Rail Safety in Palo Alto

Statistics

Since 2008, there have been 25 incidents at Palo Alto's four grade crossings in which a train struck, or nearly struck, either a pedestrian or a vehicle. Eight were fatalities.[1]

At Charleston Road during this period, there were 11 incidents -- seven with vehicles and four with pedestrians. All of the pedestrians were killed, and all were ruled a suicide according to data provided by the Federal Railroad Administration. Out of the two vehicular fatalities, one was ruled a suicide and the other, on April 15, 2011, was not.

At East Meadow Drive there were six incidents -- four vehicles and two pedestrians. Both pedestrians were killed and both were later ruled suicides according to the FRA database. In addition, a vehicle went around the gate in 2007 and an occupant was killed, although it was not ruled a suicide.

At Churchill Ave there have been seven incidents, all with vehicles, and none fatal. (However, these seven accidents accounted for $63,500 in vehicle damage according to the FRA.) There has also been one incident at Palo Alto Avenue in this period, which was not fatal.

The Federal Railway Administration maintains a system called the Web-Based Accident Reporting System[2] with data about every incident on every rail crossing in the US. A query of this database on August 6, 2020 produced the following summary data for our crossings in Palo Alto:

Crossing	Predicted Collisions	Incidents Since 2015	Trains / Day	Train Speed	Vehicles / Day
Charleston	0.543445	6	96	79	20,000
Churchill	0.422541	5	96	79	12,000
East Meadow	0.358559	4	96	79	9,331
Palo Alto Ave	0.058481	0	96	79	14,200

The "Predicted Collisions" column in this table is described by the FRA as the "probability that a collision between a train and a highway vehicle will occur at the crossing in a year."

[1] Historical grade crossing accident data comes from the Federal Railroad Administration's Office of Safety Analysis: https://safetydata.fra.dot.gov/webaps/default.aspx
[2] https://safetydata.fra.dot.gov/webaps/

The value for Charleston Road, in other words, predicts a collision about every two years, and the aggregated data would suggest at least one grade crossing accident in Palo Alto every year. This value is currently the 19th-highest prediction score in California, and higher than any other crossing in Santa Clara County.

This number should be used carefully, however, as the FRA also states: “WBAPS does not state that specific crossings are the most dangerous. Rather, the WBAPS data provides an indication that conditions are such that one crossing may possibly be more hazardous than another based on the specific data that is in the program.”

History

The railroad crossings in Palo Alto have historically created health and safety challenges for vehicles, pedestrians, and bicyclists. For example, according to the Palo Alto Historical Organization, a tragic collision at the crossing near Palo Alto High School in 1927 sparked a movement to improve safety at that intersection. Public advocacy and insistence on building a “subway” for this rail crossing led to the construction of the Embarcadero underpass nine years later in 1936.

Later, Palo Alto suffered two youth suicide cluster incidents in 2009-10 and 2014-15, including the four pedestrian deaths at the Charleston Road grade crossing that were later ruled suicides. The City of Palo Alto subsequently implemented several measures to support our youth’s health and well-being including public education about mental health resources. A comprehensive strategy was developed with input from key leaders in adolescent behavioral health, education, law enforcement, and Caltrain, also evolved to address railroad safety.

In collaboration with Caltrain and the City of Palo Alto’s Emergency Response Department, several lethal means restriction methods were implemented, including:

- Professional track watch program with monthly incident reports
- Removal of vegetation to enhance vision along the Caltrain rail corridor
- Uniform eight foot tall fencing with 18-inch anti-climbing winglets on the East side of Alma Street
- Intrusion Detection System (IDS) with nine cameras at the East Meadow Drive crossing
- Warning system to prevent trespassing on the rail corridor
- Signage for the assistance; crisis/suicide emergency hotline

Safety Considerations for all Alternatives

Clearly, public safety must be a significant consideration in the implementation of any grade separation alternative. Regardless of what grade separation alternatives are eventually chosen, important safety considerations apply.

The Importance of Means Restriction

According to Harvard School of Public Health's Means Matter campaign, restriction to lethal means is one of the most effective ways to prevent a suicidal person's access to mechanisms that cause injuries and fatalities. Although this campaign focuses on firearm-related deaths, the train is also considered a lethal means for intentional harm.

In 2014, Scott Gabree, PhD, made a presentation titled "Potential Countermeasures to Mitigate Suicides on the Railroad Right-of-Way." This document shared several prevention efforts including the use of blue lights, gatekeeper training, public awareness campaigns, signage for crisis center hotlines, media guidelines, means restrictions such as fencing, and track surveillance.

According to Frank Frey, general engineer with track safety expertise for the Federal Railroad Administration, the safest option for preventing injuries and fatalities at a dangerous crossing is closure. He also recommended tall fencing around "hot spot" areas where illegal trespass has occurred.

Safe Construction Recommendations

Fencing

Good fencing is an essential part of means restriction. At all locations where the rails are near homes, such as along the West side of the rail corridor, the tracks should be separated by eight foot tall uniform fencing with an 18-inch anti-climbing winglet.

In addition, any sound barriers constructed as part of the grade separation alternatives can be considered to be an additional safety measure.

Trenching and Tunneling

Illegal access to the tracks may be easier in places where the rail line enters a trench or tunnel, or anywhere near an open trench. Fences and sound barriers, including the aforementioned eight feet tall uniform fence with an 18-inch anti-climbing winglet, are essential here.

In addition, an Intruder Detection System (IDS) with multiple cameras and a warning system may be needed to monitor the rail corridor, and identify at-risk behavior for intentional and unintentional injuries and fatalities.

Additional Recommendations

Egress and access safety protocols should be outlined within the context of the complete design efforts for the alternatives ultimately chosen.

Cost for countermeasures to prevent illegal access to the Caltrain rail corridor regarding installation and maintenance over time should be part of the budget process. The injury and fatality prevention efforts may include means restriction equipment such as standardized eight feet tall fencing with 18-inch winglets, Intruder Detection Systems (IDS) for track surveillance, flashing lights, warning systems, gatekeeper training, public awareness campaigns, signage for crisis center hotlines, and media guidelines.

Safe Routes to School representatives should be consulted regarding the safety and efficacy of the recommended redesign alternatives

Mental health resources should be shared with key stakeholders including schools and community-based organizations, in an effort to prevent intentional injuries and fatalities on the Caltrain rail corridor.

To ensure overall public health and well-being, track safety expertise and collaboration is required from the Federal Railroad Administration, Caltrain, Emergency Response Department, City of Palo Alto, and the San Francisco Transit Police.

A strong public education campaign should be planned and implemented to ensure that the community residents are aware of the increased frequency and speed of the electrified trains.

Finally, if High Speed Rail (HSR) remains a possibility, its impact should also be considered during the planning phase of the City's preferred alternatives. For example, officials in Florida are now considering legislation to help decrease the number of deaths on the Brightline tracks and crossings between Miami and West Palm Beach. There have been over 20 deaths during the past two years, and a public education campaign is being planned, according to NPR, Good Morning Edition, January 2020.

References

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Potential Countermeasures to Mitigate Suicides on the Railroad Rights-of-Way
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U.S. Department
of Transportation
Federal Railroad
Administration

USING DATA PRODUCED BY WBAPS

(Web Accident Prediction System)

1200 New Jersey Avenue, SE
Third Floor West
Washington, DC 20590

WBAPS generates reports listing public highway-rail intersections for a State, County, City or railroad ranked by predicted collisions per year. These reports include brief lists of the Inventory record and the collisions over the last 10 years along with a list of contacts for further information. These data were produced by the Federal Railroad Administration's Web Accident Prediction System (WBAPS).

WBAPS is a computer model which provides the user an analytical tool, which combined with other site-specific information, can assist in determining where scarce highway-rail grade crossing resources can best be directed. This computer model does not rank crossings in terms of most to least dangerous. Use of WBAPS data in this manner is incorrect and misleading.

WBAPS provides the same reports as PCAPS, which is FRA's PC Accident Prediction System. PCAPS was originally developed as a tool to alert law enforcement and local officials of the important need to improve safety at public highway-rail intersections within their jurisdictions. It has since become an indispensable information resource which is helping the FRA, States, railroads, Operation Lifesaver and others, to raise the awareness of the potential dangers at public highway-rail intersections. The PCAPS/WBAPS output enables State and local highway and law enforcement agencies identify public highway-rail crossing locations which may require additional or specialized attention. It is also a tool which can be used by state highway authorities and railroads to nominate particular crossings which may require physical safety improvements or enhancements.

The WBAPS accident prediction formula is based upon two independent factors (variables) which includes (1) basic data about a crossing's physical and operating characteristics and (2) five years of accident history data at the crossing. These data are obtained from the FRA's inventory and accident/incident files which are subject to keypunch and submission errors. Although every attempt is made to find and correct errors, there is still a possibility that some errors still exist. Erroneous, inaccurate and non-current data will alter WBAPS accident prediction values. While approximately 100,000 inventory file changes and updates are voluntarily provided annually by States and railroads and processed by FRA into the National Inventory File, data records for specific crossings may not be completely current. Only the intended users (States and railroads) are really knowledgeable as to how current the inventory data is for a particular State, railroad, or location.

It is important to understand the type of information produced by WBAPS and the limitations on the application of the output data. WBAPS does not state that specific crossings are the most dangerous. Rather, the WBAPS data provides an indication that conditions are such that one crossing may possibly be more hazardous than another based on the specific data that is in the program. It is only one of many tools which can be used to assist individual States, railroads and local highway authorities in determining where and how to initially focus attention for improving safety at public highway-rail intersections. WBAPS is designed to nominate crossings for further evaluation based only upon the physical and operating characteristics of specific crossings as voluntarily reported and updated by States and railroads and five years of accident history data.

PCAPS and WBAPS software are not designed to single out specific crossings without considering the many other factors which may influence accident rates or probabilities. State highway planners may or may not use PCAPS/WBAPS accident prediction model. Some States utilize their own formula or model which may include other geographic and site-specific factors. At best, PCAPS and WBAPS software and data nominates crossings for further on-the-ground review by knowledgeable highway traffic engineers and specialists. The output information is not the end or final product and the WBAPS data should not be used for non-intended purposes.

It should also be noted that there are certain characteristics or factors which are not, nor can be, included in the WBAPS database. These include sight-distance, highway congestion, bus or hazardous material traffic, local topography, and passenger exposure (train or vehicle), etc. Be aware that PCAPS/WBAPS is only one model and that other accident prediction models which may be used by States may yield different, by just as valid, results for ranking crossings for safety improvements.

Finally, it should be noted that this database is not the sole indicator of the condition of a specific public highway-rail intersection. The WBAPS output must be considered as a supplement to the information needed to undertake specific actions aimed at enhancing highway-rail crossing safety at locations across the U.S. The authority and jurisdiction to appropriate resources towards the safety improvement or elimination of specific crossings lies with the individual States.

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ABBREVIATION KEY

for use with WBAPS Reports

1200 New Jersey Avenue, SE
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The lists produced are only for public at-grade highway-rail intersections for the entity listed at the top of the page. The parameters shown are those used in the collision prediction calculation.

RANK:	Crossings are listed in order and ranked with the highest collision prediction value first.
PRED COLLS:	The accident prediction value is the probability that a collision between a train and a highway vehicle will occur at the crossing in a year.
CROSSING:	The unique sight specific identifying DOT/AAR Crossing Inventory Number.
RR:	The alphabetic abbreviation for the railroad name.
CITY:	The city in (or near) which the crossing is located.
ROAD:	The name of the road, street, or highway (if provided) where the crossing is located.
NUM OF COLLISIONS:	The number of accidents reported to FRA in each of the years indicated. Note: Most recent year is partial year (data is not for the complete calendar year) unless Accidents per Year is 'AS OF DECEMBER 31'.
DATE CHG:	The date of the latest change of the warning device category at the crossing which impacts the collision prediction calculation, e.g., a change from crossbucks to flashing lights, or flashing lights to gates. The accident prediction calculation utilizes three different formulas, on each for (1) passive devices, (2) flashing lights only, and (3) flashing lights with gates. When a date is shown, the collision history prior to the indicated year-month is not included in calculating the accident prediction value.
WD:	The type of warning device shown on the current Inventory record for the crossing where: FQ=Four Quad Gates; GT = All Other Gates; FL = Flashing lights; HS = Wigwags, Highway Signals, Bells, or Other Activated; SP = Special Protection (e.g., a flagman); SS = Stop Signs; XB = Crossbucks; OS = Other Signs or Signals; NO = No Signs or Signals.
TOT TRNS:	Number of total trains per day.
TOT TRKS:	Total number of railroad tracks between the warning devices at the crossing.
TTBL SPD:	The maximum timetable (allowable) speed for trains through the crossing.
HWY PVD:	Is the highway paved on both sides of the crossing?
HWY LNS:	The number of highway traffic lanes crossing the tracks at the crossing.
AADT:	The Average Annual Daily Traffic count for highway vehicles using the crossing.

*PUBLIC HIGHWAY-RAIL CROSSINGS RANKED BY PREDICTED ACCIDENTS PER YEAR AS OF 12/31/2019**

*Num of Collisions: Most recent year is partial year (data is not for the complete calendar year) unless Accidents per Year is 'AS OF DECEMBER 31'.

RANK	PRED COLLS.	CROSSING	RR	STATE	COUNTY	CITY	ROAD	NUM OF COLLISIONS 19*	18	17	16	15	DATE CHG	WD	TOT TRN	TOT TRK	TTBL SPD	HWY PVD	HWY LNS	AADT
1	0.543445	755011Y	PCJX	CA	SANTA CLARA	PALO ALTO	CHARLESTON ROAD	1	2	1	1	1		GT	96	2	79	YES	4	20,000
2	0.422541	754998E	PCJX	CA	SANTA CLARA	PALO ALTO	CHURCHILL AVEN	1	1	3	0	0		GT	96	2	79	YES	3	12,000
3	0.358559	755010S	PCJX	CA	SANTA CLARA	PALO ALTO	EAST MEADOW DR	0	0	1	2	1		GT	96	2	79	YES	4	9,331
4	0.058481	754992N	PCJX	CA	SANTA CLARA	PALO ALTO	ALMA AVENUE	0	0	0	0	0		GT	96	2	79	YES	2	14,200
TTL:	**1.383026**							**2**	**3**	**5**	**3**	**2**								