

## The Analyst's Perspective: Watkins Glen

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Welcome to Watkins Glen, longtime home to the US Grand Prix, first ever NASCAR road racing course, great Finger Lakes wine, and of course, the infamous blue ARMCO. Rejoice in the history of the track and its surroundings, but keep your car off that blue fence. Track management told me repeatedly it's all for sale...

After studying an aerial view of the track, such as below, many drivers get on-track and are immediately surprised at how different and intimidating the track looks than the drawing. This is due to two issues: *limited points of emergence*, and *track elevation/camber changes*.

### You can't see it, so you better memorize it!

The Glen is difficult for drivers who need to see the complete corner from the driver's seat. Such drivers re-evaluate the corner every time, and use precious mental energy to re-assess their trajectory each lap. When they can no longer see their way, they default to the "safety-line": typically involving a slow entry with excessively late apex. This is OK for rally drivers, who have never seen the corner before, but *you* have the benefit of seeing the corner again and again and again.

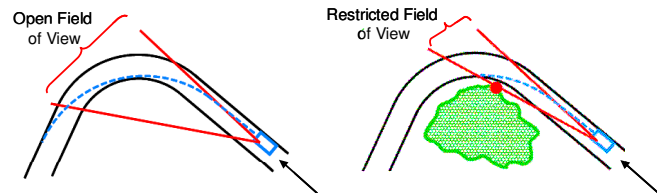
Pro drivers often possess excellent 3-D visualization skills and mentally bank the track geometry. They love tracks like the Glen, as they can attack blind corners for which others are too timid. Knowing the track stone cold permits focus on other things, such as how conditions have changed, or how to pass you!

Look ahead mentally so the track is seen as a flowing path, rather than a series of micro-track segments. Often we suggest to look as far out as possible. The visual limit (and hence maximum response time) is the point of *Emergence*. Instead of using distance, we characterize this in time units:

$$E(\text{sec}) = \frac{0.68 \times \text{FT}}{\text{MPH}}$$

So, if you are traveling at 120mph, and can only see 350ft ahead/around the track, you have just 2 seconds of vision. Not a lot of time to make a decision...

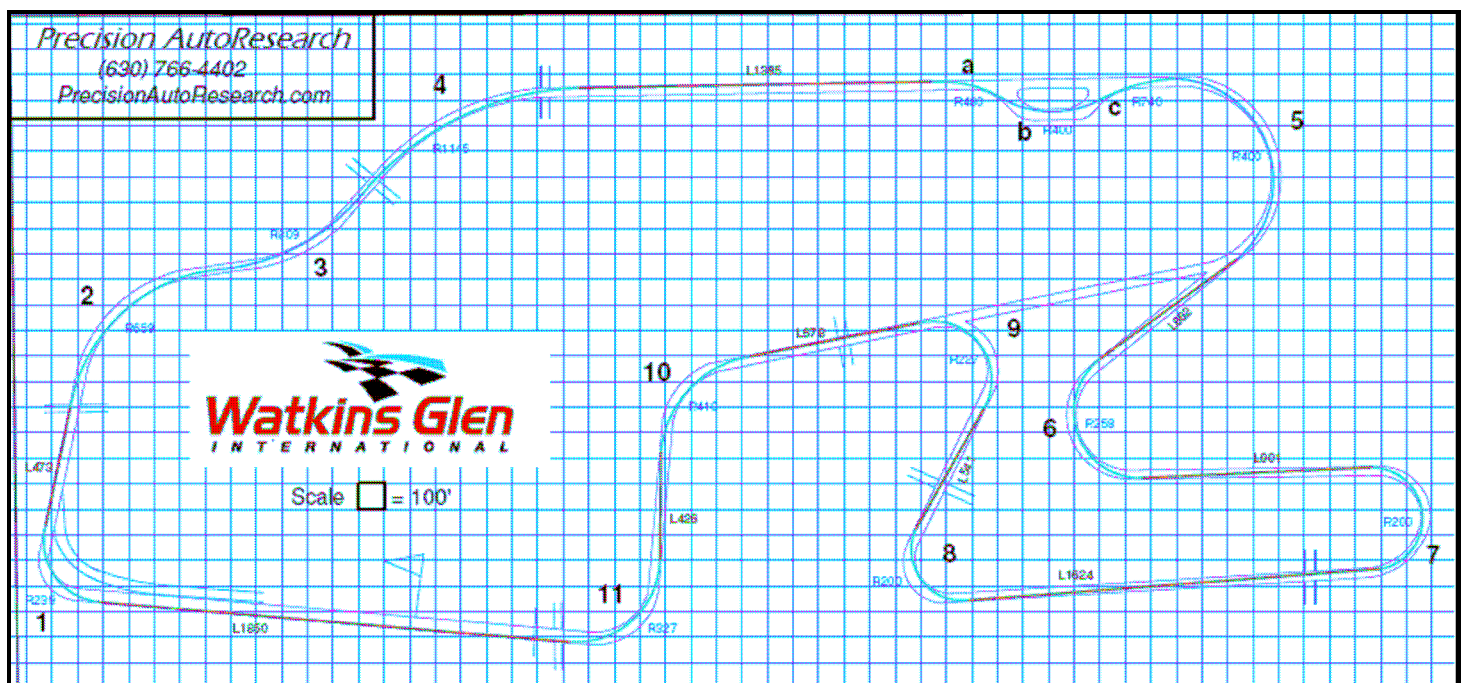
The same principle is even more pronounced with high-speed driving at night, where your visual distance is fixed to the headlight range and direction.



When your view is blocked by hills, trees, fences, corner stations, or (yes) Armco, your point of emergence is shortened. In such cases you *must* make up for it with enhanced memory of what's ahead. All the more reason to memorize supplied track maps and mark-up/correct them after each session. This activity improves your recall, so you waste less of your precious concentration on-track.

*Trick: Pre-walk the track with a notepad and/or use your SmartyCam data-video camera to assess track cues. If you walk the track with the camera, and set it on the track occasionally, you can even see the bank angle on the preview screen!*

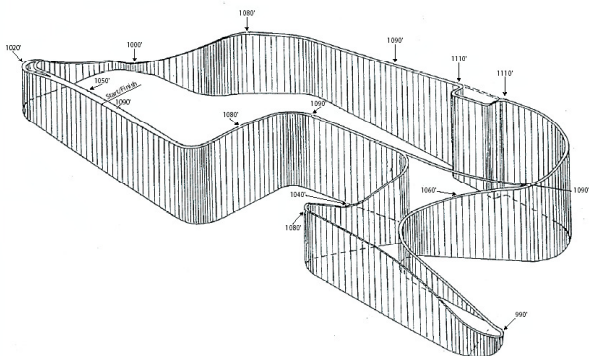
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### Vertical Loading...Look for it!

Because of the natural terrain, and the need for water runoff, nearly every corner is cambered and/or built on a hill. You are rarely on level ground! And when you are tilted yourself, it is a little difficult to interpret how much absolute camber or banking is available to you.

The elevation map supplied by the track (below) offers some help. Though the graphic is visually exaggerated, notice the mild drop through corner 1, and climb from Corner 2 exit all the way to the bus-stop. Most of this climb is an intense 5deg from Corner 2 to the bridge at Corner 3 exit. The 100ft drop from Corner 5 to the entrance of Corner 7 brings you from the highest point to the lowest point on the track. But, it takes about 1/2 mile to drop, an average downward slope of just over 2deg.



This graphic is nice as a visual memory jog, but some corner detail is more telling. With two notable exceptions, each corner has approximately 6deg of banking. This offers approximately 10% higher speed than predicted by the birds'-eye-view. For Corners 5 & 9, there is up to 10deg of banking, pushing speed potential up to 20% above normal.

*A word of caution: Corner 9, which too often is an Armco order desk, exits onto the old-course (the 5-10 straight chute, utilized by NASCAR). The track is crowned, so driver's right is suddenly off-camber, to the tune of 6 or more degrees. This 16deg (+10 to -6deg) swing drops permissible exit traction by nearly 30%! That's a real surprising (\$\$) wake-up call! Don't get caught out...*

So, what's the lesson here? Take advantage of camber where it helps you. Take special precaution where it does not. Here are a few other guidelines to consider:

- You have more traction when driving uphill.
- You have less traction when driving downhill.
- Cambered turns provide more traction (provided you don't cross over the crown!).
- Off-cambered turns give reduced traction.
- Traction is reduced substantially just prior to the crest of the hill, not merely at the top.
- If you hit a valley (flat or upward after downward section) at speed, you will experience more traction.

All of this boils down to the **vertical loading** on the tires. Vertical loading effects dwarf tire camber or other setting (short of a broken damper, perhaps). If the terrain gives you more loading (car feels "heavier"), you'll get more grip. If car feels "light" over a section, you can count on less grip.

For those Caymans for which we supplied EVO4 loggers, the data system records the vertical G's. So, we can see the amount of reserve or deficient vertical loading all around the track. For those of you who asked us to provide damper potentiometers, the loading can be estimated as well.

If you are uncertain about your grip levels at each corner, which is pretty smart, then aggressively explore the StringLine, as we discussed in a previous article. You'll find yourself exploring your G-limits without using all the road or barriers. And recall from our previous discussion, don't use all the exit track width unless the G-forces carry you there. Use this technique as a visual speedometer of extra speed you could have had that time by.

Again I refer to the **RaceDataPower** software and look up Watkins Glen. Recall we said previously that an Interseries Cayman on a dry track may pull up to 1.35g. Given that limit is out of reach for many of the cars attending, I have recreated the StringLine vs. RaceLine speed chart at just 1.25g. So, if you beat my numbers, now you'll know why!

Keep it clean!

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