Data For Drivers

SPEED SECRETS

Webinar

Goals

1. Help you self-coach using data
2. Demonstrate a coach's thought process
3. Encourage you to use data

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Warnings!

- I'm not a data engineer!
- Webinar aimed at drivers
- Not going to cover everything
- Examples not brand-specific (using Track Attack)
- Know the limitations of your data tool
- Data doesn't lie… but doesn't tell you everything
- Many ways to look at data – showing you mine

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Assumptions

- You have a data system beyond a lap timer - something that provides Speed & Long/Lat g at a minimum
- Ideally, Throttle position & Brake pressure
- Next, Steering angle & engine RPM

Question

- What data system do you currently use (if any)?

What We'll Cover...

1. Overview: The Basics
2. Examples: Single Data
3. Examples: Comparative Data
4. Examples: Coaching
5. Process
6. Resources
7. Q&A

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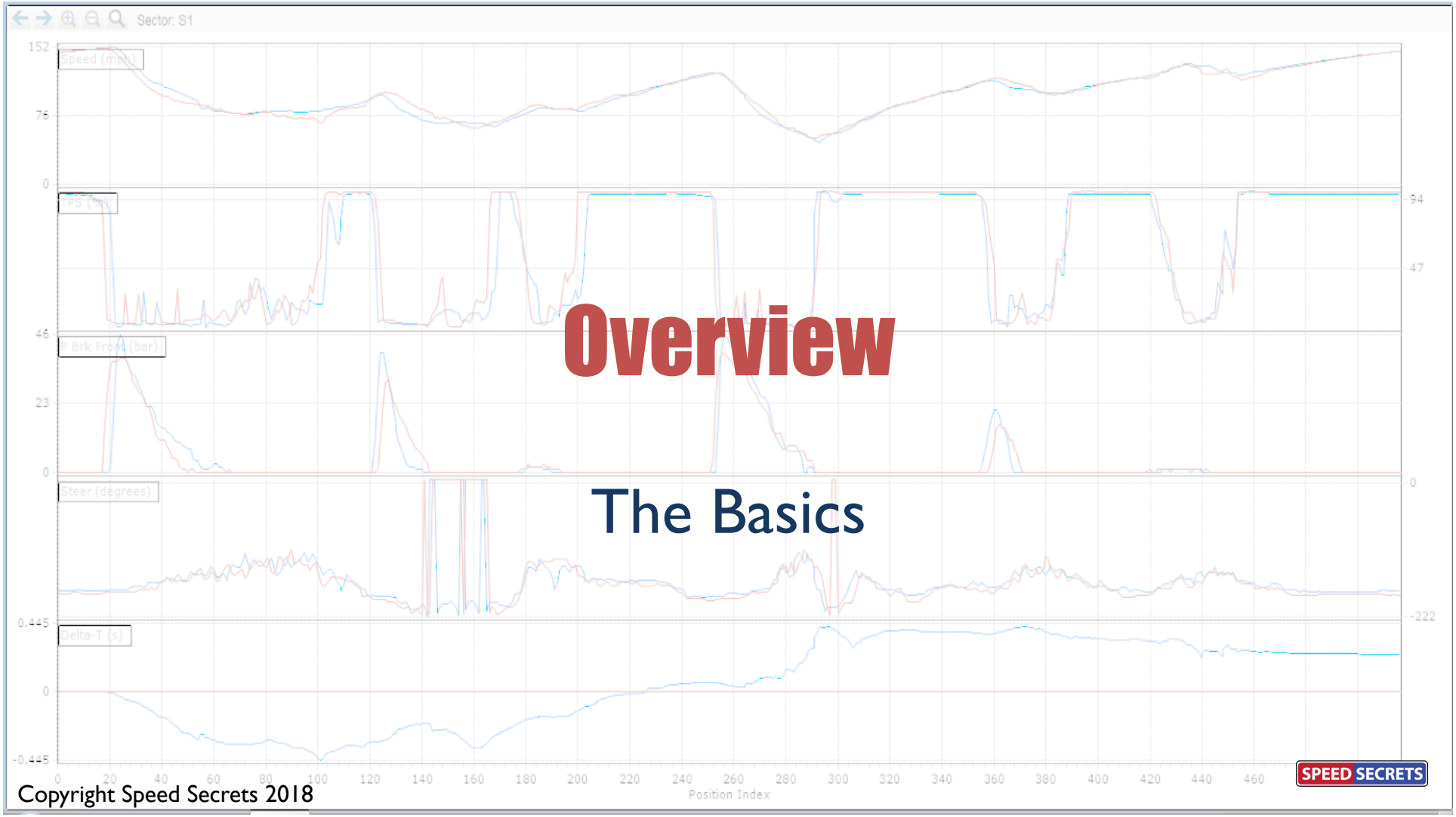
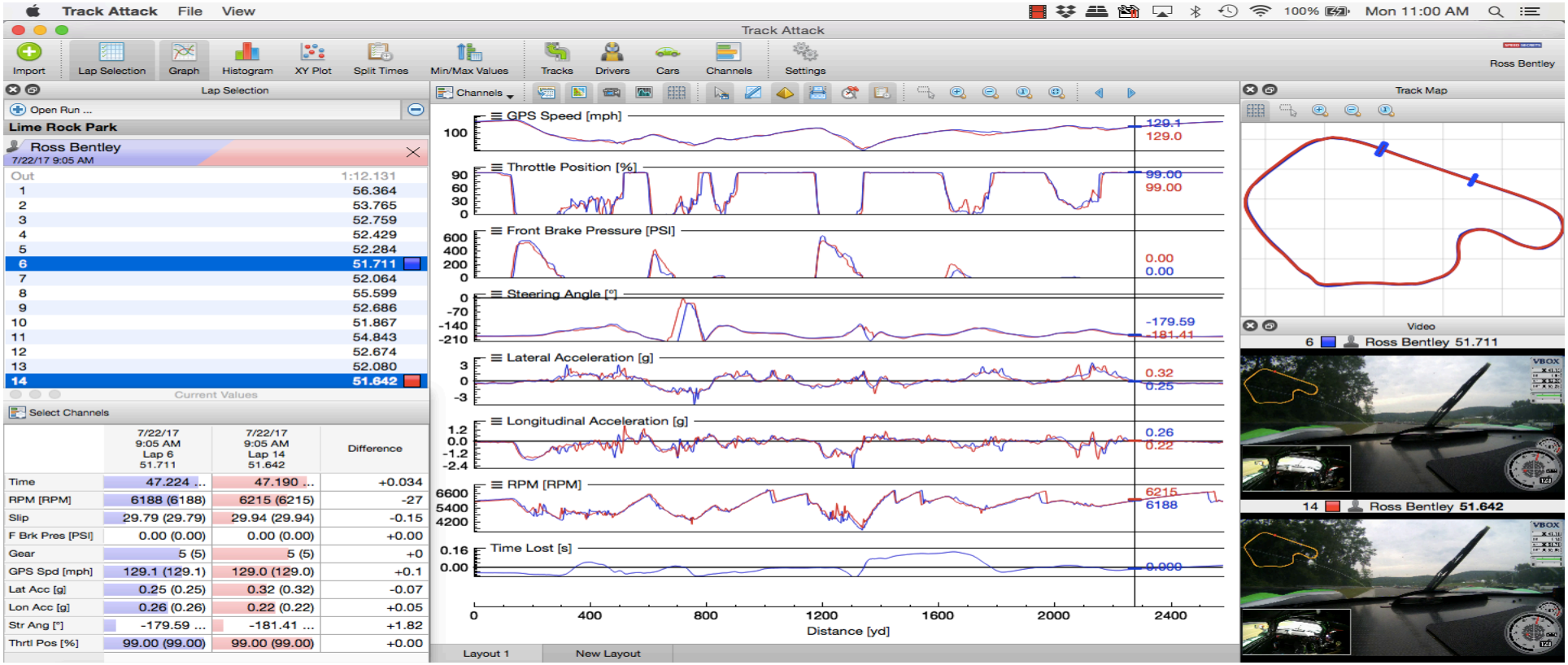
Definitions

- *Hardware*: Data logger, dash, wiring & sensors
- *Software*: Analysis application that allows you to look at and analyze data
- *Channels*: The different parameters being measured, such as speed, throttle position, engine RPM, etc.
- *Traces*: Squiggly line on a graph representing the different channels

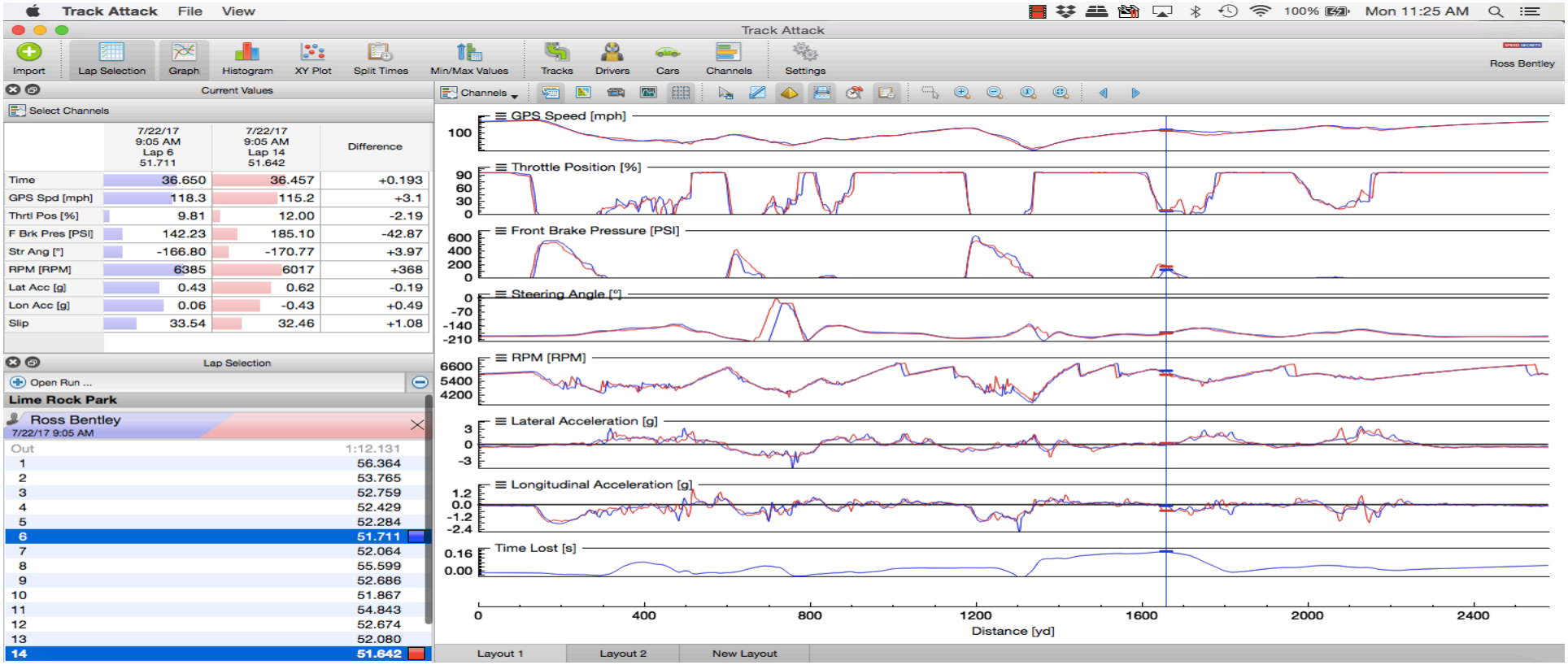


Overview

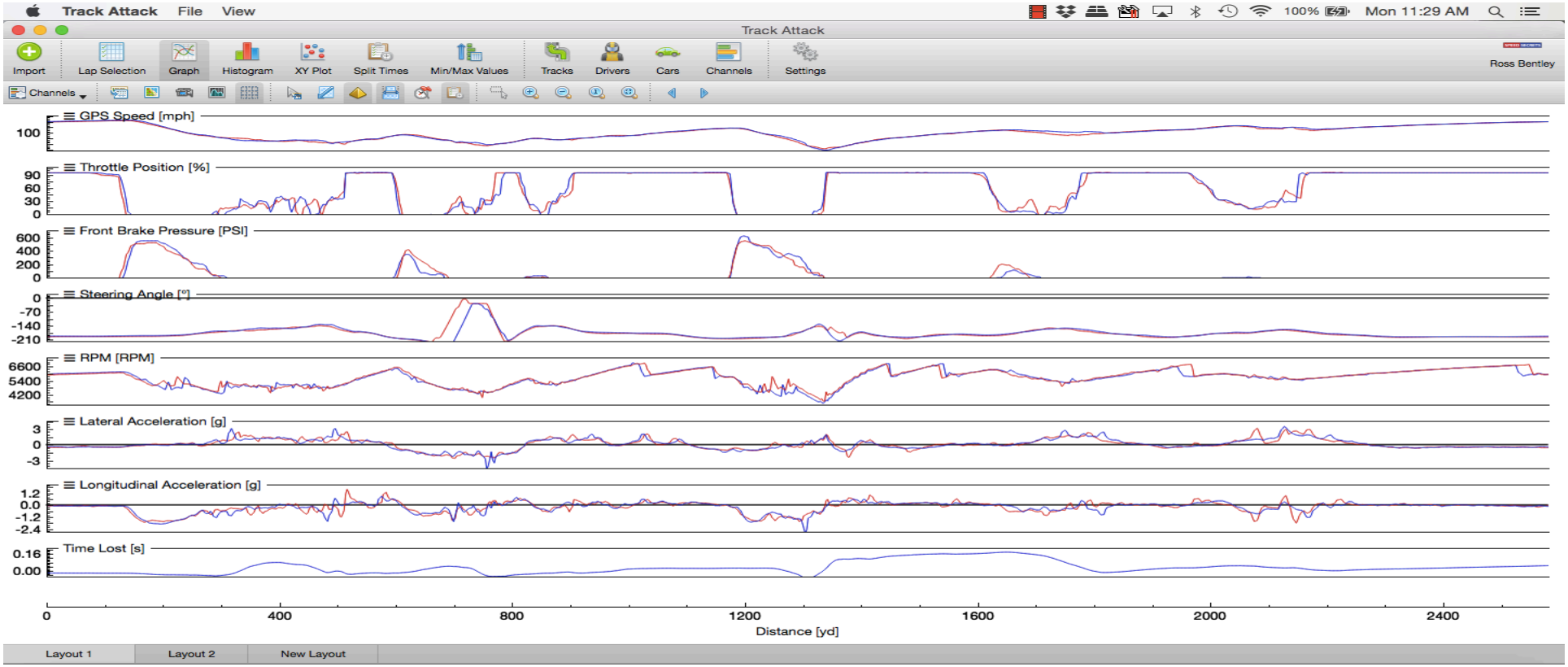
The Basics



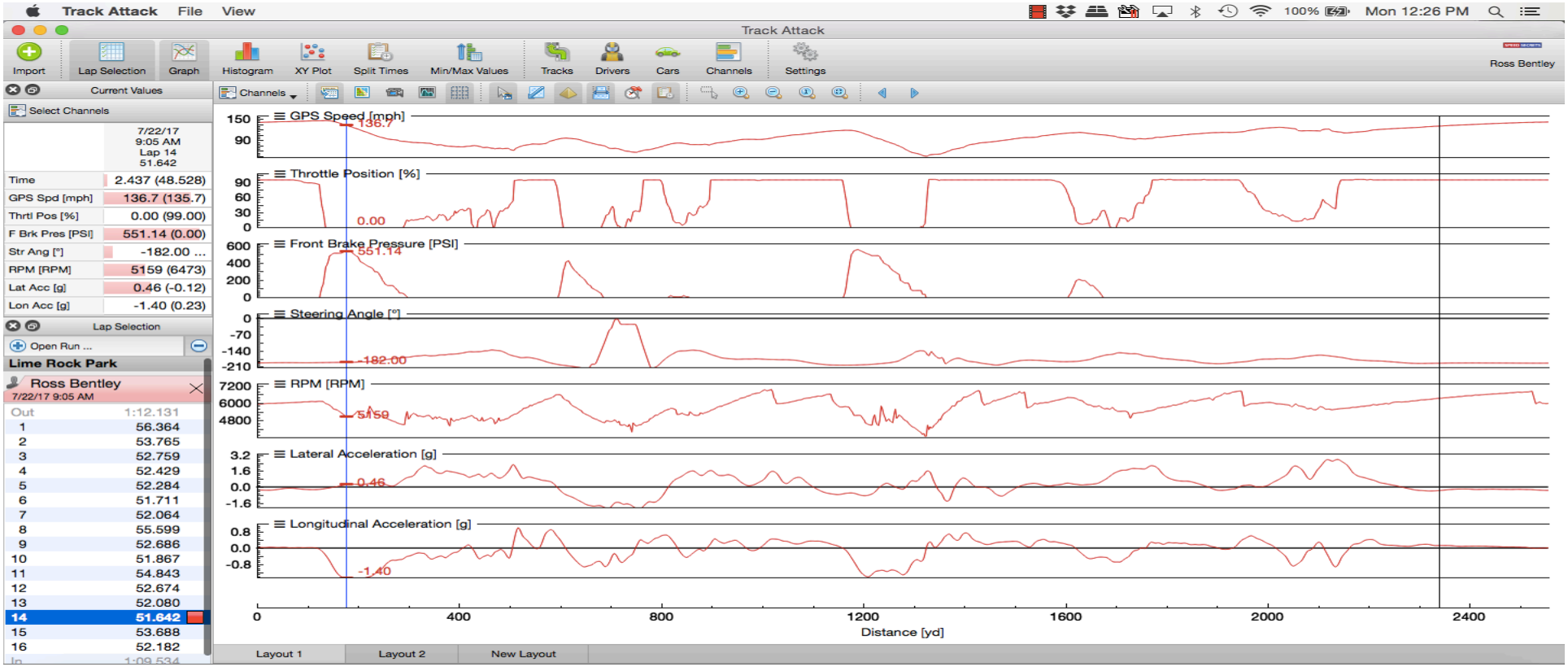
- Overview of what a full data analysis app provides (driver-focused)
- Information overload!



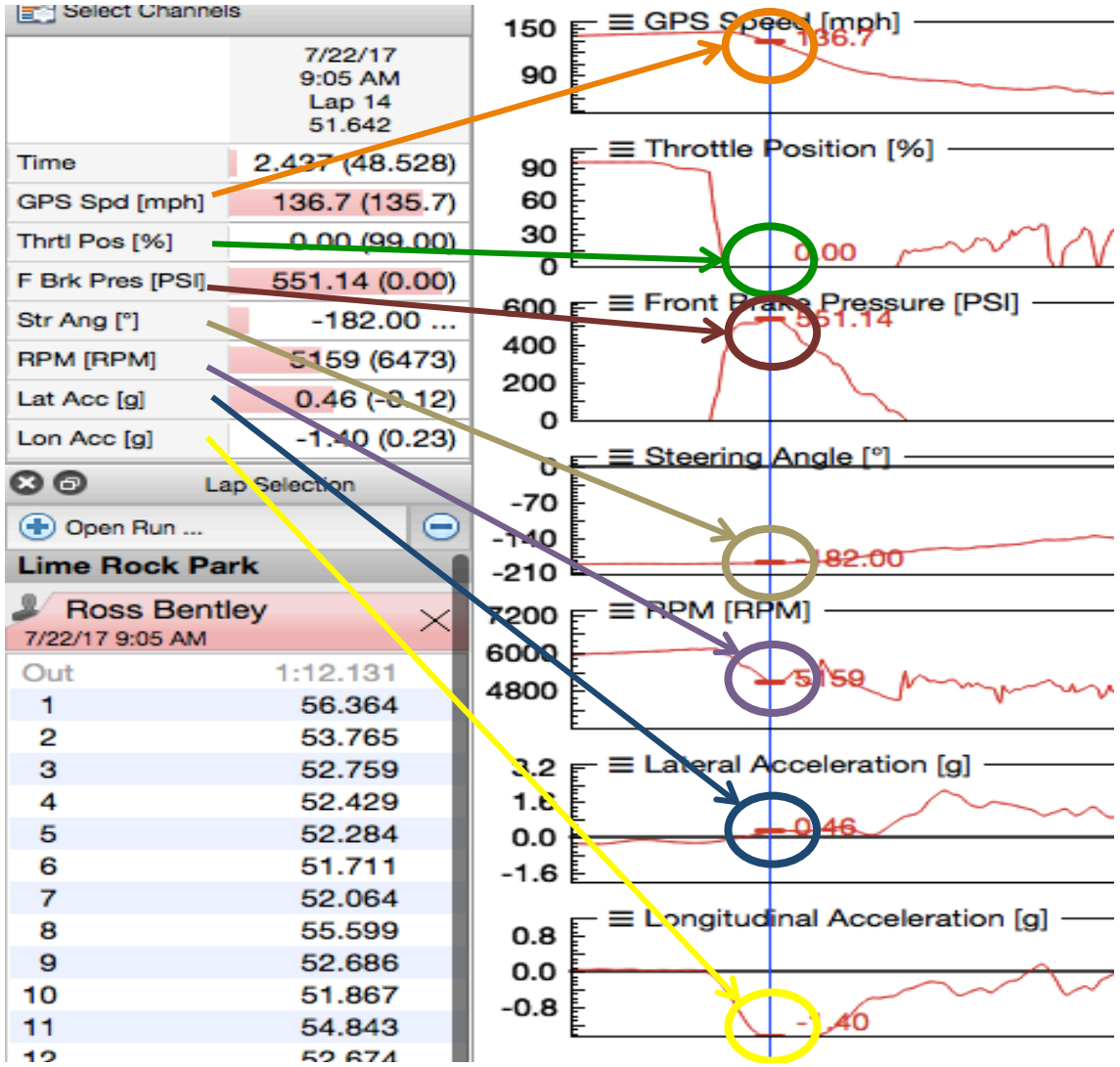
- Narrow it down to what you can use



- Simplify



- But know what you're looking at



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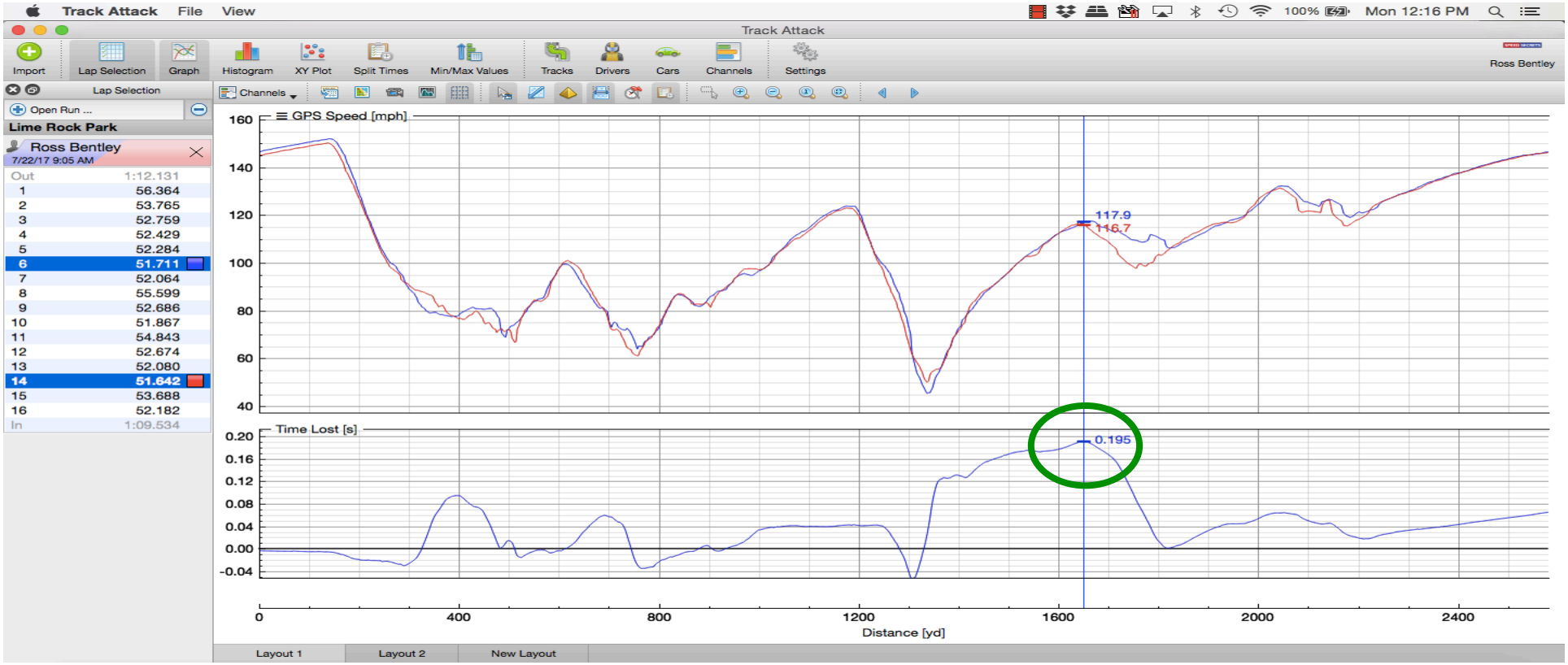
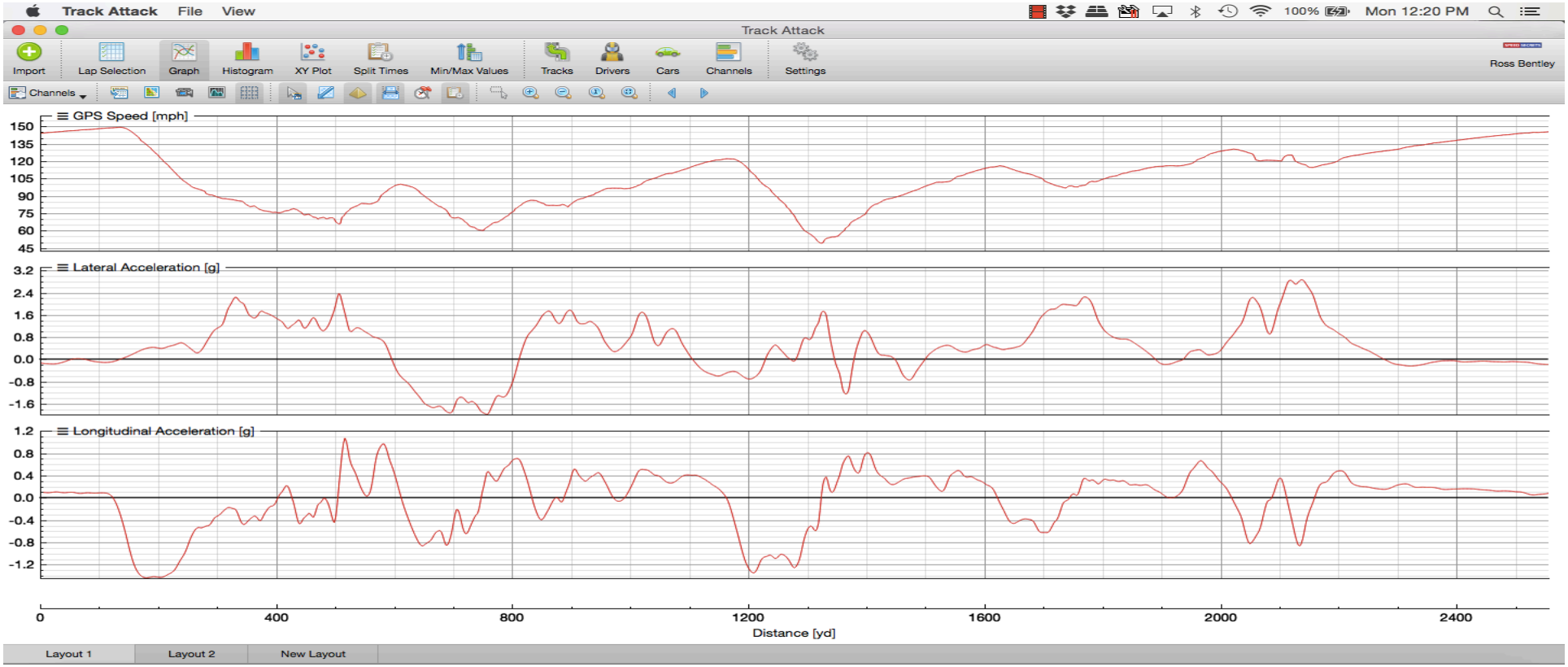


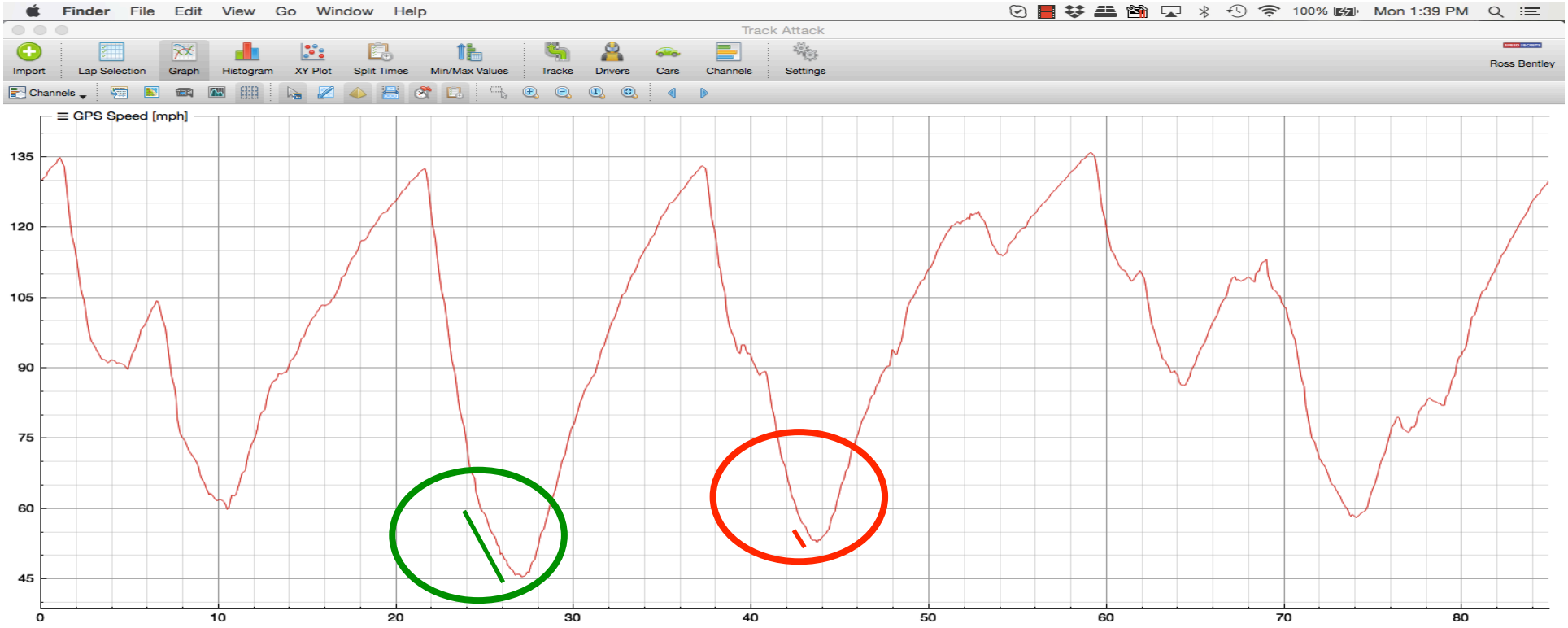
- Lap time comparison – Delta/Time Compare



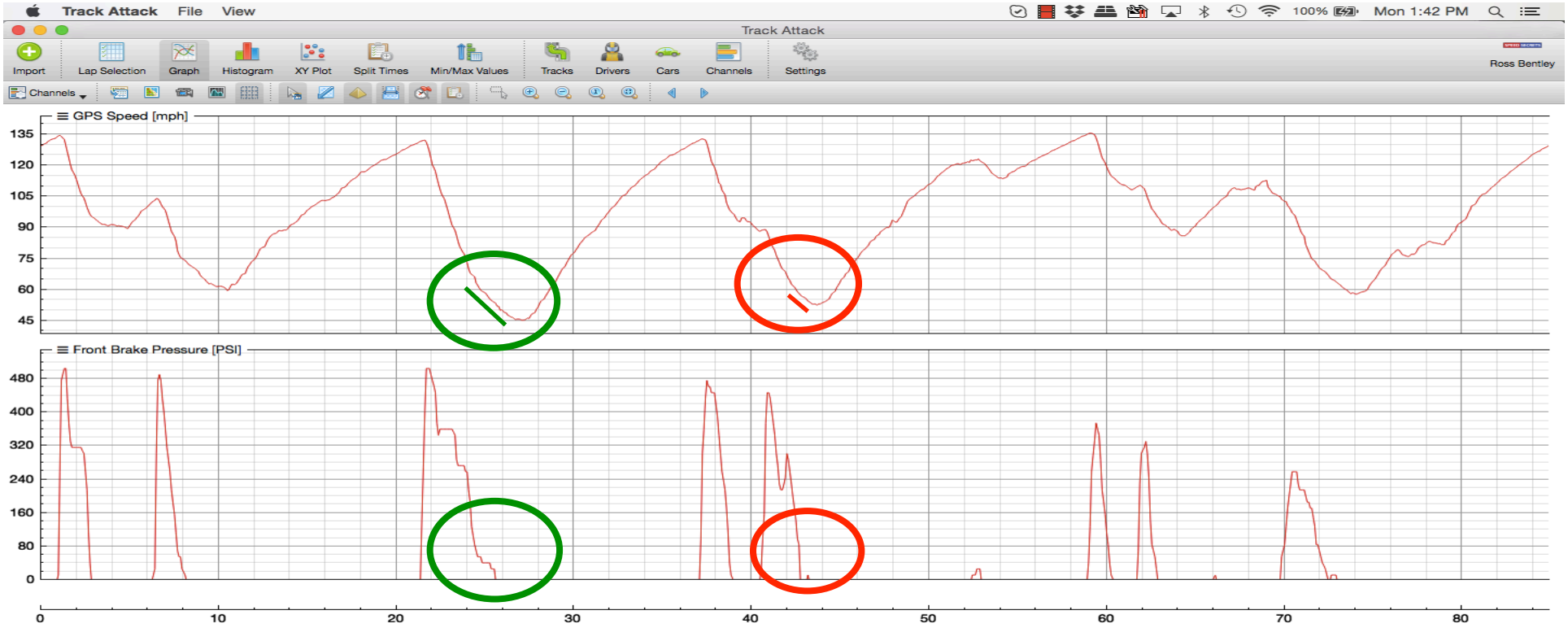
- Speed, Lateral & Longitudinal G – typical/basic

Examples

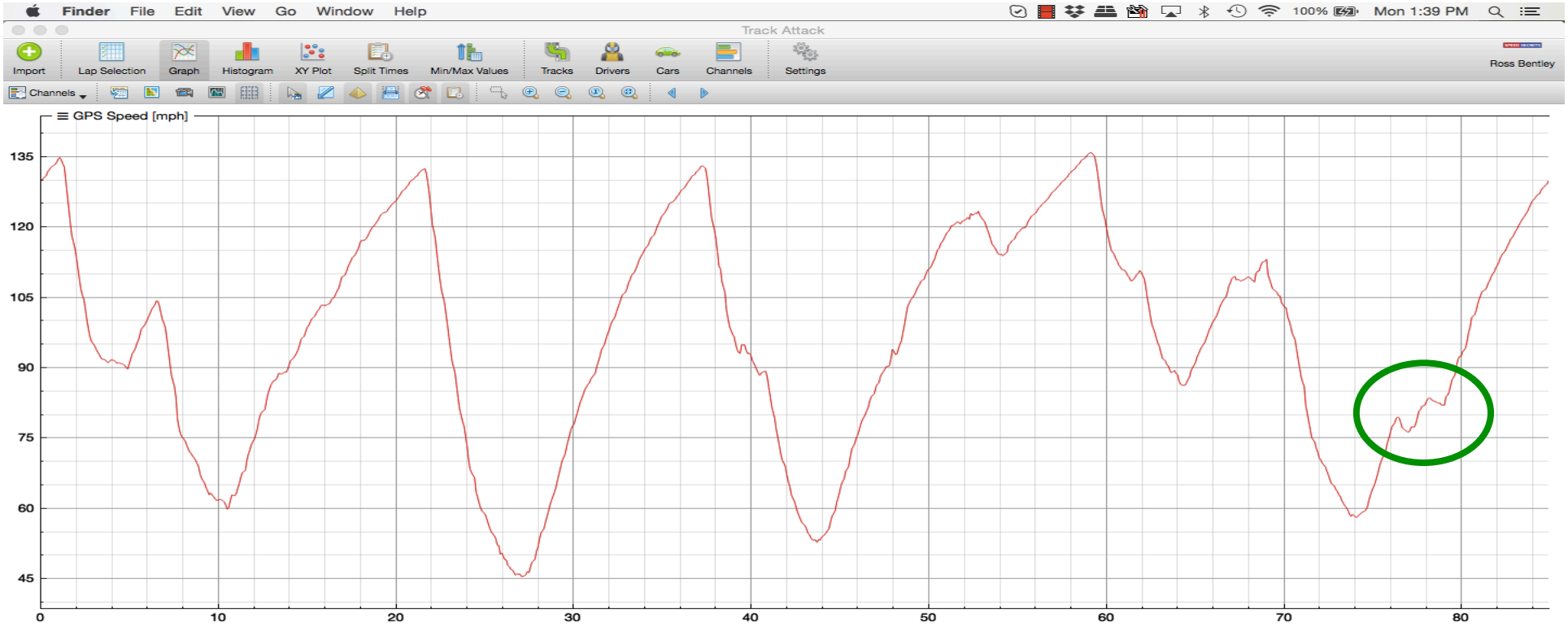
Single Data



- What can we do with just a Speed trace?
- Notice change in slope of deceleration on Speed trace
- Suspect trail braking in Green circle; little trail braking in Red circle…



- Brake pressure trace confirms trail braking in Green circle; very little in Red circle
- Good or bad?



- What's causing the changes in Speed exiting the corner onto the front straight?

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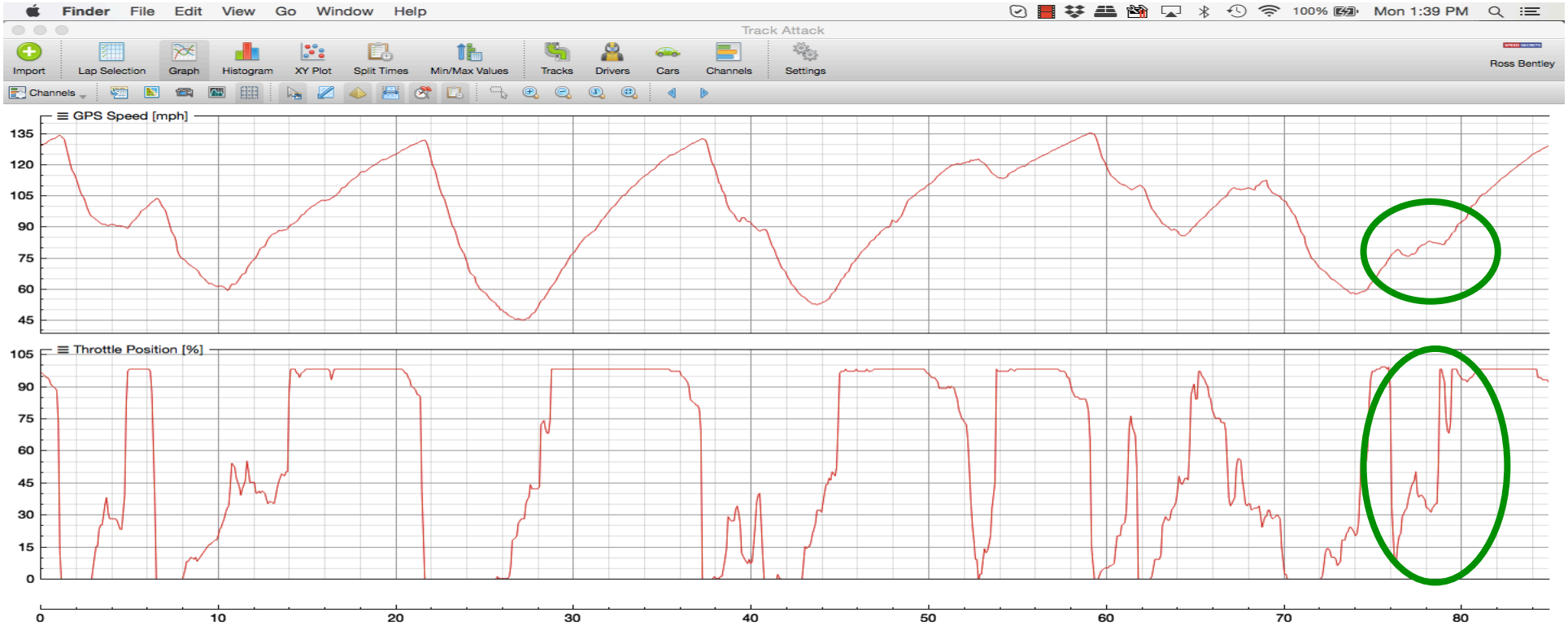
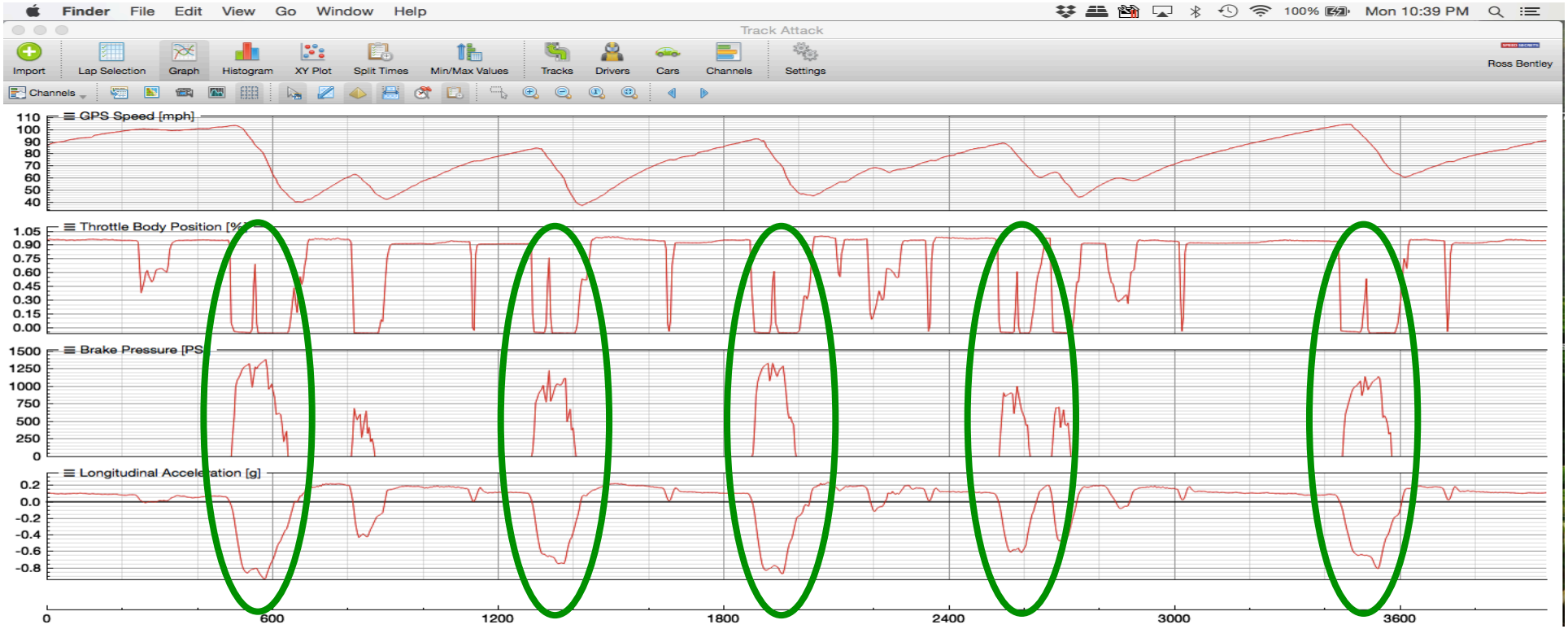


- What's causing the changes in Speed exiting the corner onto the front straight?
- Throttle adjustments
- Why? Line? Vision? Mental image of track-out? Too much mid-corner Speed/Throttle?

Look for Sloppy Footwork



- Notice relationship between Throttle blip (downshift), Brake pressure & Long G
- Throttle blip is hurting braking performance

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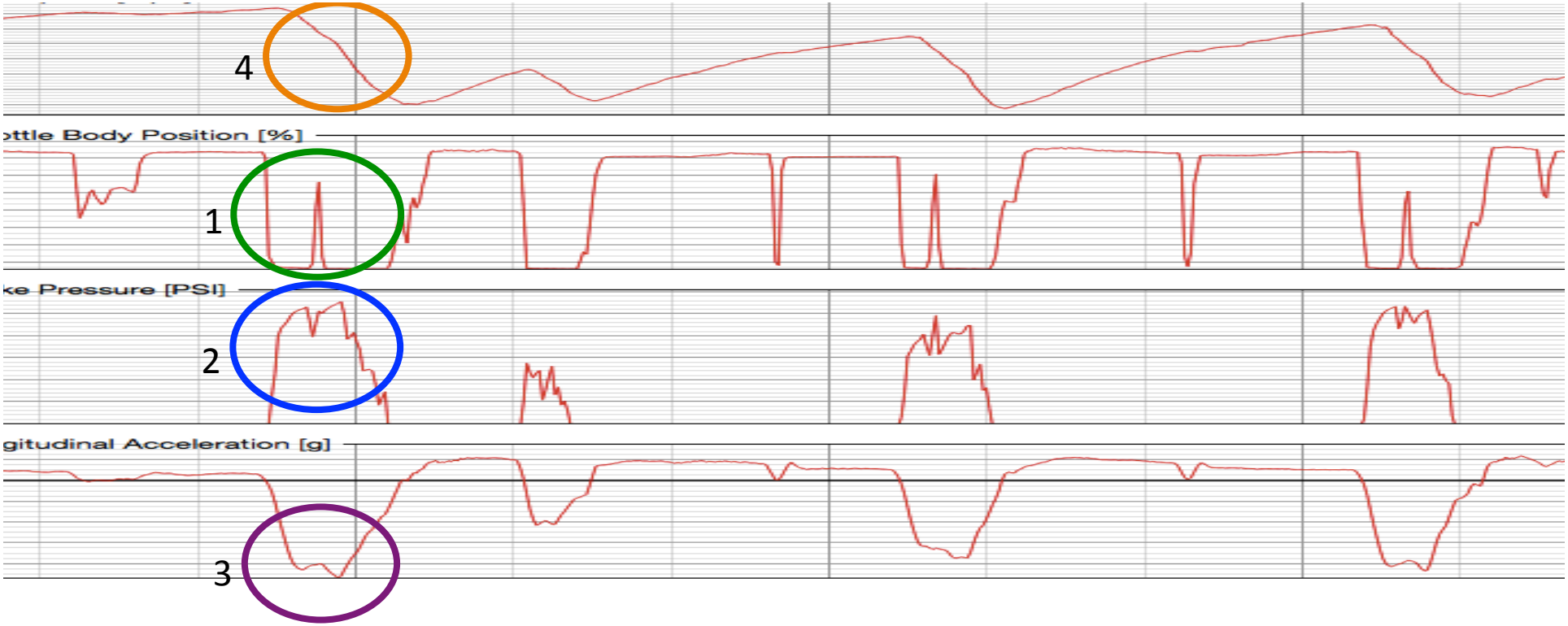
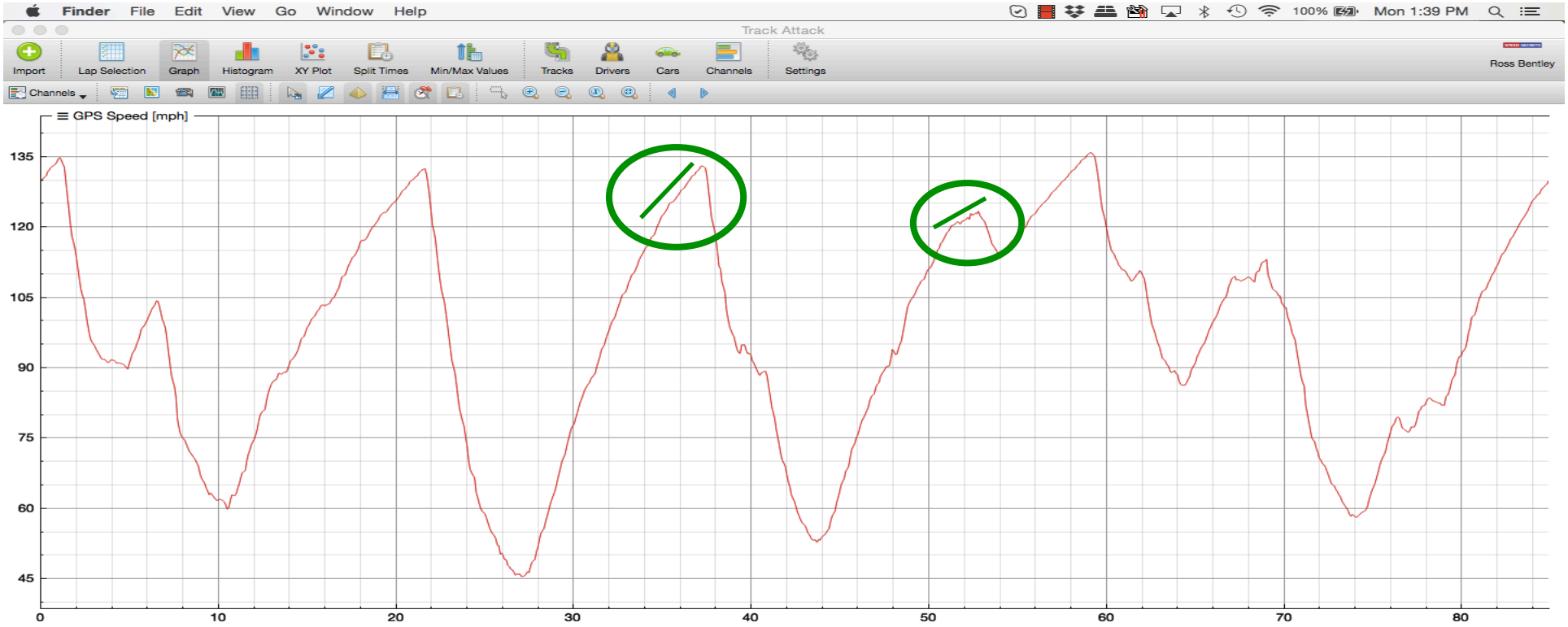
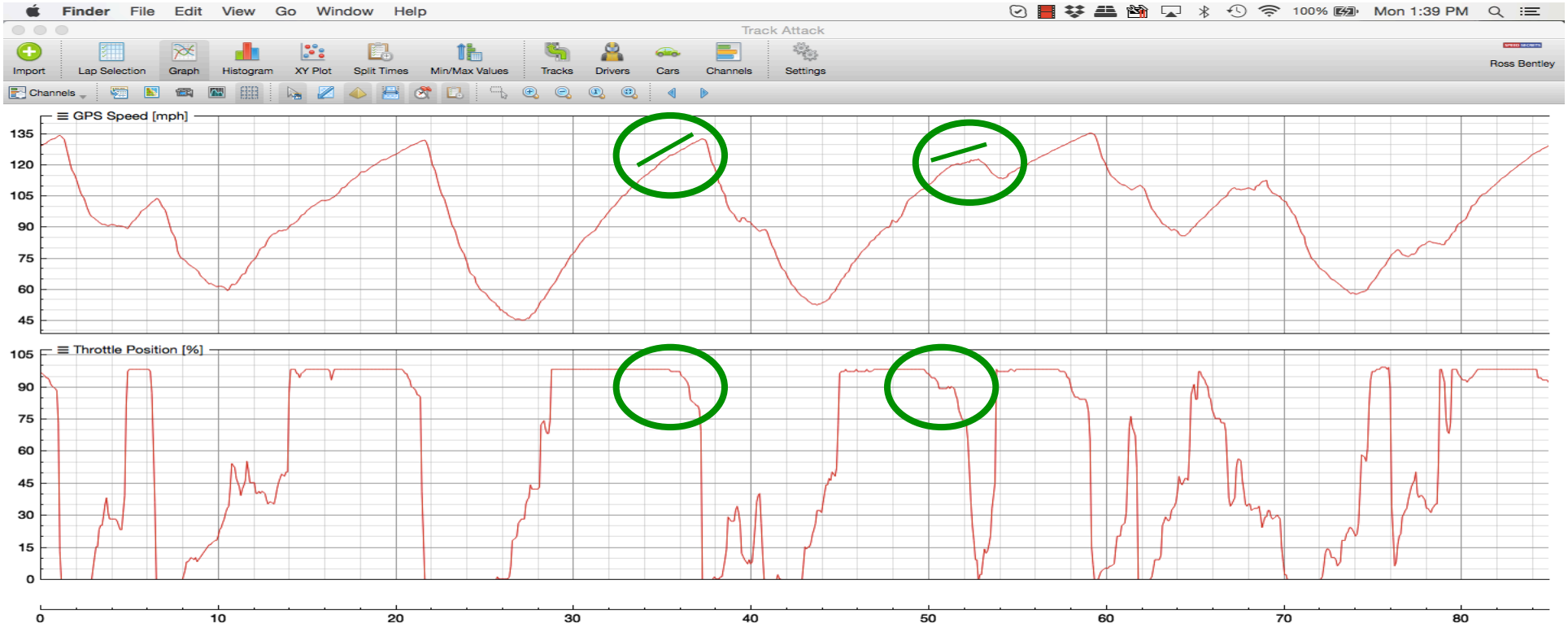


1. Throttle blip
2. Brake pressure release
3. If all you have is Long G & you see this trace shape, think about your downshift blip
4. Can even see a hint of it in Speed trace



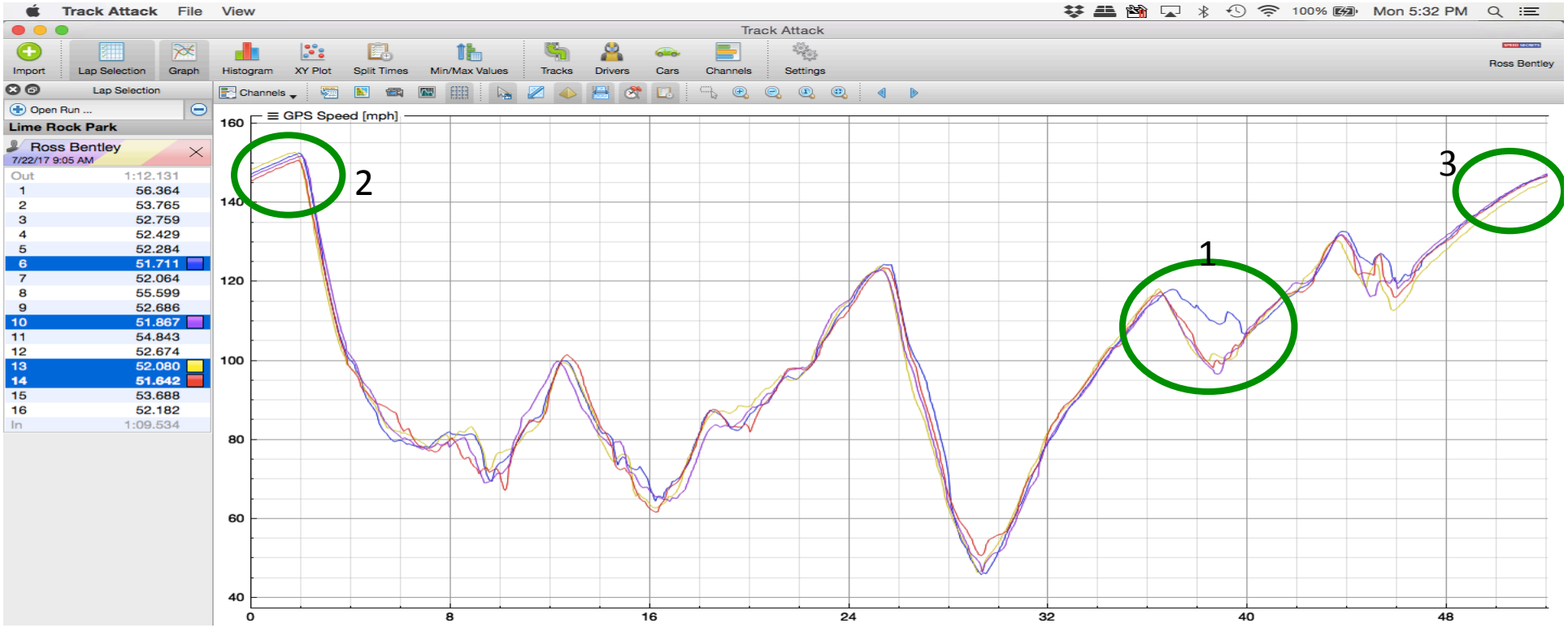
- Notice change in slope of acceleration on Speed trace
- Suspect "lazy throttle"/coasting…

SPEED SECRETS



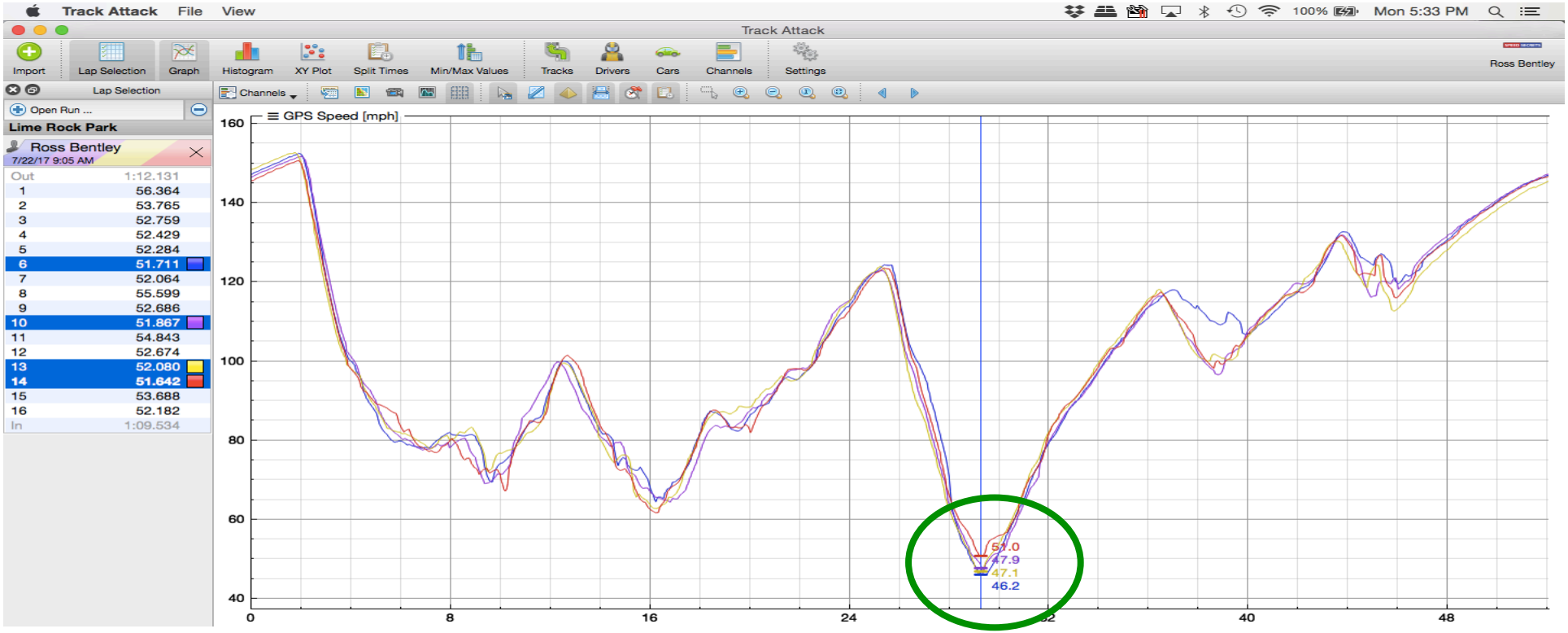
- Throttle trace confirms "lazy throttle"/coasting

Look for Areas of Inconsistency

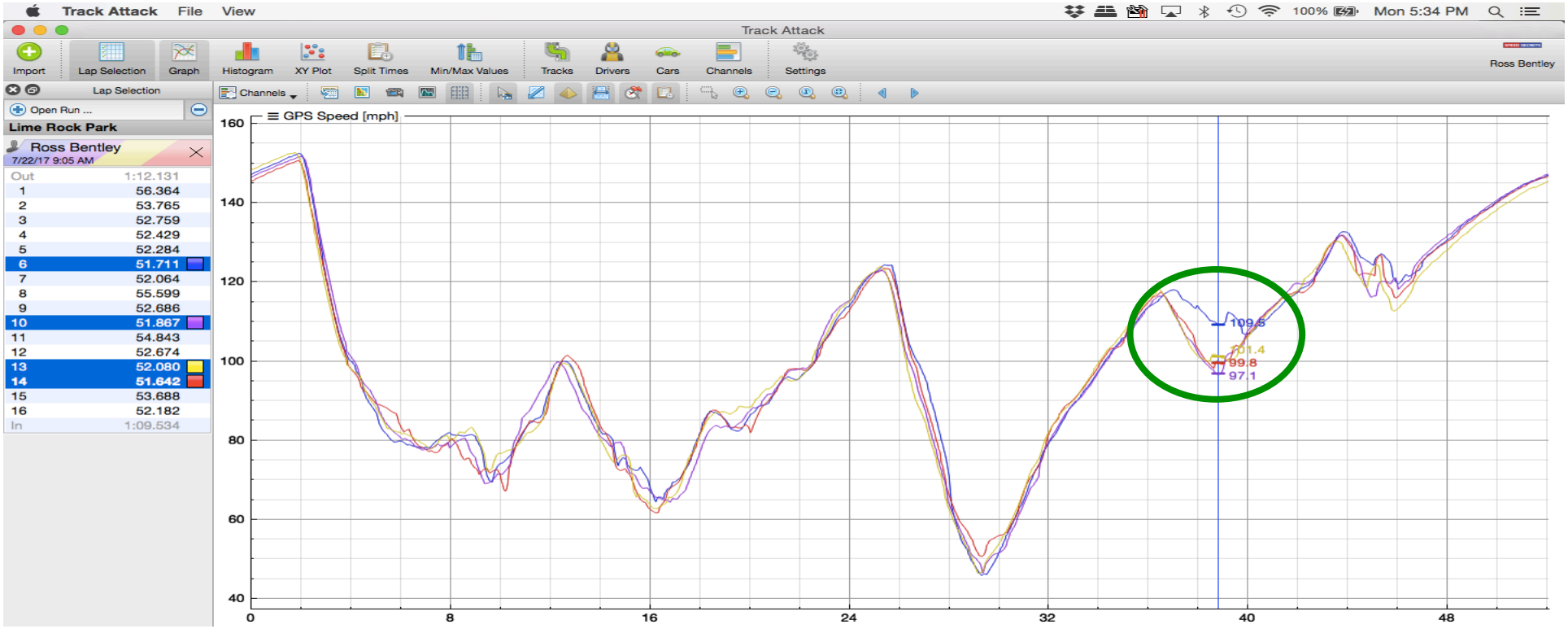


Compare multiple laps

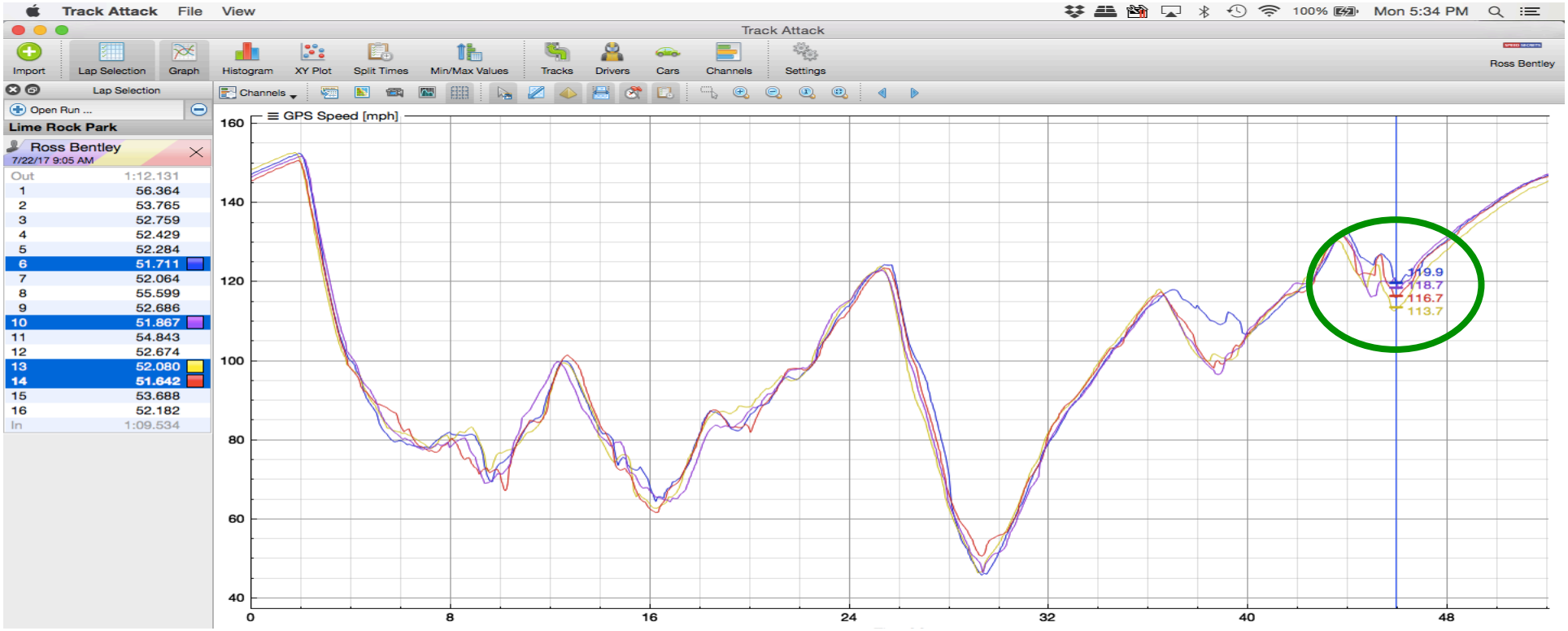
1. Notice Blue lap much faster (without losing much afterwards)
2. Yellow lap had highest front straight speed starting lap – worst lap time
3. Yellow lap had lowest front straight speed leading to fastest (Red) lap



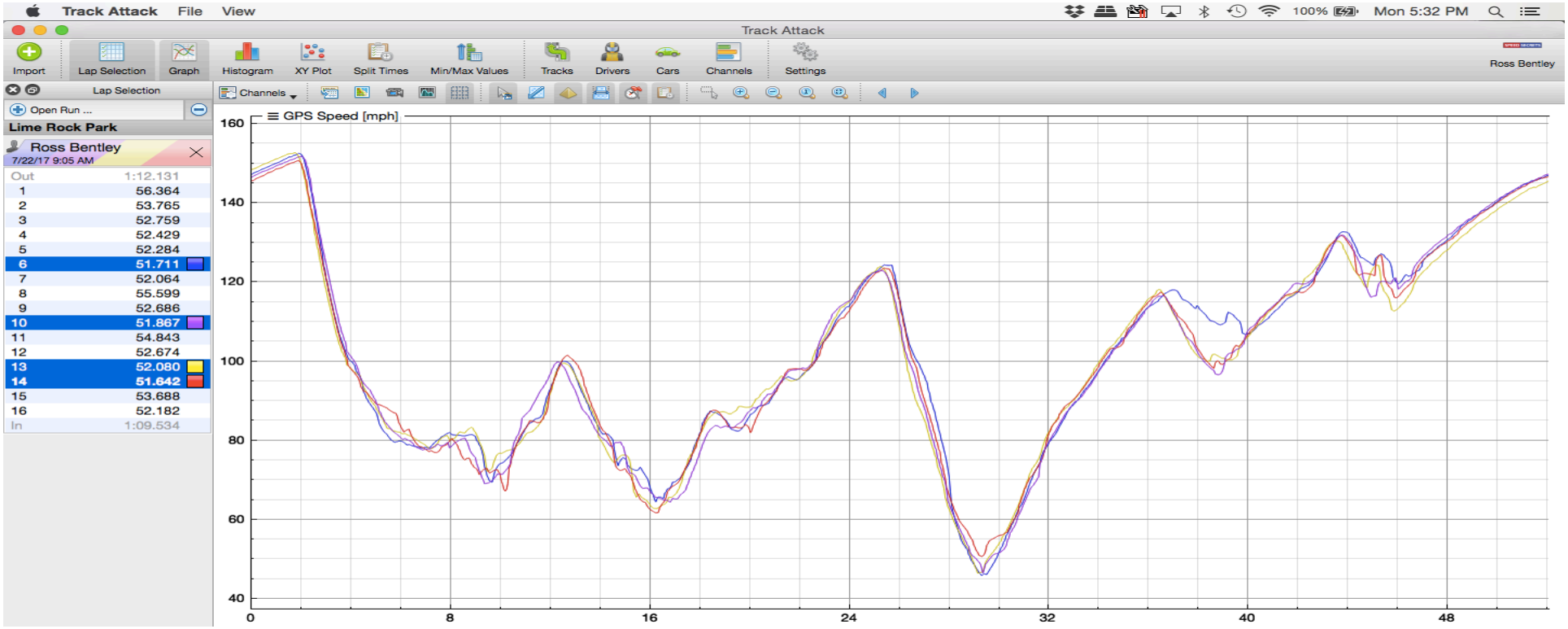
- Minimum Speeds: Red – 51.0; Purple – 47.9; Yellow – 47.1; Blue – 46.2



- Minimum Speeds: Blue – 109.5; Yellow – 101.4; Red – 99.8; Purple – 97.1



- Minimum Speeds: Blue – 119.9; Purple – 118.7; Red – 116.7; Yellow – 113.7



- Notice that if we'd only looked at fastest lap, would have missed important info
- If driver had put Red and Blue laps together…

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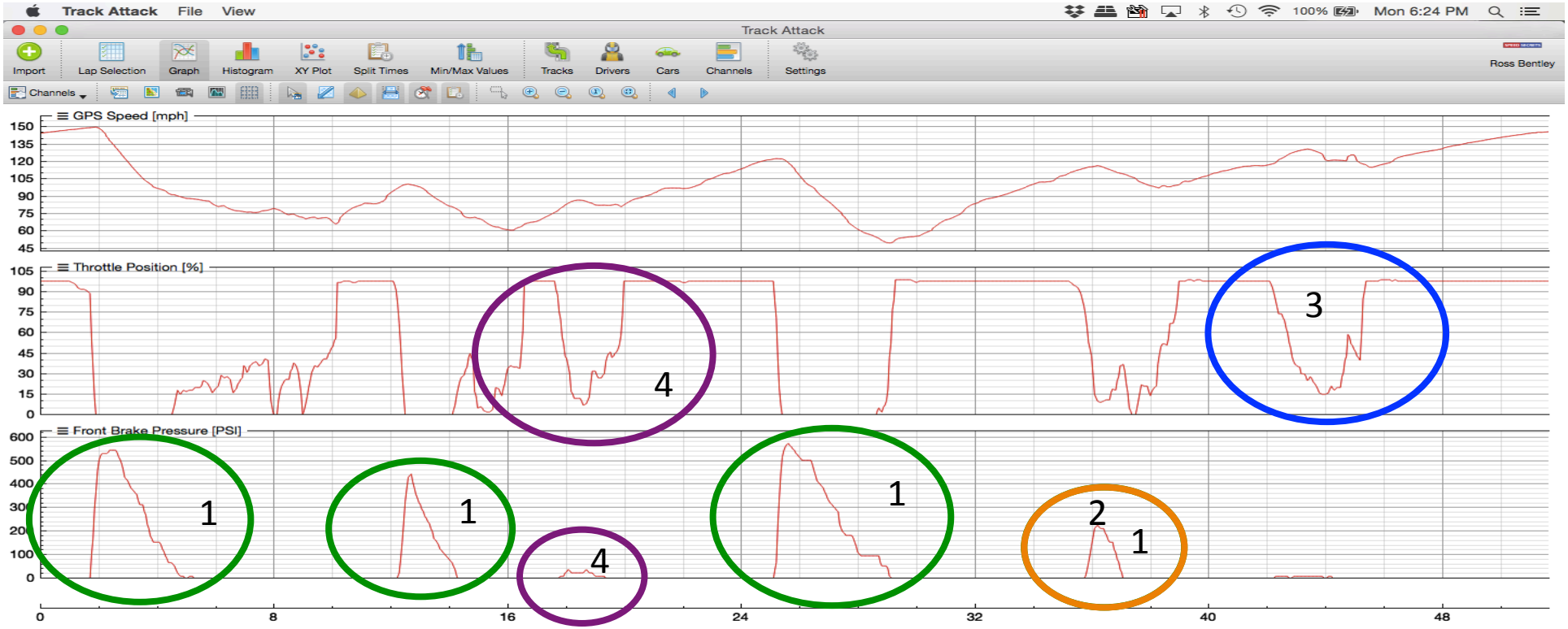
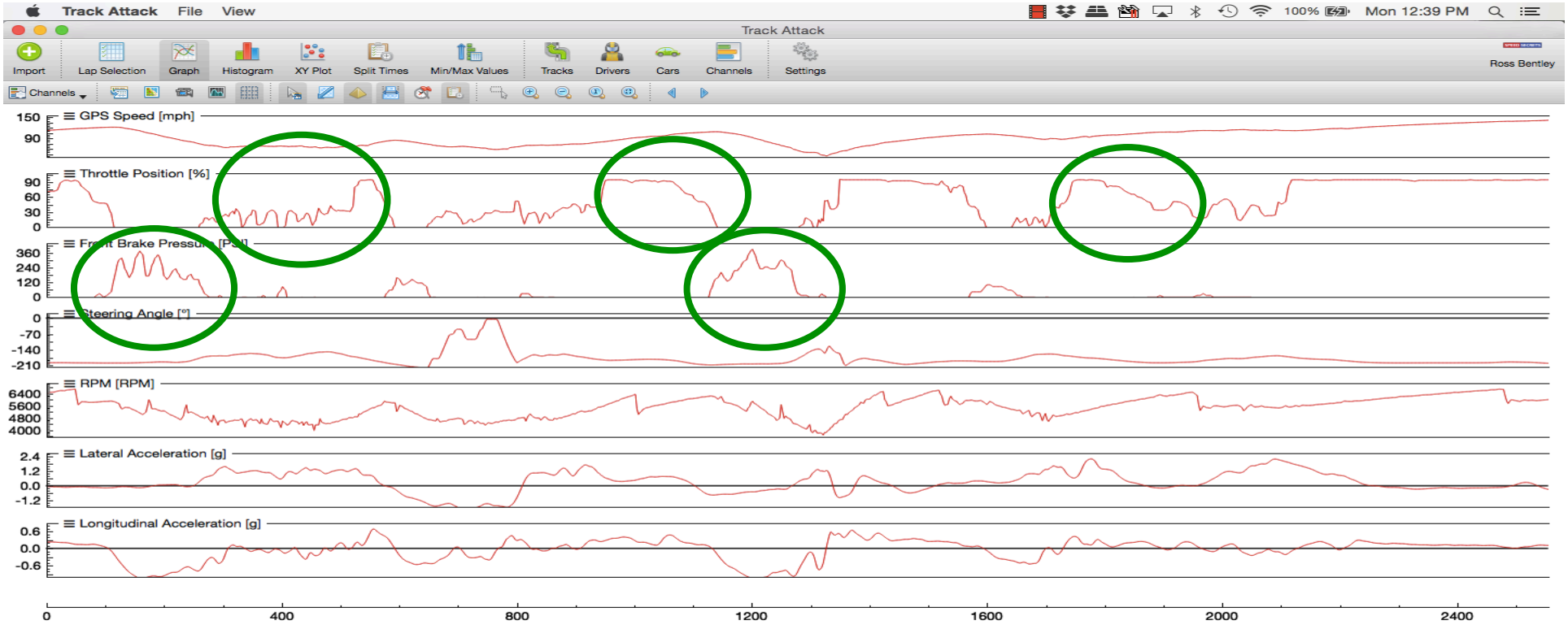
Look for Speed in Driving Technique

SPEED SECRETS

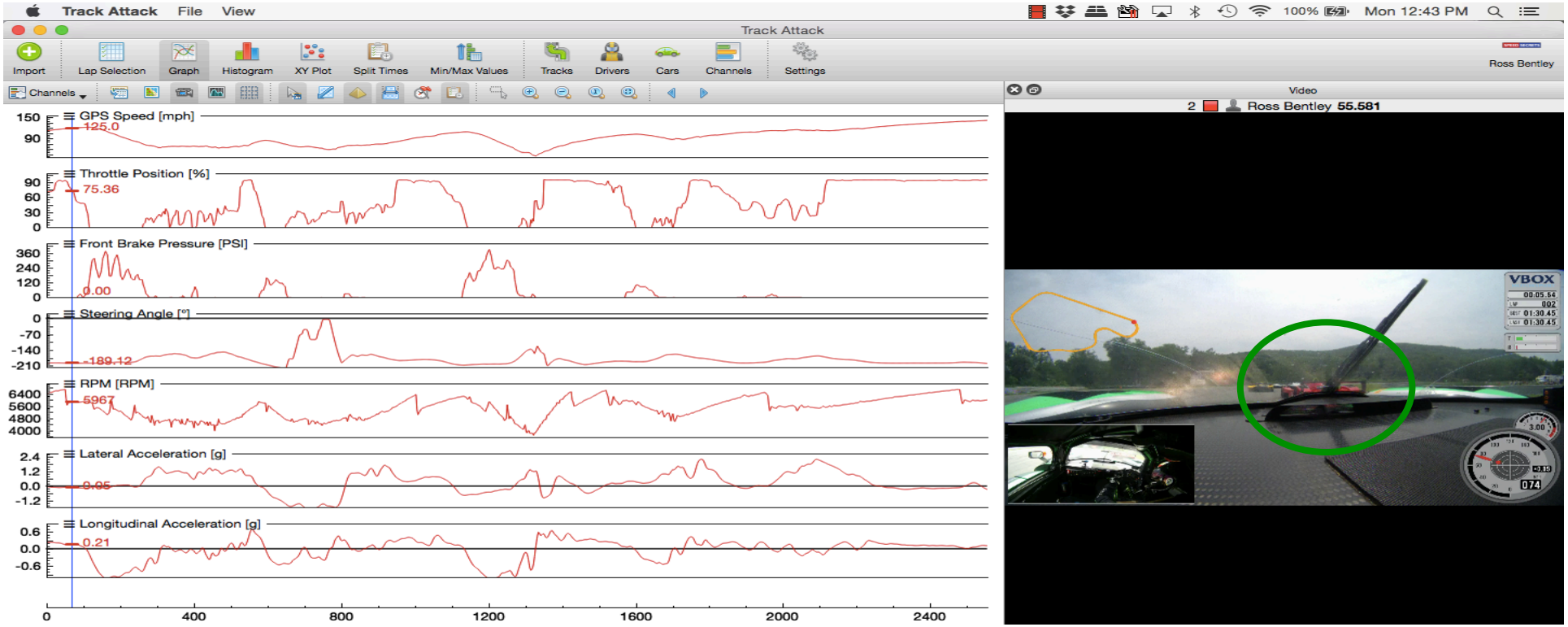


Compare Speed, Throttle & Brake pressure

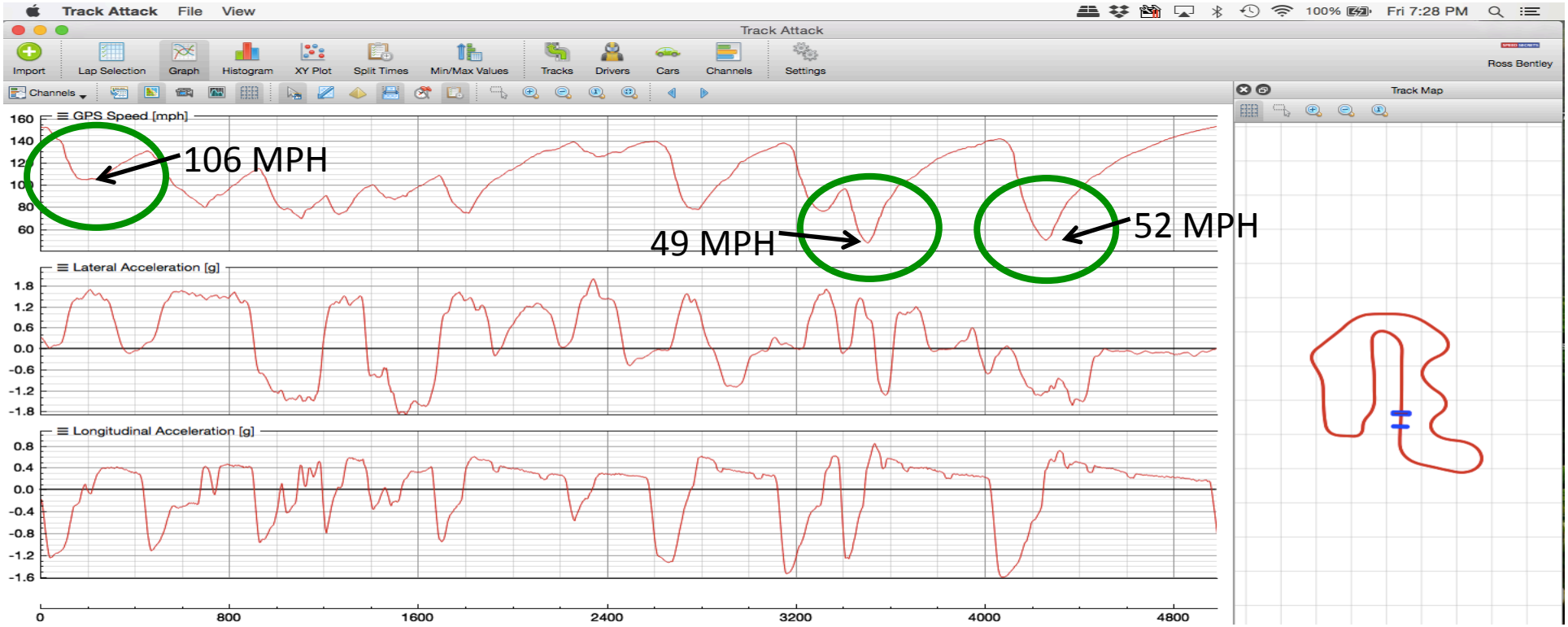
1. Good Brake pressure trace shape (hard initial application, nice release)
2. Brake for West Bend could be lighter (takes experience at this track)
3. Minimize Throttle lift for Downhill
4. Blend of Throttle & Brake – causing delay in getting to full throttle?



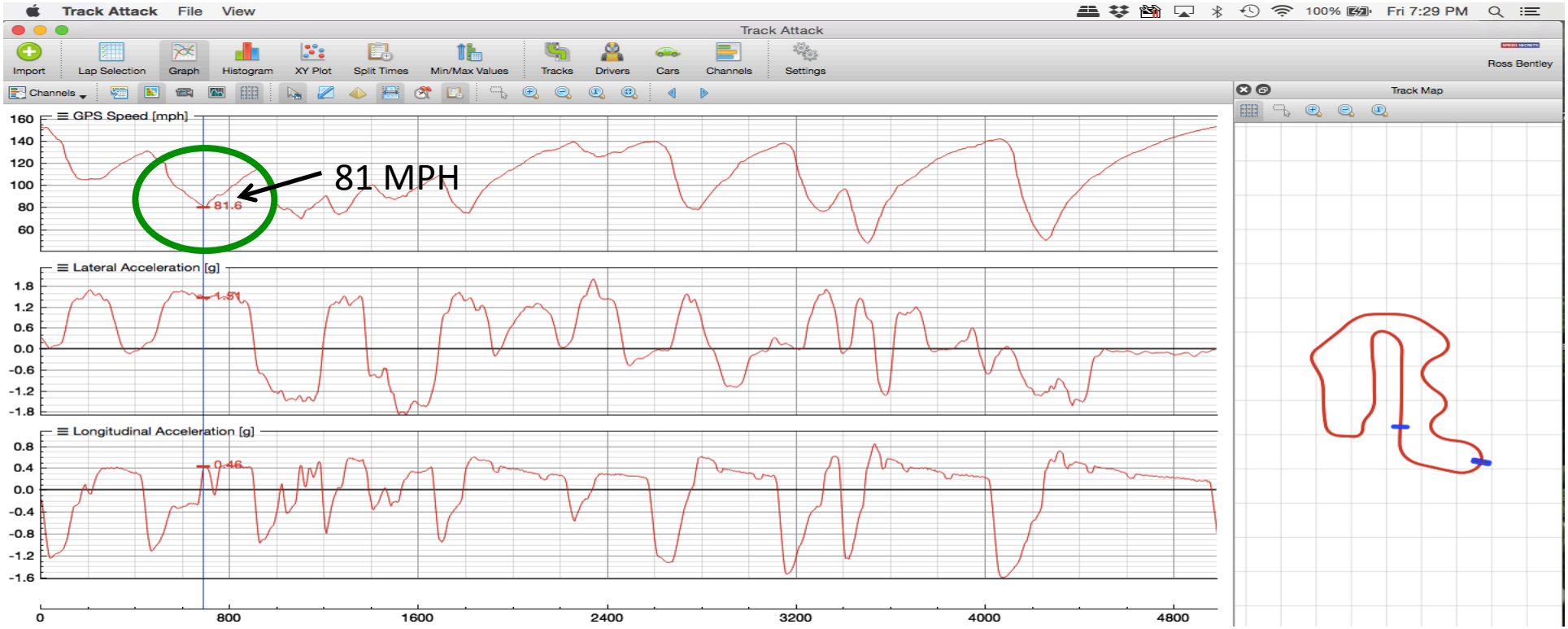
- Looks like a "hesitant" lap – notice Brake trace inconsistencies, lazy throttle release, hesitant throttle application
- Why? Traffic?
- Check video…



- Yes, traffic…

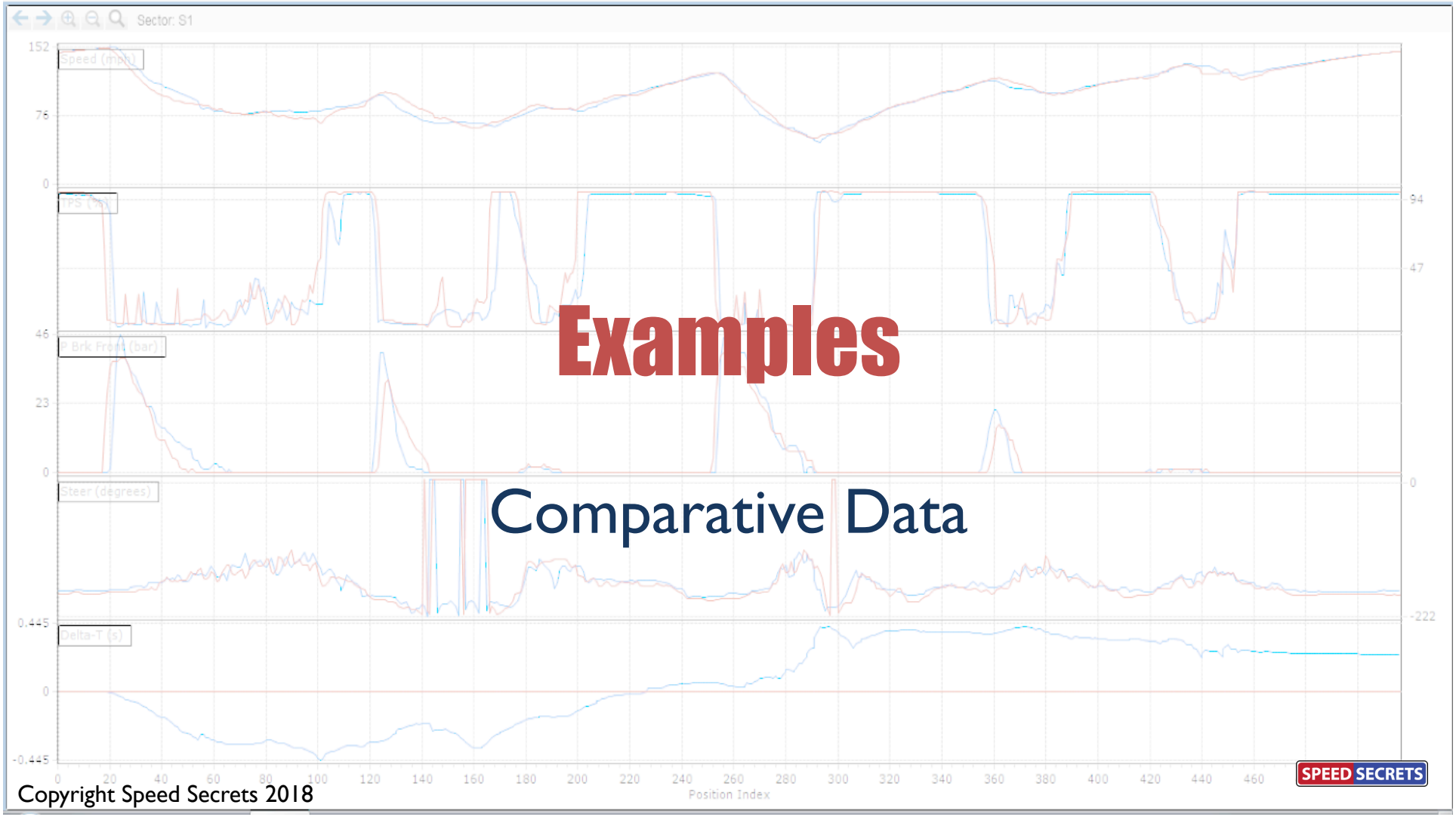


- Look at shape of Speed trace
- U-shaped vs. V-shaped traces
- Guideline: > 65-ish MPH = U-shaped; < 65-ish = V-shaped



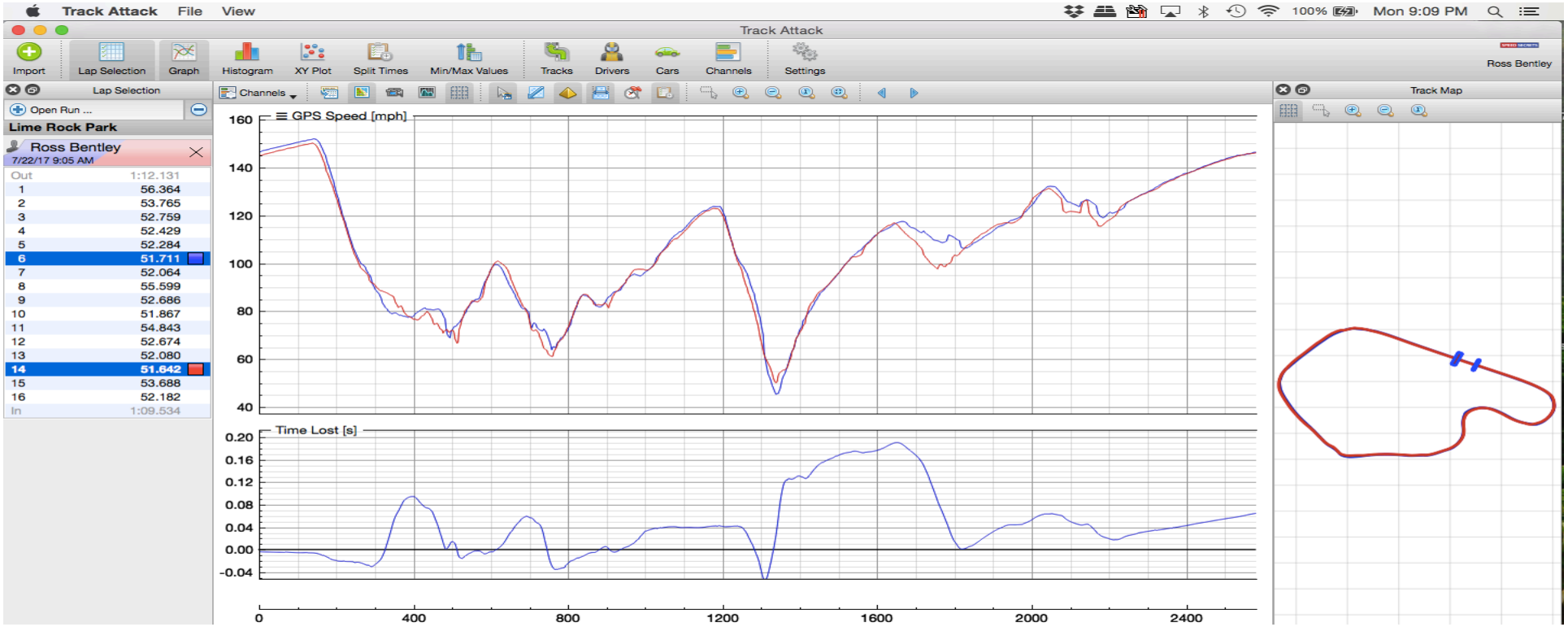
- Look at shape of Speed trace
- U-shaped vs. V-shaped traces
- Guideline: > 65-ish MPH = U-shaped; < 65-ish = V-shaped
- Exceptions… Aero cars (> 75-ish) & "diamond" corners
- If not, ask why?

SPEED SECRETS

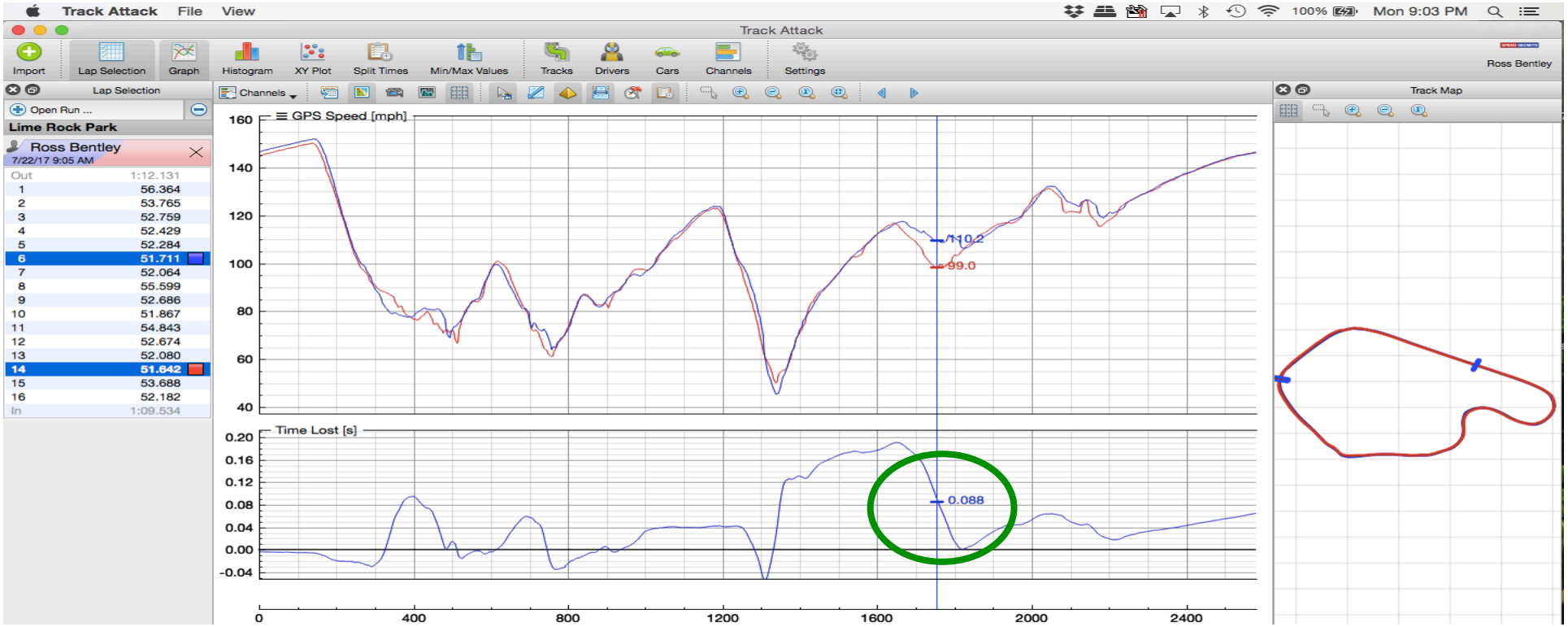


Examples

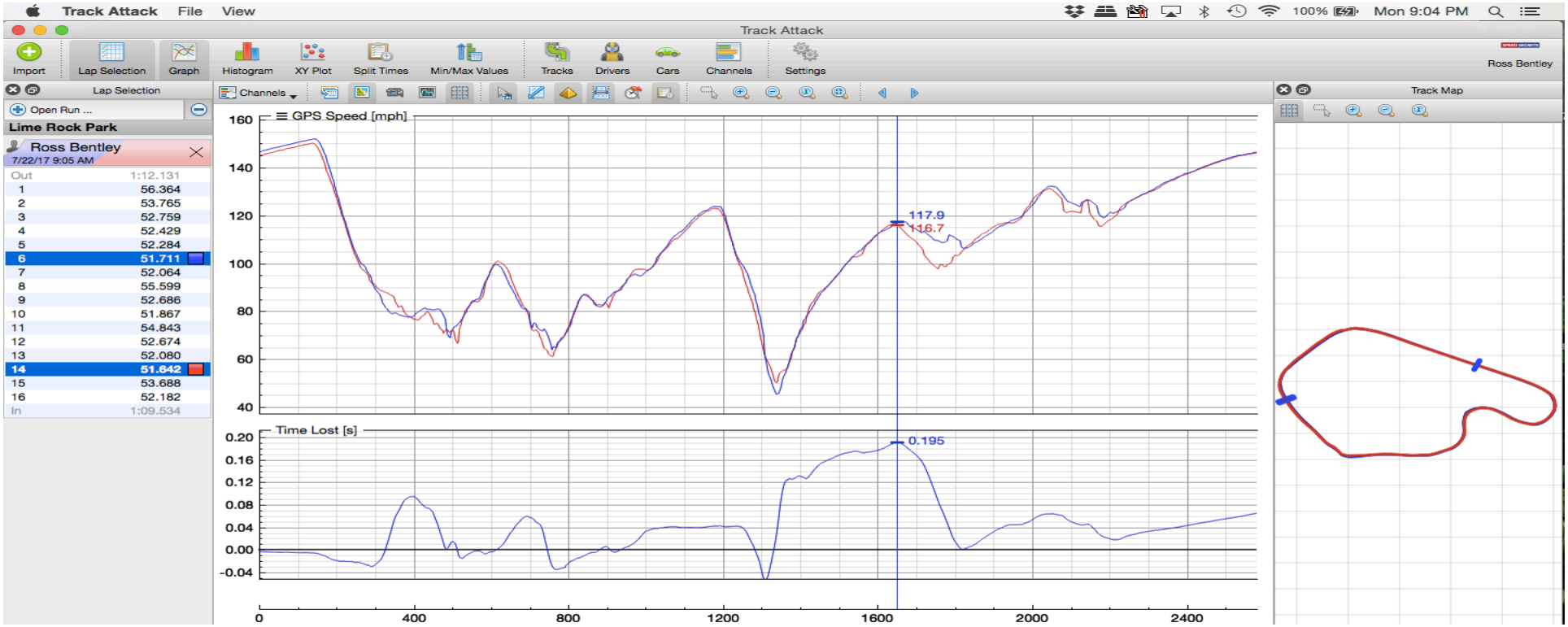
Comparative Data



- Overlay 2 laps
- Look for differences
- Use Delta/Compare Time – look for biggest differences/prioritize

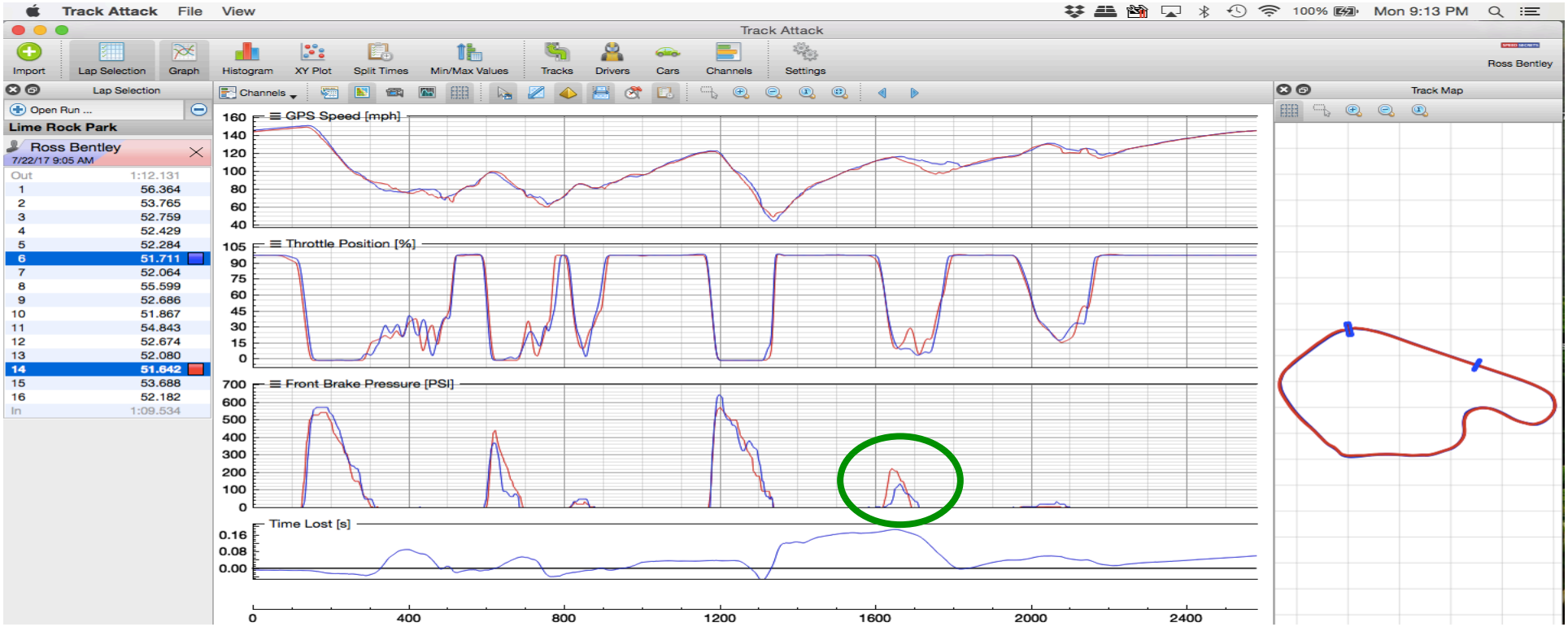


- Identify the difference



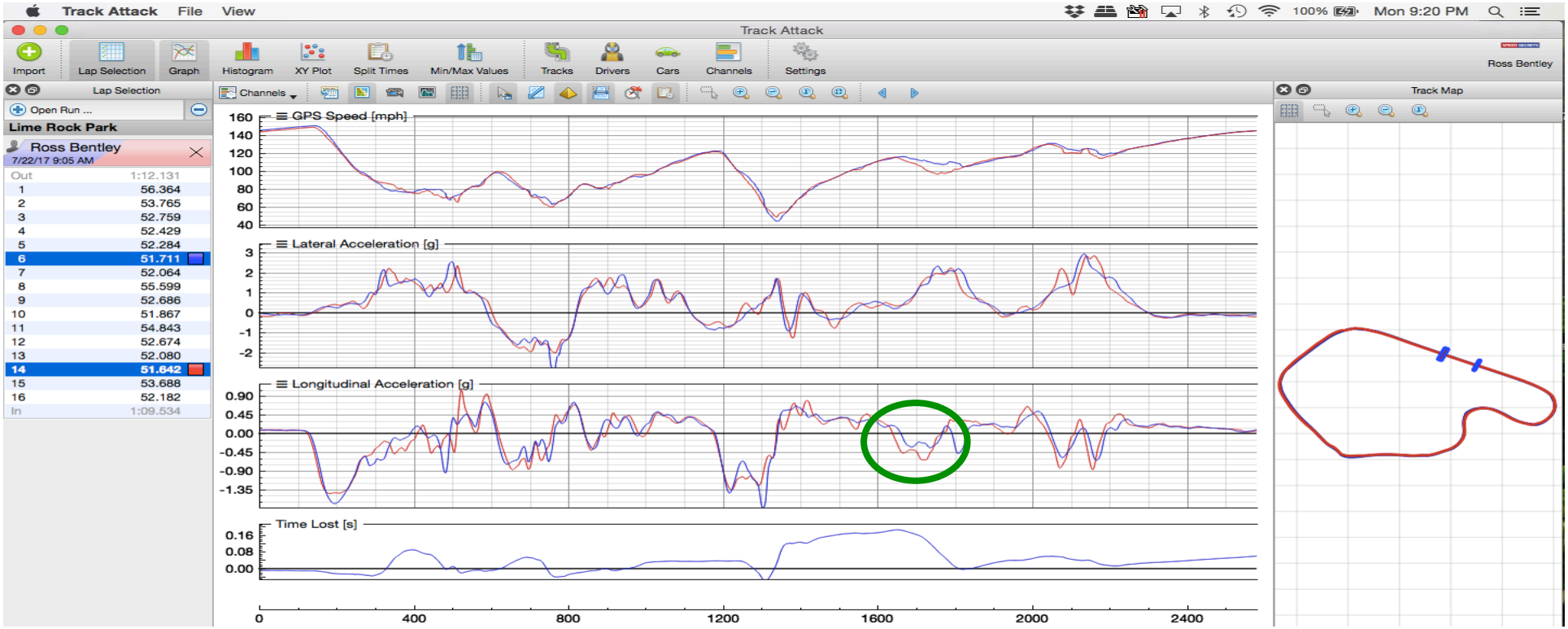
- What questions does this generate?
- What led to the reduction in speed on Red lap?
- Throttle lift? Braking? Steering angle? Line?

SPEED SECRETS



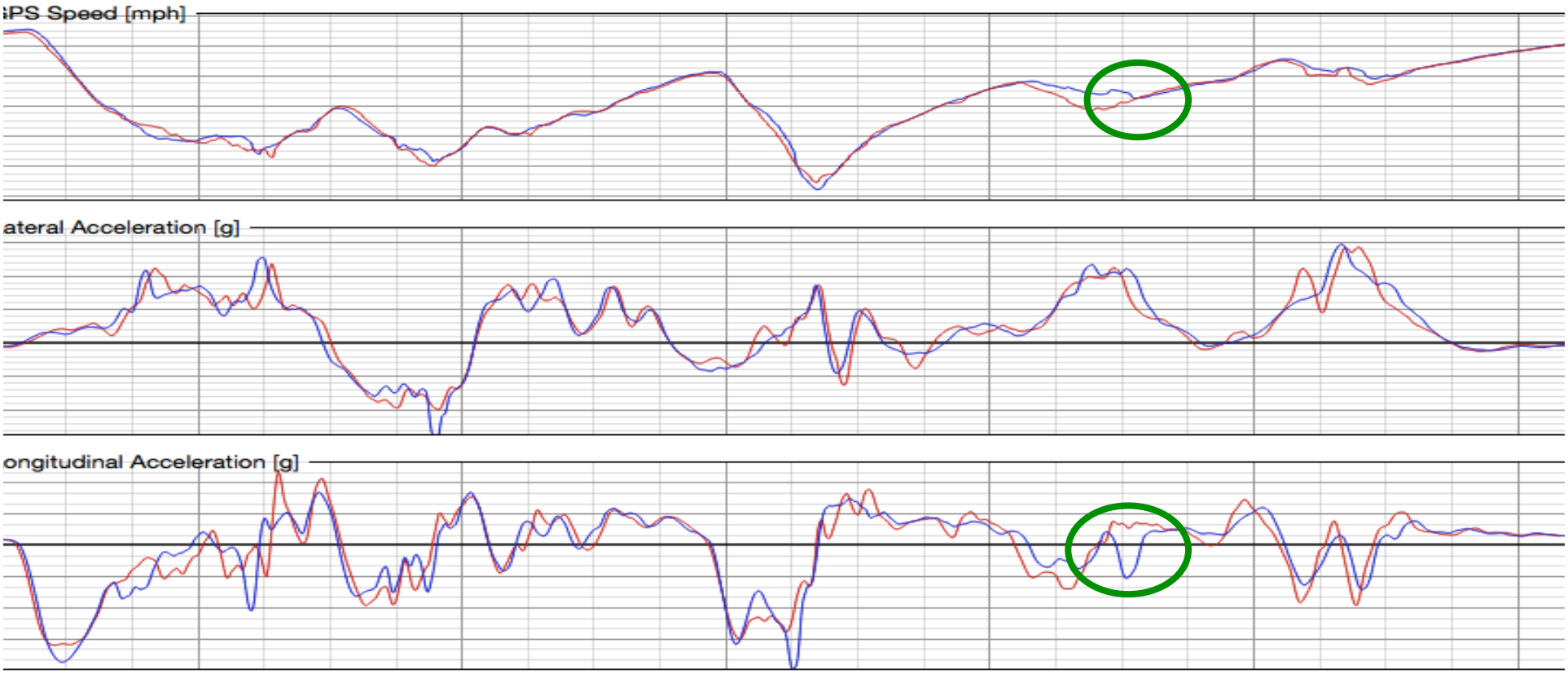
- Brake pressure
- But why? Vision? Mental image? "Bravery"? Traffic?
- Data doesn't give all the answers

SPEED SECRETS



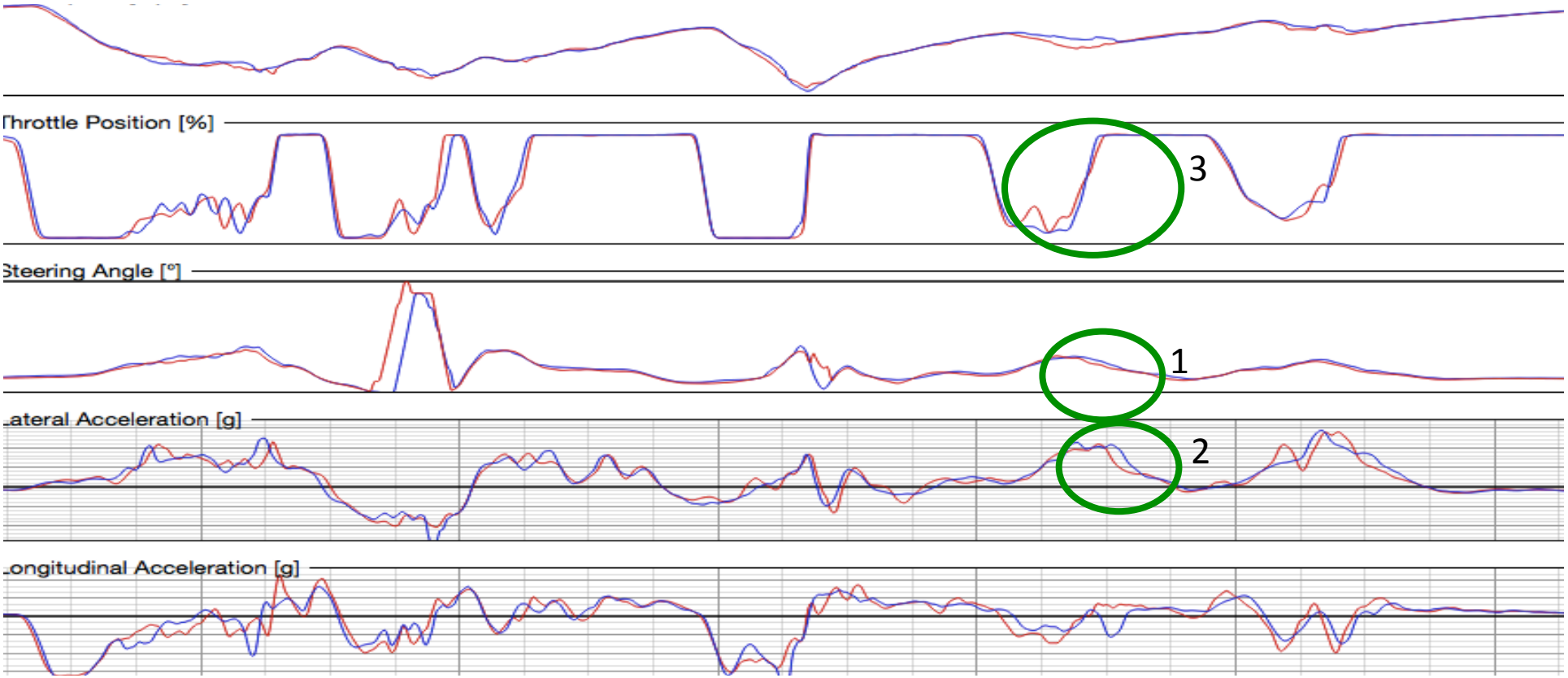
- Using Lat & Long G…
- Notice less deceleration (less braking) on Blue lap
- But why (again)?

SPEED SECRETS

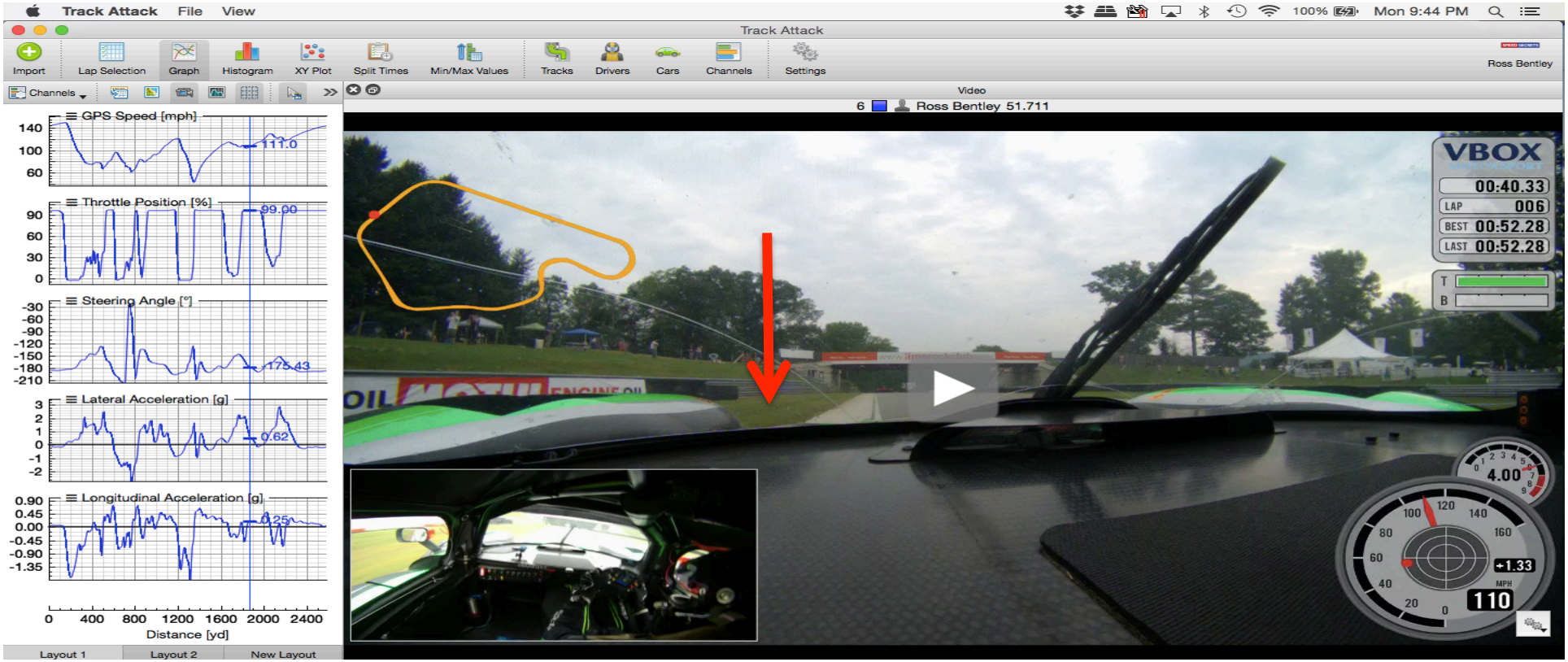


- Zoomed in… Notice secondary deceleration
- Why?
- Suspect increased steering to stay on track, probably ran wide on curb
- If we have Throttle & Steering…

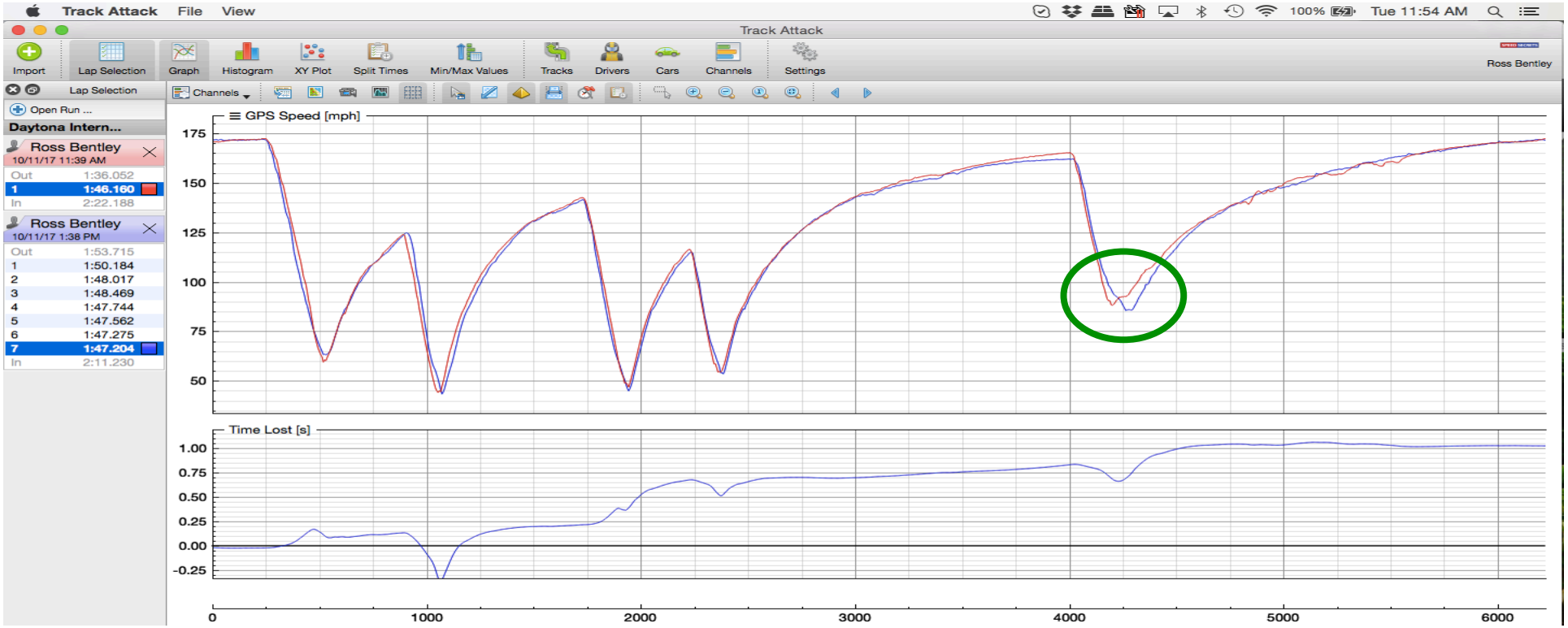
SPEED SECRETS



- Notice Steering angle (1) is maintained longer, related to extended Lat G (2) on Blue lap
- Without any big Throttle reduction (3)
- If we had video…



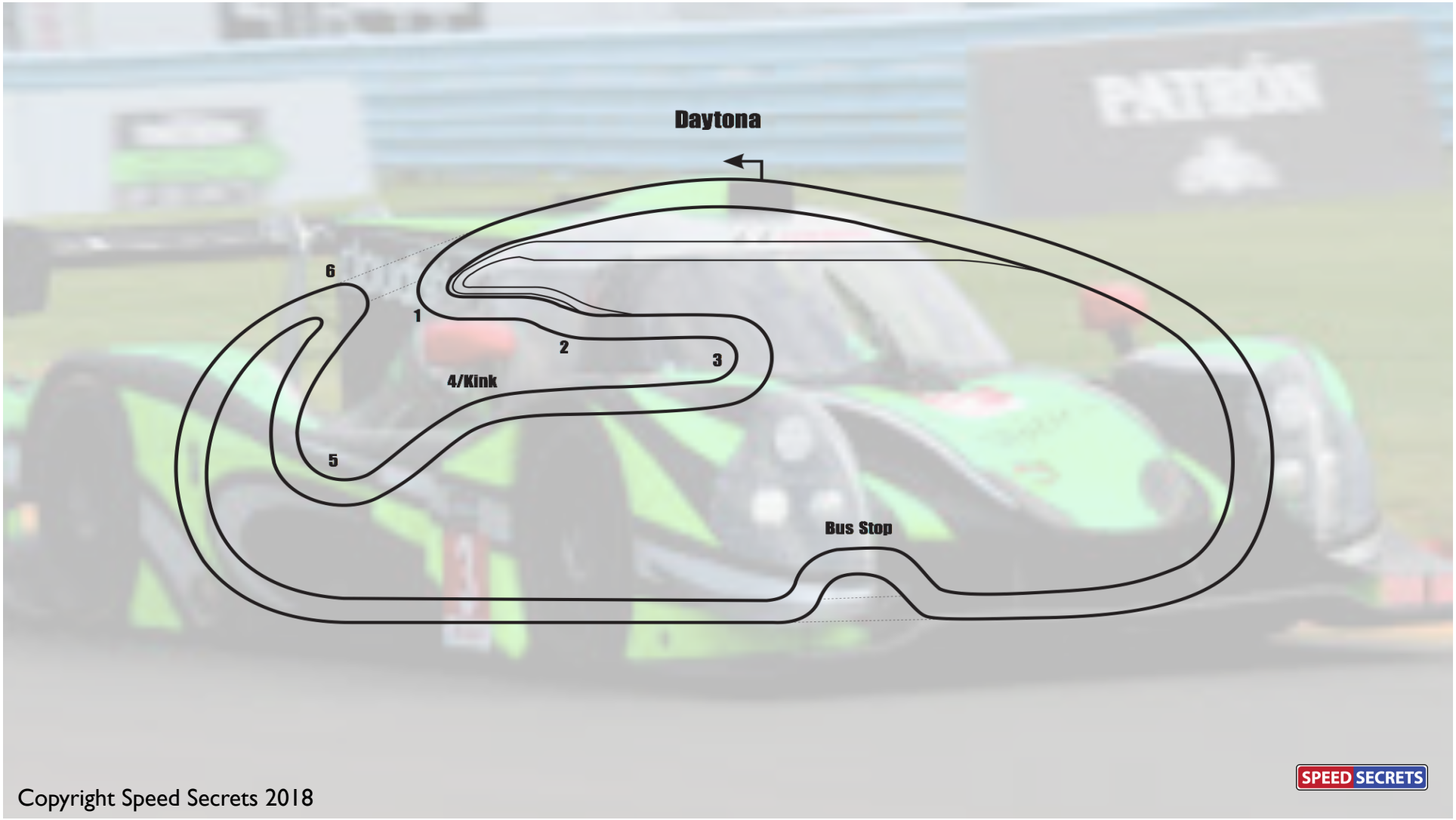
- Running out of track – maintaining steering angle scrubbing off speed

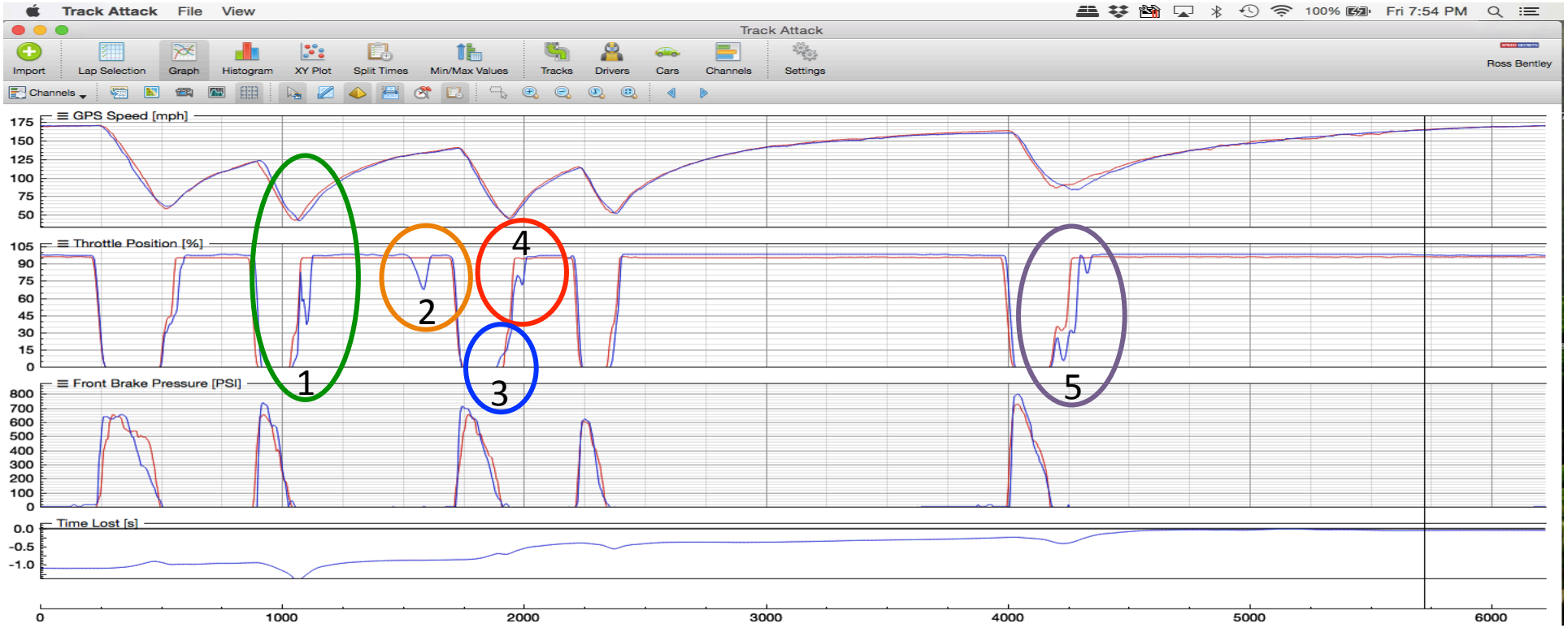


- In fast – out slow
- Identifying why is not easy
- More in Coaching Examples…

Examples

Coaching

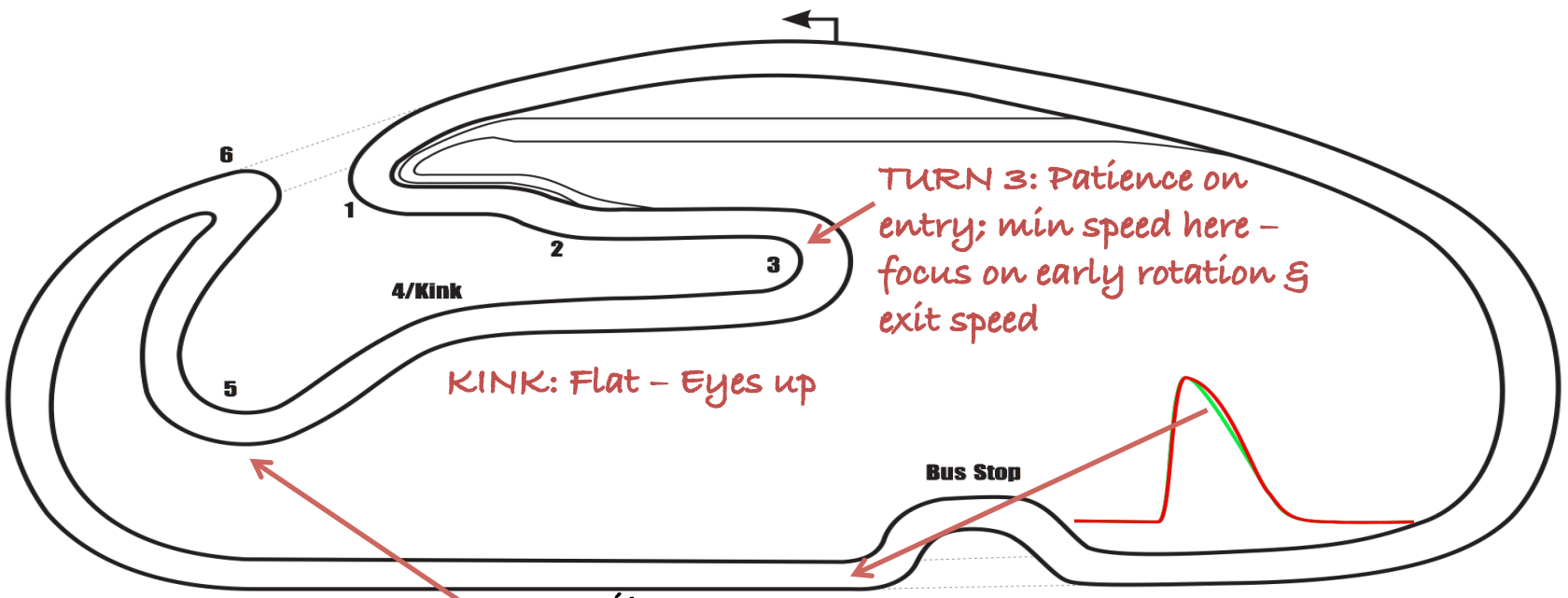




1. Hesitant throttle on Blue trace; Blue driver min speed is later = slow exit speed
2. Blue driver breathes throttle in Kink
3. Blue driver gets to throttle too early, then has to lift at exit (4)
4. Blue driver carrying too much entry speed, hurting exit speed – delayed full throttle

COACHING NOTES BASED ON DATA

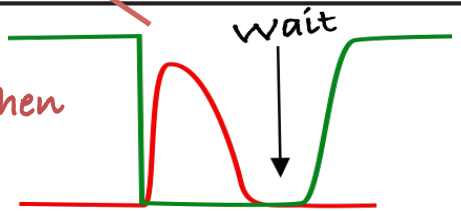
Daytona



TURN 3: Patience on entry; min speed here – focus on early rotation & exit speed

KINK: Flat – Eyes up

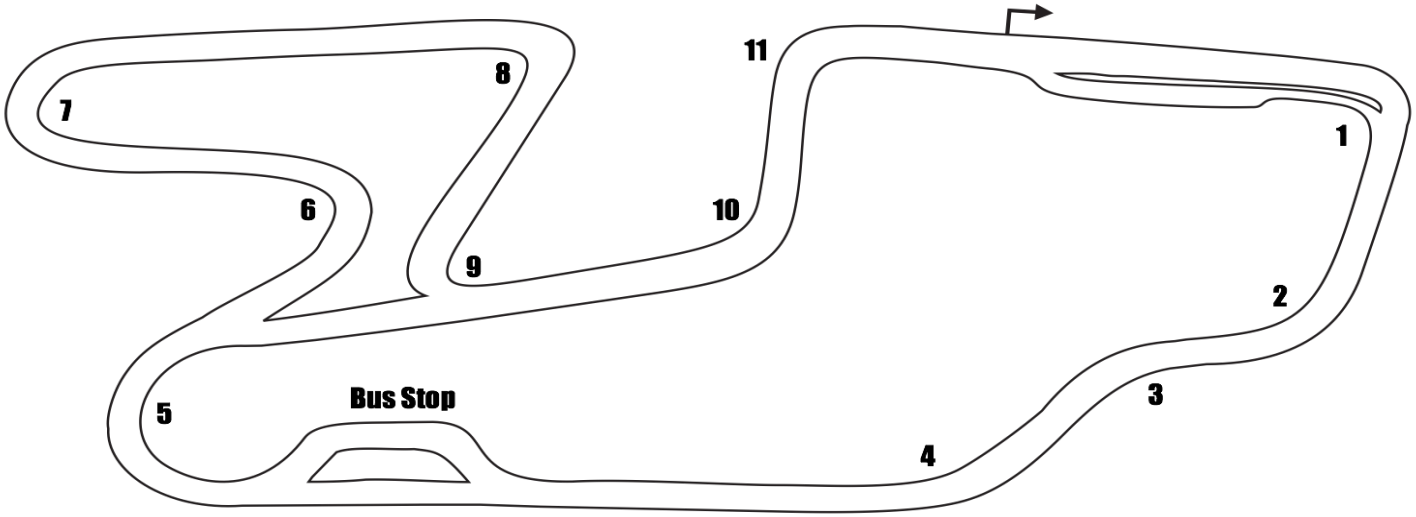
TURN 5: Hesitate with throttle – let car rotate, then commit fully to throttle

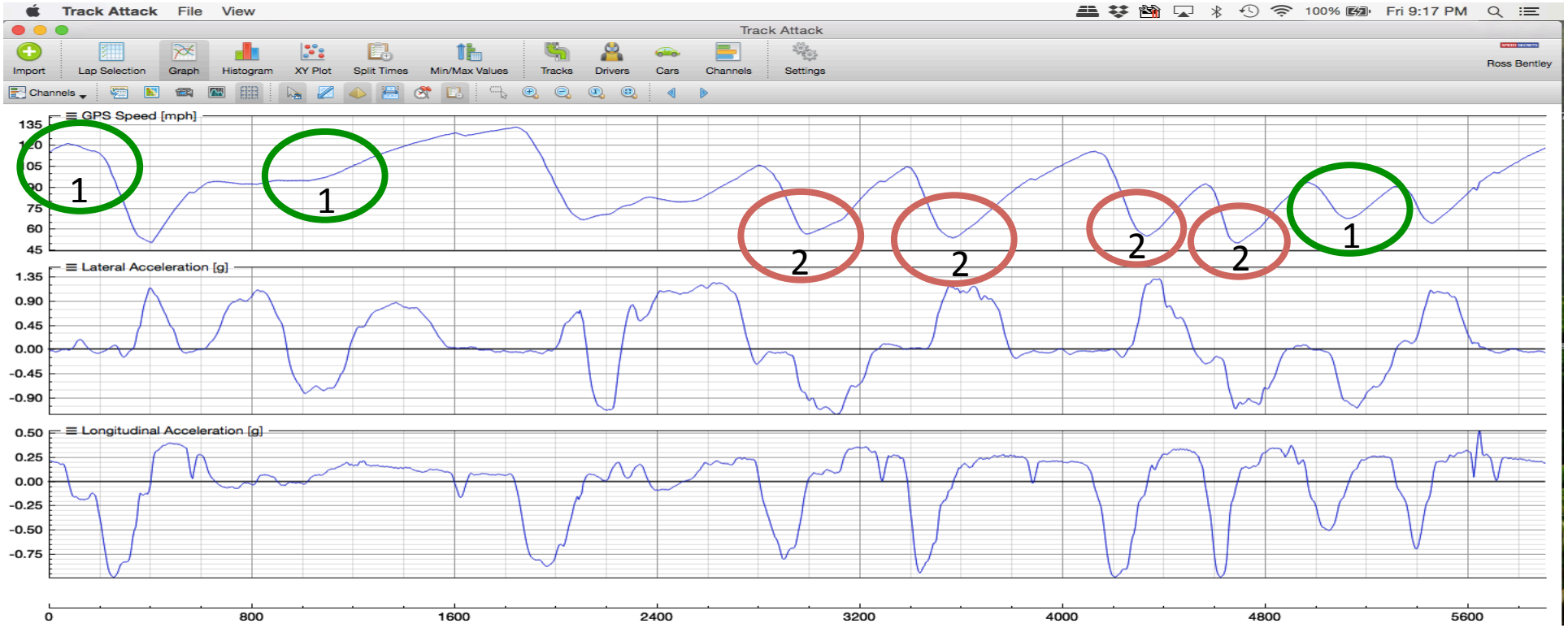


BUS STOP: Slow in – fast out; patience on entry (fatten mid-braking – red trace); commit to throttle

SPEED SECRETS

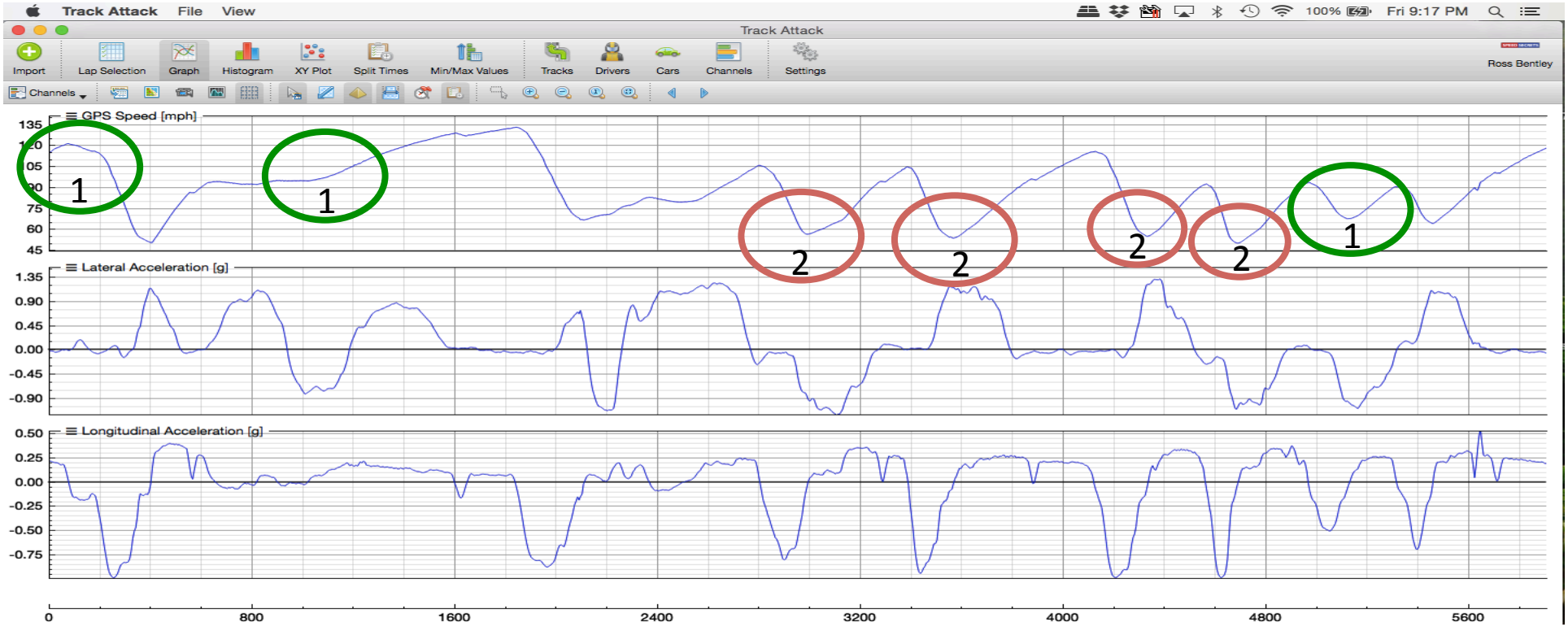
Watkins Glen





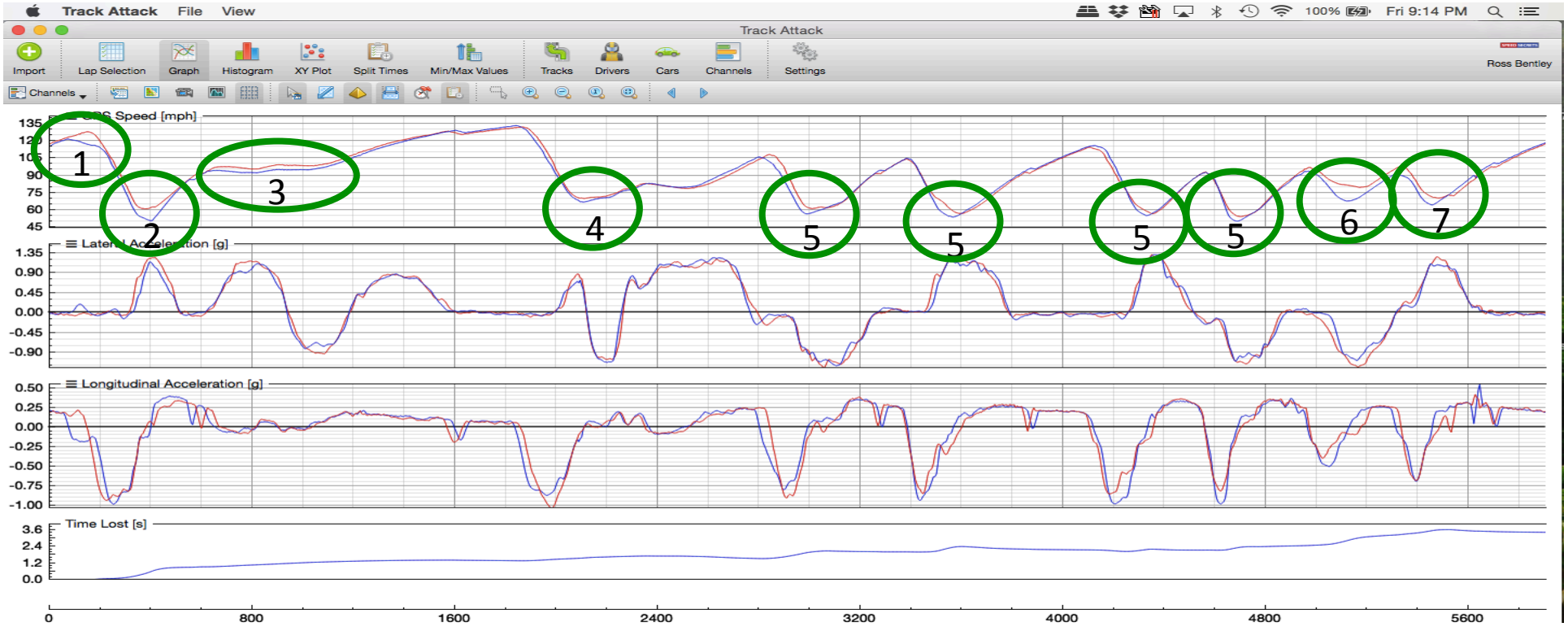
1. Slow rate of acceleration/big speed adjustment… lack of full throttle?
2. "Square" transition of Speed trace into corners?

SPEED SECRETS



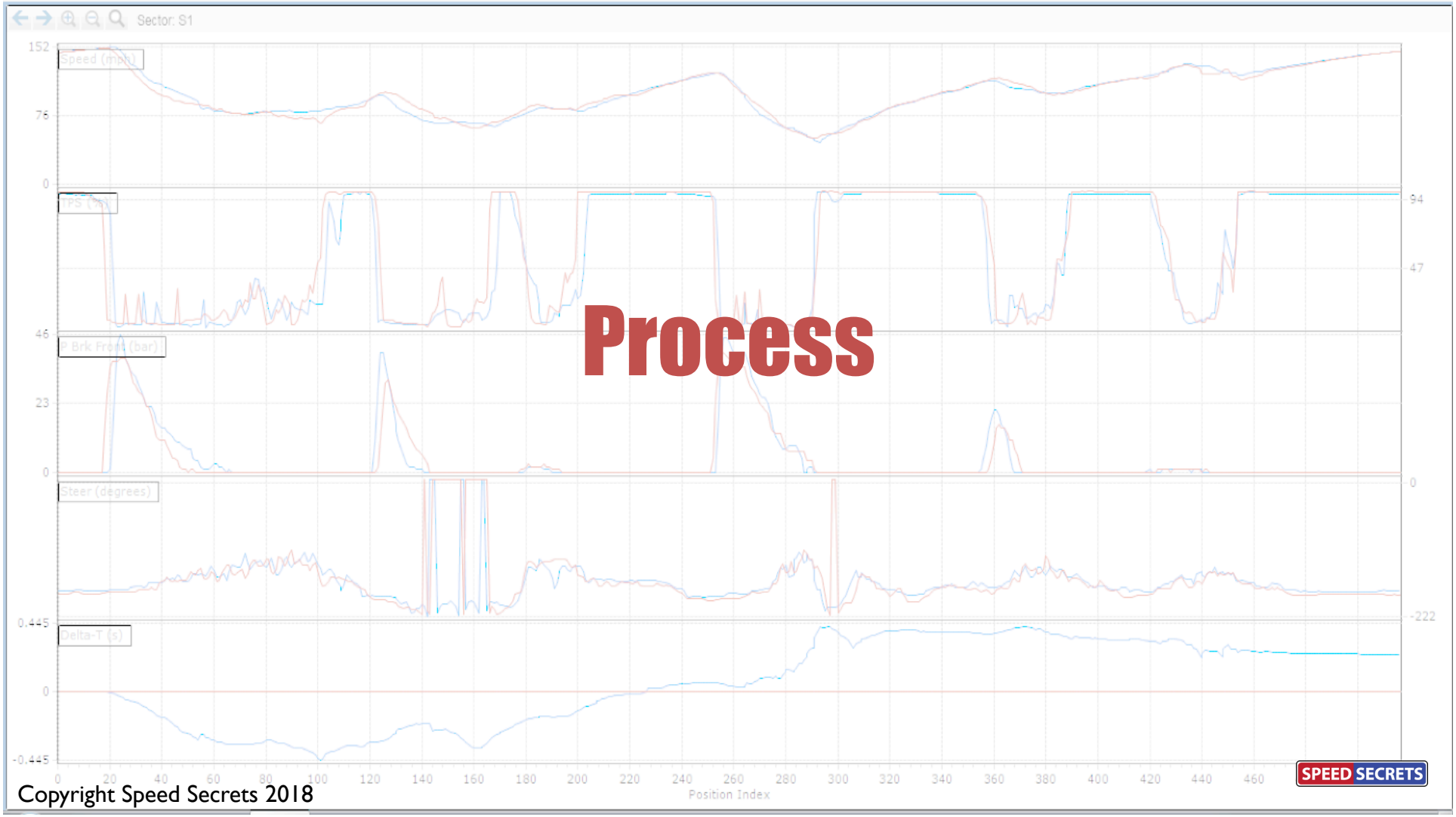
Coaching:

1. "Experiment with the timing & rate of release of the brakes – focus on Turns 6, 7, 8, 9"
2. "Spend 3% more of the lap at full throttle"



Results:

1. More throttle into Turn 1
2. More min speed in Turn 1 & better exit
3. Higher speed in Esses (2, 3, 4)
4. Higher min speed in Bus Stop
5. Better brake release in 6, 7, 8, 9 – better entry speed, good exit
6. Higher speed between Turns 10 & 11
7. Higher min speed (7 MPH more) in Turn 11
8. 3+ seconds improvement



Process

Process - Speed

- Speed trace:
  - Look at acceleration/deceleration rate
  - Coasting before brake?
  - Not full throttle between turns?
  - Throttle lifts where they shouldn't be?
  - Trail braking in slow to mid-speed corners?
  - Shifting issues – up or down?
- Ask Why?
- Confirm issues with other channels, if available
- Compare with other laps:
  - Consistency
  - Other drivers/cars/sessions
  - Delta/compare time

SPEED SECRETS

Process – Lat G

- Lateral G trace:
  - Look at peaks g-loads – consistently using?
  - Spikes (either direction)?
  - Consistency lap-to-lap?
- Ask Why?
- Confirm issues with other channels, if available
- Compare with other laps:
  - Consistency
  - Other drivers/cars/sessions

Process – Long G

- Longitudinal G trace:
  - Look at peaks g-loads – consistently using?
  - Braking issues (decel rate)?
  - Acceleration issues (accel rate)?
  - Consistency lap-to-lap?
- Ask Why?
- Confirm issues with other channels, if available
- Compare with other laps:
  - Consistency
  - Other drivers/cars/sessions

Process - Throttle

- Throttle trace:
  - Coasting?
  - Hesitant application?
  - Early application leading to lift?
  - Lifts in fast corners?
- Ask Why?
- Confirm issues with other channels, if available
- Compare with other laps:
  - Consistency
  - Other drivers/cars/sessions

SPEED SECRETS

Process - Brake

- Brake Pressure trace:
  - Shape – initial application, trail, long tail?
  - Inconsistent pressure?
  - Light/long vs. hard/short?
  - Lifts in fast corners?
- Ask Why?
- Confirm issues with other channels, if available
- Compare with other laps:
  - Consistency
  - Other drivers/cars/sessions

SPEED SECRETS

Process - Other

- Steering
- RPM
- Gear
- G-sum
- GPS line

- Segment/section report/times
- Fastest rolling
- Theoretical fastest
- Total steer angle
- Throttle histogram

- And on and on…

SPEED SECRETS

Process - Overall

- Overview
- Look for incongruencies
- Dig for details
- Use other channels if available to check
- Ask "Why?"
- Compare, if you can
- Calibrate to your driving
- Imagine what "ideal" would look like
- Set objectives for next session

SPEED SECRETS

Resources

- James Colborn: www.youtube.com/colbornjames
- Joe Hullett: www.digitalcompetitionsystems.com/
- John Block: www.auto-ware.com
- Peter Krause: www.peterkrause.net
- Matt Romanowski: www.trailbrake.net
- Roger Caddell/AiM: www.aimsports.com/eng/roger-caddell-training-events/index.htm
- Track Attack: https://trackattack.io

Note: These are just the ones I have personal experience with. There are many more!

SPEED SECRETS

Books

- *Analysis Techniques for Racecar Data Acquisition*, Jorge Segers
- *Data Power*, Buddy Fey
- *Making Sense of Squiggly Lines*, Chris Brown
- *Practical Guide to Race Car Data Analysis*, Bob Knox

SPEED SECRETS

If All Else Fails...

- Get your hands "dirty" – play around with the data
- Keep learning
- Keep it simple – focus on the basics
- Keep learning
- Ask "Why?"
- Keep learning
- Have fun!

SPEED SECRETS

Improve Your Racecraft

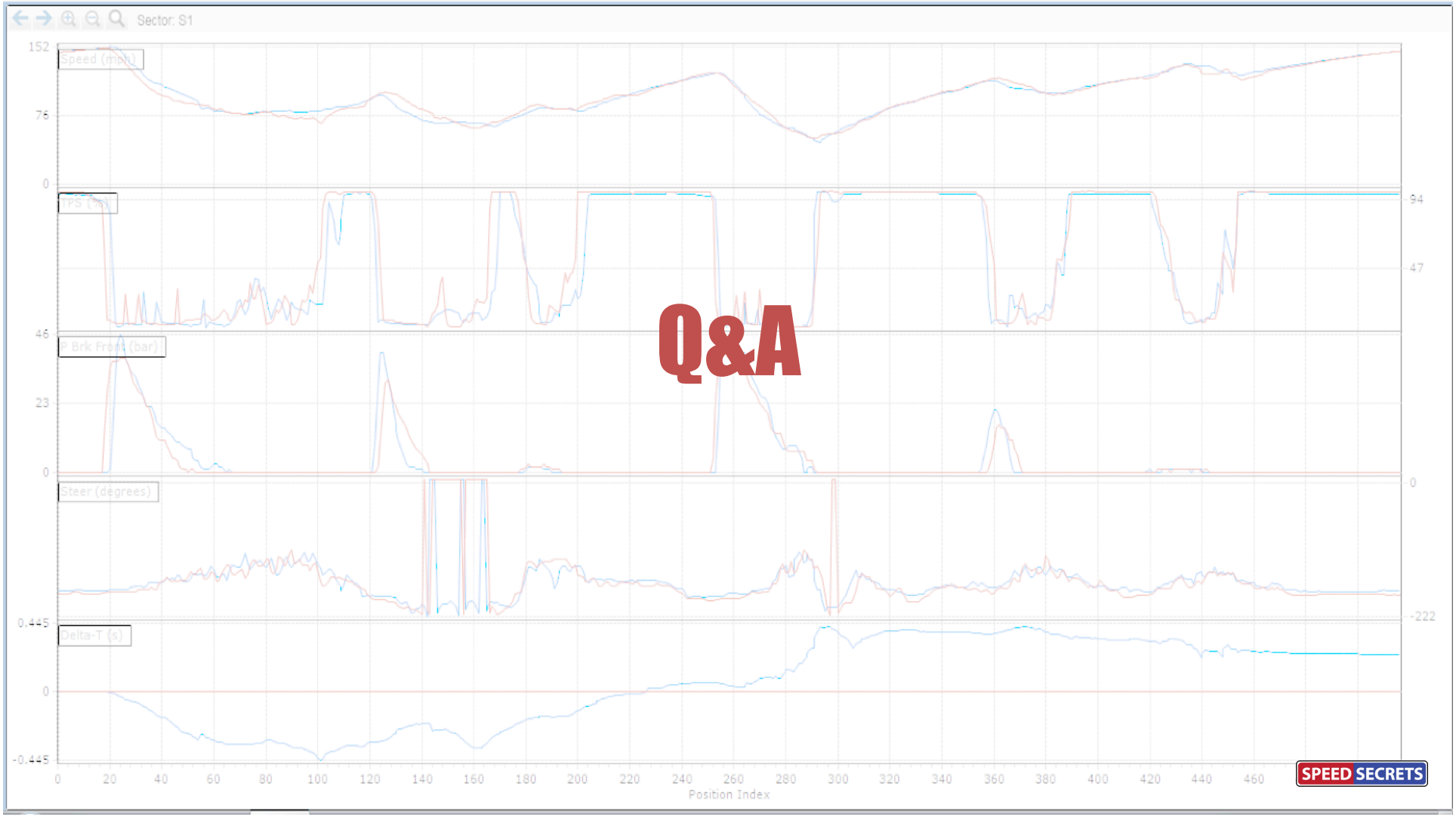
SPEED SECRETS

Webinar

February 26, 2018

www.SpeedSecrets.com/Improve-Racecraft

SPEED SECRETS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Speed (mph)
152
75
0
TPS (%)
94
47
0
F. Brk Front (bar)
46
23
0
Steer (degrees)
0
-222
Delta-T (s)
0.445
0
-0.445
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460
Position Index
Q&A
SPEED SECRETS