

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO**

DOCKET NO. 12A-900R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO ALTER AN AT-GRADE CROSSING AT CHAMBERS ROAD IN THE CITY OF AURORA, ADAMS COUNTY, STATE OF COLORADO.

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**RECOMMENDED DECISION OF  
ADMINISTRATIVE LAW JUDGE  
G. HARRIS ADAMS  
GRANTING APPLICATION WITH MODIFICATIONS**

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Mailed Date: May 16, 2013

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**I. STATEMENT**

1. On August 8, 2012, the Regional Transportation District (RTD) filed the above-captioned application.

2. The Commission gave notice of this Application (Notice) to all interested parties, including adjacent property owners pursuant to § 40-6-108(2), C.R.S. The Notice was mailed August 10, 2012.

3. On August 10, 2012, Staff of the Commission (Staff) sent a deficiency letter to RTD outlining two areas of deficiency in the Application and seeking clarification on other areas of the Application.

4. On August 20, 2012, RTD amended its Application to cure the outlined deficiencies and provide clarification for other areas of the Application.

5. On September 7, 2012, RTD filed a Motion to Extend Time for Filing of Interventions and Waiver of Response time to the Motion (Motion). RTD requested that an additional 14 days of notice be provided as RTD and the Union Pacific Railroad Company (UPRR) were in the process of discussing how a joint application could be filed in this matter.

6. On September 14, 2012, the Commission granted RTD's Motion by Decision No. C12-1069-I.

7. On September 28, 2012, RTD filed a Second Motion to Extend Time for Filing of Interventions and Waiver of Response Time to the Motion (Second Motion). RTD stated that they were still working with UPRR on a joint application solution and requested an additional 14 days of notice be provided.

8. On October 4, 2012, the Commission granted RTD's Second Motion by Decision No. C12-1149-I.

9. On October 18, 2012, RTD filed a Third Motion to Extend Time for Filing of Interventions and for Waiver of Response Time to Motion (Third Motion). RTD stated that they were still working with UPRR on a joint application solution and were in the process of finalizing the new joint application for the instant application what would obviate the need for UPRR to intervene in the instant matter, and requested an additional 14 days of notice be provided.

10. On October 26, 2012, the Commission granted RTD's Third Motion by Decision No. C12-1225-I.

11. On October 31, 2012, RTD and UPRR filed an Amended Joint Application. RTD and UPRR jointly request authority to construct two new commuter rail tracks through the intersection of the East Corridor with Chambers Road; installation of new flashing lights and gates with a proposed exit gate, loop detection circuitry, and upgrade of circuitry equipment; installation of new crossing panels; installation of pedestrian treatments, installation of traffic signal pre-signals in lieu of the cantilever signals; and interconnection to and advanced preemption of the traffic signal at Chambers Road and Smith Road, National Inventory No. 805500Y. RTD states that it will obtain any necessary inventory numbers for the crossing for the commuter rail crossing, in the City of Aurora, County of Adams, State of Colorado.

12. By Decision No. C12-1329-I, mailed on November 15, 2012, the Commission provided notice of the Amended Joint Application to all interested parties, including adjacent property owners pursuant to § 40-6-108(2), C.R.S.

13. By operation of Rule 1303(b)(III) of the Rules of Practice and Procedure, 4 *Code of Colorado Regulations* (CCR) 723-1, the Application was automatically deemed complete on January 2, 2013 within the meaning of § 40-6-109.5, C.R.S.

14. By Decision No. C13-0014-I, issued January 7, 2013, the matter was referred to an administrative law judge (ALJ) for disposition. Based upon a review the amended joint application, it was noted that crossing plans show some proposed pedestrian treatments, but no information is provided indicating why such treatments were chosen and what criteria were used

in determining that such facilities are appropriate. It was requested that the ALJ obtain information including:

- a) What criteria did the parties use to make a determination on pedestrian treatments that are proposed to be used at crossings?
- b) For the treatments proposed, how does the proposed pedestrian treatments meet the Commission's statutory charge of preventing accidents and promoting public safety and how do the proposed pedestrian treatments meet that criteria used by the parties in making that determination?
- c) For each of the various types of pedestrian treatments that could be used at a crossing including, but not limited to, pedestrian flashing lights, automatic pedestrian gates, pedestrian swing gates, pedestrian channelization, bedstead crossings, pedestrian z-crossings, and additional train approaching blank out signs, what are the initial installation costs and the ongoing maintenance costs for such treatments?
- d) What are some of the industry best practices for pedestrian safety on newer commuter rail systems or commuter rail systems that have recently been built from greenfield conditions similar to how the RTD commuter rail system is being constructed?
- e) What message do we want to send to pedestrians to tell them what we want them to do or how we want them to behave at these crossings and how does the proposed design of the pedestrian crossing treatments convey this message?
- f) We would like to see some three-dimensional renderings of the proposed pedestrian crossing treatments, or a video of similar pedestrian treatments that are in use at other transit properties.

15. Concern was also raised regarding the sequence of construction occurring at the crossing and how that may affect safety at the crossing. Specifically, there appears to be potential for commuter rail tracks to be constructed through the crossing prior to the active warning equipment installation for those tracks. As a result, motor vehicle drivers may be forced to stop on the new commuter rail tracks to wait for a freight train movement.

16. At the scheduled time and place, a hearing was convened regarding the application. All parties appeared and participated through counsel. Hearing Exhibits 1 through

11 were identified, offered, and admitted into evidence.<sup>1</sup> Mr. Michael Lapinski, of Fluor Enterprises, Mr. Timothy C. Johnson, of Jacobs Engineering, Mr. Vernon MacDonald, of Balfour Beatty Rail, Ms. Melissa Rosas, of Apex Design, and Mr. Jean Claude Aurel, of Parsons Brinckerhoff, testified on behalf of RTD. Mr. David Peterson testified on behalf of UPRR.

17. In accordance with § 40-6-109, C.R.S., the ALJ now transmits to the Commission the record and exhibits in this proceeding along with a written recommended decision.

## **II. FINDINGS AND CONCLUSIONS**

18. The Commission has jurisdiction in this matter under §§ 40-4-106(2)(a) and (3)(a), C.R.S.

19. The Commission gave notice to all interested parties, including the adjacent property owners. No interventions were received opposing the Application.

20. RTD and UPRR seek authority to construct two new commuter rail tracks through the intersection of the East Corridor with Chambers Road; installation of new flashing lights; installation of entrance gates for northbound and southbound traffic; installation of an exit gate for southbound traffic with a proposed exit gate and vehicle detection loops; pedestrian channelization fencing and detectable warning panels; “Another Train Coming” blank out signs in all four quadrants; pedestrian flashing lights on the northeast quadrant of the crossing; installation of new train detection circuitry equipment; installation of new crossing panels; installation of traffic signal pre-signals in lieu of the cantilever signals; and interconnection to and advanced preemption of the traffic signal at Chambers Road and Smith Road, National Inventory No. 805500Y. The plans show that there is a UPRR/RTD boundary. UPRR will be

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<sup>1</sup> Hearing Exhibit 9 was admitted as a late-filed exhibit without objection. It was filed on February 27, 2013.

responsible for maintenance of the vehicle detection loops north of this boundary and RTD will be responsible for maintenance of the vehicle detection loops south of this boundary.

21. Approval is requested that design and construction tolerances be allowed while permitting clearances associated with the RTD work elements through the crossing (other than warning devices) to change, so long as associated clearances stay within applicable clearance requirements contained in the Commission's Rules Regulating Railroads, Rail Fixed Guideways, Transportation by Rail, and Crossings, 4 CCR 723-7. If the final design includes a reduction or reductions in clearance from those outlined in the Commission's Rules, RTD would file a motion to permit the variance. Additionally, if the final design includes an improvement or improvements that were not originally applied for, or fails to include an improvement or improvements originally applied for, RTD would amend the Application to make the appropriate changes. RTD would not modify the applicable improvement or construct the additional improvement, or fail to construct any improvements before any required motion or amendment has been granted by the Commission.

22. The crossing is located in the City of Aurora. The city is not a party to this proceeding.

23. The Limon subdivision of UPRR has freight traffic only. The design speed of the UPRR main line at the crossing is 60 miles per hour (mph) for freight traffic. Timetable speed for the UPRR track is 25 mph. Currently there is an average of 18 daily train movements on the UPRR mainline. The timetable speed for the parallel siding track that crosses Chambers is 10 mph. The mainline track is nearest to the RTD track. Tr. at 211.

24. The Average Daily Traffic (ADT) count for motor vehicles at the crossing is 24,882 vehicles based on a 2011 All Traffic Data count, and the speed limit is 40 mph.

25. The five-year and ten-year projected motor vehicle ADTs through the crossing are approximately 31,900 vehicles and 34,200 vehicles, respectively. The projected 2030 ADT for motor vehicles at the crossing is 42,300 vehicles based on the 2008 Denver Regional Council of Governments' regional travel demand model.

26. The RTD East Corridor is scheduled to open for commuter rail transit (CRT) service in 2016. At that time, there will be approximately 146 CRT movements per weekday (combined for both directions) through the crossing. The anticipated CRT Crossing speed is 79 mph for the northbound track and 50 mph for the southbound track. It is not anticipated that CRT projections will change significantly in the future.

27. UPRR does not have projections for future freight traffic.

28. The crossing currently has standard entrance gates; cantilever signals; and standard front flashing lights, bells, and signs. The adjacent intersection of Chambers Road and Smith Road is currently signalized with advance preemption and there is existing sidewalk on both sides of Chambers Road.

29. At hearing, the parties explained that the crossing at issue is part of the East Corridor, which is part of the Eagle Project. The East Corridor includes two commuter rails (*i.e.*, not light rail) running parallel to an existing UPRR corridor.

30. The Eagle Project is part of RTD's FasTracks program, which consists of the East Corridor, the Gold Line, and the northwest electrified segment. The design of warnings at each crossing was reviewed and approved by the Executive Safety and Security Committee (ESSC) for the Eagle Project, which included the Assistant General Manager for Safety of RTD (although subsequent modifications have not been finally approved as addressed further below). Notably, any committee action requires unanimous consent. Tr. at 172, l. 22

31. Mr. Jean Claude Aurel, Jr. explained that the crossing was evaluated using the “MIL-STD.” *See generally* Tr. at 174. This approach defines risk in terms of severity and frequency or probability. As addressed further below, no documentation of this process was provided in evidence.

32. Modifications are proposed on both sides of the roadway, including fencing and truncated domes, in addition to the warning devices. The crossing will have roadway entrance gates for both directions and exit gates for the southbound direction of the crossing. The exit gate management system consists of proposed loop detection for each lane between entrance and exit gates, such that if a vehicle is detected, the exit gate will remain in the upright position until the vehicle passes. A pre-signal is proposed in lieu of a cantilever signal because the pre-signal heads are proposed to indicate a red indication when the railroad warning devices are illuminated. There is one pre-signal head proposed per travel lane. Both north and south of the crossing, raised medians exist. A reconstructed traffic signal at the intersection of Chambers Road and Smith Road will operate with advance preemption. The overhead cantilever flashing light signals will be removed and will be replaced with the pre-signals. Proposed Crossing warning devices include signs, gates, flashing lights, and bells.

33. The design of pedestrian treatments is the result of a consensus. The parties contend that the crossing treatment provides a reasonable, adequate warning of approach of trains and gives automobile drivers and pedestrians adequate information to proceed through the crossing.

34. Without the addition of the LED lit stop-when-flashing-sign addressed further below, the proposed mitigation measures were approved by the ESSC for the Eagle Project. Tr. at 173, ll. 11-16. Consistency across the RTD network was not a specific decision point



considered in the design of proposed treatments for the Eagle Project. Thus, this model has the potential for various crossing designs to evolve over time. Illustratively, proposed warnings at Chambers differ from that approved by the Commission on the West Corridor of RTD's system.

35. Cost apportionment is not requested. RTD will be responsible for all installation costs. UPRR is responsible for installation of UPRR signal work, subject to reimbursement by RTD. RTD is responsible for installation and costs for the roadway improvements, CRT railroad warning devices, and CRT work.

36. UPRR will continue to maintain, at its expense, all UPRR railroad track, appurtenances, and warning devices within its ultimate right-of-way with the exception of the pavement loops and the blank-out signs which will be maintained by RTD. RTD will maintain, at its expense, all RTD railroad track, appurtenances, and warning devices within its ultimate right-of-way, including all pavement loops and the blank-out signs within both the RTD and UPRR right-of-way. The City of Aurora will continue to maintain the roadway after construction is completed, including the approaches to the crossing, in accordance with applicable Commission rules.

37. RTD states that a grade separation at this location is not practicable because either raising or lowering the roadway over or under the tracks would have a detrimental effect to vehicular connectivity in the area including business and property access concerns. RTD also states that raising or lowering the tracks over or under the roadway is not practicable due to the proximity of the crossing to a proposed commuter rail station to the west and the proposed at-grade crossing to the east. In addition, the track geometry to the east involves tight curvature that could make an elevated or underground alignment cost prohibitive.

38. The existing traffic signal at Chambers Road and Smith Road will be updated to include installation of a pre-signal between the UPRR tracks and the commuter rail tracks for southbound vehicles. The traffic signal is proposed to be interconnected with the freight rail and commuter rail signals and preempted by any freight or commuter rail train using the crossing. The proposed pre-signal serves two purposes.

39. First, with four lanes of traffic on Chambers Road, a cantilever signal with flashing light signals over the two center lanes would typically be installed. A cantilever signal would be installed in this situation to ensure that every lane of traffic has flashing lights they are able to see given the possibility that vehicles in the two center lanes could have their view of the flashing light signals on the outer edges of the crossing blocked by larger or taller vehicles in the outer lanes. In this case, RTD and UPRR propose to use the pre-signal in lieu of a cantilever signal to accomplish the same task. A traffic signal head will be visible from each of the four lanes of traffic and would illuminate red prior to the activation of the highway-rail crossing signals.

40. Second, because of the lack of storage distance between the proposed tracks and the intersection, vehicles traveling southbound on Chambers Road will be required to stop for the Chambers Road/Smith Road traffic signal north of the UPRR tracks prior to entering the crossing. Since traffic signal heads controlling vehicle movements are typically located on the opposite side of the intersection, the distance between where vehicles would be required to stop and the traffic signal heads on the opposite side of the intersection is too great for drivers to clearly see what movements they are or are not allowed to make at the intersection. By installing a pre-signal before the crossing, drivers will receive the indication of whether they are allowed to proceed through the crossing and into the intersection, thereby promoting safety at both the

crossing and the intersection. The pre-signal would operate with the traffic signal at Smith Road in such a way that during normal operations, there will be a lag between when the pre-signal turns red and the traffic signal turns red. This will stop vehicles from entering into the crossing area and will allow any vehicles already within the crossing area to be cleared from the tracks before the intersection traffic signal turns red. To ensure that drivers traveling southbound are not able to see both the signal indications at the pre-signal and at the intersection traffic signal at the same time, special traffic signal heads known as programmable heads will be installed at the intersection traffic signal. These programmable heads can be installed such that the signal indications can only be seen once drivers are sufficiently close to the intersection and will not be able to be seen by drivers until after they have entered the crossing area.

41. RTD and UPRR propose to interconnect with and preempt the traffic signal at the Chambers Road/Smith Road intersection through advance preemption. Based on its calculations, RTD and UPRR propose providing a total of 70 seconds of preemption time with 37 seconds of advance preemption time to the traffic signal for the final crossing configuration and 67 seconds of preemption time with 45 seconds of advance preemption time to the traffic signal in an interim condition where just the UPRR tracks are in place. This period of time allows the traffic signal sufficient time for pedestrians to safely cross the intersection before the traffic signal enters into the track clearance phase. During the track clearance phase, the pre-signal will be red, the flashing lights will be activated, the vehicle entrance gates will be lowered, the traffic signal at the intersection will provide green indications to southbound traveling vehicles along Chambers Road to clear vehicles from the track area, and the vehicle exit gates will descend once no vehicles are detected between the vehicle entrance and exit gates. RTD and UPRR will be

required to initiate the final preemption time once the commuter rail tracks have been installed through the crossing to keep vehicles from stopping on any tracks.

42. RTD and UPRR propose to install pavement markings on all four southbound lanes of Chambers Road, on all three northbound lanes of Chambers Road south of the intersection, on both left-turn lanes for eastbound Smith Road to northbound Chambers Road, and for the exclusive right-turn lane from westbound Smith Road to northbound Chambers Road.

43. RTD and UPRR propose installing advance warning signs on northbound and southbound Chambers Road (W10-1) and eastbound and westbound Smith Road (W10-2L and R respectively). A quiet zone designation is proposed to be sought at this crossing from the Federal Railroad Administration. RTD and UPRR propose to install W10-9P “No Train Horn” signs at all of the advance warning sign locations; however, these signs would not be installed until implementation of the quiet zone. RTD and UPRR also propose installing a “Stop Here On Red” (R10-6) sign at the stop bar location north of the crossing on Chambers Road. Finally, RTD and UPRR propose to install crossbuck signs (R15-1) with the “4 Tracks” designation (R15-2P) on the flashing light and gate assemblies for the vehicle gates. It does not appear from a review of the plans that RTD and UPRR propose installation of the crossbuck and number of tracks designation assembly on the proposed pedestrian flashing light assembly to be installed for pedestrian use on the northeast quadrant of the crossing. RTD and UPRR will be required to install the crossbuck and number of tracks designation on this pedestrian flashing light assembly.

44. RTD and UPRR propose to install “Pedestrian Stop Here When Flashing” (R8-10a special) signs at the four pedestrian entrances to the crossing and at four locations between the commuter rail tracks and the freight tracks. The four signs installed between the

commuter rail tracks and the pedestrian tracks are proposed to include LED flashing lights that would be activated when the crossing warning devices are activated.

45. In Decision No. C13-0318, Docket No. 13A-0054R issued March 14, 2013, the Commission expressed concern that pedestrian signage being proposed along various corridors on the RTD system was not consistent, and required RTD to work with Staff and affected roadway jurisdictional agencies to develop consistent signing to be used across all jurisdictions. Once such signing plans are developed, RTD and UPRR will be required to update its signing plan in this matter for the pedestrian facilities, or in the alternative, to file a letter stating that the signage in the application is the signage that was determined to be appropriate for the pedestrian crossing treatments ordered in this application. Additional approval of the signing will not be required.

46. RTD and UPRR estimate the cost of the proposed roadway, crossing, crossing signals, and traffic signal at \$2,274,324 with the RTD FasTracks program responsible for all costs.

47. In referring this matter, the Commission specifically sought additional information regarding proposed pedestrian treatments at the crossing.

48. Hearing Exhibit 10 comprises the complete application for which approval is sought. Exhibit B to Hearing Exhibit 10 shows the proposed crossing conditions. However, to the extent of any conflict, page 23 of Hearing Exhibit 4 shall prevail. Further, to the extent that Exhibit F-1 conflicts with Hearing Exhibit 11, Hearing Exhibit 11 shall prevail.

49. The crossing is generally located in a light industrial area and is not heavily used by pedestrians. Proposed improvements were designed based upon a minimum two-hour peak pedestrian count of 10 pedestrians per hour currently and 20 pedestrians per hour in 2035. The

crossing is quite some distance from nearby stations. The nearest station to the west is more than a mile away. The nearest to the east is at 40th and Airport, actually north of I-70. Ms. Rosas testified that this is considered a low-use pedestrian crossing and that this characterization was vetted with the City of Aurora. Tr. at 148.

50. The crossing at issue being distant from a stop in either direction, trains will more likely than not be operating among higher than normal operating speeds.

51. Minimum advance warning time for an approaching train at the crossing will be 34 seconds. Using the standard of the Manual on Uniform Traffic Control Devices (MUTCD), a pedestrian pace is assumed to be 3.5 feet per second. Thus, it will take approximately 46 seconds for a pedestrian to cross. Tr. at 213. There is not sufficient time for a pedestrian to walk across the entire crossing before gates would reach the down position. Thus, public safety of pedestrians at the crossing relies upon the safety of pedestrians in the refuge area.

52. Clearance time will be determined by application of the AREMA standard, 35 feet plus an additional second for every 10 feet beyond 35 feet, applied to the final as-built design. Tr. at 207.

53. Much of the testimony addressed a “refuge area” for pedestrians focused upon by the ALJ. Where the commuter rail is more than 37 feet from UPRR’s rail, there is a sidewalk area between the tracks for pedestrians to wait for a train to clear when the crossing is being occupied. At Chambers, the refuge area between the detectible warning panels (also referenced as truncated domes) is approximately 23 feet. It is depicted on Exhibit B to Hearing Exhibit 10 between the detectible warning panels on each side of Chambers Road. Planned phases of construction are shown in Hearing Exhibit 7.

54. Hearing Exhibit 8 identifies standards and guidelines consulted in planning the design of the proposed crossing warnings. Design of pedestrian treatments substantially considered the Transit Cooperative Research Program Report 69 (TCRP 69), Hearing Exhibit 9, and the California Public Utilities Commission (California PUC) guidelines. *See* Hearing Exhibit 8.

55. The design committee developed the decision tree for the Eagle Project to provide a consistent basis for design across the project. Mr. Lapinski testified that “[o]ur recommendations are not only based upon a guidance, but it's also based upon actual field conditions, and the work that we did on our field diagnostic trips, as well as working with the local jurisdictions on coming up with our recommended treatments.” Tr. at 52, ll. 1-6; *see also* Hearing Exhibit 1.

56. Hearing Exhibit 2 is a supplemental guidance document, developed by the design team, which supplements the recommendations of Exhibit 1. Hearing Exhibit 2 introduced inclusion of the perimeter LED flashing lights on the stop-here-when-flashing sign located within the refuge area of the crossing. Tr. at 55.

57. It is noteworthy that the TCRP 69 decision points modified do not affect the outcome of the decision tree analysis for Chambers. Hearing Exhibit 3 is the application of Hearing Exhibit 2 to the Chambers crossing. Tr. at 60.

58. In addition to specific matters identified by the Commission, the undersigned addressed two related concerns during hearing. First, is RTD providing a clear consistent message to pedestrians at the crossing? Second, will pedestrians in fact feel safe in the refuge area?

59. As to the second issue, Ms. Rosas best described the concern as to pedestrians where she discussed the concept of driver discomfort during her discussion of train separation. While a driver may in fact be in a safe position, driver discomfort may lead to bad behavior in the future if they do not feel they are safe. The ALJ is concerned that if pedestrians do not feel safe in the refuge area, even though they may in fact be safe, this feeling may lead to the bad behaviors studied in TCRP 69. For example, they may dart in front of a train the next time – a problem specifically identified at LRT crossings in TCRP 69 without regard to discomfort.

60. TCRP 69 is the foundation for all opinions expressed regarding pedestrian treatments at the crossing. Tr. at 48 and Hearing Exhibit 9. That report studied light rail transit vehicles operating in semi-exclusive rights-of-way at speeds greater than 35 mph. Hearing Exhibit 9 at 1.

61. The report concludes that the “guidelines represent good design, operations, and maintenance practices for all LRT crossings where LRVs operate at speeds greater than 55 km/h (35 mph).” Chapter 3 of the study presents proposed pedestrian warrants for various crossing warning and control devices.

62. The design team also looked at guidelines developed by the California PUC. Tr. at 48. *See also* Hearing Exhibit 8. This report addresses rail/traffic interfaces, with pedestrians as well as vehicles, including light, commuter, and heavy rail.

63. Comparable to TCRP 69, Appendix B to the California guidelines provides a decision tree. Hearing Exhibit 8 at 144. Applying the decision tree to the Chambers crossing, active warning devices and barrier channelization is recommended.

64. The most common problems at higher speed LRT crossings studied are summarized in Table 2-15. Hearing Exhibit 9 at 56. Of particular concern to refuge areas, the



study specifically finds that crossing users become confused when between faster moving LRVs and slower moving railroad trains. Pedestrians darting across tracks, ignoring warning signs, walking around lowered gate arms, and pedestrian trespass are all identified as problems.

65. Mr. Lapinski attempted to address questions regarding applicability to commuter rail trains of a light rail train study. Tr. at 49, ll. 25 through 50. Because the report categorized “high speed” as being light rail at 35 mph or greater, the proponents classified the Eagle Project, commuter rail designed for up to 79 mph, as high-speed. Thus, the design team considered recommendations for a high-speed light rail interface with vehicles and pedestrians. *Id.*

66. No basis was shown for the assumption or conclusion regarding how findings apply to the circumstances of the Eagle Project. Light Rail Vehicles typically operate at speeds from 15 to 65 mph. Hearing Exhibit 9 at 10. The maximum allowed speed for RTD’s commuter rail vehicles will be 79 mph – more than twice the studied speed and more than 20 percent faster than the capability of the vehicles studied in TCRP 69.

67. Accidents at higher LRV speeds are more severe. Hearing Exhibit 9 at 63. It is also noteworthy that LRVs are nearly silent at higher speeds. Hearing Exhibit 9 at 96. No explanation was provided to support a conclusion that even higher speeds for commuter rail would not affect the identified concerns regarding LRT crossings.

68. Mr. Aurel was questioned regarding the adaptation of the decision tree in TCRP 69 to that in Hearing Exhibit 3. When asked whether he had any concern in relying on the report to consider a train traveling 70 mph rather than 35 mph, he responded that the decision tree was modified for the Eagle Project. He opined that the decision tree was acceptable for mitigating and reducing the hazards for trains traveling at 79 mph rather than 35 mph. Tr. at 188-189.

69. Three working groups were tasked to develop mitigation measures to address hazards identified during the hazard analysis conducted. No detail was provided regarding this analysis and the analysis was not included in evidence. Tr. at 182. Three categories of crossings were identified: those in the immediate area of a school, those having a high volume of pedestrians, and those not having a high volume of pedestrians. *See generally* Tr. at 166-167.

70. The Chambers crossing fell in the category of not having a high volume of pedestrians. The three potential hazards concerning pedestrians were pedestrian inattention, warning device failure, and conflicting pedestrian signals. Mitigation measures adopted were adequate signage, regulatory enforcement, and integration of pedestrian warnings with rail signalization. *See generally* Tr. at 167-169. Pedestrian channelization was also adopted. At the time of hearing, the final crossing as presented had not yet been approved by the ESSC – one of the three working groups. *See generally* Tr. at 171, ll. 22-24.

71. TCRP 69 describes manual swing gates:

A manual swing gate is a gravity-operated gate that must be pulled toward an approaching pedestrian in order to enter the trackway area. Manual swing gates, which require a positive action by a pedestrian to enter the crossing, have been effective at forcing awareness of the trackway and the possible presence of an approaching LRT. When used in conjunction with active visual and audio warning devices such as flashing light signals and bells or the LRV-activated LRT warning sign, manual swing gates can be considered functionally equivalent to automatic pedestrian gates. In fact, because swing gates are usually installed in conjunction with a barrier channelization device, the overall degree of control over pedestrian movements may exceed that provided with pedestrian automatic

gates, because pedestrians cannot avoid using the manual swing gates .... Table 3-4 summarizes the recommended uses of positive control devices, where such devices are required.

**TABLE 3-4 Use of Positive Control Devices at Pedestrian Crossings**

Location	Typical Device
Unchannelized	Pedestrian Automatic Gate
Channelized	Swing Gate with Active Visual and Audio Warning Devices

Hearing Exhibit 9 at 106-107.

72. On 9 of the 11 systems considered in TCRP 69, gates are at least planned for pedestrian control. Hearing Exhibit 9 at 99. The guideline for swing gates provides:

Swing gates: manual. Where there is a defined pedestrian pathway (e.g., at a station location or sidewalk), swing gates should be used to alert pedestrians to the LRT tracks by forcing them to pause before crossing, thereby deterring them from walking or running freely across the tracks without unduly restricting their exit from the track area. Swing gates require pedestrians to pull a gate to enter the crossing and to push a gate to exit the protected track area; therefore, pedestrians cannot physically cross the tracks without pulling open the gate. The gates should be designed to return to the closed position after pedestrians have passed.... Generally, swing gates should be used at locations where pedestrians are likely to dart across the LRT tracks without looking both ways. The Los Angeles LRT system effectively uses swing gates in conjunction with active warning devices (e.g., flashing light signals and bell). If active warning devices are not provided at the crossing, sight distance must be adequate for a pedestrian to have just entered the crossing, see an approaching LRV, and pass to a refuge area (usually the other side of the tracks) before the LRV arrives at the crossing. Typical locations for swing gates include crossings in LRT stations where pedestrians may forget about LRVs because they just alighted from one and in or near transit system transfer stations where pedestrians may rush to board another mode of transportation. Besides forcing pedestrians to take a physical action before they enter the track area, swing gates provide a positive barrier: if pedestrians are on the other side of the gates when an LRV approaches, they will know without doubt that they are clear of the tracks and will not get hit. Swing gates provide an extra level of comfort for pedestrians at higher speed LRT crossings. In fact, a survey of pedestrians using swing gates at the Imperial/Wilmington station on the Los Angeles LRT system (the Long Beach Metro Blue Line) indicates that more than three-fourths (77 percent) of those interviewed believe the pedestrian crossings are safer with the gates and almost all (90 percent) thought swing gates

should be installed at all Metro Blue Line stations where pedestrians cross the tracks.

73. The report additionally provides a guideline regarding use of pedestrian tactile warning strips, which are included in the proposed design. Hearing Exhibit 9 at 102.

74. Recommended practices are summarized in section 3.8.3, which includes the decision tree. The proposed design of crossing improvements meets application of the decision tree in Hearing Exhibit 9 at 108, as modified by for the Eagle Project at Hearing Exhibit 3. However, the TCRP 69 study does not reconcile the recommended practices decision tree to the guidelines that conflict with the decision tree. Also, there is no indication that a refuge area similar to the case at bar, or any complications with regard thereto, was considered in the study.

75. Mr. Lapinski opines that “if the tracks are more than 37 feet apart, then there is an available refuge area between the tracks.” Tr. at 20, ll. 22-23.

76. Ms. Rosas opines that five feet between the truncated domes would be adequate for a refuge area at Chambers based upon consideration of the entire crossing area. Tr. at 145. She believes that adequate messaging informs pedestrians that it is a safe area if the lights are flashing. Tr. at 145.

77. Mr. Aurel was not familiar with Ms. Rosas’ concept of driver discomfort and could not relate the concept to hypothetical scenarios exploring his expertise where an individual was safe without question, yet might not feel safe in fact. However, as to the proposed improvements to the Chambers crossing, Mr. Aurel opines that a pedestrian would feel safe standing in the refuge area between a freight train occupying the crossing at maximum permitted speed and a commuter rail train is also occupying the crossing at maximum permitted speed. Tr. at 181.

78. Mr. Peterson also contends that approximately 37 feet provides an adequate refuge area. Tr. at 197. He believes that the proposed improvements will prevent accidents and promote safety of the public at the crossing. Tr. at 209.

79. The parties propose partial channelization of the crossing at the entry points, but not at the refuge sidewalk area within the crossing.

80. Mr. Lapinski could not point to recommended treatment of refuge areas in TCRP 69 or the California PUC guidelines. Mr. Johnson has no prior experience with refuge areas. Tr. at 100. Mr. Aurel has not been involved in the design and construction of a refuge area. Tr. at 178, ll. 14-15.<sup>2</sup> Mr. Peterson only has prior experience with personal use of refuge areas for pedestrians crossing boulevards. Despite testimony of several experts addressing various aspects of the crossing improvements, no one had prior experience designing pedestrian treatments at railroad crossings including a refuge area or pointed to any determinative authority on the subject.

81. TCRP 69 discusses the dynamic envelope of an LRV as “the clearance on either side of a moving LRV that precludes any contact from taking place as a result of any condition of design wear, loading, or anticipated failure, such as air-spring deflation or normal vehicle lateral motion.” Hearing Exhibit 9 at 106, note 53. The report states that a “safe pedestrian refuge area” exists in the five feet where a pedestrian might get trapped between a pedestrian automatic gate arm and the dynamic envelope. *See also* Hearing Exhibit 9 at 99.

82. Pedestrian refuge areas are referenced in addressing median islands: the “Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) [U.S. Department of

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<sup>2</sup> He worked with a rail system in Houston utilizing a pedestrian refuge area in an area where trains of the same type were separated by a refuge area and likely operated at around 40 mph. Tr. at 179. In that system, he opined that refuge areas might have been about eight feet. That system was not referenced in TCRP 69.

Transportation, Federal Highway Administration, Washington, D.C. (1988), Section 5B-2], raised median islands should be no less than 1.2 m (4 ft) wide.” Hearing Exhibit 9 at 64, note 7. Notably, the area described is between motor vehicle traffic not crossing two railroad tracks within a crossing.

83. Mr. Aurel’s testimony regarding analogies of pedestrians in the refuge area to driver discomfort was troubling. However, he unequivocally reiterated, without any apparent consideration of the inquiry, that the design is safe. Though recognized as an expert, his opinion on the point was largely expressed and qualified based upon his personal opinion. Because the refuge area was outside the dynamic envelope, he said he would feel safe.

84. The MUTCD, 2009 Edition, addresses pedestrian crossings at LRT grade crossings at Section 8C.13. The guidance provides: “Where LRT tracks are immediately adjacent to other tracks or a road, pedestrian signalization should be designed to avoid having pedestrians wait between sets of tracks or between the tracks and the road. If adequate space exists for a pedestrian refuge and is justified based on engineering judgment, additional pedestrian signal heads, signing, and detectors should be installed (see Section 4E.08).” Hearing Exhibit 8 at 41.

85. “Flashing-light signals (see Figure BC-4) with a Crossbuck (R15-J) sign and an audible device should be installed at pedestrian and bicycle crossings where ... LRT speeds exceed 35 mph.” Hearing Exhibit 8 at 41. “If an engineering study shows that flashing-light signals with a Crossbuck sign and an audible device would not provide sufficient notice of an approaching LRT traffic, the LOOK (R15-8) sign (see Figure BC-4) and/or pedestrian gates should be considered (see Figures BC-5 through BC-7).” *Id.*

86. Turning to the referenced California material, the May 2008 report describes design principles addressing existing conditions utilized in California. This report points out considerations regarding pedestrian source generators and destinations as a primary consideration. “Higher train speeds, greater train volumes, heavier types of trains, and multiple tracks tend to increase the hazard to crossing users.” Hearing Exhibit 8 at 105. Specific factors to be considered include higher speeds, train frequency, switching, stopping distance, stations, and multiple tracks.

87. Regarding higher speeds, it is specifically noted that pedestrians have difficulty discerning the actual speed of trains approaching a crossing at a high speed. Regarding frequency, it is noted that the exposure factor increases. Stopping distance of a light rail vehicle traveling at 35 mph needs approximately 300 feet to stop. A typical freight train at 55 mph requires more than a mile to fully stop. “These numbers are provided only to show order of magnitude, and they may vary significantly depending on the weight, speed, and other factors.” Hearing Exhibit 8 at 105. There is no evidence of record as to the stopping distance of a commuter rail train traveling at 79 mph. Finally, pedestrians may not expect trains to approach on different tracks. *Id.*

88. The undersigned is also concerned, based upon TCRP 69, as to the fact that trains operating on the two tracks will operate at significantly different speeds.

89. The approach and rationale of TCRP 69 is that swing gates provide a higher level of safety than not having them. Mr. Lapinski was asked about the swing gates that were installed on RTD’s West Corridor. He explained that they were discussed by the Executive Safety and Security Committee and “we took that guidance into consideration when developing our guidelines for the Eagle Project.” Tr. at 67, ll. 9-11.

90. In follow up questioning, Mr. Lapinski explained that the supplement to the decision tree adopts usage of manual swing gates, but they were “not included in our visual decision tree.” Tr. at 81, ll. 1-3.

91. Mr. Lapinski views manual gates to be the same as automatic gates in applying the decision tree in Exhibit 3 because they both provide a physical barrier across the sidewalk. TCRP 69 provides different guidelines for installation. *See* Hearing Exhibit 9 at 106-107.

92. “An entry/exit swing gate is placed across the pedestrian pathway. It is intended to slow pedestrians by encouraging them to stop, look down the tracks for approaching trains, and then pull the swing gate open prior to entering the track area.” Hearing Exhibit 8 at 112.

93. The parties propose installation of an LED perimeter-lighted sign near the truncated domes in the refuge area, which will be activated when the post flashers and bells are activated. When activated, the LEDs will flash. The sign provides regulatory guidance to pedestrians to “stop here when flashing.” *See* page 17 of Hearing Exhibit 4 and Tr. at 21. This specific signage is not addressed in the decision tree, nor is the decision tree shown to address considerations unique to refuge areas. Mr. Peterson has not seen a sign installed like the flashing LED pedestrian sign discussed. Tr. at 218.

94. The proposed LED signage will cost \$25,500 for installation and \$1,300 per year to maintain. This is more than the cost of installing manual swing gates, which would provide a consistent message to pedestrians similar to the West Corridor on RTD’s system. *See* Hearing Exhibit 6.

95. Ms. Rosas first acknowledged that red signage typically indicates stop to people. Tr. at 152. A white regulatory MUTCD sign is proposed because it has a pedestrian symbol.



Because a regulatory message is being sent, regulatory black letters on a white sign is appropriate. Tr. at 152.

96. Putting the sign in the refuge area, those considering the design considered whether the message was clear as to what was flashing. There being nothing specifically flashing at the refuge area, lighting the sign was considered. Tr. at 153.

97. Extensive testimony was offered regarding other active warning devices included in the proposed crossing improvements. The Denver Transit Partners team contends that, based upon sight characteristics and anticipated pedestrian volumes, the illuminated LED sign at the Chambers crossing is “sufficient warning and guidance to the pedestrians.” Tr. 81.

98. Mr. Lapinski acknowledged that a manual gate would be a more effective warning device than the flashing LED sign because it forces the pedestrian to a specific action before moving forward. Tr. at 82, ll. 4-10. However, he contends the other proposed active warning devices provide sufficient treatment. Tr. at 82, ll. 11-15.

99. Swing gates are a feasible treatment option for the East Corridor. Hearing Exhibit 2 at 2.

100. Hearing Exhibit 6 is an itemized estimate of the initial capital costs and the maintenance costs over the 29-year concession period for providing typical at-grade pedestrian treatments.

101. Mr. Lapinski testified that the Denver Transit Partners would treat all pedestrian access points to the crossing the same. This is a preference to provide a consistent message to pedestrians. Tr. at 95. Thus, if a swing gate were required at the refuge area, they would add them to all approaches, including internal approaches out of the refuge areas (*i.e.*, eight gates total). Tr. at 94.

102. If installation of manual swing gates is required, the design of the southern approaches to the crossing would be modified to allow an ADA compliant ramp or flat spot to be added into the design of this crossing to accommodate wheelchair traffic. Tr. at 92.

103. While all parties support approval of the proposed modifications, it is noteworthy that the ESSC supported approved improvements without addressing the later-proposed LED sign. RTD necessarily also supported this outcome as the measure could not have been adopted without their support. Although the LED lighted sign is of interest, it has not been proven in this context. There was some concern expressed, though overcome, regarding its implementation. The undersigned is also concerned that the flashing LED lights conflict with the purpose of sign R8-10a(Special) because Section 8B.11 makes clear the flashing lights reference the alternating red flashing light signals described in Section 8C.02 of the MUTCD (i.e. not edge-lit LEDs).

104. Installation of manual swing gates provides a heightened level of protection according to authorities referenced by the parties in the development of Hearing Exhibit 3. The Commission must be cognizant of the cost of warning devices implemented when fulfilling its statutory charge of preventing accidents and promoting public safety. However, the undersigned is convinced that the cost to implement acknowledged higher protections of manual swing gates is less, or in any event not materially more, than the LED lit signage proposed. The refuge area at Chambers also raises unique concerns for the safety of pedestrians in the refuge area between the commuter rail tracks and the freight rail tracks that will better be addressed by installation of the physical barrier. Installation of manual swing gates will be required in lieu of LED lighting of the proposed MUTCD R8-10a(Special) signs.

105. This modification also considers noteworthy advice of TCRP 69 regarding signage generally: “[c]onservative use of regulatory and warning signs is recommended because, if used to excess, they lose their effectiveness.” Hearing Exhibit 9 at 70.

106. RTD proposes to start construction upon approval of the Application and have construction completed within three years. RTD will be required to inform the Commission in writing that all of the roadway, track, signal, and traffic signal work are complete and operational within ten days of completion. The Commission will expect this letter no later than May 15, 2016. However, the Commission does understand this letter may be provided earlier or later than this date depending on changes or delays to the construction schedule. RTD and UPRR will also be required to update the crossing inventory form showing the changes made at the crossing, and to file a copy of that updated crossing inventory form in this docket by May 15, 2016.

107. Pursuant to Commission Rules 4 CCR 723-7-7211(c), 723-7-7211(a), and 723-7-7301(a), the City of Aurora shall be required to maintain the approaches to the crossing surface up to the outside end of the ties, and advance warning signage and striping for the crossing on its roadway and sidewalks, and traffic signal at its expense; UPRR shall be required to maintain its crossing surfaces, track, ties, appurtenances, and warning devices within its ultimate right-of-way with the exception of the pavement detection loops and the “Another Train Coming” blank out signs at its expense; and RTD shall be required to maintain its crossing surfaces, track, ties, appurtenances, warning devices within its ultimate right-of-way, all pavement detection loops and all “Another Train Coming” blank out signs at the crossing at its expense.

**A. Conclusions**

108. Based on the Findings of Fact, the Application is granted with modifications consistent with the discussion above and RTD is required to make an additional filing consistent with the discussion above.

109. RTD's proposed special application procedure will be allowed. RTD will be required to file a copy of the final plans for the crossing once construction is complete so the Commission has an accurate record showing what was constructed at the crossing. The Commission will expect those final plans to be filed at the end of construction by May 15, 2016.

**III. ORDER****A. The Commission Orders That:**

1. The application filed by the Regional Transportation District (RTD) and the Union Pacific Railroad Company (UPRR) on October 31, 2012, requesting authority to construct two new commuter rail tracks through the intersection of the East Corridor with Chambers Road; installation of new flashing lights; installation of entrance gates for northbound and southbound traffic; installation of an exit gate for southbound traffic with a proposed exit gate vehicle detection loops; pedestrian channelization fencing and detectable warning panels; "Another Train Coming" blank out signs in all four quadrants; pedestrian flashing lights on the northeast quadrant of the crossing; installation of new train detection circuitry equipment; installation of new crossing panels; installation of traffic signal pre-signals in lieu of the cantilever signals; and interconnection to and advanced preemption of the traffic signal at Chambers Road and Smith Road, National Inventory No. 805500Y in the City of Aurora, County of Adams, State of Colorado is granted as modified in the above discussion.

2. The special application procedure proposed by the Joint Applicants is approved.

3. The Joint Applicants are authorized and ordered to proceed with construction of two new commuter rail tracks through the intersection of the East Corridor with Chambers Road; installation of new flashing lights; installation of entrance gates for northbound and southbound traffic; installation of an exit gate for southbound traffic with a proposed exit gate and vehicle detection loops; pedestrian channelization fencing and detectable warning panels; “Another Train Coming” blank out signs in all four quadrants; pedestrian flashing lights on the northeast quadrant of the crossing; installation of new train detection circuitry equipment; installation of new crossing panels; installation of traffic signal pre-signals in lieu of the cantilever signals; and interconnection to and advanced preemption of the traffic signal at Chambers Road and Smith Road. Pedestrian treatments shall consist of pedestrian channelization, pedestrian swing gates, detectable warning strips at the locations of the sidewalks entering the crossing, and at the locations on the sidewalks within the crossing defining the pedestrian refuge areas, and appropriate static signs directing pedestrians as will be determined by RTD and filed in this docket without the requirement for additional approval.

4. The City of Aurora shall maintain its roadway approaches up to the end of tie, pavement markings, and advance warning signs at the new crossing location and traffic signal at its expense in accordance with Rule 4 *Code of Colorado Regulations (CCR) 723-7-7211(c)*, Rules Regulating Railroads, Rail Fixed Guideways, Transportation by Rail, and Rail Crossings.

5. UPRR is required to maintain its crossing surfaces track, ties, appurtenances, and warning devices within its ultimate right-of-way with the exception of the pavement detection loops and the “Another Train Coming” blank out signs at its expense pursuant to Rule 4 CCR 723-7-7211(a).

6. RTD is required to maintain the crossing surfaces, its crossing surfaces, track, ties, appurtenances, warning devices within its ultimate right-of-way, including all pavement loops, and all “Another Train Coming” blank out signs within both the RTD and UPRR right-of-way at the crossing at its expense pursuant to Rule 4 CCR 723-7-7211(a).

7. RTD and UPRR shall provide 70 seconds of preemption time with 37 seconds of advance preemption time to the traffic signal for the final crossing configuration and 67 seconds of preemption time with 45 seconds of advance preemption time to the traffic signal controller during the interim condition for the intersection of Chambers Road and Smith Road. The final preemption timings shall be in place once the commuter rail tracks have been constructed through the crossing.

8. RTD and UPRR shall install the R15-1 and R15-2P crossbuck and number of tracks designation on the northeast quadrant flashing light assembly.

9. RTD and UPRR are required to inform the Commission in writing that the crossing changes are complete and operational within ten days after completion. We shall expect this letter by May 15, 2016. However, we understand this letter may be provided earlier or later than this date depending on changes or delays to the construction schedule.

10. RTD and UPRR shall be required to update the crossing inventory form showing the changes made at the crossing and to file a copy of the new crossing inventory form in this docket by the end of construction on May 15, 2016.

11. RTD shall file a complete set of plans for the constructed crossing by May 15, 2016.

12. The Commission retains jurisdiction to enter further orders as necessary.

13. This Recommended Decision shall be effective on the day it becomes the Decision of the Commission, if that is the case, and is entered as of the date above.

14. As provided by § 40-6-109, C.R.S., copies of this Recommended Decision shall be served upon the parties, who may file exceptions to it.

a) If no exceptions are filed within 20 days after service or within any extended period of time authorized, or unless the decision is stayed by the Commission upon its own motion, the recommended decision shall become the decision of the Commission and subject to the provisions of § 40-6-114, C.R.S.

b) If a party seeks to amend, modify, annul, or reverse basic findings of fact in its exceptions, that party must request and pay for a transcript to be filed, or the parties may stipulate to portions of the transcript according to the procedure stated in § 40-6-113, C.R.S. If no transcript or stipulation is filed, the Commission is bound by the facts set out by the administrative law judge and the parties cannot challenge these facts. This will limit what the Commission can review if exceptions are filed.

15. If exceptions to this Decision are filed, they shall not exceed 30 pages in length, unless the Commission for good cause shown permits this limit to be exceeded.

(S E A L)



THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF COLORADO

G. HARRIS ADAMS

\_\_\_\_\_  
Administrative Law Judge

ATTEST: A TRUE COPY

A handwritten signature in cursive script that reads "Doug Dean".

Doug Dean,  
Director