

Practical Boundary Surveying

Paul Gay

Practical Boundary Surveying

Legal and Technical Principles

 Springer

Paul Gay
Westport, MA
USA

ISBN 978-3-319-07157-2 ISBN 978-3-319-07158-9 (eBook)
DOI 10.1007/978-3-319-07158-9

Library of Congress Control Number: 2014945258

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2015

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Disclaimer

This book is intended to present the reader with an overview of general principles of land surveying and the general legal principles underlying boundary establishment and easements. Because statutes and common law vary from jurisdiction to jurisdiction the information presented herein may not be applicable in the reader's jurisdiction or to any particular circumstances in any jurisdiction. Because the conclusions and observations presented in this book rely on the author's opinion, the information presented herein is subject to interpretation by other professionals in the field who may be more familiar with laws, precedent and practices in their own jurisdiction, and they may have their own opinion on the subjects presented in this book. Prior to relying on the materials presented herein, the reader is encouraged to research laws, methods and requirements of land surveying existing in the reader's jurisdiction and survey system and to seek land surveying advice from a land surveyor licensed in the jurisdiction and legal advice from an attorney licensed to practice in that jurisdiction. This book is not, under any circumstances, to be construed as providing legal advice or surveying advice and the author shall not, under any circumstances, be liable for losses by readers who rely on any information presented herein.

To my wife Viola, a tireless researcher and a surveyor in her own right, and to my mother Elinor who encouraged me to become a surveyor.

Contents

1	Introduction	1
2	Getting Started	5
2.1	Land Surveying Types	5
2.2	Land Surveyors Must Be Licensed	7
2.3	A Land Surveyor's Ethical Obligations	8
2.4	What Does a Surveyor Need to Know?	8
2.5	What a Surveyor Can and Cannot Do	9
2.6	The Surveyor's Authority	10
2.7	Trespass by Surveyors and Adjoining Property Owners	11
2.8	Why Become a Land Surveyor?	13
3	Basic Legal Concepts	17
3.1	Evidence	17
3.2	Record and Physical Evidence	18
3.3	Implied Notice of Recorded Documents	18
3.4	Property Lines and Boundaries	19
3.5	Physical Monuments	19
3.6	Record Monuments	20
4	Basic Technical Concepts	23
4.1	Distance and Direction	23
4.2	Distances	23
4.3	Distances: Units of Measure	28
4.4	Area	29
4.5	Angles	31
4.6	Bearings	31
4.7	Bearing Systems	34
4.8	True North	35
4.9	Grid North	35
4.10	Magnetic North	36

4.11	Bearing System Confusion	40
4.12	Bearings Versus Angles	41
4.13	Reversing Bearing Directions	41
4.14	Cartesian Coordinates	43
4.15	The Concept of a Property Line Closure	44
4.16	Error of Closure Standards	48
4.17	Understanding the Accuracy of Measurements	48
4.18	The Accuracy of Measurements Using GPS	49
4.19	The Difference Between Precision and Accuracy	51
5	Surveying Instruments	53
5.1	Transits and Theodolites	54
5.2	Total Stations	57
5.3	Reflectorless Total Stations	58
5.4	Robotic Total Stations	60
5.5	Servo Driven Total Stations	60
5.6	Tripods and Tribrachs	61
5.7	Setting-Up a Tripod	66
5.8	Corner Cube Prisms	71
5.9	Prism Poles	72
5.10	GNSS and GPS	75
5.11	Data Collection	78
5.12	Field Books	79
5.13	Some Common Terms Relating to Using a Surveying Instrument	81
5.14	Improving Accuracy When Measuring Angles	84
5.15	Example of Using a Total Station to Measure an Angle and Distance	87
5.16	Example of Using a Total Station to Set an Angle and Distance	88
5.17	Some Commonly Used Surveying Techniques	90
6	Road Geometry	95
6.1	Curves in Roads and Highways	96
6.2	Intersecting Streets	97
7	The Public Land Survey System	99
7.1	The Manual of Surveying Instructions	99
7.2	Principal Meridians and Base Lines	99
7.3	Quadrangles	101
7.4	Townships	102
7.5	Sections	103
7.6	Nomenclature for Locating Townships and Sections	104
7.7	Measurements Under the PLSS	104
7.8	Monumentation Under the PLSS	105

- 7.9 Meandering 106
- 7.10 Restoration of Lost Corners 106
- 7.11 Single Proportionate Measurement 108
- 7.12 Double Proportionate Measurement 108

- 8 Making a Boundary Survey 111**
 - 8.1 How Does a Boundary Survey Proceed? 111
 - 8.2 Original Surveys and Retracement Surveys. 112

- 9 Boundary Survey Research. 115**
 - 9.1 The Concept of Real Property 115
 - 9.2 Deeds 116
 - 9.3 The Statute of Frauds 117
 - 9.4 Deed Descriptions 118
 - 9.5 Deed Calls for Plans. 119
 - 9.6 Warranty and Quitclaim Deeds 120
 - 9.7 The Recording System 120
 - 9.8 Recording System Index 121
 - 9.9 Chain of Title Problems 122
 - 9.10 Constructive Notice and the Recording System. 123
 - 9.11 The Torrens System of Title Registration. 124
 - 9.12 Getting Oriented. 126
 - 9.13 Getting Deed References 128
 - 9.14 A Deed May Not Describe Current Ownership 129
 - 9.15 Researching Plans 129
 - 9.16 Problems Researching Plans 131
 - 9.17 Internet Searches of Land Records 132
 - 9.18 Mortgage Plot Plans 132
 - 9.19 Compiling the Research. 133

- 10 Starting Field Work 135**
 - 10.1 Preparing for the Unexpected. 137
 - 10.2 Dangerous Wildlife 141
 - 10.3 Safety When Working in the Field. 150
 - 10.4 Land Surveyor Etiquette. 155

- 11 Field Work—Finding Monuments 159**
 - 11.1 Monuments Must Be Called-for in the Record in Order to Control 159
 - 11.2 Kinds of Physical Monuments 162
 - 11.3 Finding Monuments—Initial Steps 171
 - 11.4 Diligence in Finding Monuments. 173

- 12 Field Work—Traversing 183**
 - 12.1 Using State Plane Coordinate Systems with GPS 187

- 12.2 Low Distortion Projections 195
- 12.3 Using GPS in Boundary Surveying 196
- 13 Water Boundaries.** 201
 - 13.1 Tie Lines. 204
- 14 Calculations** 207
 - 14.1 Coordinate System Example 207
 - 14.2 Traverse Adjustment. 209
 - 14.3 Reconciling the Record and Physical Evidence. 211
 - 14.4 The Order of Importance of Evidence 212
 - 14.5 Unwritten Title 212
 - 14.6 Junior and Senior Rights 212
 - 14.7 Intentions of the Parties to the Conveyance. 215
 - 14.8 Calls for Monuments 215
 - 14.9 Dignity Among Monuments. 217
 - 14.10 Distance and Direction. 217
 - 14.11 Area 218
 - 14.12 Coordinates 218
 - 14.13 Example of Conflicting Deed Elements. 220
 - 14.14 Apportionment in Subdivision Lots. 223
 - 14.15 Boundary Agreements Between Abutters 225
 - 14.16 Ownership of Streets and Ways 227
- 15 Setting Lot Corners** 229
 - 15.1 How Many Monuments? 229
 - 15.2 What Kinds of Monuments should be Set 231
 - 15.3 Using Global Positioning for Setting Corners 237
- 16 Survey Plans** 239
 - 16.1 Recording Plans 240
 - 16.2 Effect of Recording a Plan. 240
 - 16.3 Plan Materials and Size 241
 - 16.4 Information Shown on a Boundary Survey Plan 242
 - 16.4.1 General Requirements 242
 - 16.4.2 Boundaries. 246
 - 16.4.3 Monuments and Control 248
- 17 Unwritten Title** 251
 - 17.1 Adverse Possession 251
 - 17.2 Practical Location. 253
 - 17.3 Agreement Followed by Possession. 254
 - 17.4 Acquiescence 254
 - 17.5 Estoppel 255

- 18 Easements** 257
 - 18.1 Express Easements 258
 - 18.2 Easement Appurtenant 258
 - 18.3 Easement in Gross 259
 - 18.4 Scope of an Easement 260
 - 18.5 Prescription 261
 - 18.6 Easement Implied from Necessity 262
 - 18.7 Easement Implied from Prior Use 264
 - 18.8 Easement Implied From a Plat 265
 - 18.9 Termination of Easements 266
 - Appendix 267

- Glossary of Terms Used in Boundary Surveying** 319

- Further Readings** 329

- Index** 331

About the Author



Paul Gay is an attorney and a professional land surveyor. He has been a land surveyor in private practice for more than 35 years and has been primarily involved in boundary surveying with a special interest in boundary dispute resolution. Mr. Gay has served as an expert witness in many trials involving land and boundary issues from Massachusetts and Rhode Island to Alaska. He wrote the book *Fundamentals of Boundary Surveying*, Professional Surveyor Publishing Co., Inc. in 2002, *Survey*, a computer program for surveying

calculations, *Metrology*, a Windows units conversion program, and *Tide*, a program for calculating tides for any date at many U.S. coastal locations. Other publications include articles in surveying publications, *A History of Gray's Mill*, *Basic Principles of 19th Century Water Power* and *Sediment Transport around Gooseberry Neck*. Mr. Gay holds a B.S. degree in Sociology from the University of Massachusetts, an ScM degree in Geological Sciences from Brown University and a J.D. degree from New England Law.