BULLETPROOFING YOUR SURVEYS

NSAPLS
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Introduction

- Courts, legal profession, deal with ambiguities
- Both sides have facts; which side prevails?
- Testimony, evidence and arguments are used to further each side’s claims
- Surveyors asked to provide testimony on measurement and analysis of property lines and other points, lines, planes and volumes on the surface of the earth

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The Point

- Even if no lawsuit pending, surveyor must be prepared to answer these questions...
- It is what we do!

Even When a Lawsuit is Not Imminent...

- It is the surveyor’s professional responsibility to conduct him or herself as if it is
- That is, facts must be documented; decisions must be recorded with underlying reasoning properly laid out
- There are many reasons “why” or “what” is asked that are not connected with a lawsuit but as to the propriety of a surveyor’s professional conduct
Outline

- Testimony
- Dealing with the issue (the same way you tackle any other problem)
- Ethical responsibility
- Surveyor’s report
- Skills development

Testimony
Testimony Required

- Case A: Dispute develops after the surveyor’s work is completed
- Case B: Dispute develops first and surveyor is hired as expert

Case A

- If surveyor performed work not thinking about how to defend work in court, testimony face obstacles to being admitted
- In spite of all the warnings, how many surveyors routinely perform their work as if they had been hired as an expert?
**Case B**

- Client is usually attorney
- Surveyor has to make it clear that his/her work is not guaranteed to develop case on client’s behalf
- Expert’s status is that of an impartial witness; thus findings must be the same regardless of which side does the hiring
- However, interpretations with respect to the law must be left to the lawyers, but surveyors can advise on pros and cons
- Extra careful prep and attention to detail is req’d

**Expert Modus Operandi**

- What does the expert do?
- Does the average surveyor know what it entails?
- Is the legal and judicial process a mystery? If so, the likelihood of failure as an expert is high
- Can the surveyor speak (and write) with authority?
Regardless...

- Whether Case A or Case B, this course offers tips on
  - How to be a better expert
  - To understand what is expected
  - How to be a true professional in providing these services

The Problem

- Understand it first
- Figure out how to tackle it
- Communicate often and well
- (always!)
How to Tackle a Problem

- Once a need for an expert has been identified and the surveyor hired, the problem must be well-defined first
- Develop plan on how to attack it; outline alternate paths in case primary is blocked
- Data is collected
- Analysis done
- Opinion(s) rendered
- Judgments formed

Understanding the Problem

- The surveyor must begin with a discussion with client as to the issues; reading reports, legal documents filed, perhaps other expert opinions must be read
- Surveyor develops plan of attack
- Then the plan must be communicated with attorney
- Agreed-upon schedules must be followed
Data Gathering

- Leave no stone unturned
- Surveys are not the only means for gathering data
- Look at similar cases
- Opposite experts’ opinions; data and analysis
- Even opposite expert’s office and field equipment
- Document *ad nauseum* (photographs, testimony, certified copies, contact information of parties providing information, etc.)

Analysis

- Be painstaking in the analysis
- Take every step with thought about how to defend it
- Be constantly thinking about how to communicate the process, results and conclusions
- Document
Testimony

- Oral in court (i.e. from the witness box) supplemented with exhibits, surveys, focused surveys and “cartoons”
- Depositions—oral
- Interrogatories—written
- All your notes and records (from every source)
- Surveyor’s (written) report or opinions
- [You can’t write about it if you can’t talk about it]

Surveyor’s Report

- Format and content MUST be discussed with attorney
- Follow attorney’s instructions, but do not hesitate to express your opinion
- Begin report with what you will do in it and how you will reach your opinions, using what data and information
- List biographical information establishing you as expert in this matter (include compensation and state that it is not dependent on case outcome)
Surveyor’s Report

- List groups of information considered in forming opinions
- Summary of opinions
- Opinions separated by categories, together with detailed analysis, explanations, illustrations, footnotes, citations, etc.
- Close with conclusion and signature

Judgments of the Surveyor

- While we make judgments from our analysis and the opinions we form, attorney and judges aren’t always receptive to us saying so
- Be always situationally aware. Even if you make judgments don’t always call them that.
Key Report Elements

- “I have been retained by … “
- “I have been asked to express opinions … on (a) based on…; (b) based on …; (c) based on....“
- Provide full c.v. as appendix; include facts pertinent to case in body of report
- “In forming my opinions I relied primarily on…”
- “It is my opinion, based on ..., that <claims>, <statements>, <conclusions>, <analysis>, <conclusions>... are incorrect”

Key Report Elements 2

- “I will further demonstrate that ... is/are actually ..., leading to the conclusion that X’s claims are incorrect/premature/flawed/incomplete/ inconsequential…”
- Include “I am prepared to testify as to these matters…”
- When describing analysis and conclusions, explain every word or phrase that is not in the common U.S. English vernacular
Key Report Elements

- When explaining terms quote from well-accepted references (learn how to attribute to books, articles, internet pages, speeches, interviews, catalogs, etc.)
- Particularly pay attention to the lawyer’s standard style of formal writing
- Illustrate profusely with diagrams, blowups, photographs, cartoons, similar situations
- Explain purpose of each calculation and adjustment
- Indicate how your equipment was used, checked and calibrated or adjusted

Key Report Elements

- Quote freely from the appropriate dictionary to explain non-standard and standard words used by you and others
- Do not be shy
- If a detail by opposite experts is not properly documented or explained, at the very least say that “...Y’s method is silent on the subject of ..., and thus the reliability of his/her opinion is suspect.”
Legal Citation Styles


Legal Citation Styles


**Key Report Elements**

- Fully document all site conditions including weather (sky, temp, barometric pressure, humidity, precipitation) at various parts of the day.
- Remember that you are discussing facts; if you get hypothetical, be very clear that you are analyzing and opining on a hypothetical situation.
- Record and report other environmental and site data; e.g. trains go by this site…the schedule is...

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**Key Report Elements**

- The judge, jury, if there’s one, lawyers, are all laypeople when it comes to surveying, if you are not sure he/she/they understand it, break it down for them…explain it.
- Use textbook language; avoid common informal terms (gun, pin, peg, stake, PK, MH, CL, FL, etc.)
- Do not try to be economical with time or space on paper or exhibits...getting your point across is prime!
**Key Report Elements**

- Have someone with an editor’s eye read and edit your written statements
- Sometimes editors specialize in different types of services (readability vs. copy editing), so select carefully and knowingly
- Brevity is not a desirable attribute when important information is left out...just don’t make it so complicated they don’t understand!

**Records**

- Detailed records of who did what
- Only keep what is pertinent to what you did
- Always review for material that can be misinterpreted
- Learn to examine your documentation and other work as if being cross-examined
- Especially document quality assurance techniques (field, office and elsewhere)
Conditions Causing 0.01 ft Error in 100 ft. (calibrated) Steel Tape

<table>
<thead>
<tr>
<th>Source</th>
<th>Error (ft.)</th>
<th>Error²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape Length</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>15°F</td>
<td></td>
</tr>
<tr>
<td>Tension (pull)</td>
<td>5.4 lbs</td>
<td></td>
</tr>
<tr>
<td>Sag</td>
<td>7.5” at center</td>
<td></td>
</tr>
<tr>
<td>Alignment</td>
<td>1.4 ft at one end or 7.5” at center</td>
<td></td>
</tr>
<tr>
<td>Tape Not Level</td>
<td>1.4 ft diff in elevation</td>
<td></td>
</tr>
<tr>
<td>Plumbing</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Marking</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Interpolation</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

Possible Errors Using Common Procedures

Standard 100 ft measurement with calibrated tape

<table>
<thead>
<tr>
<th>Source</th>
<th>Error (ft.)</th>
<th>Error²</th>
</tr>
</thead>
<tbody>
<tr>
<td>°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lb error)</td>
<td>0.009</td>
<td>0.000081</td>
</tr>
<tr>
<td>Alignment (0.05 ft)</td>
<td>0.000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Tape Not Level (0.5 ft)</td>
<td>0.001</td>
<td>0.000001</td>
</tr>
<tr>
<td>Plumbing</td>
<td>0.005</td>
<td>0.000025</td>
</tr>
<tr>
<td>Marking</td>
<td>0.001</td>
<td>0.000001</td>
</tr>
<tr>
<td>Interpolation</td>
<td>0.001</td>
<td>0.000001</td>
</tr>
<tr>
<td>SUM</td>
<td>0.023</td>
<td>0.000145</td>
</tr>
</tbody>
</table>

Sq Rt of Sum of Errors² = 0.012 ft

1: 8,000 OR 120 PPM
# Possible Errors Using Common Procedures

## Calibrated EDM (100 ft; accuracy 3 mm + 3 PPM)

<table>
<thead>
<tr>
<th>Source</th>
<th>Error (ft.)</th>
<th>Error²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mfr’s error constant</td>
<td>0.003</td>
<td>0.0000009</td>
</tr>
<tr>
<td>Mfr’s error scale</td>
<td>3 PPM = 0.0003</td>
<td>0.00000009</td>
</tr>
<tr>
<td>SUM</td>
<td>0.0393</td>
<td>0.000093459</td>
</tr>
</tbody>
</table>

\[ \text{Sq Rт of Sum of Errors}^2 = 0.0306 \text{ ft} \]

1: 3,000 OR 306 PPM

## Calibrated EDM (5,000 ft; accuracy 3 mm + 3 PPM)

<table>
<thead>
<tr>
<th>Source</th>
<th>Error (ft.)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Known</td>
<td>0.0000000</td>
</tr>
<tr>
<td>Temp (10° F error)</td>
<td>5 PPM = 0.025</td>
<td>0.000625</td>
</tr>
<tr>
<td>Pressure (1” Hg)</td>
<td>5 PPM = 0.025</td>
<td>0.000625</td>
</tr>
<tr>
<td>Centering w/O.P.</td>
<td>0.005</td>
<td>0.000025</td>
</tr>
<tr>
<td>Centering w/O.P.</td>
<td>0.005</td>
<td>0.000025</td>
</tr>
<tr>
<td>Mfr’s error constant</td>
<td>0.003</td>
<td>0.0000009</td>
</tr>
<tr>
<td>Mfr’s error scale</td>
<td>3 PPM = 0.015</td>
<td>0.000225</td>
</tr>
<tr>
<td>SUM</td>
<td>0.078</td>
<td>0.001534</td>
</tr>
</tbody>
</table>

\[ \text{Sq Rт of Sum of Errors}^2 = 0.03917 \text{ ft} \]

1: 127,000 OR 8 PPM
## Possible Errors Using Common Procedures

**RTK GPS (pole w/bipod) 2,500 ft baseline ±(1 cm + 2 PPM)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Error (ft.)</th>
<th>Error²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mfr’s error constant 0.01 m = 0.03281</td>
<td>0.001076</td>
<td></td>
</tr>
<tr>
<td>Mfr’s error scale 2 PPM = 0.005</td>
<td>0.000025</td>
<td></td>
</tr>
<tr>
<td>SUM</td>
<td>0.05581</td>
<td>0.001218</td>
</tr>
<tr>
<td>Sq Rt of Errors² = 0.0349 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1:72,000 OR 14 PPM

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## Ethical Responsibilities
A Constant Reminder

- From the beginning, if warranted, the surveyor must stress that his or her opinion on the essential facts may cause the case to collapse
- The client must be prepared; if an attorney, they should understand
- This requires a high standard of communication from the surveyor—for transmitting information, and for receiving it

Constant Reminder

- At every step of the way, the surveyor must be evaluating the client’s likelihood for success
- Facts and opinions adverse to the client’s case must be communicated, as soon as practicable, with full disclosure
- Surveyor must be in a position of competence and status to influence decisions, including whether to continue prosecution of the case
Confidentiality

- Easy to violate simply by being careless
- Just don’t talk about the case until completely concluded

Skills

- Self-assess
- Ask third parties
- Find your strengths and weaknesses
- Work on how to neutralize the weaknesses
Read

- Books and articles on evidence, especially if they relate to technical issues
- Stories about surveyor’s experiences as expert witnesses

- *Surveying the Courtroom*, John Briscoe
Library

- An expert witness is considered especially learned
- But any professional who is of a learned profession, as surveying is, is supposed to at least be “ordinarily” learned
- Having an extensive library and being well read on science and literature of the past, present and cutting edge is all required to be properly successful

Write

- If you are weak in this area, develop good writing habits on your own, through courses, etc.
- Read good literature
- Have good references on how to write, how to cite, etc.
- Technical writing is different from literary writing. But knowledge of one greatly improves one’s chances at doing well at the other.
**Understand**

- Talk to lawyers, other surveyors, even if you are not involved in a lawsuit
- Do not accept a single opinion or “fact” as representing the truth about what you will encounter
- Develop your own skills for assessing situations, understanding ambiguities and arriving at conclusions
- Don’t hesitate to ask for advice from, or hire someone, to advise who has more experience

**Develop**

- Self-evaluate how...
- You communicate ideas
- Explain technical things to non-technical people
- Simplify, use analogies, to increase clarity, but not leave out important information
Remember:
The contrary may always be shown!