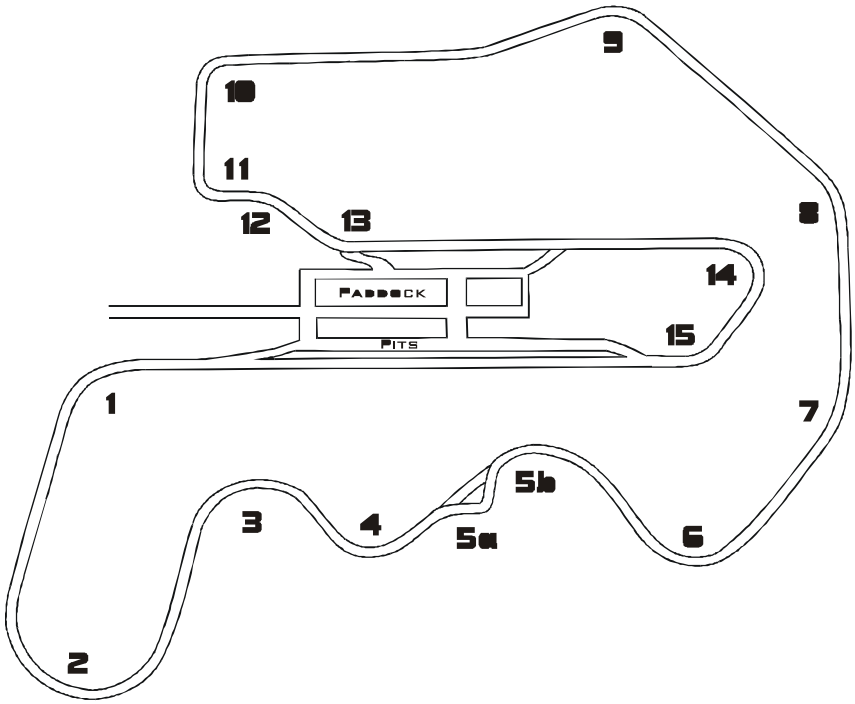
# Thunderhill Park (Clockwise Direction)

*DISCLAIMER: The following information is provided by the Golden Gate Region of the Porsche Club of America as an orientation to this track. It is intended to be used only as a guideline and intended only for use by drivers at GGR events. All drivers are responsible for determining the safest and best approach for themselves and their cars. Under no circumstances will the region, its officers, event organizers, instructors or other members be responsible for any consequences to any driver as a result of completely or partially following the recommendations herein. This exclusion applies to events conducted by GGR as well as other events where drivers may choose to use these guidelines to assist in learning to drive this track.<BR>*

Thunderhill Park is owned and operated by the San Francisco Region of the Sports Car Club of America. It is a delightfully open course with lots of run-off room. Smooth, wide pavement, many elevation changes, and a good variety of turns make Thunderhill a great choice for first-time time trialers. The track was expanded in 1998 to include 15 turns over 3.0 miles, and can be run in either driving direction, although the counter-clockwise direction is most commonly used. Amenities include a large paddock with paved and gravel areas, restrooms, unleaded and race gas, a snack bar, shade pavilion, and newly added showers. Paddock camping is permitted, while hotel accommodations and restaurants are available in the nearby city of Willows, CA.

Thunderhill Park is located off Interstate 5, north of Sacramento. From the Bay Area, follow I-80 East, then take I-505 north, just past Vacaville, until it joins I-5 North. On I-5 at the second Willows exit, take Highway 162 west for about 7 miles. Entrance is on the right just at the beginning of the Coast Range hills & is well-marked.



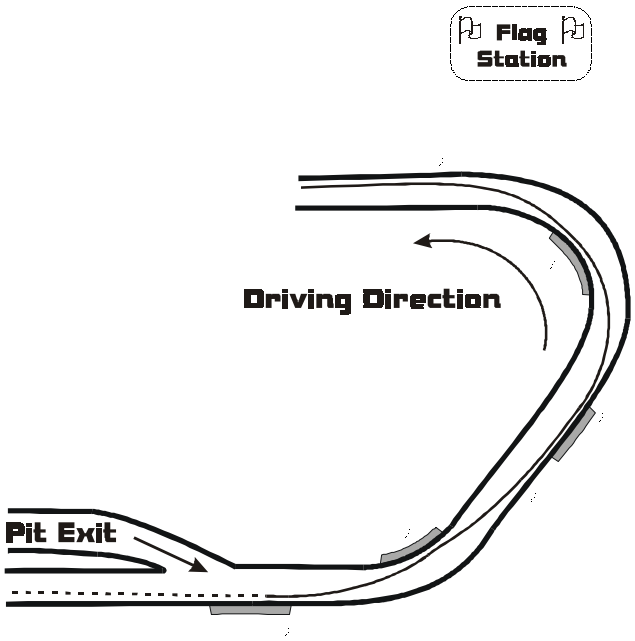
The text occasionally indicates likely gear choices as a very general guideline only. The gear chosen will, in many cases, depend not only on the gearing, rev limit and torque curve of the car, but also on driver preference. There are places where higher gears may add smoothness and may make a high-horsepower or low-available-traction car more controllable but at the expense of critical acceleration. Cars with narrow horsepower bands obviously need more careful gear selection; cars with broad torque curves may care less.

Entry, apex and exit berms at ThunderHill are either flat painted concrete or mounded concrete. Many of the flat berms (apexes of turns 8, 12 and 13) should be fully driven on.

Turns are numbered the same no matter which direction the track is driven. Counter clockwise is the normal direction, so driving clockwise begins with turn 15.

The lines described in this document are qualifying or time trial lines. With appropriate adjustments for the specifics of your car, they should produce the fastest laptimes available for your driving level.

# Turn 15 and Turn 14




Cars enter the track from the pits on the left side, watching for high speed traffic coming down the main straight. When the coast is clear, cross over to the right side of the track to set up for turn 15.

From the main straight, keep to the right side of the track, brake firmly, and turn in at the end of the berm. Many cars will downshift to third gear here. An optional cross-over section of track which continues straight ahead will be blocked off with cones.

Aim for a late apex 60% of the way along the apex berm, and drift to the right edge of the track for a full exit. Turn 15 is well less than 90 degrees, so the turn in for the late apex is nonetheless earlier than your eyes may suggest.

It is possible to carry quite a bit of speed through this turn if you can stay with substantial throttle.

## Turn 14

Turn 14 follows turn 15 rather quickly, and is much more than 90 degrees. This is also a type I turn leading onto a long back straight, so precision and exit speed are important for a good lap time.

Be sure to brake in a straight line along the right edge of the track, and turn in as you reach the end of the turn-in berm (actually the exit berm when the track is driven in the opposite direction).

If Turn 15 is taken quickly, there will be very little time to transition the car' from cornering near the limit to braking for 14.

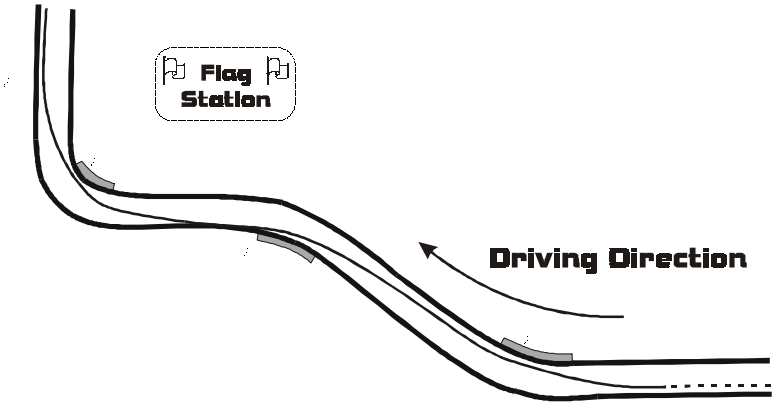
Most cars will do well with 2nd gear for turn 14.

A visual cue for the late apex is the seam or crease in the concrete apex berm. Drift out to a full exit, which will not be visible as you first look ahead past the apex point . . .

… but comes into view as you complete the turn. This back straight is a good cooperative passing zone. Waive faster cars by early to allow plenty of time for everyone to set up for turn 13.

You'll use 3rd and 4th gears on the straight.

# Turns 13 and12 (The Esses), and Turn 11




The right-left combination of turns 13 and 12 form the Thunderhill esses. Each turn is much less than 90 degrees. As you approach the esses speeds will be high, and the pit wall will be on your left.

Set up for the first turn of the esses on the left side of the track. Some cars will need to tap the brakes to settle the nose of the car into the turn, while a deliberate lift will suffice for others. Cars with high gearing may need to downshift to 3rd for this turn.

The apex point here is 60% along the low berm, which can be taken aggressively. Exit by drifting only partially across the track before working briefly back to the right to set up for turn 12, the second turn of the esses. While the ideal line when running the track counter-clockwise is completely sinuous as you accelerate through these esses, in this direction we are decelerating though them. Maximum braking can only be accomplished in a straight line. Therefore, as you learn to take 13 very quickly, you will likely need to insert a straight-line braking zone between 13 and 12. If and when you do this, this is an optional point for the downshift to 3rd. Other cars may just wait until turn 11 and go from 4th directly to 2nd.

## Turn 12

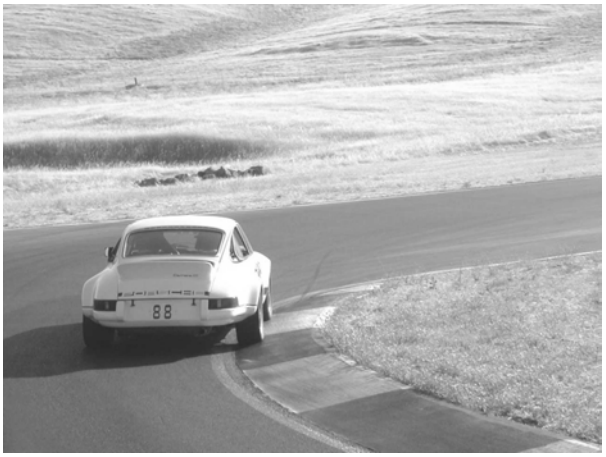
From a point as far right as possible (given how you got through 13, which means you will <u>not</u> be at the extreme right side of the track, merely as far right as you could get), turn into 12 aiming for a very late apex. Take this low berm aggressively and very late, driving right off the end of the berm. From this point hold the wheel and continue turning left as you pass over the shallow crest, preventing the car from drifting to the right. .

## Turn 11

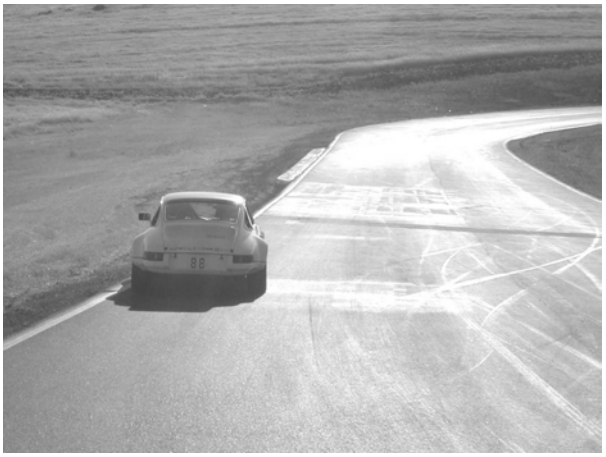
Depending on your car, additional braking and a quick downshift to 2nd may be needed. This will set up the entry to turn 11 along the left side of the track

Entering at the top of a low hill, turn 11 is a sharp downhill right. This is one of the slowest parts of the course. Most cars will want some trail braking into this turn to rotate the car effectively…

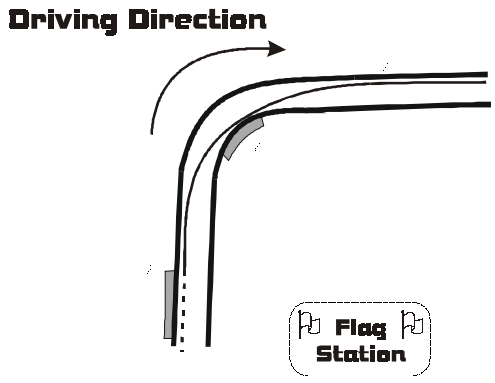
…then apply throttle aggressively and ride up the low berm for an apex four feet from the end of the berm.



Drift left to a full exit, setting up also for turn 10. A shift to 3rd gear just after the exit will be needed if you took 11 in 2nd.



# Turn 10



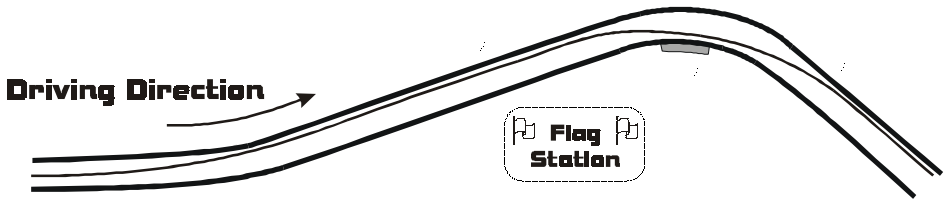

Light braking may be needed to settle the car into turn 10, an uphill right leading onto a fairly long uphill section of track. Turn in at the end of the turn-in berm…

…and apex late, approximately 70% of the way along the apex berm. Drive over the near half of this berm to maximize room at the exit.

Exit as far left as necessary, avoiding heavy pressure on the steering wheel to maximize acceleration up the straight. 4th gear will be needed. This is another type I corner where momentum conservation is important, and also another good opportunity to let faster cars pass.


The track camber changes from slightly banked at the apex to off-camber at the exit, so grip will progressively deteriorate as you travel through the turn. You'll have the sense that the exit comes at you pretty quickly. Allow appropriate room for this phenomenon.

# Turn 9a and Turn 9




The left-hand kink that is turn 9a is more significant when Thunderhill is driven in this direction due to the visual barriers in this area of the track. The turn continues left a bit as you crest the hill before dropping to the right into turn 9.

The turning point for 9A is just as the right edge of the track surface begins to veer more sharply to the left. Turn smoothly into 9a, aiming for the left edge of the visible track surface and hug the left side as you climb the hill toward turn 9. The trick here is to build confidence that your line will deposit you precisely along the left edge of the track (but not in the dirt) as you crest the hill.

Confidence in your brakes and your line must be established before attempting to hold full throttle all the way to the crest. There may be enough room to accomplish all necessary braking after the car settles from the crest, but such a tactic must be approached in very, very small increments.

## Turn 9

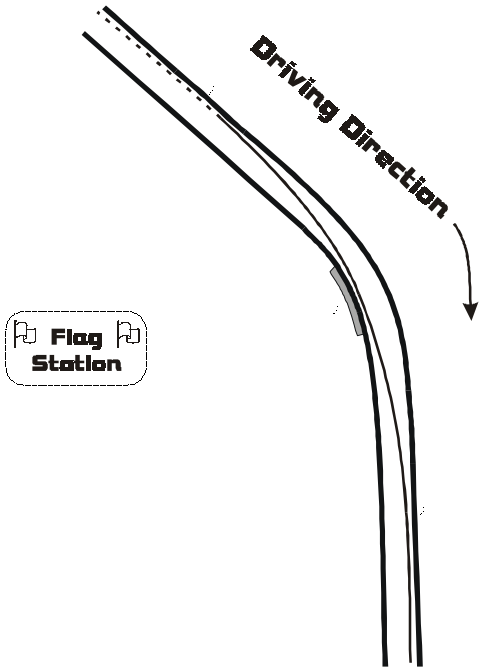
The turn-in for 9 is just barely past the top of the hill; the apex is not fully visible until your car is over the crest.

The most important technique for turn 9 is to previsualize it. As you are approaching the crest you need to paint in your mind a clear picture of how things look to you at the turnin point so that, when you do come over the crest, it's just a matter of the visual data registering and you can react to it essentially immediately. If you simply wait until you can see the turn and what's happening there won't be enough time to see, comprehend and react; you'll almost always be late in turning in.

Also, cars behind you cannot see you until they crest the hill, at which point they will be very busy trying to navigate this corner. Should you manage a spin or other maneuver that leaves you stopped in the line, take rapid steps to get you and your car elsewhere. Do not get out of the car (this is a general rule as well).

Turn downhill to a very late apex 80% of the way along the apex berm. Drift left to a full exit, setting up for turn 8.

# Turn 8



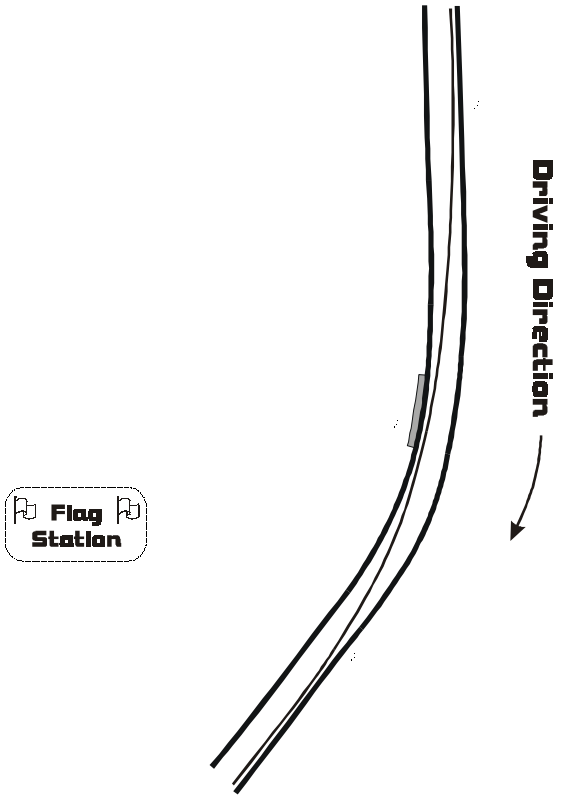

This is a high speed turn at the bottom of a shallow hill, and is less than 90 degrees. The track surface near the apex has in the past been rippled and prone to wetness from seepage, so this is a spot where varying your line by a few feet in cautious experimentation may substantially alter the feel of the corner.

Most cars will be in and stay in 4th gear.

The entry to turn 8 is about three feet before the end of the turn-in berm.

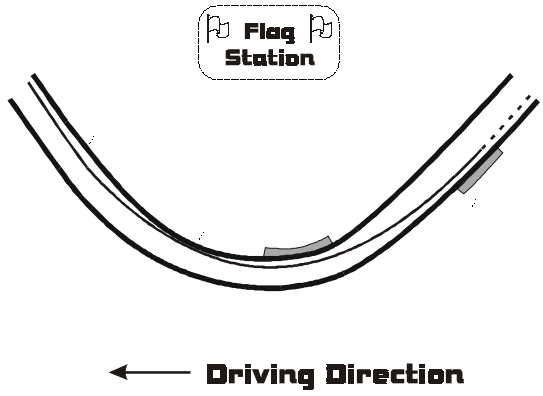
Take a neutral apex in the middle of the berm (using some of the berm to drive on) and drift left to a full exit. Beware of dips in the track and water that occasionally collects at this high speed section.

# Turn 7




Turn 7 is a deceptive right dogleg in a long back straight, which must be taken as a real turn due to the high speeds in this section of the track. From the left side of the track, turn in deliberately and aim for a late apex. Drift fully left to set up for the entry to turn 6. Most cars will stay in 4th and not need to brake, or brake very little.

# Turn 6



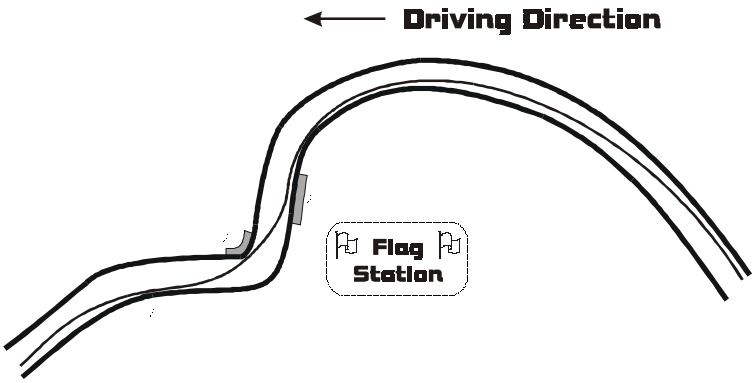

Approach speed is high at the end of the back straight as you head into turn 6, a roomy righthander. At these speeds, even slight misjudgments in brake-timing can seriously disrupt your ideal line. The large entry berm is heavily used as an exit berm for the opposite direction, but should be avoided while braking to maintain equal traction on both sides of the car.

There are tradeoffs that must be made between turns 6 and 5A. You can give up some of the speed of 6 (by taking a very late apex and not going to the exit point) to optimize the approach to 5A, but the better course appears to be to optimize turn 6 and make some compromises with 5A and the beginning of turn 5.

Enter this corner so as to use a somewhat late apex  Exercise caution if you try to trail-brake into this corner, as it is easy to over-rotate the car here.

End up at a reasonable exit on the left. Move the car as far to the right as reasonably possible to prepare for 5A. The photo shows the alternate approach, giving up turn 6 to better optimize 5A.

# Turn 5a and Turn 5




From a point as far to the right as you have managed to get (whichever approach you are using to take turn 6) squeeze left all the way through turn 5a…

…reaching the left edge of the track as you climb the hill toward turn 5.

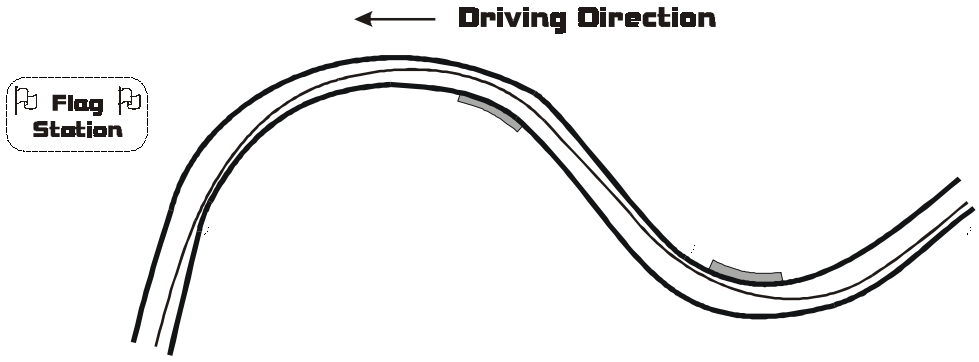
## Turn 5

Approaching up the steep hill, turn 5 is a completely blind righthander past the crest. While working up the out of 5A and to the entry of 5, it is very important to be able to keep the throttle down. This will improve traction at the rear and increase speed. The line must be fine tuned so that you enter this portion on a line that allows you to do this. You can just steer up the hill off the throttle; the hill and the drift of the rear tires will pretty much slow you down as much as you need. This is, however, a slow approach. At the top many drivers prefer using 3rd gear for smoothness, but 2nd gear will give you a better launch off the crest.

Enter from the left side of the track, midway along the turn-in berm. Don't necessarily take your cue from the apex berm (or worse, the unreliable apex cone) before turning in, as your best visual reference point should be something visible long before you reach the crest. From this point turn in smoothly, aiming for a late apex just past the crest of the steep hill. This is a point on the track where it is even more important than normally to drive your own line and not follow the car in front.

Beware of the very blind, short exit past the crest of the hill. An inadvertent early apex here will leave surprisingly little track to work with before reaching a dusty exit. Cars using 2nd gear for turn 5 will need to shift going down the hill.

# Turn 4 and Turn 3




The approach to turn 4 is steeply downhill at first, with a slight kink to the left as the hill flattens out.

This pair of turns poses challenges similar to 6/5A. where there are also two approaches available. Depending upon your car, the answer here is similar: be prepared to give up a little bit of turn 4 so that you can be sure of optimizing 3. This requires a late apex on 4 setting up for a standard approach to turn 3.

Therefore, enter 4 from the left side of the track, moving towards a very late apex . . .

…and avoid drifting out any more than necessary at the exit, moving back to the right side of the track to set up for the off-camber turn 3.

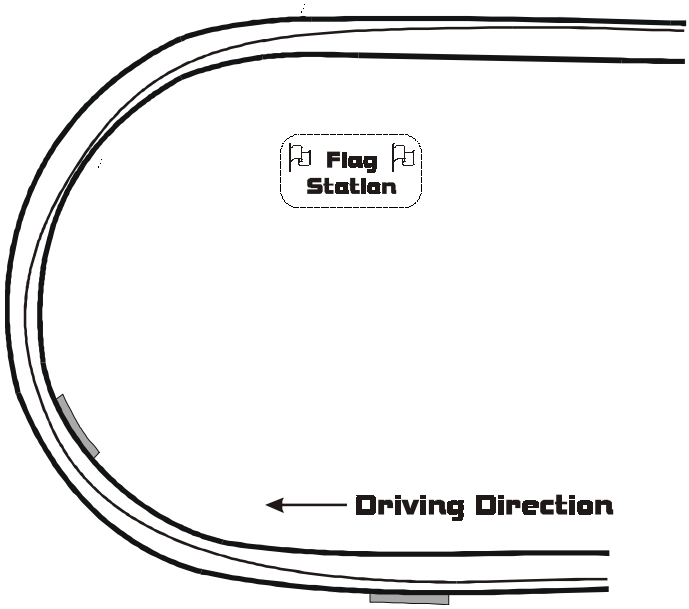
## Turn 3

Turn 3 is a long lefthander with poor camber. Setting up for a late, blind apex, turn 3 appears to be decreasing in radius. Entering from as far to the the right side of the track as you were able to achieve, squeeze left all the way around…

…apexing at what initially appears to be the crest of the hill. There is no apex berm. Due to the poor camber, some cars may tend to understeer here and push away from the apex, so be persistent. An earlier apex with high speed will put almost any car over into the dirt on the right, since the car will get light at the crest and tend to go straight.

Drift right as you pass over the true crest of the hill. A full exit is not quite necessary if the correct apex is reached, but the track is wide here just in case. Work back to the left as much as reasonably possible to set up for the long sweeping turn 2. Some cars will need 4th gear briefly between 3 and 2.

# Turn 2




This turn is a long, fairly wide righthand sweeper. A good amount of time is available to settle into the turn and develop a feel for your car cornering strongly at speed.

Enter turn 2 from the lefthand third of the track and squeeze smoothly to the right, apexing after completing 120 degrees of this 180 degree corner. Concentrate on keeping your eyes as far ahead as possible.

From the apex, drift left and exit near the "#2" brake point marker used when entering this turn from the opposite direction.

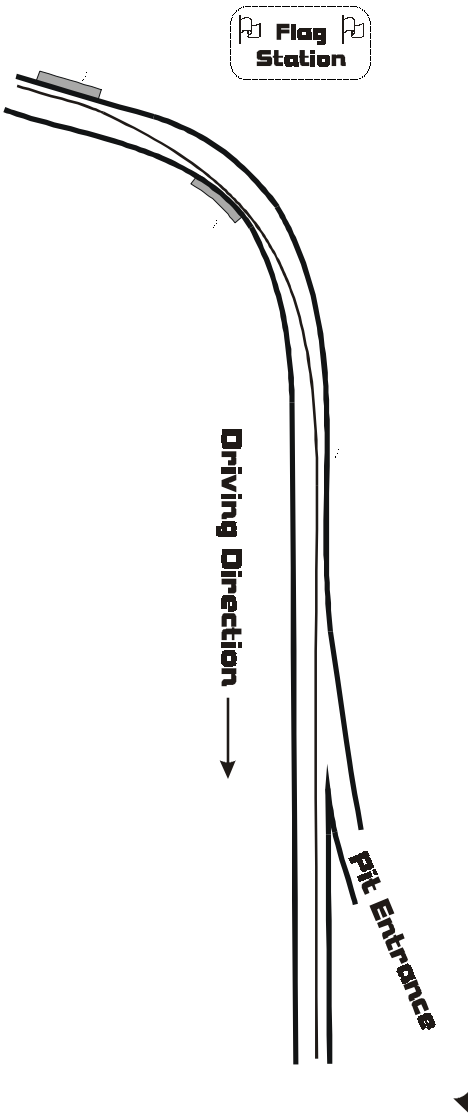
Alternatively, this turn can be taken as a double apex. To do this, move to the left after exiting turn 3, then, about when you might tap the brakes, turn in so as to come to an early apex on the right side. As soon as the car has settled from the rotation you're likely to need a bit of braking, then rotate the car onto the regular line for a second and late apex.

Hug the left side of the track as you drive up the low hill toward the entrance to turn 1. Most cars will shift into 4th gear in this section.

The straight between the exit of Turn 2 and the entry of Turn 1 is a good place check and establish a reference speed or rpm. Use this as a benchmark to judge your success in exiting Turn 2 as quickly as possible, and also as a means of measuring your entry speed into Turn 1. Because this is such a high-speed corner, and because it precedes the track's longest straight, improvements of even one or two miles-per-hour here will pay substantial dividends.

# Turn 1

Turn 1 is a type I corner emptying onto the main straight. It has a big enough radius to be quite fast and there is extra room available at the exit, making it even faster.



Entering ten feet from the end of the turn-in berm,…

…steer to a late apex ten feet from the end of the apex berm.

Drift left to a full exit, avoiding the entrance to pit road. On the main straight, check gauges and waive faster cars by. Move right to set up for turn 15, watching for cars entering from the pits on the left.

That is one lap of ThunderHill Raceway, running clockwise. It's an exciting track in this direction providing interesting challenges while rewarding diligence.

*Credits: The GGR track driving documents were prepared primarily by Hank Watts (GGR Chief Instructor) and Brad Maker. Hank did the photography and the text first draft; he had the final say about the text and is therefore responsible for it. Brad did the larger amount of work, putting the text, photos and graphics together, graphics parsing and editing, the entire layout and provided input to the text as well. Others contributed to the photography process (Neil Yonk, Fred Nelson, Warren Walker, Evan Williams) and in suggesting modification and additions to the text (especially John Tavernetti). Source trackmaps were by Trevor Swallow.*