

MEMORANDUM

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From: Peter Meyerhofer
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Date: April 30, 2024
Subject: Palo Alto Quiet Zone
Initial Investigation

Introduction and Background

The City of Palo Alto (“City”) has retained Kimley-Horn to investigate the feasibility of implementing a quiet zone along the Caltrain corridor within City limits. The crossings included in this study are Churchill Avenue, E Meadow Drive, and Charleston Road (“Study Area”).

The City has a fourth at-grade Caltrain crossing at Palo Alto Avenue/Alma Street. This crossing is currently in final design under a separate contract. While it is Kimley-Horn’s understanding that the position of the City is to maintain two separate quiet zones, CFR 222.35(a)(1)(iii) indicates that if two separate quiet zones are to be established in one political jurisdiction, they must be separated by at least one public highway-rail grade crossing. Since these crossings are not separated by a public crossing, all four at-grade crossings will be analyzed as one quiet zone in this study.

Kimley-Horn has initiated inquiries regarding the current safety ratings of the three crossings included in the Study Area, and what mitigation measures allow for quiet zone approval per Federal Rail Administration (FRA) guidelines. This precedes any conceptual design, diagnostic meetings, and coordination with Caltrain and CPUC.

FRA Quiet Zone Calculator

Kimley-Horn has performed analysis on risk mitigation measures using the FRA Quiet Zone Calculator. Various proposed safety improvements are input into the calculator, which outputs a reduced risk level for the crossing. Kimley-Horn has set up a test quiet zone with the four crossings in the City limits and analyzed several scenarios to determine viable options for quiet zone approval.

Assumptions

The test quiet zone used in the FRA Quiet Zone Calculator includes the four crossings in the City limits.

Existing Conditions

The FRA Quiet Zone Calculator uses the existing conditions as a baseline, setting the Supplementary Safety Measures (SSM) to 0, and outputs a risk value to each crossing based on the existing configuration and safety measures. Because the Palo Alto Avenue crossing will be modified to include non-traversable medians (SSM Code 13) in advance of any future quiet zone enhancements, this is included in every scenario, including the existing conditions, as a “Pre-SSM”. The total risk associated with the Quiet Zone is the average of the crossings included in the zone of interest.

Table 1: Existing SSM and Risk values associated with Quiet Zone

Street	Pre-SSM	Risk
Palo Alto Avenue (Alma Street)	13	82,827.10
Churchill Avenue	0	588,964.84
E Meadow Drive	0	295,736.94
W Charleston Road	0	426,060.47
Risk Index with Horns (RIWH)		258,527.84
Quiet Zone Risk Index (QZRI)		348,397.34

Per the FRA Quiet Zone Calculator, the **Risk Index With Horns for the proposed quiet zone is 258,527.84**. This means the Quiet Zone Risk Index (QZRI) cannot exceed this value for a quiet zone to be approved.

The SSM value is related to additional improvements to a crossing. The option for the crossings in the Study Area explored at this stage are:

- SSM Code 6: Four-Quadrant Gates, Upgrade from Two Quadrant Gates, with Vehicle Presence Detection

No other SSM codes were explored due to the following reasons:

Table 2: SSM Exclusions

SSM	Definition	Reason for Exclusion from Study
1	Temporary Closure	Does not align with City's goals
2	Permanent Closure	Does not align with City's goals
3	Grade Separation	Infeasible for the timeline of this study.
4	Four-Quadrant: upgrade from two-quadrant; no vehicle presence detection	Does not comply with CPUC regulations surrounding four-quadrant gate systems.
5	Four-Quadrant: upgrade from two-quadrant, with medians and no vehicle presence detection	Does not comply with CPUC regulations surrounding four-quadrant gate systems.
6	Four-Quadrant: upgrade from two-quadrant, with vehicle presence detection	Investigated.
7	Four-Quadrant: upgrade from two-quadrant, with medians and vehicle presence detection	Intersecting roadways/driveways preclude medians from being an accepted length.
8	Four-Quadrant: new installation; no vehicle presence detection	All crossings have gates in existing conditions.
9	Four-Quadrant: new installation; with medians and no vehicle presence detection	All crossings have gates in existing conditions.
10	Four-Quadrant: new installation; with vehicle presence detection	All crossings have gates in existing conditions.
11	Four-Quadrant: new installation; with medians and vehicle presence detection	All crossings have gates in existing conditions.
12	Mountable medians with reflective traffic channelizers	Intersecting roadways/driveways preclude medians from being an accepted length.

13	Non-traversable curb medians with or without channelizers	Intersecting roadways/driveways preclude medians from being an accepted length in Study Area.
14	One-way streets with gates	Does not align with City's goals.

There are three main methods by which a set of crossings can achieve quiet zone approval:

Option 1: Upgrade each crossing.

The first option would be to implement SSMs at each crossing. Installing SSMs at each crossing in a quiet zone automatically grants Quiet Zone approval. To maintain quiet zone status, the zone would need periodic updates, including updates to the USDOT Grade Crossing Inventory Form, taking place every 4.5 – 5 years.

For Option 1 risk analysis, see Table 3 below.

Table 3: SSM and Risk Values, upgrading every crossing.

Street	Pre-SSM	SSM	Risk
Palo Alto Avenue (Alma Street)	13	0	82,827.10
Churchill Avenue	0	6	135,461.91
E Meadow Drive	0	6	68,019.50
W Charleston Road	0	6	97,993.91
Risk Index with Horns (RIWH)			258,527.84
Quiet Zone Risk Index (QZRI)			96,075.6

Option 2: Upgrade minimum subset to gain approval.

A second way by which a quiet zone can be achieved is by upgrading crossings with SSMs such that the QZRI is less than the RIWH. During this evaluation, it was determined that two crossings in the Study Area are required to be upgraded in order for the Quiet Zone to qualify.

For Option 2 risk analysis, see Tables 4, 5, and 6 below.

Table 4: SSM and Risk values, upgrading Churchill and Meadow

Street	Pre-SSM	SSM	Risk
Palo Alto Avenue (Alma Street)	13	0	82,827.10
Churchill Avenue	0	6	135,461.91
E Meadow Drive	0	6	68,019.50
W Charleston Road	0	0	426,060.47
Risk Index with Horns (RIWH)			258,527.84
Quiet Zone Risk Index (QZRI)			178,092.24

Table 5: SSM and Risk Values, upgrading Meadow and Charleston

Street	Pre-SSM	SSM	Risk
Palo Alto Avenue (Alma Street)	13	0	82,827.10
Churchill Avenue	0	0	588,964.84
E Meadow Drive	0	6	68,019.50

W Charleston Road	0	6	97,993.91
Risk Index with Horns (RIWH)			258,527.84
Quiet Zone Risk Index			209,451.34

Table 6: SSM and Risk Values, upgrading Churchill and Charleston

Street	Pre-SSM	SSM	Risk
Palo Alto Avenue (Alma Street)	13	0	82,827.10
Churchill Avenue	0	6	135,461.91
E Meadow Drive	0	0	68,019.50
W Charleston Road	0	6	97,993.91
Risk Index with Horns (RIWH)			258,527.84
Quiet Zone Risk Index (QZRI)			153,004.96

Option 3: Alternative Safety Measures

In locations where implementing upgrades may be infeasible due to geometry or spatial constraints, Alternative Safety Measures (ASMs) may be implemented. ASMs require a more frequent cycle of re-certification of the quiet zone and are evaluated on a subjective basis. Where SSMs have a numeric value associated with risk reduction (e.g., SSM code 6 is a risk reduction of 0.77), ASMs do not. This is because ASMs do not uniformly impact the risk associated with a crossing. In order to implement ASMs, the FRA would need to sign off on the improvements before they are implemented.

“Engineering” ASMs may include roadway changes, such as reprofiling, sight visibility enhancements, or signalization upgrades. “Non-engineering” ASMs could include public outreach initiatives or police enforcement.

For the crossings in the Study Area, ASMs may be useful if the City determines four-quadrant gates would not be feasible, specifically related to the limited clearance between the grade crossings and nearby intersections with Alma Street. However, it is important to note the risk associated with implementation of ASMs, due to the increased frequency of recertification (2.5 – 3 years) as well as the subjective evaluation of the safety measures.

Option 4: Wayside Horns

Wayside horns are allowed to be installed at crossings already equipped with flashing lights and automatic gates. The wayside horn would be placed on the warning device, and oriented to face the roadway. The sound would be directed down the roadway, which has the ability to reduce the overall spread of the noise. However, wayside horns are not the same as establishing a quiet zone.

Wayside horns may be an interim measure to reduce the spread of the sound associated with train horns while a more permanent solution is evaluated, planned for, and constructed.

OTHER CONSIDERATIONS

Churchill Avenue is in the final design phases for a safety enhancement funded through Section 130. Through this project, various upgrades are to be implemented at the crossing to enhance user safety, including modifications to pedestrian gate arms and the installation of a pre-signal, interconnected with the traffic signal at Churchill Avenue and Alma Street. While these safety enhancements do not qualify as SSMs, they may qualify as Engineering ASMs, which are subject to approval by the FRA, but may

decrease the risk associated with the crossing. The amount by which the risk is impacted is not currently quantifiable given the FRA Quiet Zone Calculator tool.

Quiet Zone improvements at Churchill Avenue should take into account these future upgrades, particularly when considering practicability of grade crossing enhancements.

Similarly, Charleston Road has been obligated Section 130 funding for safety enhancements. The Section 130 program will not fund or install Quiet Zone improvements, but allocations for future Quiet Zone improvements have been recorded by Caltrans and the City of Palo Alto. These upgrades could be more aligned with traffic signal upgrades to interconnect or better preempt the signal at Charleston Road and Alma Street.

In addition, the crossing at Palo Alto Avenue/Alma Street is currently in final design under a separate contract. Since the City cannot create two different quiet zones in accordance with CFR 222.35(a)(1)(iii), the likely quiet zone implementation will involve getting Palo Alto Avenue/Alma street quiet zone certified, and then amending the quiet zone in the future when the remaining 3 crossings are upgraded.

FINDINGS

Evaluating the crossings solely by the FRA Quiet Zone Calculator, the City of Palo Alto has several options when moving forward with a quiet zone. From a risk reduction standpoint, it would be most conservative to upgrade each crossing within the quiet zone – this is also the method recommended by the FRA. However, upgrading two of the three crossings within the Study Area are sufficient to reduce the risk and grant quiet zone approval.

NEXT STEPS

Kimley-Horn will proceed with Conceptual Design drawings prior to a field diagnostic meeting. The conceptual designs will reflect the SSM for four-quadrant gate systems at all three crossings in the Study Area. While preparing these concepts, Kimley-Horn will begin to engage the respective stakeholder agencies, to include Caltrain, CPUC, and UPRR (as a courtesy only – recognizing they do not own the crossing area and are an operator on the Caltrain corridor).

The City of Palo Alto should begin internal discussions on a preferred approach for quiet zone implementation, as presented through Options 1-4, above. This preferred will serve to guide the future field diagnostic meetings and support the accommodation of the City's goals to the extent feasible.