https://www.epa.gov/sites/production/files/2020-01/documents/navigable_waters_protection_rule_prepublication.pdf

¹³ Refer to legal test established in *The Daniel Ball*, 77 U.S. (10 Wall.) 557, 563 (1870).

2. Tributaries (defined in paragraph (a)(2) of the rule)

The final rule defines “tributary” to mean a river, stream, or similar naturally occurring surface water channel that contributes surface water flow to the territorial seas or traditional navigable waters in a typical year either directly or through one or more tributaries, lakes, ponds, and impoundments of jurisdictional waters, or adjacent wetlands. A tributary must be perennial or intermittent in a typical year. The alteration or relocation of a tributary does not modify its jurisdictional status as long as it continues to satisfy the flow conditions of this definition. A tributary does not lose its jurisdictional status if it contributes surface water flow to a downstream jurisdictional water in a typical year through a channelized non-jurisdictional surface water feature, through a subterranean river, through a culvert, dam, tunnel, or similar artificial feature, or through a debris pile, boulder field, or similar natural feature.

A tributary includes a ditch that either relocates a tributary, is constructed in a tributary, or is constructed in an adjacent wetland as long as the ditch satisfies the flow conditions of the “tributary” definition. A ditch can also be a traditional navigable water if it meets the conditions of that category. All other ditches are excluded from the definition of “waters of the United States,” other than those identified in paragraph (a)(1) and (2) ditches any portion of which are constructed in an adjacent wetland that lack perennial or intermittent flow but that develop wetlands in all or portions of the ditch that satisfy the “adjacent wetlands” definition in paragraph (c)(1).

Distinction from 2015 – No significant nexus test; all ephemeral streams are non-jurisdictional, whereas some may be found jurisdictional under previous rule.

3. Lakes and ponds, and impoundments of jurisdictional waters (defined in paragraph (a)(3) of rule)

A lake, pond or impoundment of a jurisdictional water meets the definition of “waters of the United States” if it (1) satisfies any of the conditions in paragraph (a)(1), *i.e.*, it is a traditional navigable water like Lake Michigan or Lake Mead; (2) contributes surface water flow to the territorial seas or a traditional navigable water in a typical year either directly or through one or more jurisdictional waters; or (3) is inundated by flooding from a paragraph (a)(1) through (3) water in a typical year. A lake, pond, or jurisdictional waters does not lose its jurisdictional status if it contributes surface water flow to a downstream jurisdictional water in a typical year through a channelized non-jurisdictional surface water feature, through a culvert, dike, spillway, or similar artificial feature, or through a debris pile, boulder field, or similar natural feature.

4. Adjacent wetlands

Adjacent wetlands are defined to mean wetlands that

- (1) abut a paragraph (a)(1) through (3) water;
- (2) are inundated by flooding from a paragraph (a)(1) through (3) water in a typical year;
- (3) are physically separated from a paragraph (a)(1) through (3) water only by a natural berm, bank, dune, or similar natural feature; or
- (4) are physically separated from a paragraph (a)(1) through (3) water only by an artificial dike, barrier, or similar artificial structure so long as that structure allows for a direct hydrologic surface connection between the wetlands and the paragraph (a)(1) through

(3) water in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature.

Thus, under the final rule, an adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure (*i.e.*, not naturally occurring) divides the wetland, as long as the structure allows for a direct hydrologic surface connection through or over the structure in a typical year.

C. Waters and Features that Are Not Waters of the United States

In paragraph (b) of the final rule, the agencies are codifying twelve exclusions from the definition of “waters of the United States.” Such waters cannot be determined to be jurisdictional under any of the categories in the rule under paragraph (a). Any water not enumerated in paragraphs (a)(1) through (4) is not a “water of the United States.” In addition to this general exclusion, the final rule specifies additional exclusions for certain common landscape features and land uses that are more appropriately regulated, if at all, under the sovereign authorities of States and Tribes. These include, in addition to the Waters not listed as WOTUS:

1. Groundwater
2. Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools
3. Diffuse stormwater run-off and directional sheet flow over upland
4. Ditches not identified as WOTUS
5. Prior converted cropland
6. Artificially irrigated areas
7. Artificial lakes and ponds
8. Water-filled depressions incidental to mining or construction activity
9. Stormwater control features
10. Wastewater recycling features
11. Waste treatment systems¹⁴

VIII. GREAT PONDS

Great Ponds are defined as any ponds containing in their natural state more than ten acres of land, and shall be subject to any rights in such ponds which have been granted by the commonwealth. M.G.L. c. 91, § 35. Under the regulations, they are defined as any pond which contained more than ten acres in its natural state, as calculated based on the surface area of lands lying below the natural high-water mark. The title to land below the natural low water mark is held by the Commonwealth in trust for the public, subject to any rights which the applicant demonstrates have been granted by the Commonwealth. Mass DEP for regulatory purposes shall presume that any pond presently larger than ten acres is a Great Pond, unless the applicant presents topographic, historic, or other information demonstrating that the original size of the pond was less than ten acres, prior to any alteration by damming or other human activity. 310 CMR 9.02.

The high-water mark for Great Ponds means “the present arithmetic mean of high-water heights observed over a one-year period using the best available data as determined by the

¹⁴ For detailed descriptions of each category, refer to the pre-publication version of the final Navigable Waters Protection Rule, at 244-247.

Department.” *Id.* The natural high-water mark means the historic high-water mark, and the natural low water mark means the historic low water mark. *Id.*

Public Access to Great Ponds. M.G.L. c. 91, § 18A provides for public access to Great Ponds “upon petition of ten citizens of the commonwealth that in their opinion public necessity requires a right of way for public access to any great pond within the commonwealth, the department and the attorney general or a representative designated by him sitting jointly shall hold a public hearing and receive such evidence thereon . . .”

This right to public access to Great Ponds does not apply to a body of water that is “used as a source of water supply by the commonwealth or by any town or district, or water company,” and does not affect the rights of the commonwealth or any town, district or water company to “use and control the water of any such pond for the purposes of a water supply . . .” nor does it affect or diminish existing rights to use the water for manufacturing purposes. *Id.*

A littoral property owner on a Great Pond has ownership of the soil to the low water mark. See *Inhabitants of West Roxbury v. Stoddard*, 89 Mass. 158, 167 (1863); *Potter v. Howe*, 141 Mass. 357, 359 (1886).

Great Ponds which are not being used as a source of water supply, or for certain other purposes, are considered public for the purposes of hunting or boating and are open to all inhabitants of the commonwealth for fishing. M.G.L. c. 131, § 45.¹⁵

A list of jurisdictional great ponds is provided by MassDEP at <https://www.mass.gov/doc/massachusetts-great-ponds-list/download>.

IX. PRIVATE PONDS

The owner of a private pond, had the right to dispose of the water, and of the ice, explicitly holding that the owner of the pond owns the water in it. *Richards v. Gauffret*, 145 Mass. 486 (1888).

In *Inhabitants of Lynnfield v. Inhabitants of Peabody*, the court directly addressed the question of whether an owner of a private pond may make regulations for the use of the pond, and confirmed that owner has exclusive right to use of the water in the pond while it is within the pond, but not to the detriment of property owners on an outlet stream of a pond. 106 Mass. 977 (1914) (stating that even when pond is privately owned, rights of owner to water are not absolute, but subject to the riparian rights of present or future owners of land upon the outlet stream, and that such title confers a right to the bed of the pond with existing rights in the waters, as far as the center of the pond if the grantor’s ownership extended so far).

In *Attorney General v. Herrick*, the court reiterated that the waters of a pond that is not a great pond are owned by its private owners, stating that “the (colonial) ordinance secures to the commonwealth, in the great ponds, the same kind of ownership in the water that an individual purchaser of the entire area of a small pond would by a perfect deed, or by an original grant from the government, without restrictions.” 190 Mass. 307, 309 (1906).

¹⁵ Note that a Great Pond as defined for the purposes of M.G.L. c. 131, and defined in § 1, is one that is 20 acres in size or more

In *Brooks Pond Conservation Association v. Starr*, the Appeals Court upheld Superior Court decision that Brooks Pond was not considered a Great Pond. The Court based its decision on testimony from expert witnesses regarding the size of Brooks Pond in its natural state, and the lack of listing of the Brooks Pond as a Great Pond by the Department of Environmental Protection. 79 Mass. App. Ct. 1130 (2011).

The abutters of a private pond do not by virtue of that ownership have any ownership rights in the pond or any right to use the pond. *Chambers v. Glen Echo Improvement Association*, 23 Mass. L. Rptr 509 (2008); *See also Davis v. Spaulding*, 157 Mass. 431, 435 (1892) (“Water percolating underground and not running in a definite stream or watercourse, is in law a part of the land itself . . . and is the absolute property of the owner of the land.”).

See also Howe v. DiPierro Manufacturing Co., 1 Mass. App. Ct. 81, 85 (1973) (holding that an owner of land could fill in a pond and swamp on his land and enclose a natural water course on his land in a culvert, provided this does not cause flooding of a downstream property).

X. TIDELANDS AND WATERWAYS

A. Chapter 91 Waterways Definitions

M.G.L. c. 91 provides for the licensing of any structure, or filling of any lands or flats in or over tidewaters below the high water mark,¹⁶ construction of pipelines within harbors,¹⁷ construction or extension of structures, or filling of lands in or over any river or stream for which public funds have been expended for improvements for flood control,¹⁸ and a number of other activities. *See also* 310 CMR 9.04(1). 310 CMR 9.02 provides definitions for waterways covered within Chapter 91 jurisdiction. These include:

Waterway

A “waterway” is defined as any area of water and associated submerged land or tidal flat lying below the high-water mark of any navigable river or stream, any Great Pond, or any portion of the Atlantic Ocean within the Commonwealth, which is subject to 310 CMR 9.04. These include:

- (a) Great Ponds;
- (b) The Connecticut River;
- (c) The section of the Westfield River in the Towns of West Springfield and Agawam lying between the confluence of said river with the Connecticut River and the bridge across said river at Suffield Street in said Town of Agawam;
- (d) the non-tidal portion of the Merrimack River; and
- (e) any non-tidal river or stream on which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work, either upstream or downstream within the river basin, except for any portion of any such river or stream which is not normally navigable during any season, by any vessel including canoe,

¹⁶ M.G.L. c. 91, § 14.

¹⁷ *Id.*

¹⁸ M.G.L. c. 91, §§ 12, 12A.

kayak, raft, or rowboat; the Department may publish, after opportunity for public review and comment, a list of navigable streams and rivers. 310 CMR 9.04.

In *Moot v. Department of Environmental Protection* the SJC held that 310 CMR 9.04(2), which provided that “trust lands” subject to licensing and permitting requirements under Chapter 91 included “all filled tidelands, except for landlocked tidelands” to be invalid, because it relinquished the Department’s obligation under Chapter 91 to protect public rights in Commonwealth tidelands as it allowed landlocked tidelands to be exempt entirely from the statutory licensing procedures. These involve a determination by the Department as to whether a proposed use of filled tidelands meets the “proper public purpose” requirement for non-water dependent uses of filled land. *Moot v. Department of Environmental Protection* 448 Mass. 340, 352 (2007). Following *Moot*, provisions relative to fill, uses and structures on landlocked tidelands were modified to address this invalidity of this exemption. M.G.L. c. 91, §§ 18, 18B.

Tidelands

Generally defined by the regulations as “present and former submerged lands and tidal flats lying between the present or historic high-water mark, whichever is farther landward, and the seaward limit of state jurisdiction.

Tidelands include both flowed and filled tidelands...” Flowed Tidelands are “present submerged lands and tidal flats which are subject to tidal action,” and Filled Tidelands are “former submerged lands and tidal flats which are no longer subject to tidal action due to the presence of fill.”

Formerly Filled Tidelands

Filled tidelands are also subject to Chapter 91 jurisdiction. As stated in 310 CMR 9.04 (2), “all filled tidelands, except for landlocked tidelands, and all filled lands lying below the natural high water mark of Great Ponds,” are considered “trust lands” and subject to the licensing and permitting requirements of Chapter 91.

Commonwealth Tidelands

Defined as “tidelands held by the Commonwealth, or by its political subdivisions or a quasi-public agency or authority, in trust for the benefit of the public; or tidelands held by a private person by license or grant of the Commonwealth subject to an express or implied condition subsequent that it be used for a public purpose.” The regulations direct the MassDEP to presume that (a) “tidelands are Commonwealth tidelands if they lie seaward of the historic low water mark or of a line running 100 rods (1650 feet) seaward of the historic high water mark, whichever is farther landward; such presumption may be overcome only if the Department issues a written determination based upon a final judicial decree concerning the tidelands in question or other conclusive legal documentation establishing that, notwithstanding the Boston Waterfront decision of the Supreme Judicial Court, such tidelands are unconditionally free of any proprietary interest in the Commonwealth,” and (b) “tidelands are not Commonwealth tidelands if they lie landward of the historic low water mark or of a line running 100 rods (1650 feet) seaward of the historic high water mark, whichever is farther landward; such presumption may be overcome only upon a showing that such tidelands, including but not limited to those in certain portions of the Town of Provincetown, are not held by a private person.”

Private Tidelands

Privately owned tidelands are subject to the Public Trust Doctrine. *See Commonwealth v. Alger*, 61 Mass. (7 Cush.) 53, 81 (1851). These are tidelands “held by a private person subject to an easement of the public for the purposes of navigation and free fishing and fowling and of passing freely over and through the water.”

This means that ownership of the shore is subject to the rights of every member of the public to:

- pass on foot over the shore for the purposes of fishing and fowling¹⁹
- pass over the shore in boats and other vessels for navigation, fishing and fowling²⁰
- to swim or float in tidal waters²¹

However, these rights do not include the rights to use the shore for bathing or sunning. *See Butler v. Attorney General*, 195 Mass. 79 (1907); *See also Opinion of the Justices to Senate*, 383 Mass. 895 (1981).

MassDEP is directed to presume, in accordance with the Colonial Ordinances of 1641-1647 that “tidelands are private tidelands if they lie landward of the historic low water mark or of a line running 100 rods (1650 feet) seaward of the historic high water mark, whichever is farther landward; such presumption may be overcome upon a showing that such tidelands, including but not limited to those in certain portions of the Town of Provincetown, are not held by a private person or upon a final judicial decree that such tidelands are not subject to said easement of the public.”

In *Porter v. Sullivan*, 7 Gray 441 (1856) and *Valentine v. Piper*, 22 Pickering 85, 93-94 (1839), the court made it clear that ownership of an upland parcel and the flats may be separated. “An owner may separate his upland from his flats, by alienating the one without the other.” *Valentine* at 94. “The owner may convey the upland land without the flats, or the flats without the upland.” *Porter* at 445. However, this is not a conclusive presumption but rather rebuttable.

B. Boundaries and List of Ways

The Massachusetts Historic Shoreline Change Project, compiled and maintained by the Massachusetts Coastal Zone Management Office, provides maps and data that show the relative positions and long-term change rates of historic shorelines between the mid 1800s and 2009. The project presents both long-term (approximately 150-year) and short term (approximately 30-year) shoreline change rates at 50-meter. This database is available at <https://www.mass.gov/service-details/massachusetts-shoreline-change-project>.

The Massachusetts Ocean Resource Information System (MORIS) also provides information related to Chapter 91 jurisdiction, by maintaining GIS layers of resource area information pertaining to Chapter 91 waterways. Information about access to these maps and data is available at <https://www.mass.gov/service-details/massachusetts-ocean-resource-information-system-moris>.

¹⁹ *Commonwealth v. Hilton*, 174 Mass. 29 (1899); *Paine v. Woods*, 108 Mass. 160 (1871); *Proctor v. Wells*, 103 Mass. 216 (1869); *West Roxbury v. Stoddard*, 89 Mass. (7 Allen) 158 (1863); *Commonwealth v. Roxbury*, 75 Mass. (9 Gray) 451 (1857); *Dunham v. Lamphere*, 69 Mass. (3 Gray) 268 (1855); *Sale v. Pratt*, 36 Mass. (19 Pick.) 191 (1837); *Ingraham v. Wilkinson*, 21 Mass. (4 Pick.) 268 (1826); *Commonwealth v. Charlestown*, 18 Mass. (1 Pick.) 180 (1822).

²⁰ *Old Colony St. Ry. Co. v. Phillips*, 207 Mass. 174 (1911); *Butler v. Attorney General*, 195 Mass. 79, (1907).

²¹ *Butler v. Attorney General*, 195 Mass. 79 (1907).

Where the shore of a river is relatively straight, abutting owners' title to the riverbed is delineated by extending the shared lot line at right angles to the centerline of the river, unless the grantor expressly states otherwise. *Knight v. Wilder*, 2 Cush. 199, 208-209 (1848). Divisions are made by drawing lines at right angles from the termini of the side lines on the shore to and at right angles with the throat of the stream. *Tappan v. Boston Water-Power Co.*, 157 Mass. 24, 30 (1892).

XI. BOUNDARIES IN DEEDS: CANONS OF INTERPRETATION

A. Particularity and Presumed Intent

A deed must describe the land conveyed with sufficient particularity so as to identify it. *McHale v. Treworgy*, 325 Mass. 381, 385 (1950). In order for the conveyance made to be valid, it is essential that the land that is the subject of the conveyance be capable of identification; if the conveyance does not describe the land with sufficient particularity so as to make its identification possible, the conveyance is null, and is invalid conveying no land. *Id.*

“The basic principle governing the interpretation of deeds is that their meaning, derived from the presumed intent of the grantor, is to be ascertained from the words used in the written instrument, construed when necessary in the light of the attendant circumstances.”²² *Shefel v. Lebel*, 44 Mass. App. Ct. 175, 179 (1998).

B. Inconsistencies and Lack of Evidence

Where inconsistent descriptions of a parcel of land are contained within a deed, ambiguity is resolved by the more specific description which governs; the addition of an inconsistent general description does not enlarge the grant. *See Presbrey v. Presbrey*, 95 Mass. 281, 13 Allen 281, 283 (1866); *Morse v. Chase*, 305 Mass. 504, 507–508 (1940); *W.M. Gullicksen Mfg. Co. v. MacNeil*, 347 Mass. 568, 575, 199 N.E.2d 195 (1964), citing *Crabtree v. Miller*, 194 Mass. 123, 126, 80 N.E. 225 (1907).

If the deed lacks evidence of a different intention, the priority for descriptions to be relied on is as follows:²³

1. Monuments, which includes neighboring land owned by someone other than the grantor²⁴
2. Courses and bearings in a running description²⁵
3. Distances²⁶
4. Area²⁷

²² See *J.S. Lang Engr. Co. v. Wilkins Potter Press*, 246 Mass. 529, 532 (1923); *Suburban Land Co. v. Billerica*, 314 Mass. 184, 189–190 (1943); *Barchenski v. Pion*, 9 Mass.App.Ct. 896, (1980).

²³ See *Raymon v. Jackson*, 297 Mass. 509, 511 (1937) (“Area is comparatively unimportant in the construction of a deed. Distances are of less weight than courses exactly defined. Monuments are usually given more weight than either.”).

²⁴ See *Daviau v. Betourney*, 325 Mass. 1, 2 (1949) (“Boundaries by other lands, as well as by other kinds of monuments, control distances in the construction of a deed.”); *Ryan v. Stavros*, 348 Mass. 251 (1964); *Sheftel v. Lebel*, 44 Mass. App. Ct. 175 (1998); *Fulgenitti v. Cariddi*, 292 Mass. 321 (1935); *Holmes v. Barrett*, 269 Mass. 497 (1930); *McMahon v. Blanchard*, 265 Mass. 56 (1928); *Stefanick v. Fortuna*, 222 Mass. 83 (1915); *Temple v. Benson*, 213 Mass. 128 (1912); *Howe v. Bass*, 2 Mass. 380 (1807).

²⁵ See *Iverson v. Swan*, 169 Mass. 582 (1987).

²⁶ See *Raymon v. Jackson*, 297 Mass. 509, 511 (1937).

²⁷ See *Holmes v. Barrett*, 269 Mass. 497 (1930); *Hall v. Eaton*, 139 Mass. 217 (1885); *Powell v. Clark*, 5 Mass. 355 (1809); *Morse v. Kelley*, 305 Mass. 504, 507-508 (1940).

Parol evidence is admissible, for the purpose of determining the intent of the parties, where the description of property in a deed is ambiguous. “Where general terms only are used to designate the subject-matter of the agreement or conveyance, or the description is of a nature to call for evidence to ascertain the relative situation, nature and qualities of the estate, then parol evidence is not only admissible, but is absolutely essential to ascertain the true meaning of the instrument, and to determine its proper application with reference to extrinsic circumstances. *Gerrish v. Towne*, 69 Mass. (3 Gray) 82, 87 (1854).

C. Ambiguities and Extrinsic Evidence

There are two forms of latent ambiguity: (1) where an instrument clearly describes a person or thing, and two or more persons or things exactly fit with that description, and (2) where no person or thing exactly fits the description provided in an instrument but two or more persons or things partially fit that description. *Adams v. Peterson*, 35 Mass. App. Ct. 782 (1994).

The doctrine of acquiescence provides that, where the description in the deed is unclear, extrinsic evidence is admissible to establish the parties’ interpretation of the deed, as exhibited by their behavior. However, these acts must amount to an acceptance of a line, fence or other marker as a boundary. Simply agreeing to the existence of a fence or a line as a barrier is insufficient to establish a boundary under this doctrine. *Ryan v. Stavros*, 348 Mass. 251, 260-61 (1964) (citing *Iverson v. Swann*, 169 Mass. 582, 583–584 (1897); *Douglas v. Harty*, 343 Mass. 775 (1961)).

D. Access to Public and Private Ways

The question sometimes arises whether the owners of land within a proposed subdivision have the right to use the ways on which access is proposed. If the ways in a previously developed subdivision have not been accepted as public ways, this may be problematic.

A way is not public unless it has become in one of three ways: (1) a laying out by public authority in the manner prescribed by statute; (2) prescription; or (3) prior to 1846, a dedication by the owner coupled with acceptance by the public. *Fenn v. Town of Middleborough*, 7 Mass. App. Ct. 80, 83-84 (1979) (citing *Longley v. City of Worcester*, 304 Mass. 580, 587-589 (1939); *Ulliaz v. Gillette*, 357 Mass. 96, 104 (1970)).

This point was illustrated by *Southwick v. Planning Board of Plymouth*, 65 Mass. App. Ct. 315 (2005). A subdivision was approved and built, but the subdivision way was not accepted as a public way. Pursuant to G.L. c. 183, sec. 58, each of the owners of the subdivision lots held title to the centerline of the subdivision way, subject to the rights of the owners of the other lots in the subdivision to pass and repass.

E. Boundaries by the Water or Bank

The “presumption of law, is that title to the flats follows that of the upland on which they lie, and proof of title to the upland establish(es) a title to the flats.” *Porter v. Sullivan*, 7 Gray 441, 445 (1856). “The general principle is that a boundary by the tide water passes the flats, but a boundary by the land under the water excludes them.” *Commonwealth v. Roxbury*, 75 Mass. 451, 524 (1857). The “flats are included in a grant bounded ‘by the harbor,’²⁸ ‘by the sea or salt

²⁸ *Mayhew v. Norton*, 17 Pick. 359 (1835).

water,’²⁹ ‘by the sea,’³⁰ ‘by the creek,’³¹ ‘on the stream,’³² or ‘river,’³³ or ‘bay.’³⁴ On the other hand, ‘by the shore,’³⁵ or ‘beach,’³⁶ or ‘flats’³⁷ excludes the flats.” *Id* and all cases cited therein.

Porter v. Sullivan, 7 Gray 441 (1856) and *Valentine v. Piper*, 22 Pickering 85, 93-94 (1839) make clear that ownership of an upland parcel and the flats may be separated. “An owner may separate his upland from his flats, by alienating the one without the other.” *Valentine* at 94. “The owner may convey the upland land without the flats, or the flats without the upland.” *Porter* at 445. However, this is not a conclusive presumption but rather rebuttable.

The owner of an upland parcel also owns the adjoining flats as far out as the mean low water line OR 100 rods (1650 ft) from the mean high-water line, whichever is less, unless the two parcels are severed. *Opinion of the Justices*, 365 Mass. 681, 685 (1974); *See also Mayhew v. Norton*, 34 Mass. (17 Pick.) 357 (1835).

In *Storer v. Freeman*, 6 Mass. 439, 439-440 (1810) the SJC described the distinction between a conveyance bounded “by the sea or salt water” or other boundaries equivalent in meaning, and a conveyance not expressly bounded on the sea or salt water, but rather extending to the sea-shore or bounded by the sea-shore. The SJC substituted “flats” for “shore” and held that:

“the land described will then extend to the flats, and be bounded by the flats. On this substitution the construction is manifest. The land conveyed extends *to* the flats, but not *over* them; and the flats, being a bound of the land conveyed, are not a part of it. Thus, by a strict and technical construction of the description of the land conveyed, we are satisfied that no part of the flats passed by the first deed.” *Id.* (emphasis in original).

In *Hatch v. Dwight*, 17 Mass. 289, 298 (1821), the court stated that “(t)he land released is limited to the bank of the stream, which necessarily excludes the stream itself; and there are no general words by which a right to keep up a dam there, can be said to be conveyed.”

Kane v. Vanzura held that tidelands were not adjacent to the uplands conveyed under the deed in the usual sense, as the uplands abutted a way on one side and the tidelands abutted the way on the other side. In such circumstances, the way is considered a bounding monument, and such a boundary by a way excludes the flats which are beyond it. 78 Mass. App. Ct. 749, 754 (2011).

However, these cases recognize that these general rules may be affected by a contrary intent evidenced by the specific language in a deed. *Commonwealth v. Roxbury*, 75 Mass. at 524.

²⁹ *Green v. Chelsea*, 24 Pick. 77 (1836).

³⁰ *Saltonstall v. Long Wharf*, 7 Cush. 200 (1851).

³¹ *Harlow v. Fisk*, 12 Cush. 302 (1853).

³² *Lapish v. Bangor Bank*, 8 Greenl. 92, 93 (1831).

³³ *Moore v. Griffin*, 22 Maine, 350 (1843).

³⁴ *Partridge v. Luce*, 36 Maine, 19 (1853).

³⁵ *Storer v. Freeman*, 6 Mass. 439 (1810).

³⁶ *Niles v. Patch*, 13 Gray, 257 (1859).

³⁷ *Storer v. Freeman*, 6 Mass. 439 (1810); *Saltonstall v. Long Wharf*, 7 Cush. 200 (1851).

F. How Far Out to Sea: Mean Low or 100 rods

The high-water line at ordinary tides is the landward boundary of tidal flats or seashore. The sea-shore is defined as the margin of the sea, in its usual and ordinary state. *Storer v. Freeman*, 6 Mass. 435, 439 (1810). “(W)hen the tide is out, low water mark is the margin of the sea; and when the sea is full, the margin is high water mark. The sea-shore is therefore all the ground between the ordinary high-water mark and low water mark.” *Id.*

See also Castor v. Smith, 211 Mass. 473, 474-475 (1912) (defining the term “beach” in grants of lands bounded upon tidal waters, to mean “the space between ordinary high and low water maker, or the space over which the tide usually ebbs and flows) (emphasis added).

Every owner of land bounded on tidal waters has title to the shore or flats to low water mark, but no farther than 1,650 feet (or 100 rods). The Colonial Ordinance of 1641-1647 declared that private ownership along the tide waters extend to the ‘low water mark where the sea doth not ebb above one hundred rods, and not more wheresoever it ebbs further’ subject to the public rights of navigation, fishing, and fowling.

G. Defining the Low Water Mark

Neither the Colonial Ordinance of 1641-1647 nor *Storer v. Freeman* specified criteria for identifying the exact location of an ordinary low water mark, but it was generally “clear that the court did not mean a low water mark reflecting the lowest possible level the sea might ever have reached.” *Rockwood v. Snow Inn Corp.*, 409 Mass. 361, 367 (1991) (reviewing the case law on boundaries of tidelands).

Butler v. Attorney General, 195 Mass. 79, 83 (1907). Under the colonial ordinance of 1641-47, private ownership, subject to the right of navigation and other public rights, is extended to low-water mark where the sea doth not ebb above one hundred rods, and not more wheresoever it ebbs further.

In *East Boston Co. v. Commonwealth*, the court, constraining the Colonial Ordinance as referring to the “extreme low water mark,” considered the reference to be the extreme low water at an ebb of the tide “resulting from usual causes and conditions.” In *Opinion of the Justices*, 365 Mass. 681, 684 (1974), the Justices interpreted *Storer* as holding that the Colonial Ordinance of 1641-1647 “extended private titles to encompass land as far as mean low water line or 100 rods from the mean high-water line, whichever was the lesser measure.” The Appeals Court had made the determination that the “low water mark” or terms of similar nature and effect shall mean the mean low water mark as defined by the National Geodetic Vertical Datum (NGVD), resolving the ambiguity of the much more subjective “usual causes and conditions” test which “provides little predictive value, and creates the need for case-by-case adjudication.” *Spillane v. Adams*, 76 Mass. App. Ct. 373, 386-392 (2010) (establishing that the standard for determining the location of the low water mark for the purposes of determining party ownership is based on the NGVD).

For the purposes of M.G.L c. 91 regulations, the high-water line is an average of the high tide lines over a nineteen-year period. 310 CMR § 9.02.

XII. SHAPE OF LOTS OUT INTO WATER

A. Division of Water Sheet Generally

There is no single rule for the division of flats among upland property owners that applies to all cases. John J. Whittlesey, *Law of the Seashore, Tidewaters and Great Ponds* 59 (1932).

In *Walker v. Boston & M.R.R.* the SJC stated that there is no general rule of division. Due to the nature of irregularity and variety of coves, inlets, estuaries, and rivers, it is “impossible to apply to them any of the rules which have been applied to other cases.” 57 Mass. 1, 22 (1849). The court advised that the application of the Ordinance of 1641 “according to its true spirit; and by as near an approximation as practicable, to the rules which have been juridically established, to lay down such a line of division, as to give each riparian proprietor his fair and equal share.” *Id.*

The guiding principle, where conditions in a particular case do not accord with any established rule of division, is to give each property owner a fair and proportional share of the flats. *Law of the Seashore, Tidewaters and Great Ponds* at 59. The intention of the Ordinance was, if practicable, to give every proprietor the flats in front of his upland of equal width with his lot at high-water mark; but in many cases this approach isn’t practical. *See Gray v. Deluce*, 59 Mass. 9, 12 (1849) (determining that in the case of a cove, the division “is to be made by running a base line across the mouth of the cove, and the whole flat within the cove are to be divided among the proprietors, by parallel lines, at right angles with the base line...” also noting that these parallel lines were not to interfere with the rights of adjacent property owners).

See also Porter v. Sullivan, 73 Mass. 441, 443 (1856) (stating that shape proceeding seaward varies based on circumstances of a case, and noting that “if the shore is convex, the flats attached to it, in proceeding seaward, will expand; if very prominent, the flats will be of a fanlike shape.”); *See also Wonson v. Wonson*, 96 Mass. 71, 74 (noting that there is no established rule for division shorelines).

See also Tapan v. Boston Water-Power Co., 157 Mass. 24 (1892) (holding that when land bounds a running stream which is within the ebb and flow of the tide, and out of which the tide wholly ebbs, but which at ebb tide is still a stream with well-defined banks, the Colonial Ordinance of 1641-1647 does not extend the boundary of the land of the riparian or literal owners across the stream or beyond the line of low water of the stream).

There are several leading rules established for the division of flats. *Law of the Seashore, Tidewaters and Great Ponds* at 59-60. These are:

- (1) Dividing lines are, generally, to be drawn in the most direct course from high water mark towards low water mark,³⁸
- (2) Where practicable, each proprietor is entitled to flats in front of his upland of the same width at low water as at high water,³⁹ and
- (3) Flats are to be divided so as to give to each parcel a width at the outer or seaward end proportional to the high-water line.⁴⁰

³⁸ *Walker v. Boston & M.R.R.*, 57 Mass. 1 (1849); *Porter v. Sullivan*, 73 Mass. 441 (1856); *Attorney General v. Boston Wharf Co.*, 78 Mass. 553 (1859); *Wonson v. Wonson*, 96 Mass. 71 (1867).

³⁹ *Valentine v. Piper*, 39 Mass. 85 (1839); *Gray v. Deluce*, 59 Mass. 9 (1849); *Wonson v. Wonson*, 96 Mass. 71 (1867).

⁴⁰ *Walker v. Boston & M.R.R.*, 57 Mass. 1 (1849); *Gray v. Deluce*, 59 Mass. 9 (1849); *Porter v. Sullivan*, 73 Mass. 441 (1856); *Wonson v. Wonson*, 96 Mass. 71 (1867); *Tapan v. Boston Water-Power Co.*, 157 Mass. 24 (1892).

Smaland Beach Association, Inc. v. Genova provides a recent example of division of a riverbed, relying on *Tapan*. 94 Mass. App. Ct. 106, 112 (2018) (noting that where the shore of a river is relatively straight, abutting owners' title to the riverbed is delineated by extending the shared lot line at right angles to the centerline of the river, unless the grantor expressly states otherwise).

In cases where the high-water line is very curved, either concave or convex, the flats appurtenant to the corresponding upland cannot be of equal width throughout. *Id.* Divisions should be made in such a way as to give each proprietor access to the water, without interfering with access of neighbors. *Law of the Seashore, Tidewaters and Great Ponds* at 60; *Knight v. Wilder*, 56 Mass. 199 (1848); *Porter v. Sullivan*, 73 Mass. 441 (1856); *Wonson v. Wonson*, 96 Mass. 71 (1867).

The direction of the side lines of flats is not governed by the side lines of the upland. *Law of the Seashore, Tidewaters and Great Ponds* at 60.

See *Rust v. Boston Mill Corp.*, 23 Mass. 158 (1828) (deciding that in a case where the flats to be divided were within a deep cove with narrow mouth, where it was impossible to make the division among the several proprietors by parallel lines, from necessity the division was made by running converging divisional lines from high water mark to the mouth of the cove); See also *Piper v. Richardson*, 50 Mass. 155, 158 (1845) (emphasizing that the side lines of the upland have no influence in deciding the direction of the exterior side lines of the flats); See also *Curtis v. Francis*, 63 Mass. 427 (1852).

Where the shoreline generally follows a straight line, a straight line is drawn from the shoreline at high water mark, extending the side lines of the lots being extended at right angles from the shore towards low water. *Law of the Seashore, Tidewaters and Great Ponds* at 60; *Knight v. Wilder*, 56 Mass. 199 (1848); *Porter v. Sullivan*, 73 Mass. 441 (1856); *Wonson v. Wonson*, 96 Mass. 71 (1867).

If a cove is shallow and there is no channel, a base line is run across the mouth and parallel lines at right angles to the base line are drawn to the ends of the division lines of the upland area. *Law of the Seashore, Tidewaters and Great Ponds* at 62; *Gray v. Deluce*, 59 Mass. 9 (1849); *Attorney General v. Boston Wharf Co.*, 78 Mass. 553 (1859).

The direction of the side lines of flats in a cove may be modified by the course of the channel bounding them or by the position of other channels between part of that channel and the upland. *Law of the Seashore, Tidewaters and Great Ponds* at 63; *Walker v. Boston & M.R.R.*, 57 Mass. 1 (1849); *Commonwealth v. Alger*, 61 Mass. 53 (1851); *Porter v. Sullivan*, 73 Mass. 441 (1856); *Attorney General v. Boston Wharf Co.*, 78 Mass. 553 (1859). Lines may diverge to low water after passing the mouth of a cove. *Law of the Seashore, Tidewaters and Great Ponds* at 62; *Walker v. Boston & M.R.R.*, 57 Mass. 1 (1849).

For deep coves, out of which the tide ebbs completely at low water, these are divided by drawing a line across the mouth, and each proprietor is given a width on the baseline proportionate to the width of his/her shoreline and then straight converging lawns are drawn out. *Law of the Seashore, Tidewaters and Great Ponds* at 63; *Rust v. Boston Mill Corp.*, 23 Mass. 158 (1828); *Inhabitants of Deerfield v. Arms*, 34 Mass. 41 (1835); *Ashby v. Eastern R. Co.*, 46 Mass. 368 (1842); *Wheeler v. Stone*, 55 Mass. 313 (1848); *Tapan v. Boston Water-Power Co.*, 157 Mass. 24 (1892).

If the low water line is within the cove, between the high water line and base line from headland to headland, flats are divided by taking the whole length of the upland at high water, and ascertaining each owner's proportion, giving him/her the same proportion of the low water line, and then drawing the sidelines straight out from each proprietor's lines at high water to his/her corresponding points at low water. In determining the length of the lines, either at high or low water, a general line should be taken and not the actual length of the line if it happens to be elongated by deep indentations or sharp projections. *Law of the Seashore, Tidewaters and Great Ponds* at 64; *Wonson v. Wonson*, 96 Mass. 71 (1867).

Where a cove is not fully exposed at low tide, but is an arm of the sea with a constant channel, the proprietors take the proportion of the flats that is equal to their respective shore lines in relation to the channel line. *Law of the Seashore, Tidewaters and Great Ponds* at 64; *Ashby v. Eastern R. Co.*, 46 Mass. 368 (1842); *Walker v. Boston & M.R.R.*, 57 Mass. 1 (1849).

Where flats are in the bed of a freshwater stream which empties out into the ocean, and are covered by the tide at high water, the rule of division for ownership of opposite proprietors is to give each an equal share of the bed in proportion to his/her line in front of or adjacent to the upland, or by lines drawn at right angles to the thread of the stream. *Law of the Seashore, Tidewaters and Great Ponds* at 61; *Ingraham v. Wilkinson*, 21 Mass. 268 (1826); *Bardwell v. Ames*, 29 Mass. 333 (1839); *Harlow v. Fisk*, 66 Mass. 302 (1853); *Boston v. Richardson*, 95 Mass. 146 (1866) (additional citations omitted). The center of the stream is the midway line between the banks, but that is not necessarily the center of the channel. *Tapan v. Boston Water-Power Co.*, 157 Mass. 24 (1892). The lowest line of the tide in a river or cove, not that of a freshwater stream emptying into the sea, is what was intended by the Colonial Ordinance. *Id.* at 30.

B. Divisions by Curative Proceedings

M.G.L. c. 240, §§ 19 through 26, which are referenced in M.G.L. c. 185, §1(h), contain provisions that outline the approach for determinations of the lines and boundaries of ownership of land or flats adjacent to or covered by high water. M.G.L. c. 185, §1(h) gives the Land Court exclusive original jurisdiction over such determinations. The Land Court may, but is not required to, appoint commissioners to hear and report on such determinations.

A determination on this type of matter by the Land Court is final, but it does not affect any right or title of the Commonwealth to any flat, unless it consents to become a party to the proceeding. Edward C. Mendler, *Other Curative Proceedings*, *MACONVEY* § 10:9 (4th Ed. 2019).

C. Municipal Boundaries in the Ocean

M.G.L. c. 42, § 1 states that “(t)he seaward boundary of cities and towns bordering on the open sea shall coincide with the marine boundary of the commonwealth.”

Town of Orleans v. Town of Eastham, 2016 WL 6583812 No. 15MISC000275KFS (Nov. 4 2016) identifies the sources of law that should be relied upon to define such boundaries. It states that these include, but are not limited to the Atlas published by the Harbor and Land Commissioners, and colonial act establishing the towns.

XIII. GROUNDWATER OWNERSHIP AND USE

A. Use to the Detriment of Abutters and Application of the Standard of Reasonableness

The rights of property owners in subsurface or ground waters is distinct from their rights of ownership in surface waters. In *Davis v. Spaulding*, the SJC held that private landowners have an absolute ownership of subsurface waters, creating the absolute ownership doctrine. 157 Mass. 431, 435 (1892) (holding that “water percolating underground, and not running in a definite stream or water course, is in law a part of the land itself, in the same sense that earth, gravel, stones, or minerals of any kind are constituent parts of the land, and is the absolute property of the owner of the land . . .”).

A landowner has the right to use subsurface waters as they saw fit, even if such use resulted in loss of water in neighboring land. *Id.*; *See also Gamer v. Town of Milton*, 346 Mass. 617, 620-621 (1964) (describing the Commonwealth’s reliance on the absolute ownership doctrine for subsurface percolating waters, and affirming that such ownership allows use of waters “as (owner) sees fit, even if this results in a loss of water in his neighbor’s land.”).

In *Wilson v. City of New Bedford*, the SJC stated that a property owner may use subsurface waters to the detriment of abutting property owners, and that the property owner may “dig a well . . . take the water which would otherwise pass by natural percolation into his neighbor’s land, and draw off the water which may come by natural percolation from his neighbor’s land . . .” 108 Mass. 261, 265 (1871).

There are limitations to the absolute ownership doctrine. Such rights are subject to the limitation in that they pertain only to natural percolation and not artificially created percolation. A landowner is liable for use or removal of percolating waters, where such removal is done with the malicious purpose of depriving an adjoining landowner of its use of groundwater. *Greenleaf v. Francis*, 35 Mass. 117, 122 (1836). An owner is liable for removal of percolating water if it is done in a negligent manner and results in injury to the adjoining owner’s land or any improvements made to the land. *See Gamer v. Town of Milton*, 346 Mass. 617, 621 (1964); *See also Deyo v. Athol Housing Authority*, 335 Mass. 459 (1957) (discussing the lack of a distinction between injuries stemming from collected or retained water from the flow of surface water or from subsurface percolation).

The SJC has been asked to modify this rule of absolute ownership to reasonable use, but has denied to do so, but also mentioned that it may be inclined to reexamine the doctrine in the future. *See Prince v. Stockdell*, 397 Mass. 843, 845 (1986) (stating that based on the case before them, they would not make a determination as to whether the reasonable use test should apply in the context of subsurface waters).

The Commonwealth, local government, water authorities, and water districts have extensive regulatory authority over groundwater and its use. *See* M.G.L. c. 21G (authorizing regulations limiting water withdrawal volumes); *See also Walsh v. Hingham Mut. Fire Ins. Co.*, 24 Mass. L. Rptr. 51 (2008) (providing a discussion of the authority of the Commonwealth over groundwater).

The Massachusetts Water Management Act recognizes the importance of protecting water resources for a number of public purposes, and authorizes the state to regulate large-volume withdrawals of 100,000 gallons per day or more. M.G.L. c. 21G, §§ 2-3; 310 C.M.R. § 36.07 (authorizing conditions on registered withdrawals).

Where groundwater is used as a public water supply, a protective radius around the supply well must be established to guarantee direct or perpetual ownership or control of the restricted area (referred to as Zone I). The size of this required protective radius is calculated based on the volume of water to be pumped from the well daily.

For such supplies that are larger than 100,000 gpd, the owner is required to also delineate the area of the aquifer that contributes to the well under worst-case pumping and recharge scenarios (Zone II), as well as further area from which surface and groundwater drain into Zone II (Zone III). *See* “Guidelines and Policies of Public Water Systems” Ch. 4, § 5; 310 CMR § 36.00.

B. Recent Cases on Well Withdrawals

Town of Concord v. Littleton Water Department, 2019 WL 5100376 No. 18 MISC000596 (Oct 11, 2019)

Where plaintiff, the Town of Concord, commenced an action against defendant, Littleton Water Department (LWD) seeking a declaration as to the extent to which LWD’s claimed right to withdraw water from Nagog Pond pursuant to Chapter 201 of the Acts of 1884, § 10, had been superseded by the Water Management Act (WMA), and specifically to what extent Concord’s registration of rights under the WMA essentially negated LWDs rights under the 1884 Act. The Land Court held that the WMA did in fact impliedly repeal the 1884 Act, and any rights granted to Littleton and Acton through the LWD to water withdrawals from Nagog Pond, including groundwater wells in the vicinity of the Pond.

XIV. SUBSURFACE & AIRSPACE: OWNERSHIP AND SHAPE

A. Airspace

At common law, ownership of land included ownership of the airspace above the surface of the land to an indefinite height. *See Smith v. New England Aircraft Co.*, 270 Mass. 511, 519 (1930) (referencing this doctrine but acknowledging that “whatever the precise technical rights of the landowner to the airspace above his land, the possibility of his actual occupation and separate enjoyment of it as a feasible accomplishment has through all periods of private ownership of land been extremely limited”); *See also Burnham v. Beverly Airways*, 311 Mass. 628, 635 (1942).

Traditionally, an owner could assert an action of trespass against an adjoining property owner for any intrusion into the airspace which overhang the plaintiffs land. *See Codman v. Evans*, 87 Mass. 308 (1862) (asserting trespass against property owner by adjoining property owner who erected a bay window over the plaintiff’s land); *See also Smith v. Smith*, 110 Mass. 302 (1872) (finding trespass where defendant erected a building (eves) over plaintiff’s land).

The air transportation industry spurred modification of this common law rule, with both federal and state laws that have been enacted to establish “navigable air space” above a prescribed minimum altitude over privately-owned land such that such action no longer constitutes trespass. *See M.G.L. c. 90, 35(p)* (defining navigable airspace); *M.G.L. c. 90, 46* (stating that the flight of aircraft within navigable airspace is lawful unless at such low altitudes as to interfere with the then existing use to which the land or water or space over the land or water is put by the owner or occupant).

Flights that are below the prescribed minimum altitude may be considered trespass against the right of the landowner, and may be enjoined if such trespass unjustifiably interferes with the owner's use of land. See *Burnham v. Beverly Airways*, 311 Mass. 628, 637 (1942) (enjoining flights below the prescribed minimum altitude of 500 feet over the plaintiff's house and grounds, as there was no public necessity for such an invasion and the noise it caused on plaintiff's property).

In some instances, even if flight is within the navigable airspace, it may be so low and so frequent, where the resulting attendant noise results in a direct interference with the use and enjoyment of private land effectuating a taking and resulting in an easement in the overhead airspace to which the landowner is entitled to damages as compensation. See *U.S. v. Causby*, 328 U.S. 256, 262 (1946); *Lacey v. U. S.*, 595 F.2d 614, 615 (1979); *Branning v. U. S.*, 654 F.2d 88, 97–99 (1981).

Federal regulations establish a general 500-foot navigable airspace line, below which rights belong to surface owners, however this number varies depending on the context. According to the regulations, the line over “congested areas” is drawn at “an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.” 14 C.F.R. § 91.119(b) (2010); over bodies of water or in “sparsely populated areas,” aircraft can fly less than 500 feet above the ground so long as they are not “operated closer than 500 feet to any person, vessel, vehicle, or structure.” *Id.* § 91.119(c); within six miles of some airports, the navigable airspace line may commence at heights of less than 500 feet above ground level to provide space for takeoffs and landings. *Id.* § 77.17.

A Landowner does have the right to exclude others from the use of low-altitude “non-navigable” airspace directly above their property. See *U.S. v. Causby*, 328 U.S. 256, 262 (1946) (finding that frequent government intrusions in the “immediate reaches above the claimants’ land” which amount to “direct and immediate interference with the enjoyment and use of the land” are actionable taking). But this right extends to the “immediate reaches” above a property owner’s land, which encompass areas that a landowner “could use in connection with the land” and the airspace through which unwelcome aerial intrusions would result in “subtract(ion) from the owner’s full enjoyment of the property.” *Id.*

Municipalities have sought to address concerns regarding trespass into this low-altitude zone, by regulating the activity of drones through ordinances, but such ordinances are likely to be found to be preempted based on the Federal Aviation Association regulation of drones. See *Singer v. Newton*, 284 F. Supp. 3d 125 (2017) (holding that FAA regulations, 14 C.F.R. § 107.1(a), which require unmanned aircrafts be within the visual line of sight of the operator or designated visual observer⁴¹ and below an altitude of 400 feet above ground level or within a 400 foot radius of a structure,⁴² preempted Newton from establishing its own ordinance to regulate the use of drones within airspace).

B. Subsurface

A person who owns or who has the right to possess land also owns or has the right to possess the surface beneath the land, including mineral rights. See *Milton v. Puffer*, 207 Mass. 416, 418 (1911); *United Electric Light Co. v. Deliso Const. Co.*, 315 Mass. 313, 317–321 (1943).

⁴¹ 14 C.F.R. §§ 107.3 and 107.31

⁴² *Id.* 107.51(b)

Restrictions may be placed on a landowner's right to extract minerals from his property, and such restrictions do not necessarily constitute a taking when the property as a whole retains substantial value. *See Daddario v. Cape Cod Com'n*, 425 Mass. 411, 416 (1997) (holding that decision by Cape Cod Commission denying a development permit for a sand and gravel extraction project did not amount to a taking); *See also Keystone Bituminous Coal Ass'n v. DeBenedictis*, 480 U.S. 470, 496-497 (1987); *Hodel v. Virginia Surface Mining & Reclamation Ass'n, Inc.*, 452 U.S. 264, 296-297 (1981).

XV. NUISANCE & TRESPASS ACROSS BOUNDARIES

We end this paper with a cautionary tale, rather than a comprehensive outline of all the various types of harms to real property, personal property, and persons that can occur across lot boundaries. Such a survey will have to wait another day.

In *Rattigan v. Wile*, the Supreme Judicial Court concluded that where activities on one's own property create or maintain unreasonable aesthetic conditions for neighbors, such activities are a cause of action for a claim of private nuisance. 445 Mass. 850 (2006).

The case at all levels of the Massachusetts judiciary involves a longstanding history of litigation (now in its 27th year of litigation with most recent case of *Wile v. Dinkin*, 2020 WL 215687 (Jan 14, 2020)).

In this specific matter, the two properties which abut a sandy beach and enjoy views of the ocean, one with a right of way through the other. *Rattigan*, on behalf of Edgewater House Trust, brought actions against the defendant, seeking a determination that the defendant did not in fact enjoy a right of way through the Edgewater and that the defendant's land was not buildable under the Beverly zoning bylaws. Those suits were unsuccessful, and then the defendant retaliated.

Over a period of 4 years, the defendant placed a number of "unusual objects at the edge of his lot, immediately adjacent to the boundary with the Edgewater property." *Id.* at 852. Defendant "dumped construction debris along the boundary line with Edgewater – broken concrete blocks, used pipe, and rushed metal components including a crane bucket . . . a 'gigantic, red, metal ocean container . . . used to ship freight . . . detached bed of a pick-up truck that at one point held a large truck tire, and an unusual 'wire frame or rack' from which hung a yellow detergent bottle and several plastic figures including a duck, a goose, and an owl . . . a construction trailer . . . several portable toilets . . . which generated an offensive odor that wafted over . . . fifteen foot white and yellow striped tent . . ." *Id.* at 852-853.

Despite plaintiff's efforts to shield its property from this view by shrubs and a trellis fence, the defendant responded and "moved the construction debris inexplicably" so that the materials continued to be prominently visible, even stacking some of the larger items on top of each other.

Additionally, the Defendant licensed the property for use as a heliport. *Id.* at 854. The SJC affirmed lower court judgment that the defendant's placement of items near the plaintiff's property was intended to harass his neighbors, and constituted an aesthetic interference with the plaintiff's right to use and enjoy their property. *Id.* at 857 – 861.

Stay tuned.

sUAS: Integrating Into A Surveying Business

Joseph V.R. Paiva, PhD, PS, PE
2024 MALSCE Convention

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1

A Brief Overview

- Types of UAS
- Applications and potential new customer areas possible with UAS
- Company operations and management of personnel including mandatory training
- Differences between photogrammetry for UAS as compared to “conventional”
- How the FAA regulates UAS flying and possible changes

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2



2

We Love Drones

- Lots of benefits
- Makes us look good in front of clients
- Address difficult jobs
- Impressive speed
- But...how do we judge the quality of the product?

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Client's Perspective

- You're a surveyor
- You got this (whatever the job for which you are using a drone)
- Deliverable looks "pretty"
- How do they use it and are they disappointed if they try to maximize use of your product?

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Truth Is

- Most of us don't have a lot of background in photogrammetry
- Even if you studied it at school, classical photogrammetry and close range photogrammetry have major differences
- Major similarities as well

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Getting to Deliverables

- What training is done to get to the deliverable?
- Is it the same for all deliverables?
- Are there standards that need to be met?
- Is there a client specification?

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Applications

- Site surveys (planimetrics, topography)
- Volumes (monitoring)
- Earth movement tracking (landslides, etc.)
- Construction monitoring
- Mining
- Other SURVEYS
- As-builts (together with ground surveying)
- Boundary line surveys and inspection
- Natural resource apps (tree cover, soil, water, pollutants and sources)
- General purpose MAPPING

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New Applications All the Time

- E.g.
- Beyond visible line of sight flights
- Night time flights
- Flying over prohibited areas

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Applications

- Transportation & railroad
- Roof inspection
- Solar PV inspection
- Precision agriculture
- Facade inspection
- Insurance inspection
- Energy & utilities

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Applications

- Formal walk- and fly-throughs
- Transmission and cell tower inspection
- Natural resource applications (tree cover, soil, water, pollutants and pollutant sources)

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Close Range Photogrammetry

- Camera coords are unknown, but as it is “overdetermined,” camera coordinates/ orientations, can be calculated and bundle block (least squares) adjustment done
- Match points (100s or 1000s per image) are computed and the rest of the image is interpolated from this “control”

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Close Range Photogrammetry

- This process can result in a 3-D point cloud
- But it is still not oriented to “reality”
- Final process for small parts is to “control” the cloud with precise measurements of the model by other means and “adjusting” the model to fit
- With topography, fit (rotate and scale) to ground control, and as every good surveyor knows, prove it with “ground truth”

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(Some) Terminology

- **Orthomosaic**—image corrected for topographic relief, camera tilt, and distortions in camera optics so scale is uniform throughout (like map); formed from orthophotos
- **GCP**—Ground Control Point; physical marker used to keep map spatially accurate. GCPs must be accurately measured and datum noted. Properly used, can be used to control (hence “control,” the horizontal and vertical metric map quality).

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Terms

- **RTK**—does not negate the need for GCPs, but it can greatly reduce this need. Verification is still needed from the ground (ground truth).
- **Point Cloud**—collection of point coordinates resulting from mapping activity. Can be used to create a 3D model. Point clouds are often derived from photogrammetric or LiDAR data.

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Terms

- **Relative Accuracy**—statement about how accurately a map point is located on a map relative to other points on the map.
- **Absolute Accuracy**—accuracy of a map point relative to the real world. How the map point coordinates, after applying datum and projection factors compares to the real world point's position on the same datum.

Terms

- **Resolution**—level of detail on a map. Often expressed X cm/pixel (or ft/pix), which means X cm or feet on the ground are represented by each pixel. Also represented by ground sampling distance or GSD.

Drone Datasets

- Often integrated with other software
 - GIS
 - BIM
 - CAD of various flavors
 - COGO and other survey software
 - Mining
 - Change detection/monitoring
 - Δ volume detection
-

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Ingredients

- Producing accurate 3D drone surveys requires “only” three ingredients: aerial drone imagery, good ground control, and the science of photogrammetry
-

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Photogrammetry

- Involves multiple views of the same **feature**, or a visually distinct point in an image, to triangulate its x, y, and z coordinates in space
- The more features you match between images, the better you can relate images to each other and reconstruct objects within them

Point Clouds

- ~~These outline the shapes of features on a worksite, but to get a photorealistic digital surface model, you need to match those shapes with visuals~~
- This is where image stitching, or **ortho-rectification**, comes in
- The software looks for common features (generically, match points) shared by multiple images captured in the same location to fit images together and combine them with the point cloud as in an advanced jigsaw puzzle

Most of the Time, It Works!

- Works well on most surfaces, but there are limitations to the computer's ability to recognize patterns. Experience is best way to anticipate problems...and sooner or later they will exist.
 - If a surface is too featureless or turbulent, like the polished windows of a building or a snowy or sandy plain or the churning waves of the ocean, stitching probably doesn't work!
 - You can't match a feature between images if it's there in one photo and gone in the next, or if every feature looks the same as every other. Requires "thinking" like the software.
-

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3D Models

- Combined, orthophotos and digital terrain models (DTMs) create the 3D models of your site
 - DTM, DSM, DEM are all 3D models
-

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Generating Accurate 3D Models

1. **Optimal height:** fly at optimal altitude to achieve the best ground sample distance
 2. **80% image overlap:** To stitch images into an orthophoto, a huge amount of information is needed
 3. **Angles:** A wide variety of angles is required to create a digital terrain model
 4. **Steady flight:** High-quality photos are necessary for drone photogrammetry; requires good planning, understanding of photography, stable platform and quality camera
-

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Helpful to Look at Others

- Check out what other industries advise or require when using drones in a work project
 - You might get tips that could “save the day” at some point down the line
-

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Many Industries Have Guidelines

[Recommended Guidelines for Safely Working Around Unmanned Aircraft Systems \(UAS\)](https://www.csatf.org/wp-content/uploads/2018/05/36UAS_11012017.pdf)

https://www.csatf.org/wp-content/uploads/2018/05/36UAS_11012017.pdf

- Note radio frequency interference issues in bulletin issued by Contract Services for film and TV industry

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FAA Summary

- <https://www.faa.gov/uas>
- The FAA requires that UAS owners register their UAS prior to operation
- This rule pertains to UAS weighing more than 0.55 lbs and less than 55 lbs
- If you want to fly your UAS for commercial use, you must follow the FAA's set of operational rules (known as "Part 107")
- Register your drone at <https://faadronezone-access.faa.gov/#/>

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Resources for Your State

- <https://www.dronethusiast.com/drone-regulations-by-state-laws/>
 - <https://uavcoach.com/drone-laws>
-

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Let's Talk About Commercial Operation

- Requires Part 107 Operator License (Remote Pilot Certificate)
 - sUAS must weigh less than 55 lbs. (25 kg)
 - VLOS, daylight operation only (PIC and active operator)
 - VO allowed as alternate
 - Unaided vision (no binoculars!)
-

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Part 107 License

- May not fly sUAS over persons – waiver possible
- Daylight ops only (also civil twilight, i.e. 30 min before sunrise to 30 min after sunset, local time with anti-collision lighting) – waiver possible
- Maximum altitude 400 ft above ground level (AGL); if a structure, 400 ft above structure within 400 ft horizontally of structure
- May not fly BVLOS – waiver possible

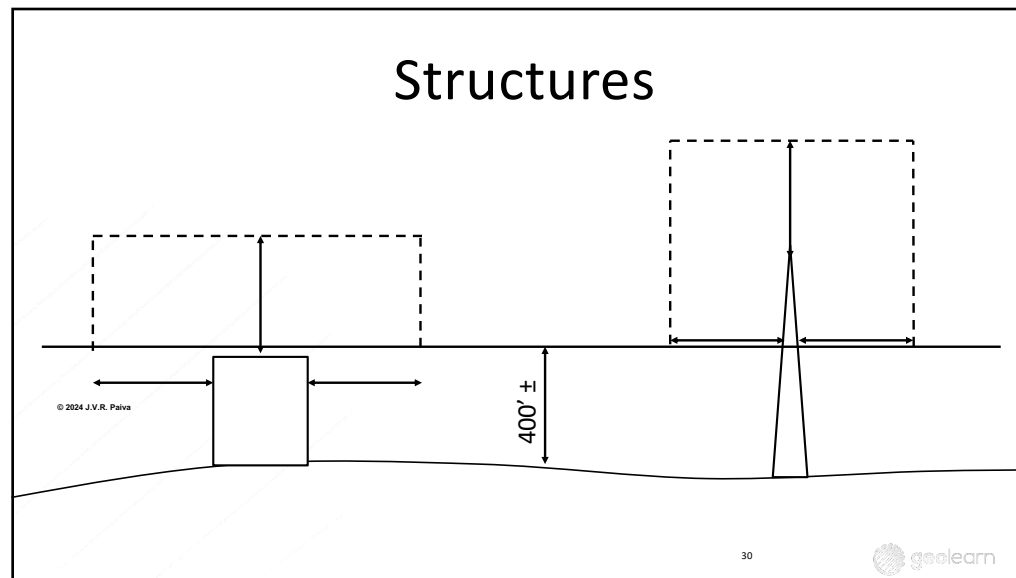
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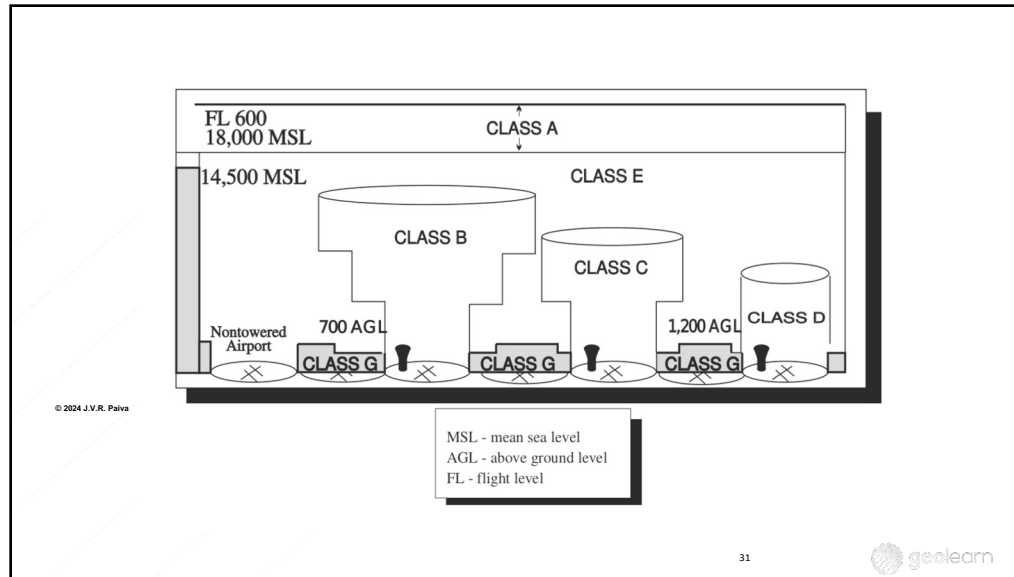


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Structures



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Part 107 License

- Mandatory pre-flight inspection (record keeping!)
- Self-evaluate physical/mental condition to ensure safe flight
- Aircraft must be registered; foreign registered is OK if they meet requirements of part 375

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geolearn

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Part 107 License

- Demonstrate aeronautical knowledge
 - Pass knowledge test, or hold a part 61 pilot certificate for manned aircraft with small FAA course
 - Be vetted by TSA
 - 16 years of age minimum
-

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Part 107 License

- Remote pilots must provide sUAS for inspection or testing on demand from FAA
 - Also provide records/documents on demand
 - Report within 10 days any incident involving serious injury, loss of consciousness or property damage of \$500 or more
-

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That Thing About Accidents

- PIC must report any sUAS accident to FAA no later than 10 days after ...
 - Serious injury to any person or any loss of consciousness; or
 - Damage to any property, other than the sUA, unless one of the following conditions is satisfied:
 - The cost of repair (materials and labor) \leq \$500; or
 - FMV of property \leq \$500 in event of total loss
-

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Part 107 License

- Conduct pre-flight inspection of aircraft and control station to satisfy the pilot it can be operated safely
 - Only fly aircraft that are properly registered with FAA
-

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Once Registered

- Label with registration number
 - Carry certificate with you whenever you (or whoever) fly
 - Engraving, permanent label, permanent marker on outside surface of drone are all OK
-

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Model Aircraft

- Part 107 does not apply to model aircraft that are flown under the Exception for Recreation Flyers
-

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Flights Near Airports

- For flight near airports in controlled airspace, operators must receive airspace authorization prior to operation
 - Authorizations come with altitude limitations and may include other operational provisions
 - Controlled airspace and other flying restrictions can be found on FAA's B4UFLY app
-

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Automated Authorizations Through LAANC

- Part 107 remote pilots can get airspace authorization for altitudes below the posted UAS Facility Map grid altitudes automatically from a LAANC service supplier
 - LAANC: Low Altitude Authorization and Notification Capability
-

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40

The Test

- Aeronautical topics
 - List published by FAA
 - Most enroll in an online school like <https://www.dronepilotgroundschool.com>
 - Exam fee is \$160, certificate good for 2 years
-

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Risk Mitigation

- Waivers possible for many of the restrictions
 - But know what “risk mitigation” means, seeking permission has to be thorough
 - Seek help of attorneys experienced in waiver applications
 - Don’t forget to update your insurance carrier
-

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Remote ID for sUAS

- Final rule published April 21, 2021, many postponements, but it looks real now, see next slide
 - Three ways to comply with this new rule
 - Also a schedule for pilots and manufacturers for compliance is published
 - There are some places (FRIAs) where drones may operate without remote ID
-

FAA Policy on Remote ID Enforcement

Drone pilots are expected to comply with the September 16, 2023, compliance date for Remote ID. However, the FAA understands that some drone pilots may not be able to comply because of limited availability of broadcast modules and lack of approved FAA-Recognized Identification Areas. In those instances, the FAA will consider all factors in determining whether to take enforcement action through March 16, 2024.

Schedule for Remote ID Compliance

- All drone pilots will need to fly in accordance with remote ID regs beginning March 16, 2024
- Drone manufacturers have already been put on notice to comply with requirements and furnish drones with built-in Remote ID

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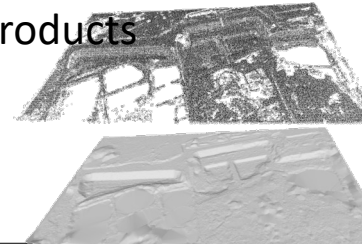
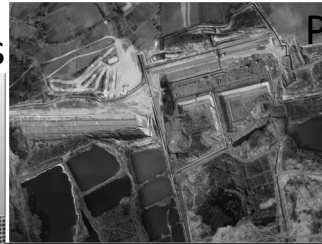
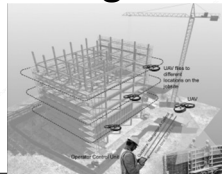
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3 Ds to 3D

1. Dull
 2. Dirty
 3. Dangerous
- Three-Dimensional (3D) Survey/Mapping Products



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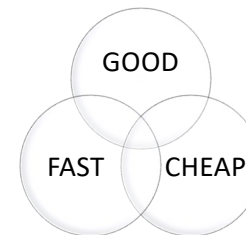
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Professional Decisions

- Cheap?
 - GOOD system \$15,000 PLUS
 - Services/Support....Not necessarily
- Fast? Possibly
- GOOD?
 - Requires professional intervention
- Better data?
 - Maybe (But there are limitations)
 - LiDAR is here!
- But a little scary to put \$100k in the sky!



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People Are the Most Important

- The largest resource of any business engaged in professional activities
 - With UAS, there needs to be a conscious decision by management that things will be done “by the book”
 - It is not just professional responsibility, but lives also (personal and corporate)
-

Have a Manual

- Procedures, policies, compliance requirements should be mandatory reading for the entire field and office teams dealing with UAS projects
 - An author and/or editor should be assigned, and it must be made part of their regular duties to write, update, index, and modernize as needed
-

Qualifications

- Field personnel (including managers who may largely stay in the office) must be fully versed on FAA regulations
 - FP must be fully versed on the aircraft they fly, bulletins, maintenance and updates
 - They are probably the personnel who will do routine scheduled and unscheduled maintenance
-

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Maintenance

- Have a checklist that includes verification that all req'd maintenance has been done before the UA goes out and up
 - Keep a record (log) for repairs and maintenance as well as flights
 - Many good electronic ones are available
-

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Training

- You can do internal training or re-training
 - Cover all kinds of “what ifs”
 - Try to use third party schools for initial part 107 training (uniformity) if you prefer to train employees to get their “wings”
-

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Have a Hierarchy Among Pilots

- Designate one person as a check pilot
 - Make sure everyone flies regularly
 - If it is the first time in the last 60 days, have someone along who has flown this type of aircraft recently as a “check” pilot
 - Designated check pilot should be responsible for training and internal testing program
-

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Q/A and Q/C

- Preparing for flights must follow checklists when it comes time to packing equipment
 - Follow FAA regulations for shipping/carrying Li-ion batteries
 - Make sure you carry plenty of consumables (propeller blades, repair tape, screws) and tools
-

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Adequate Storage/Transmission

- Check adequacy of on-board or on-ground storage
 - What if data link to the ground develops fault?
 - How big is the on-board buffer?
 - Do the systems monitoring this give you warning so flight plan can be aborted if necessary?
-

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Checking Collected Data

- Images, LiDAR files, etc. must all be checked for complete of coverage before leaving site
 - Files must be checked for usability
 - What about things like clouds, fog, mist, drizzle?
-

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UA Condition

- Vibration effects
 - Propellor blades
 - Lack of streamlining may increase buffeting
 - Using rotorcraft with 5 or more motors may increase safety of flight
 - What is flight stability and servo-motor response time on fixed wing UA?
-

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For Good Processing

- Good match points (texture, light/dark areas, shadows)
- Avoid autoexposure systems
- Avoid auto zoom systems
- If you have a lot of change in lighting conditions or large light and dark areas, break up into several flights with different exposure setting

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Pixel Matching--Autocorrelation

Multiple View Geometry

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Measure Targets

Computer Vision & Bundle Adjustment

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Extend Area Being Mapped

- Where possible image at least one photograph strip or two images beyond your areas being mapped
 - Known fact that accuracy falls off near project edges
-

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Ground Control/Ground Truth

- Not enough to have enough good ground control
 - Ground truth targets are needed to check computed model results against known, surveyed points
 - Once you they they check in well horizontally and vertically, you can rerun the processing including the check targets as ground control
-

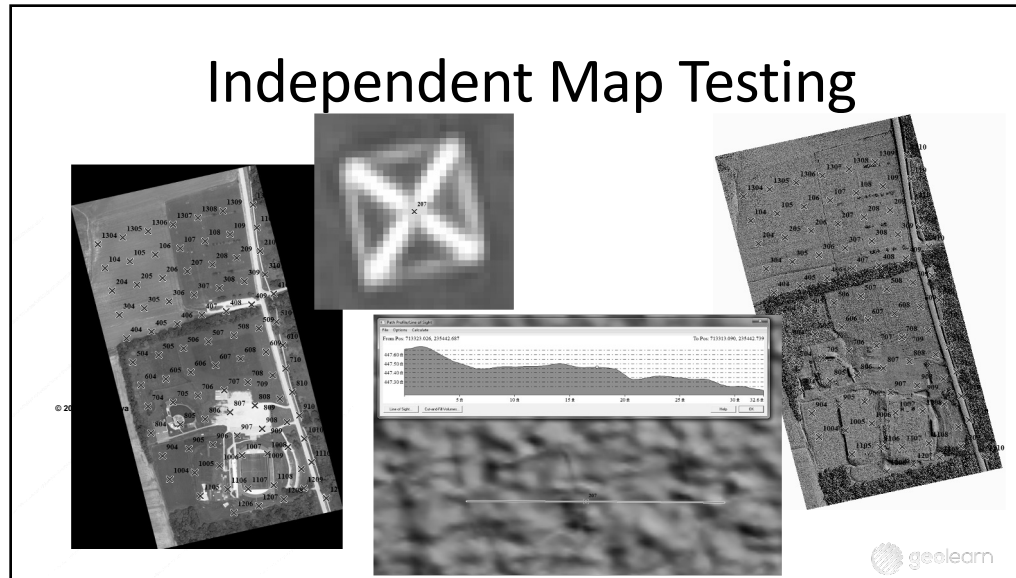
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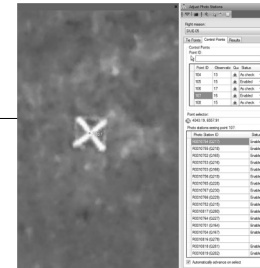
Independent Map Testing



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Dispelling Myths?

- More survey control/targets needed than you think!
 - It actually happened, for first project:
 - 4 ft vertical error
 - How was it caught?



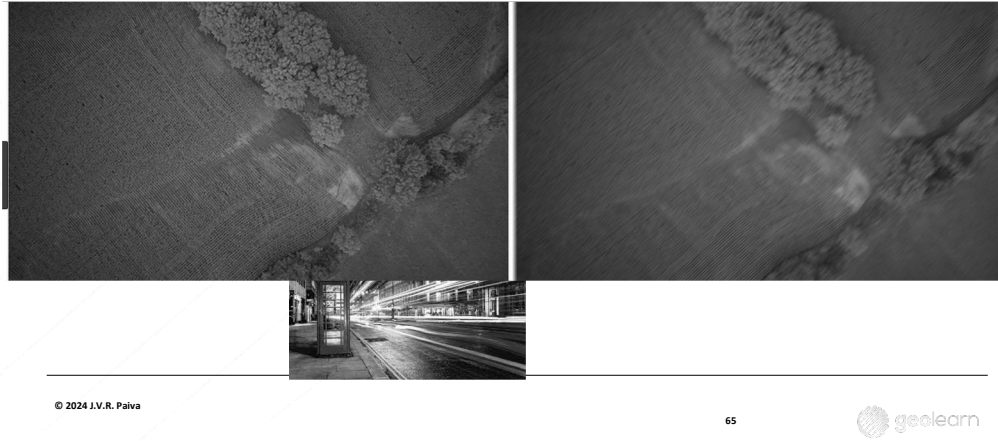
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Motion Blur (for example)



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Quality Data Processing

- Have more than one processing software to use as a check
- Not a recommendation but some common ones: Drone Deploy, Pix4D, Agisoft (formerly Photoscan), Propellor, Raptor Maps, Precision Hawk
- Tip: some software more suited for certain types of terrain/applications than others
- How much manual tweaking is possible
- Avoid the “totally no hands-on” products

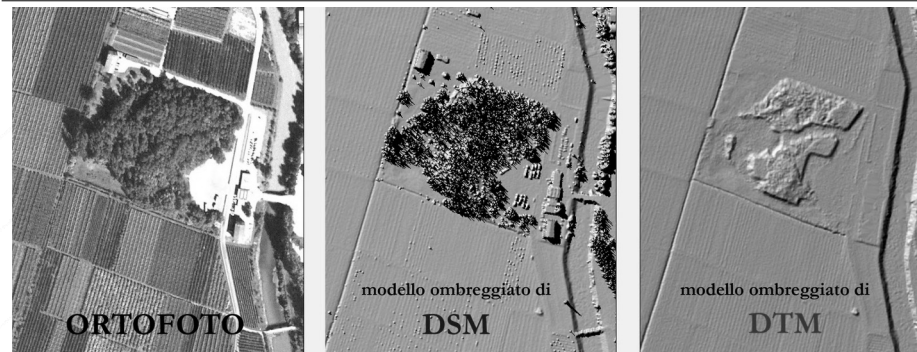
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Quality Drone/UAS Data



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LiDAR

- Processing has its own issues
- Make sure your office staff have good training on the particular LiDAR you are using and how to most beneficially process for the application
- Generally imagery is taken as well—how will you use it?

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Knowledge

- The professional must understand:
 - Drone/UAS performance & capabilities
 - Imaging sensors
 - Computer Vision (CV) image processing and pitfalls
 - Map accuracy quality control and assurance
 - How to design a project to meet project requirements
 - Q/A and Q/C; ever heard of “ground truth”

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Sensors & Lenses



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Professional Evaluation of Quality

- Error, accuracy, precision
 - Published standards
 - Industry acceptance
 - Professional knowledge
 - Mapping or surveying?
 - Standard of care
-

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Map Accuracy

OLD – Based on Map Scale (paper)

NEW – Digital based on ground sample distance (GSD)

- Horizontal Industry Standards
 - Vertical Industry Standards
 - ALL RMSE converted to 95% Confidence Levels
-

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Demonstrate Competency

Surveying Profession

Professional Land Surveyor

Land Surveyor in Training
(State Licensed)

National NSPS(Certification)

Surveyor Technician

Federal Surveyor (CFedS)

Hydrographer

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Mapping Profession(s)

ASPRS (Certification)

Photogrammetrist

Mapping Scientist Remote Sensing

Mapping Scientist GIS/LIS

Mapping Scientist Lidar

Mapping Scientist UAS

GIS/LIS Technologist

Lidar Technologist

Remote Sensing Technologist

Photogrammetric Technologist

UAS Technologist

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Some Rules...

-
- Is your company committed to process and safety?
 - Will you invest in training and re-training?
 - Will you invest in preventive maintenance and inspection?
-

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National Map Standards (NSSDA)

- How do you comply with these?
- Why are these important?

Understand How Software Works

- Close range photogrammetry is different from traditional photogrammetry (but also similar)
- Understand what controls you have
- If it doesn't handle ground control, as a surveyor, you don't want it

Getting “Metric-Worthy” Results

- Selection of aircraft
- Selection of sensor
- What is the ground resolution you need to achieve (function of camera system and flying height AGL)?

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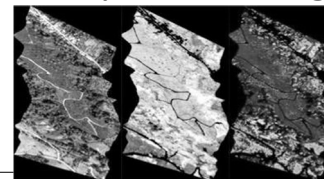
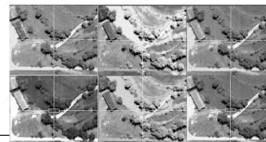
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Products

- Volumes, areas, counts, change monitoring
- NIR and other products
- LiDAR, hyperspectral and multispectral imaging products



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Good Luck

Questions?



Photo by Ian Waggon Unsplash

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About seminar presenter Joseph V.R. Paiva

Dr. Joseph V.R. Paiva, PS, PE is principal and CEO of GeoLearn, LLC (www.geo-learn.com), an online provider of professional and technician education for surveyors and survey technicians and those on a licensing path since February 2014. He also works as a consultant to lawyers, surveyors and engineers, and international developers, manufacturers and distributors of instrumentation and other geomatics tools, as well being a writer and speaker. Some of his previous roles includes Asst. Prof. of Civil Engineering at Univ. of Missouri-Columbia, teaching surveying; VP at Sokkia and later at Trimble in product development and general management; managing director of Spatial Data Research Inc.; partner in a surveying/civil engineering firm; and COO at Gatewing NV, a Belgian manufacturer of unmanned aerial systems (UAS) for surveying and mapping during 2010-2012

Joe continues his formal teaching as an adjunct instructor of online credit and non-credit courses at the State Technical College of Missouri. He has served in similar positions at Texas A&M University-Corpus Christi and the Missouri University of Science and Technology. His key contributions in the development field are: design of software flow for the SDR2 and SDR20 series of Electronic Field Books, project manager and software design of the SDR33, and software interface design for the Trimble TTS500 total station. He holds several patents.

Dr. Paiva is a Registered Professional Engineer and Professional Land Surveyor, was an NSPS representative to ABET serving as a program evaluator, where he previously served as team chair, and commissioner, and has more than 35 years' experience working in civil engineering, surveying and mapping. Joe has written dozens of articles for *POB*, *The Empire State Surveyor* and many other publications and has been a past contributor of columns to *Civil Engineering News*. He has published many articles and papers and has presented over 150 seminars, workshops, papers, and talks in panel discussions, including authoring the positioning component of the NSPS Surveying Body of Knowledge published in *Surveying and Land Information Science*. Joe has B.S., M.S. and PhD degrees in Civil Engineering from the University of Missouri-Columbia. Joe's past volunteer professional responsibilities have included president of the Surveying and Geomatics Educators Society (SaGES) 2017-19 and member of various *ad hoc* and organized committees of NSPS, the Missouri Society of Professional Surveyors, ASCE and other groups.

GeoLearn is the online learning portal provider for the National Society of Professional Surveyors, New York State Association of Professional Land Surveyors and Oklahoma Society of Land Surveyors.

Feb 2024

MALSCE'S PUBLIC AWARENESS COMMITTEE

*Bringing Awareness to the
Land Surveying Profession*

MALSCE
CONFERENCE
Presentation on 02/01/2024

1

Introduction

David Prince, PLS

- WSP New England Survey Manager
- 30+ Years of Experience
- Licensed in Several States
- Experience in all Aspects of Land Surveying
- Chairman of the Public Awareness Committee



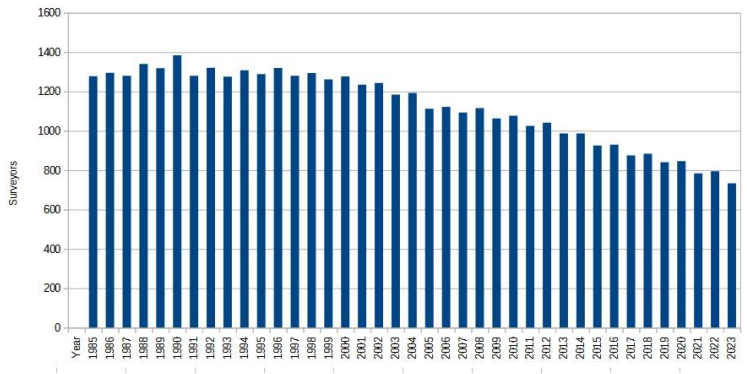
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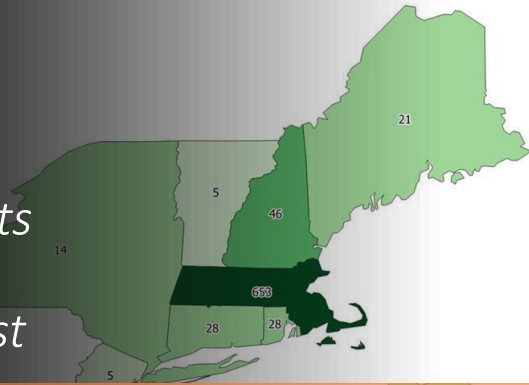
Massachusetts Registered Land Surveyors
1985-2023



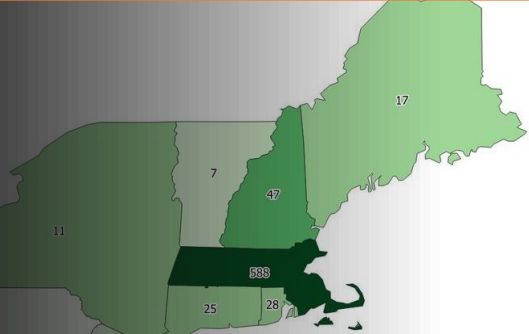
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Number of Massachusetts Licensed Land Surveyors by State for the Northeast

2019



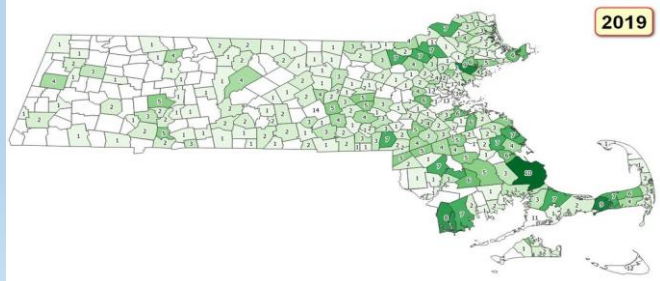
2021



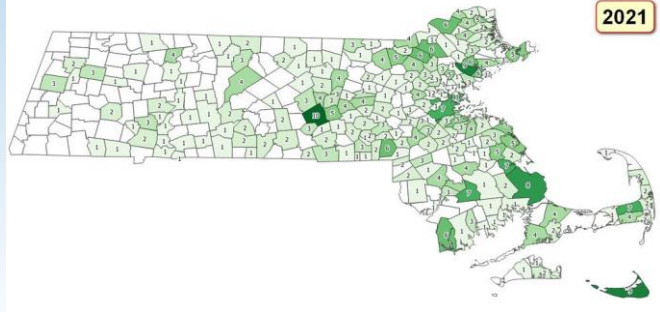
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NUMBER OF MA LICENSED LAND SURVEYORS PER TOWN IN MASSACHUSETTS

2019



2021



6

WHAT CAN
WE DO TO
HELP?



7

WHAT CAN WE DO TO HELP?

- *Join Our Zoom Meeting*
 - *Meet about every 3 weeks*
 - *Generally, Tuesday Nights 7-7:45*
- *School Visits*
 - *Junior High School*
 - *High School*
 - *Community Colleges*
- *Job Fairs*
- *Conferences*
- *Word of Mouth*



8

THE LAND SURVEYING PROFESSION

**SCHOOL NAME
GOES HERE**

Prepared by the MALSCE Public Awareness Committee

MALSCE

Presentation on 01/01/2024

9

Introduction

- Presenters
 - *Person #1*
 - Company X
 - *Person #2*
 - Company Y



10

Presentation Overview

- What is Land Surveying?
- Who is a Land Surveyor?
- Clients We Work With
- Everyday Projects
- Is Land Surveying for You?
- Path to Becoming a Licensed Surveyor

11

Fun Fact Trivia #1

QUESTION	ANSWER
<p>Measured at the equator, the Earth has a circumference of approximately 24901 miles. The Earth is approximately 70% water and 30% land. A mile is 5,280 feet long. The area of one square mile of land is equal to 640 acres.</p> <p>How many acres of land are there on the face of the Earth?</p>	<p>37 Trillion Acres!</p>

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What is the Land Surveying Profession?

A profession made up of professionals and non-professionals with varying degrees of education, ranging from Bachelor of Science to high school diploma, responsible for determining property boundaries and encumbrances for all parcels of land and collecting georeferenced spatial data in an organized manner to provide to engineers and architects for design projects.

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Fun Fact Trivia #2

QUESTION

Mount Rushmore, which resides in the Black Hills region of South Dakota, consists of 4 former U.S. Presidents: Washington, Jefferson, Roosevelt, and Lincoln.

How many of these former presidents were land surveyors?

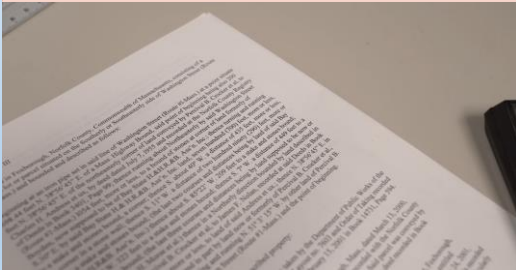
ANSWER

3

14

Who is a Land Surveyor?

Boundary Experts



Data Acquisition Experts



15

Who do Surveyors Work With?



16



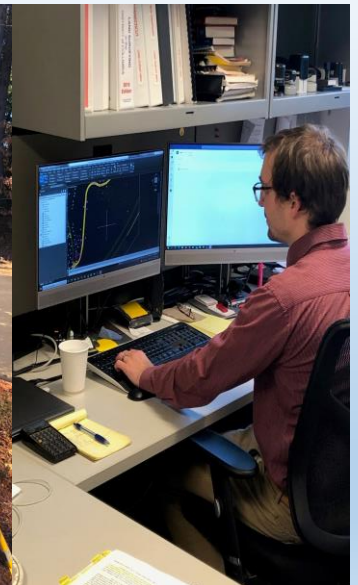
Railroad Surveying, Pipeline Surveying, etc.

What Types of Surveys do We Perform?

17

Outdoor/Indoor Profession

Why Land Surveying is for You!



18

Opportunity Fun Fact Trivia #3

QUESTION

There are estimated 800,000 professional engineers in the United States whose average age is 41 years old.

How many licensed land surveyors are there currently employed in the U.S. and what is their average age?

ANSWER

*Est. 60,000 in Total
Average Age of 55*

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How do You Become a Professional Land Surveyor?

- Complete the level of education required in your state
- Pass the Fundamentals of Surveying (FS) Exam
- Gain sufficient work experience under a licensed surveyor
- Pass the Principles and Practice of Surveying (PS) Exam
- State Specific Exam

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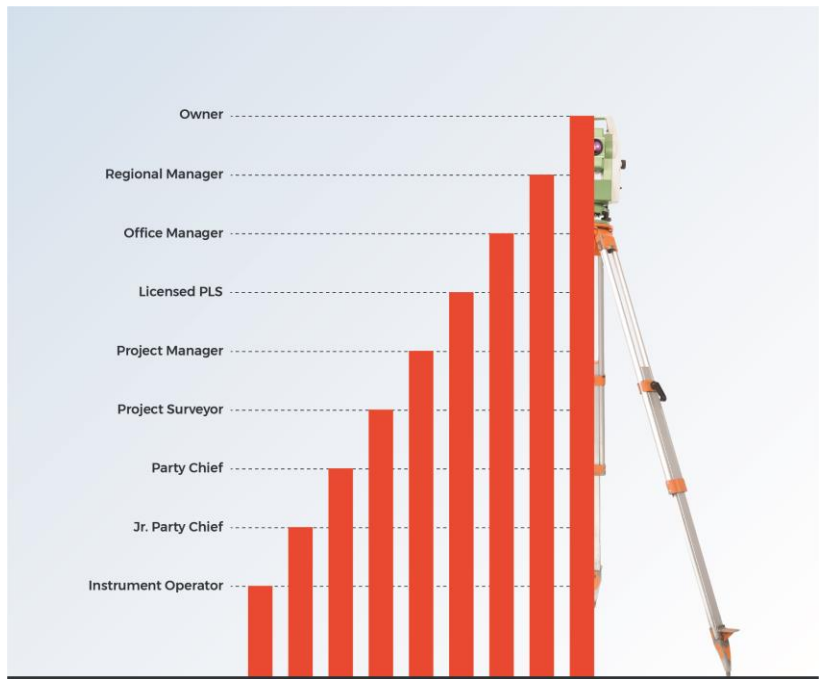
Thank You!

Questions / Suggestions?

Interested in being part of the
Public Awareness Committee?
Send me an email and I can include you
on the next Zoom Meeting

David.Prince@wsp.com


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Business Aspects in the Profession of Land Surveying

Joseph V.R. Paiva, PhD, PS, PE
2024 MALSCE Convention

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How Important is this Topic?

- Informally, licensing boards across the country report that technical issues or complaints are in the minority
- Complaints arising from business practices, ethical issues, transparency and communications are in the great majority

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2

One Reason

- Schools, mentors, even licensing boards don't emphasize this aspect enough when helping applicants prepare for licensure
- There might be some coverage of ethics
- Business practices don't get the same attention
- It is starting to change but very often emphasis is on things like accounting

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3



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Even Though...

- Canons of ethics or professional practice guidelines often include many technical requirements that the land surveyor must fulfill
- Not that much on business practices beyond advertising, and a general requirement for honesty

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Truth Is

- Business aspects that would be a good idea to adhere to can be written (with general agreement) on how a surveyor deals with clients before being retained, during the period of being retained, and afterwards

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Some Things to Think About

- That's what this seminar is about
- Obligations to your client
- Obligations or optional requirements to communicate with stakeholders
- Behaving like a friendly, reliable consultant
- To help be a wanted, successful business in your community

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Some Things to Think About

1. How do potential clients find out about you; what attempts do you make to become known?
2. If a potential client contacts you, how do you (or your company) respond?

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Think About

3. Which methods of communication are you set up to respond?
4. Are you “equipped” to answer appropriately
5. Client may decide to retain you from that initial contact or they may want a more in-depth discussion

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Think About

6. If a more in-depth discussion is needed, how do you conduct it?
7. Do you ask why the client is seeking to get a survey?
8. Are there specific things the client is expecting in the map or report you will deliver?

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Think About

10. Do you explain, in general terms, how you will go about getting the survey done?
11. Do you explain payment terms and consequences of not paying?
12. Do you explain what the deliverable will be?
13. What is your policy on filing the map?

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Think About

14. Do you indicate when you will start work?
15. Do you indicate estimated fee? And the uncertainties (or is it firm/fixed price?)
16. Do you indicate estimated schedule to complete?

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Think About

17. Do you have a written agreement about the work to be done and the obligations of the parties?
18. How do you inform your team(s) about the work and progress that you expect?
19. Do you track cumulative fee and time?

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Think About

20. Do you keep the client informed of progress?
21. When you see potential for fee or schedule to increase, do you contact client? And how?
22. Do you notify client, adjoiners and contiguous parties whose lands you may enter in advance?

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Think About

23. Do you let client know when the work is finished and advise when payment and map delivery can occur and where?
24. How do you handle situations where client says map is necessary for “deal” to close before payment is possible?

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Think About

25. After delivery of map and payment, do you send a “thank you” letter?
26. Do you use seasonal events or holidays to stay in touch with client?
27. Do you ask client for referrals?
28. If payment is not made, how do you handle receivables?

You Develop Specifics From

- Self-reflection
- Internal discussions
- Consultation with peers
- Consultation with experts
- Experience

Business Processes

- Formation
- Organization
- Team Building
- Supporting Services
- Supporting Technology
- Various HR “stuff”
- How Do You Engage in Commerce?
- Marketing
- Client Intake
- Job Processes
- Relationships with Professions

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Is there a Board?

- Is it part of the structure with formal responsibilities?
- Is it advisory?
- Makes sure it has good mission, vision statement and goals to work with

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Business Structure

- What form?
- Consult with lawyer and accountant at a minimum
- Sole owner
- Partnership
- LLC, S Corp, other Corp, etc.

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Internal Organization

- How big when founded?
- Plans for structure as you grow?
- How are responsibilities defined?
- Who's responsibility is it to define the responsibilities
- Job Descriptions, goals and expectations (both directions)

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Side Note

- Raking in business isn't success
- It is surviving explosive growth with thoughtful management of the changes that come with the growth
- Failures often occur because management didn't anticipate how hard it is to manage growth

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Internal Business Organization

- How are responsibilities divided between office and field survey work?
- Who's doing all the other "stuff" (owners, employees or contractors)
- Many people hate organizational charts...but they can really help to strengthen the team

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HR

- Hiring
- Employment Reviews
- Promotions
- Salary and Wage
- Pay scales
- Employee feedback, morale officer
- Employee communication
- Work agreements or contracts
- Third party contractors
- Firing, Layoffs
- Many more

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Team Building

- Job Descriptions
- Individual development paths
- Regular meetings with supervisor
- Discuss successes but areas to improve as well

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Team Building

- Build morale
- Training: whole company or small teams
- Encourage supervisors to conduct their own training...but keep you informed
- Mostly technical but...

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Team Building

- Spend time to explain what you expect of team when in the public eye (department, ethics)
- Uniforms? (nice but not necessary)
- Vehicle etiquette
- Neatness
- Speaking with passersby, clients and others

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How Do You Engage in Commerce?

- Web presence
- Printed: newspapers, magazines
- Service clubs, associations
- Personal contact with other industries/professions
- Public presentations

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Marketing

- Methods available to you are numerous
- Websites, social media, e-blasts (if you have a decent mailing list)
- Sometimes, converting from old to new ways takes diligence and focus

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Marketing For Surveyors

- Often means that the principals must have visibility
- Be seen in public forums
- Volunteer for public service
- Volunteer for charitable service

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Client Intake

- Friendly and hospitable?
- Clients range in understanding of surveying
- Many come in with incorrect notions
- Describe the value you provide
- Advise them on things like owner's title insurance

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The Client Relationship

- Manage it like a relationship
- Yes, a business relationship
- But key is transparency and communications
- Avoid the "black hole" of surveying

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Insurance

- Liability
- Protecting your records, equipment
- E&O
- Special note for drone operators
- Licensing boards are starting notice

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Job Processes

- How is a job handled internally
- One person maintains oversight?
- Or handed from one manager to another?
- No right way, but have a responsible person always, at all times

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Relationships with Professions

- Allied professions: architects, engineers, construction professionals, geologists, etc.
- Stakeholder professions: lawyers, accountants, governmental authorities (regulatory and records), title companies, etc.

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Commitment to Quality

- Quality of what?
- Everything!

Understand QA, QC and CQI

- Quality assurance is inspecting project deliverables to verify they meet criteria already established
- Quality Control is how you design and improve steps between start and finish to ensure quality
- Continuous quality improvement seeks to constantly evaluate and provide input to the feedback loop

Quality Assurance

- Checklist for everything to be observed on site
- Checklist for all sources of records to be investigated
- Checklist for inspecting deliverables

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Quality Control

- Angle checks
- Repeat distances
- Error of closure
- Triangle closure (with GPS)
- Re-observing (especially with GPS)
- Ground truth (especially LiDAR, drones)

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Quality Control

- Internal (or external) standards for how you do specific things in the surveying process
- Go/No Go criteria
- Inspecting and adjusting equipment (including peripherals)

Continuous Quality Improvement

- Debrief all projects internally
- What went well? Can it be made routine?
- What went not so well? Can we modify our processes to do better in the future?

Fees

- Charge appropriately
- Take careful note of all “overhead”
- Do job costing as precisely as possible
- Try to determine cost to company of routine operations

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Have Company Retreats

- Finger on the pulse
- “How are we doing”
- “What/where can we improve”
- Seek feedback from the lowest levels...they see a lot but may not feel they can report or discuss

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Recognition

- Desired behavior must be rewarded
- “Over and above” behavior must be rewarded
- Your teams are not your servants, having communications with them individually and as a group will help build morale

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Your Company is the Sum

- Examine all parts
- Is the sum appealing?
- To clients
- Employees
- Third parties

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Good Luck

Questions?



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Business Letters & Forms

1. Phone contact (inquiry, follow up by client, etc.)
2. Agreement outline
3. Notification that field work is starting
4. Update/estimate or schedule change
5. Request for neighbors to allow access
6. Completion letter
7. Thank you, letter
8. Ongoing communications

We Are Surveyors, Inc.
Phone Contact

S/N

Caller/visitor title and name

Date of call and time

Initial company contact

Reason for call

Transferred to other contact(s)

Response given _____

Follow up by Phone E-mail Letter Other _____

Any promises made _____

Any internal work to be done before follow-up contact?

This form by Reviewed by _____ on _____

Disposition _____

WORK ORDER / AGREEMENT ENGAGING PROFESSIONAL SURVEYING SERVICES / CONTRACT

This agreement between _____ (“Client”) and We Are Surveyors, Inc. (the “Company”),
Whereas,

Client desires professional surveying services to be performed on Client’s behalf and
The Company agrees to provide surveying services to accomplish the Client’s desired end result.
Client wishes to have Company provide consultation, surveying services in the field and office,
accomplishes the Client’s expressed needs, and provides a map, and if applicable and/or desired by
client a written report to describe what was accomplished and/or furnish a technical description of what
was done by the Company.

The services desired by Client from Company are those that the Company decides to provide in its own
professional judgment to resolve the following issues which are written based on the Client’s explanation
of the problems and solution(s) desired and the Company’s general understanding of the work to be
done based on such explanation: _____

Company estimates, based on its current backlog, that it will begin work on this project in approximately
_____. The professional work requires the following documents to be furnished by the client,
understanding that some of these will be obtained from personal records, other information that the
Client has access, and some may have to be obtained through third parties.

1. _____
2. _____
3. _____

The office work done by the Company will include review of these documents as well as research that
may be required to be done a various official public records. The Company will then conduct field
research and perform the survey. After all the data have been gathered, further analysis and
computations will be done before setting property corner markers at every angle point in the boundary.
The markers will be _____ with a _____ cap marked with _____. Flagging will be placed on
each one, and if not readily visible to the layperson, will have a 3 to 4 foot long lath placed next to it with
flagging or attached to nearby physical objects. A map with a description of the boundaries surveyed by
the company will be furnished, drawn with ink on Mylar at a suitable scale. The map will fully describe
the boundaries delineated by the survey. The map will be signed and sealed by the professional surveyor
with primary responsibility for the work, and it will be filed in the public records of _____
County/City.

The Company estimates that this work will cost the Client approximately \$ _____. This fee is [firm /
is only an estimate and subject to change as the work progresses. Any projected increase in the fee will
be promptly communicated to the Client.] An advance payment (retainer) of \$ _____ is to be paid at
the time of signing of this document. The balance will be due [at completion of the work but before final
delivery of the map OR at monthly intervals invoicing for partial work done during the month]. The
entire project is estimated to be completed within _____ weeks/days of the start of the project. As

the anticipated effort of the Company and problems that may be unearthed which will need to be resolved cannot be exactly determined in advance, Client understands that this estimate may be exceeded by 10%. If the cost or schedule is discovered as the work progresses to be more than estimated here, Client will be notified and will be required to approve the continuation of the work with the new estimate and schedule.

All monies invoiced by the Company will be due within _____ days of the invoice. If not paid within that time, and if Company request to pay the invoice is unanswered, work on the project will stop and Client will be furnished a final invoice. If invoices are overdue by 45 days, action to compel payment will be taken, which may include submitting the invoice to a collection agency, filing a lien on the property or other remedies at law.

When the project is completed, Company will explain actions taken in the field, offer to physically point out the property markers set, show the general locations of lines, and if encroachments by the Client on neighboring property(ies) or by neighboring landowners on the Client's property are discovered as part of the surveying work, in addition to showing them clearly on the map together with a description of the encroachment areas, will be shown to the Client or Client's representative on the property.

This agreement will be interpreted by the law of the State of _____ in the event legal actions arise.

If any part of this agreement is deemed to be ineffective in a court of competent jurisdiction, only that part will become ineffective and the rest of the agreement will continue to be in force until full payment for the work has been remitted. In the event legal action is required to compel payment, Client will bear such legal fees, including costs of releasing a lien, if one had to be filed.

Subscribed on this date, the _____ of _____, in the year xxx

Mr and Mrs John Q Client

Mr. John Q. Client

We are Surveyors, Inc.

Robert Surveyor, PLS, CEO

VIA EMAIL WITH COPY SENT BY U.S. MAIL

Dear xxxx,

This is to let you know that We Are Surveyors, Inc. (WASI) will be beginning the field work part of the project on or about _____. This is a friendly notification that you may expect to see our staff and vehicles on or near your property. We will notify all your neighbors that we may be entering their property for the purpose of conducting the survey. We will place hang tags on their doors to contact us if they have questions or have objections to our entry, or if they have specific instructions about gates, locks, pets, livestock, crops, etc.

We would appreciate it if you can help facilitate a cooperative environment with the neighbors by contacting them in advance as well.

Should you have any questions, or if you have any similar instructions regarding gates, pets, locks, livestock, etc. that are different from the instructions you gave us at the time you signed the agreement, please let us know immediately.

Sincerely,

We Are Surveyors, Inc.

Robert Surveyor, PLS

Attachment: example door hanger to be placed on your neighbors' front doors, or other practical location

VIA EMAIL WITH COPY SENT BY U.S. MAIL

Dear xxxx,

This is to let you know that We Are Surveyors, Inc. (WASI) have been working diligently on your project. At this time, we have evaluated our progress and wish to notify you, as per our agreement, that we estimate that the estimated cost of completion of the project is now expected to be \$_____. We also believe that a best estimate of completion is now _____ weeks or a final date of _____.

These costs/schedule increases are due to _____.

Please let us know if you have any questions about the content of this letter. You are more than welcome to telephone us or visit the office to discuss this matter.

Sincerely,

We Are Surveyors, Inc.

Robert Surveyor, PLS

VIA EMAIL WITH COPY SENT BY U.S. MAIL OR ON DOOR HANGER

Dear neighbor

This is to let you know that We Are Surveyors, Inc. (WASI) have been retained by your neighbor, _____, to complete a survey of their land. To finish this project we may have a need to enter your land to find and survey land corners and other physical features on or near your land. This is to notify you of such possible occurrences in the future.

If you have any questions about this activity, you may contact us at by phone at _____ or by email at _____. We encourage this contact especially in the case of specific directions for entering your land such as keys, codes, contacts to be made immediately prior to entering your land, gates, pets, livestock, etc.

Sincerely,

We Are Surveyors, Inc.

Robert Surveyor, PLS

VIA EMAIL WITH COPY SENT BY U.S. MAIL

Dear xxxx,

This is to let you know that We Are Surveyors, Inc. (WASI) has completed the work and are ready to deliver the map and receive final payment for this work at a place and time that is to your convenience. Please let us know whether you would like to meet at our office or some other place.

The final invoice is attached. It is in the amount of \$_____. It accounts for the retainer you paid in advances [as well as periodic payments you have made over the course of the project].

Sincerely,

We Are Surveyors, Inc.

Robert Surveyor, PLS

VIA EMAIL WITH COPY SENT BY U.S. MAIL

Dear xxxx,

This is to let you know that We Are Surveyors, Inc. (WASI) are truly appreciative of you retaining us to perform the survey we recently completed for you.

If you have been satisfied with our work, we would appreciate it if you would refer anyone in your circle of friends, relatives and work acquaintances of our performance in the event that you hear of someone needing to get survey work done.

I am enclosing a couple of business cards which you may feel free to distribute. Please let me know if you would like me to send you more, or directly to your acquaintances.

If there is any element of the work that was dissatisfactory to you, I invite you to get in touch with me to discuss this over the phone or in person at your convenience.

Again, thank you very much for retaining us to perform this work for you.

Sincerely,

We Are Surveyors, Inc.

Robert Surveyor, PLS

Mass mailing on cards or email distribution

We Are Surveyors, Inc. (WASI) wish you a _____ and hope that this finds you and your family in good health and prosperity.

Please remember us if you or your acquaintances require surveying services

We Are Surveyors, Inc.

Robert Surveyor, PLS (optional to include name)

About seminar presenter Joseph V.R. Paiva

Dr. Joseph V.R. Paiva, PS, PE is principal and CEO of GeoLearn, LLC (www.geo-learn.com), an online provider of professional and technician education for surveyors and survey technicians and those on a licensing path since February 2014. He also works as a consultant to lawyers, surveyors and engineers, and international developers, manufacturers and distributors of instrumentation and other geomatics tools, as well being a writer and speaker. Some of his previous roles includes Asst. Prof. of Civil Engineering at Univ. of Missouri-Columbia, teaching surveying; VP at Sokkia and later at Trimble in product development and general management; managing director of Spatial Data Research Inc.; partner in a surveying/civil engineering firm; and COO at Gatewing NV, a Belgian manufacturer of unmanned aerial systems (UAS) for surveying and mapping during 2010-2012

Joe continues his formal teaching as an adjunct instructor of online credit and non-credit courses at the State Technical College of Missouri. He has served in similar positions at Texas A&M University-Corpus Christi and the Missouri University of Science and Technology. His key contributions in the development field are: design of software flow for the SDR2 and SDR20 series of Electronic Field Books, project manager and software design of the SDR33, and software interface design for the Trimble TTS500 total station. He holds several patents.

Dr. Paiva is a Registered Professional Engineer and Professional Land Surveyor, was an NSPS representative to ABET serving as a program evaluator, where he previously served as team chair, and commissioner, and has more than 35 years' experience working in civil engineering, surveying and mapping. Joe has written dozens of articles for *POB*, *The Empire State Surveyor* and many other publications and has been a past contributor of columns to *Civil Engineering News*. He has published many articles and papers and has presented over 150 seminars, workshops, papers, and talks in panel discussions, including authoring the positioning component of the NSPS Surveying Body of Knowledge published in *Surveying and Land Information Science*. Joe has B.S., M.S. and PhD degrees in Civil Engineering from the University of Missouri-Columbia. Joe's past volunteer professional responsibilities have included president of the Surveying and Geomatics Educators Society (SaGES) 2017-19 and member of various *ad hoc* and organized committees of NSPS, the Missouri Society of Professional Surveyors, ASCE and other groups.

GeoLearn is the online learning portal provider for the National Society of Professional Surveyors, New York State Association of Professional Land Surveyors and Oklahoma Society of Land Surveyors.

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