Date: December 22, 2020
To: File
From: Cameron Beck, San Francisco Municipal Transportation Agency
Matt Lasky, San Francisco Municipal Transportation Agency
Re: Twin Peaks for All - Comparison of horizonal curves between Burnett and Portola Gates

Summary

- the evaluation of the options
- an explanation of why the staff recommendation is what it is
- what the remaining concerns are and proposals to mitigate them

Background information:

- Historical tour bus restriction (vehicles with over 9-seat capacity) has existed on Twin Peaks Boulevard between Burnett Avenue and Clayton Street for decades. These restrictions existed in the San Francisco Police Department code before the existence of the SFMTA. The SFMTA has no record of the rationale for the tour bus restriction on Twin Peaks Boulevard.
- Pre-COVID, tour buses routed from Portola Drive to Christmas Tree Point Road and back to Portola Drive.
- There have been no reported tour bus-involved collisions on Twin Peaks Boulevard between Clarendon Avenue and Panorama Drive in the last 10 years.
- From counts taken in 2015 and 2017, an average of 112 large vehicles (e.g. tour buses) made trips on Twin Peaks Boulevard on counts taken on Fridays, Saturdays, and Sundays. Since one vehicle would be counted once on the accent and once on the decent, it is estimated that about five to six large vehicles per hour were travelling along Twin Peaks Boulevard during the observation periods.

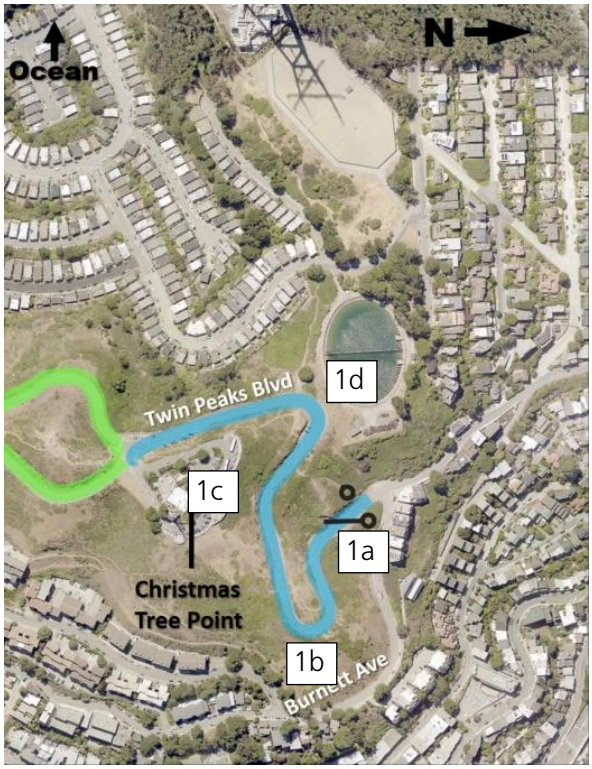
Definitions:

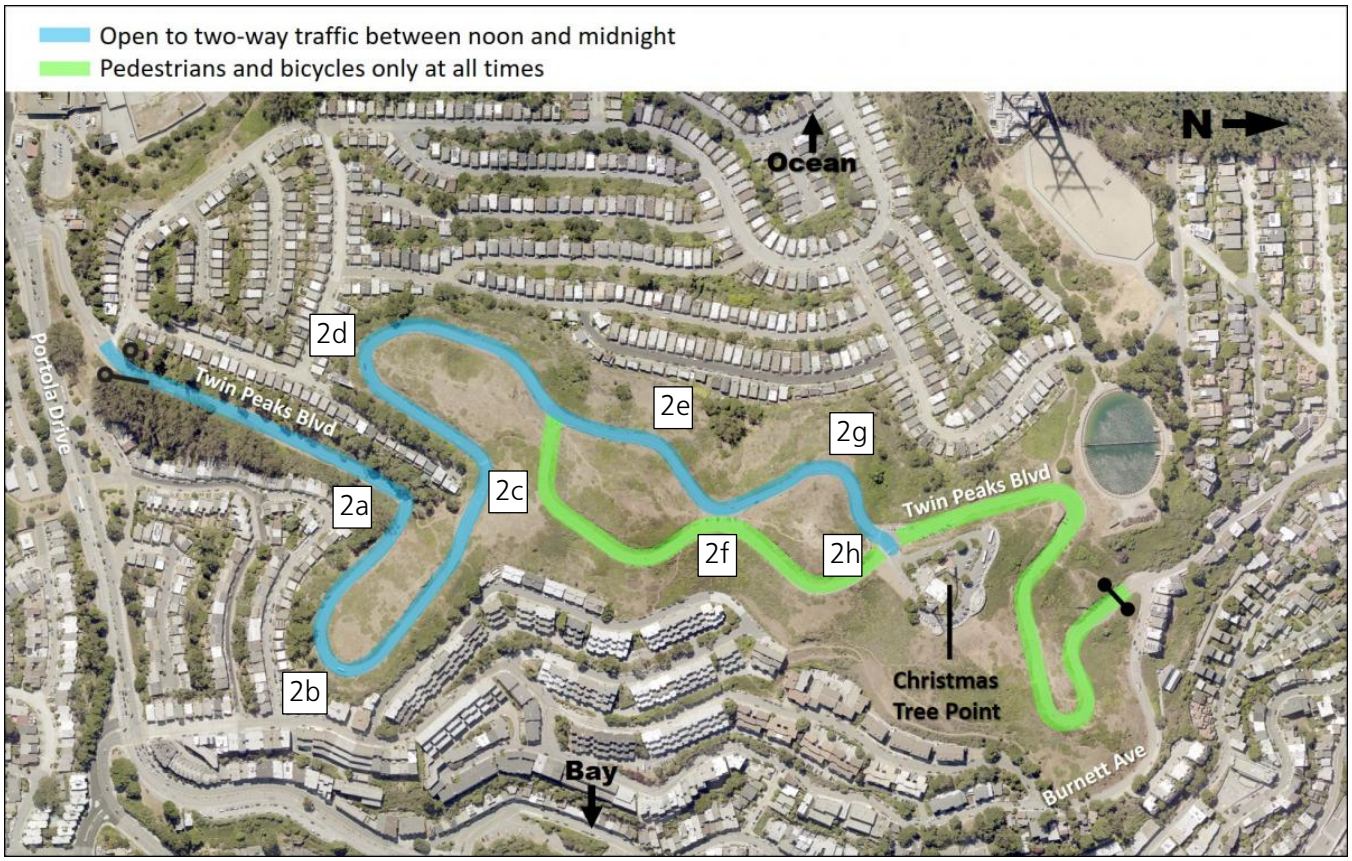
Curve radius: Horizontal roadway curves are generally created using circular arcs connecting two segments of tangent or straight roadway. This circular segment has a radius that can be empirically measured.
Length: Distance along the horizontal curve between tangent segments.
Roadway Width: Distance measured between the edge of pavement on either side of the paved roadway. The roadway width can change as you travel along the length of the roadway.
Travel Lane Width: Distance measured between the center line and the edgeline. The lane width can change as you travel along the length of the roadway.

Twin Peaks Boulevard north of Christmas Tree Point Road: If the Burnett Avenue gate is open with parking and a vehicle turnaround available on Christmas Tree Point Road, vehicles would need to travel through the curves shown to the right on Twin Peaks Boulevard to reach Christmas Tree Point:

Curve	Radius (ft)	Length (ft)	Roadway Width (ft)
1a	90	120	38
1b	71	225	36
1c	157	155	38
1d	72	190	50+

Curve 1b and 1d have hillsides adjacent to the roadway that make sight lines challenging for motorists.





Twin Peaks Boulevard south of Christmas Tree Point Road:: If the Portola Avenue/Panorama gate is open with parking and a vehicle turnaround available on Christmas Tree Point Road, vehicles would need to travel through the curves on Twin Peaks Boulevard to reach Christmas Tree Point as shown on the image above:

Curve	Radius (ft)	Length (ft)	Roadway Width (ft)	Comments
2a	79	100	29	
2b	91	310	29	Compound curve.
2c	95	120	29	
2d	82	220	29	Compound curve.
2e	167	155	29	
2f	98	135	29	Large outside shoulder at middle of Figure 8
2g	118	250	30	
2h	127	140	32	

Curve 2b, 2d, and 2g have hillsides adjacent to the roadway that make sight lines challenging for motorists.

Christmas Tree Point Road and Parking Lot:
All Twin Peaks for All options require vehicles to turnaround using the parking area along Christmas Tree Point Road. This is a one-way loop with angled parking stalls and tour bus loading zones. Curves are shown in the image to the right.

Curve	Radius (ft)	Length (ft)	Roadway Width (ft)	Comments
P1	84	195	26	One-way.
P2	46	115	20	One-way.
P3	45	120	20	One-way. Curve to limit line.

Discussion

Comparing the curve geometries along Twin Peaks Boulevard, north of Christmas Tree Point Road there are four curves under 200-foot radius, while south of Christmas Tree Point Road there eight of these types of curves. The tightest curves south of Christmas Tree Point Road are compound curves meaning they are made up of curves of varying radii. In the cases of Curve 2b and 2d, the tightest radii are only present for a portion of the total curve length. The longest curves north of Christmas Tree Point Road are also the tightest curves.

The roadway width in the curves north of Christmas Tree Point Road is at least 36 feet wide, but generally more, while the roadway width south of Christmas Tree Point Road is generally 29 feet wide. The curve travel lane widths are comparable on both ends of Twin Peaks Boulevard. Travel lane widths are designed for typical passenger vehicles and edgelines provide a visual narrowing effect to address speeding concerns and enhance roadway visibility. With a wider roadway, shoulder width increase, providing space for large vehicles to make turns. Shoulders are also used by people walking and biking since these sections of Twin Peaks Boulevard do not have sidewalks.

Both sides of Twin Peaks Boulevard include curves with hillsides adjacent to the roadway that obstruct sight lines for motorists. The amount of roadway motorists can see in front of them is a function of curve radius and the distance an obstruction is from the roadway. Curve 2b has the lowest sight distance since the radius is low and the terrain is very close to the roadway. Curves 1b and 1d have slightly better sight distances even with tighter radii because the hillsides are setback further from the roadway. Curves 2d and 2g have even better sight distance given the larger obstruction offset distance and larger curve radius respectfully.

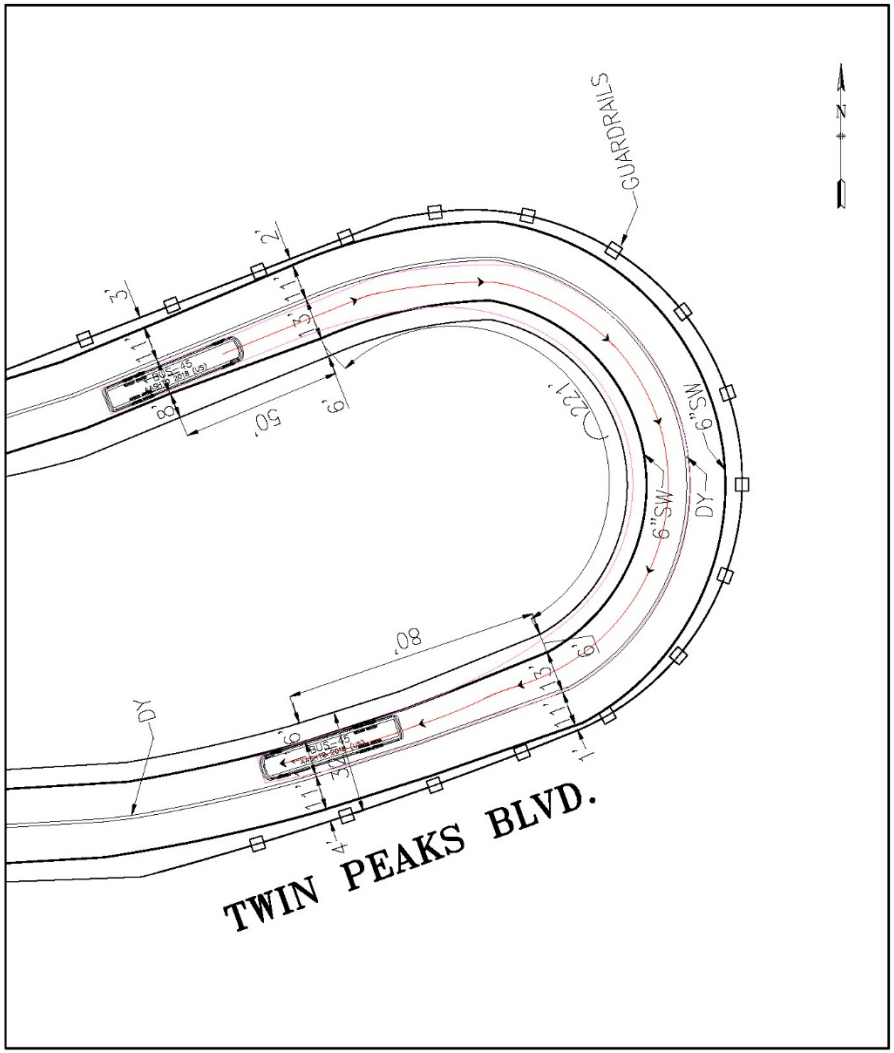
Since any option includes vehicles utilizing the one-way loop of Christmas Tree Point Road to turn around, these turns were also measured. The curves along Christmas Tree Point Road have the tightest radii of all curves analyzed at about 45 feet. Christmas Tree Point Road primarily functions as a parking lot so vehicles are traveling at very low speeds making maneuvers around corners less difficult.

Large vehicles, like motor coach tour buses, have accessed the top of Twin Peaks by way of Portola Drive. This route includes many horizonal curves as Twin Peaks Boulevard winds its way through the terrain. The roadway is generally 29 feet wide along this route with narrow shoulders. In Pre-COVID conditions, large vehicles routinely crossed over the double yellow centerline while driving this route.

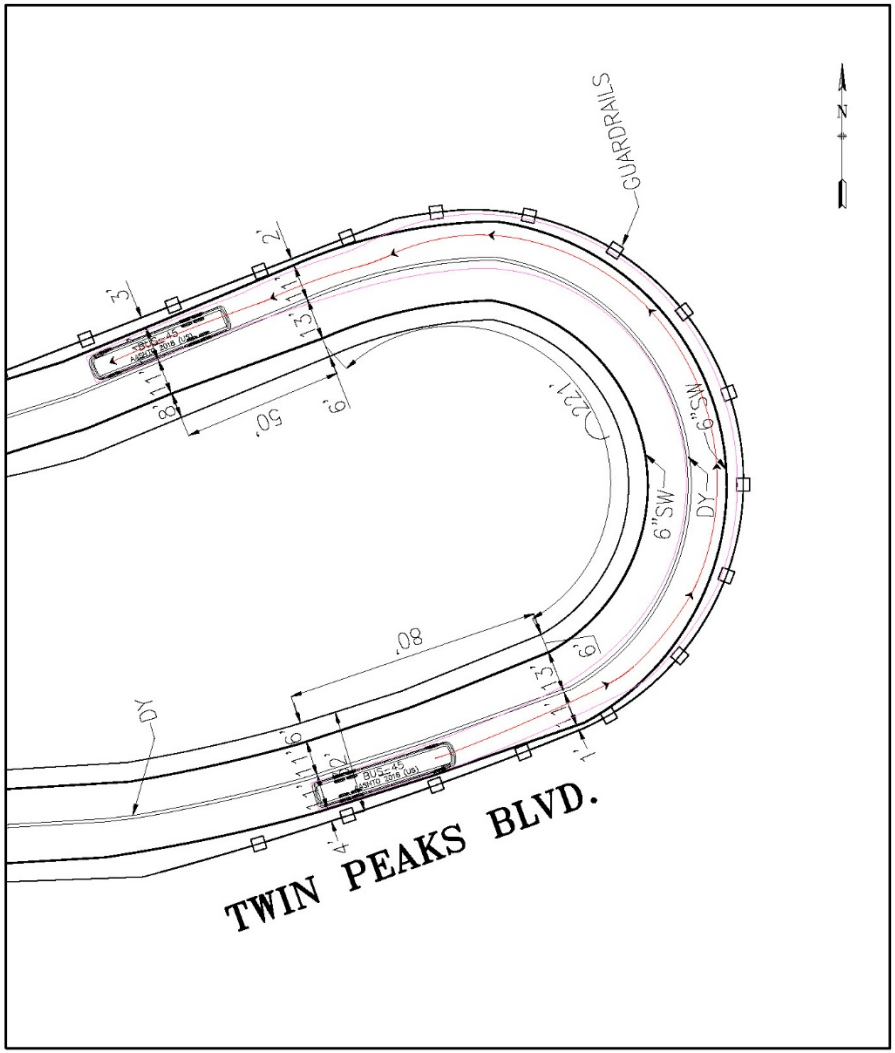
Since passenger vehicles with 9-seat and more capacity have been prohibited from Twin Peaks Boulevard between Burnett Avenue and Clayton Street, there were no observed behavior of motor coaches driving this route. SFMTA staff were able to coordinate a tour bus field test and observe the conditions. Please see *Coach Bus Field Test Memo to File* for more details about these observations.

Figure 1: Turn Templates around Curve 1b

UPHILL



DOWNHILL



NO.	DATE	DESCRIPTION	BY	APP
		TABLE OF REVISIONS CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION		

SFMTA

DRAWN: C.BECK DATE: 12/2020
CHECKED: DATE:

APPROVED
SENIOR ENGINEER DATE:
CITY TRAFFIC ENGINEER DATE:

SCALE:
SHEET/SHEETS:

TWIN PEAKS FOR ALL

45' MOTOR COACH TURN TEMPLATE

CURVE 1B

CONTRACT NO.
DRAWING NO.
FILE NO.
REV. NO. DRAFT

FILE NAME:
DATE: --/--/----

Figure 2: Turn Templates around Curve 1d

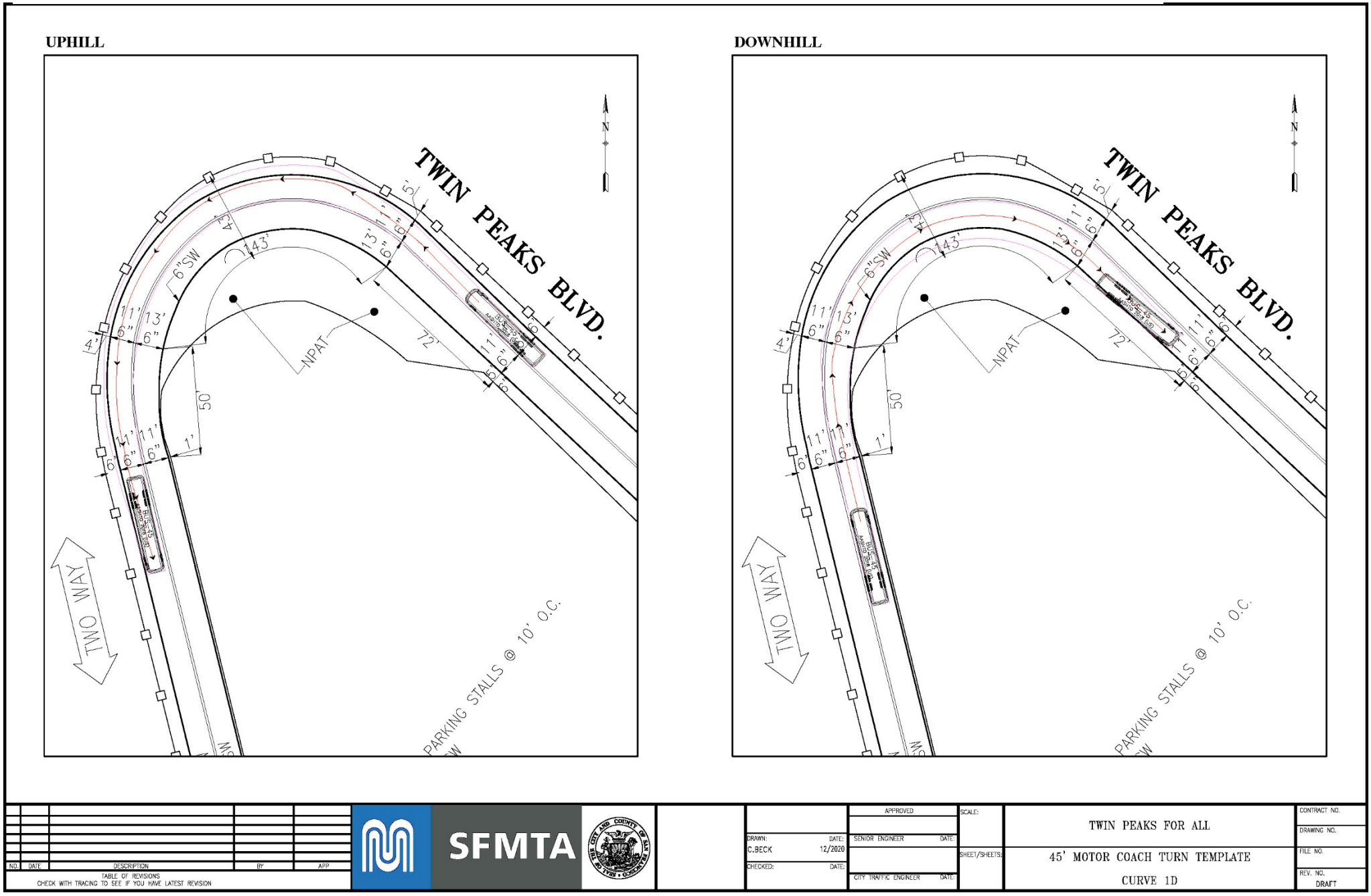


Figure 3:: Turn Templates around Curve 2b

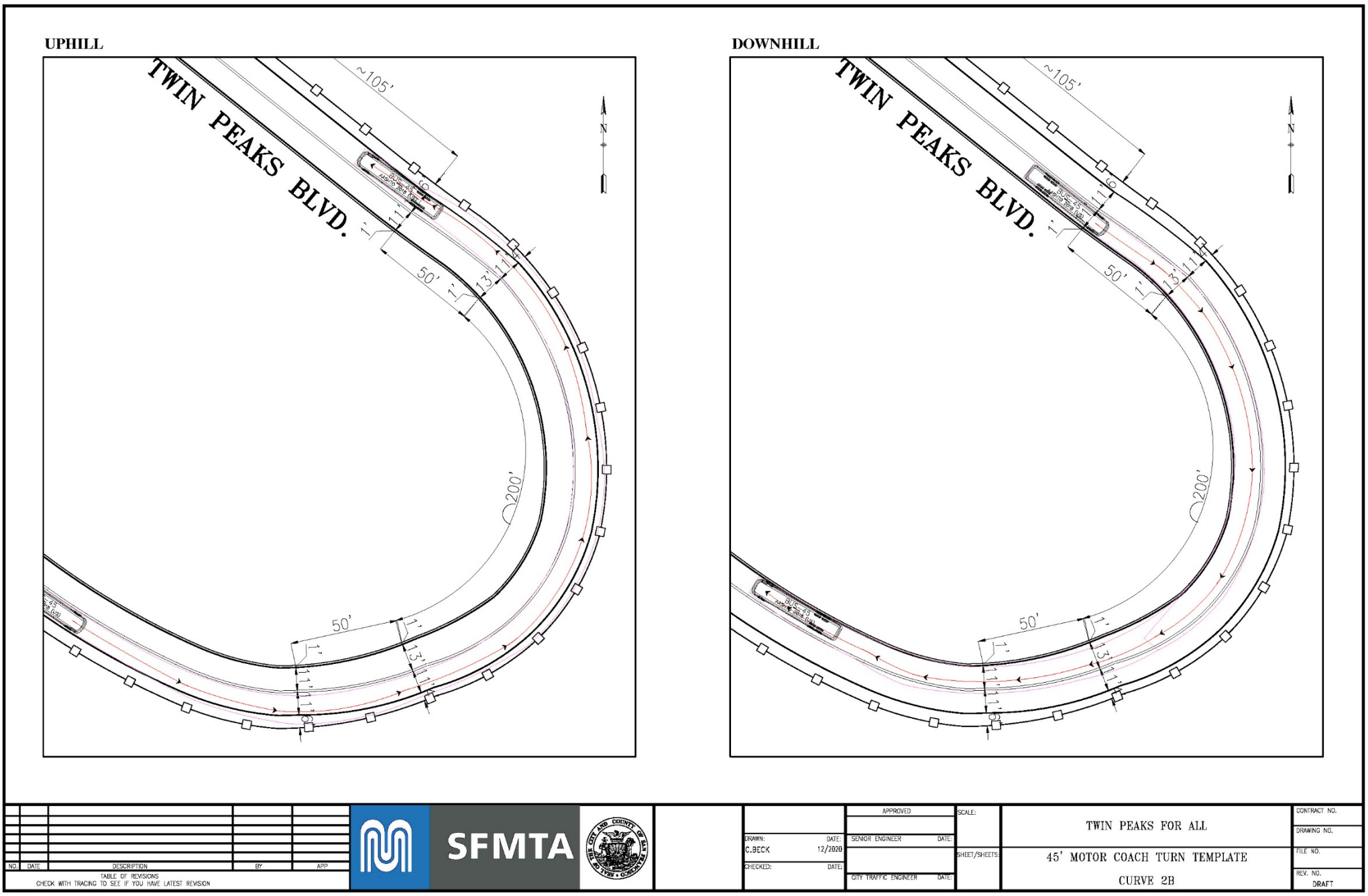


Figure 4: Turn Templates around Curve 2d

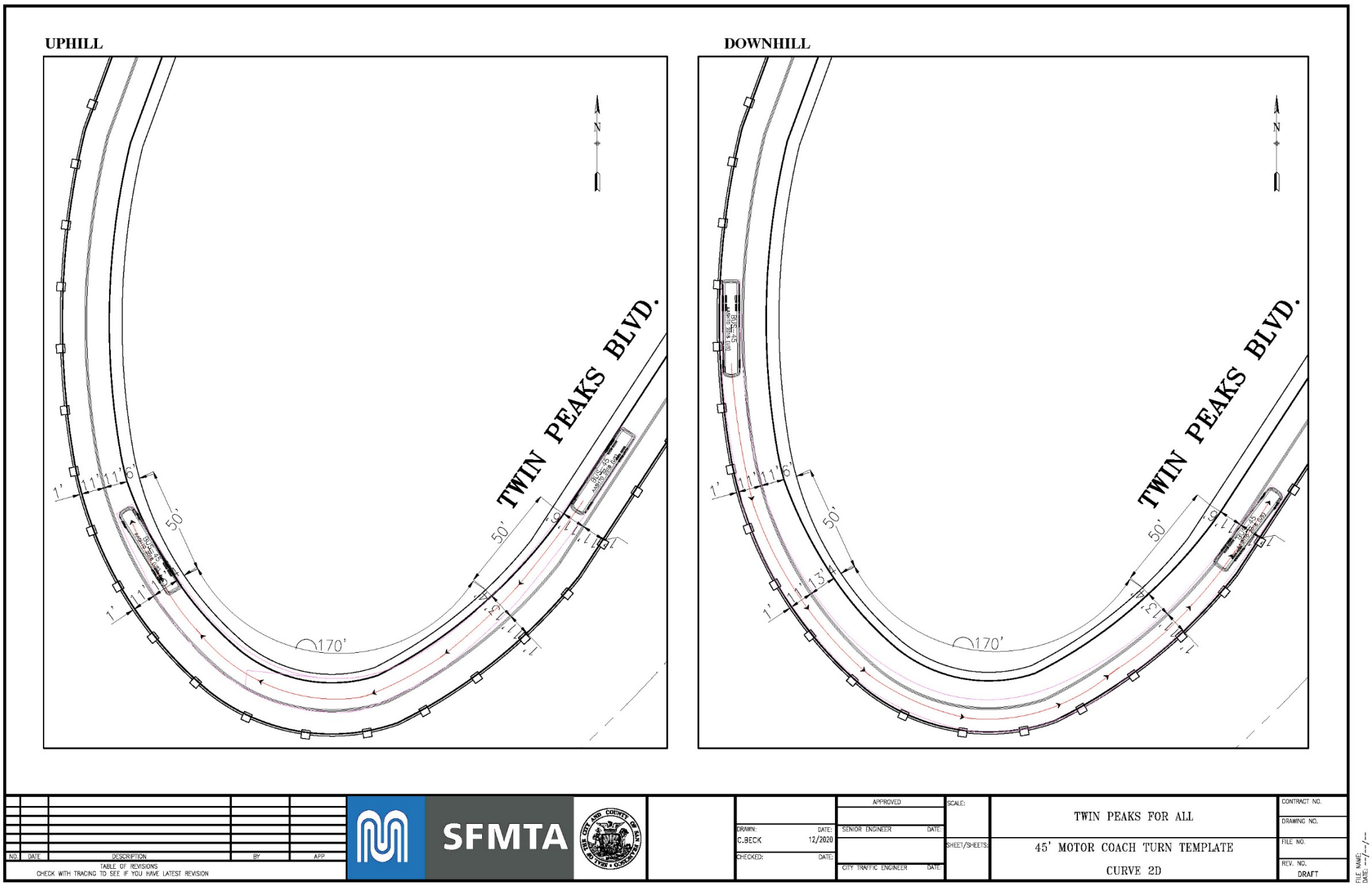


Figure 5: Turn Templates around Christmas Tree Point Road