

Decision No. R11-0550

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

DOCKET NO. 10A-736R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND CARR STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-737R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND TELLER STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-738R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND INDEPENDENCE STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-739R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND HARLAN STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-740R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND PIERCE STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-741R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND ESTES STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-742R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND GARRISON STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-743R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND PERRY STREET IN THE CITY AND COUNTY OF DENVER, STATE OF COLORADO.

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DOCKET NO. 10A-744R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND OAK STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-745R

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IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND LAMAR STREET IN THE CITY OF LAKEWOOD, COUNTY OF JEFFERSON, STATE OF COLORADO.

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DOCKET NO. 10A-746R

IN THE MATTER OF THE APPLICATION OF THE REGIONAL TRANSPORTATION DISTRICT FOR AUTHORITY TO CONSTRUCT AND OPERATE AN ALTERED AT-GRADE CROSSING AT RTD'S WEST CORRIDOR AND KNOX COURT IN THE CITY AND COUNTY OF DENVER, STATE OF COLORADO.

**RECOMMENDED DECISION OF  
ADMINISTRATIVE LAW JUDGE  
KEITH J. KIRCHUBEL  
GRANTING AUTHORITY TO CONSTRUCT AND  
OPERATE AT-GRADE CROSSINGS WITH CONDITIONS;  
AND CLOSING CONSOLIDATED DOCKETS**

Mailed Date: May 20, 2011

Appearances:

Roger Kane, Esq., Denver, Colorado, on behalf of Applicant  
Regional Transportation District,

Truel West, Lakewood, Colorado, on behalf of Intervenor  
1283 Lamar and East-West Holdings, LLLP.

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# **I. STATEMENT**

1. This consolidated proceeding was initiated by the Regional Transportation District (RTD) on October 15, 2010, with the filing of 11 applications for Commission authority to alter at-grade crossings on RTD’s West Corridor Light Rail Project (West Corridor Project) in

the City of Lakewood and the City and County of Denver, and operate those same crossings without audible warnings. As each of the subject crossings already exists, the issue presented is what devices, configurations, and operational procedures are necessary to ensure that the safety of the public is appropriately safeguarded at these locations.

2. On October 26, 2010, the Commission provided public notice of the applications by publishing a summary of the same in its Notice of Applications Filed. The Notice described the scope of the primary application as follows:

For authority to construct and operate an altered At-Grade Crossing at RTD's West Corridor and Carr Street in the City of Lakewood[.]<sup>1</sup>

3. On October 27, 2010, Ms. Pamela Fischhaber, Chief of the Commission's Rail and Transit Safety Section advised RTD of deficiencies regarding the timing of exit gates in the applications and requested clarification regarding the specification of certain visible warning equipment at the subject crossings. In addition, Ms. Fischhaber posed questions regarding the proposed operation of the subject crossings.

4. On November 2, 2010, RTD filed amended applications addressing the deficiencies.

5. On November 4, 2010, the Commission re-noticed the proceeding in language identical to that quoted from the original Notice, above.

6. On December 1, 2010, Intervenor 1283 Lamar, LLC (1283 Lamar) timely filed a Petition to Intervene as of Right in Docket No. 10A-745R (Lamar Street). Intervenor 1283 Lamar owns property at the intersection of Lamar Street and 13th Avenue in Lakewood, adjacent to the proposed crossing at that location.

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<sup>1</sup> A similar Notice was generated for each of the 11 applications consolidated in this Docket.

7. On December 3, 2010, Intervenor East-West Holdings, LLLP (East-West) timely filed a Petition to Intervene as of Right in Docket No. 10A-745R (Lamar Street). East-West owns property near the intersection of Lamar Street and 13th Avenue in Lakewood, close to the proposed crossing at that location.

8. On November 26, 2010, and December 6, 2010, the Commission filed public comments in the Docket that had been submitted by various entities and individuals regarding the subject applications. With one exception, the public comments were submitted to the Commission's internet website.

9. On December 7, 2010, RTD filed an amendment to the applications setting forth its Exit Gate Clearance Time Calculations.

10. On December 30, 2010, by Decision No. C10-1387, the Commission deemed the application complete and referred it to the undersigned Administrative Law Judge (ALJ) for disposition. In addition, the Commission ordered the 11 applications consolidated for resolution under Docket No. 10A-736R.

11. In Decision No. R11-0059-I, issued on January 18, 2011, the ALJ scheduled a technical conference where the details of the proposed equipment, configuration, and operation of the subject crossings could be discussed and clarified by the parties, Commission Advisory Staff, and the ALJ. The technical conference was convened on February 1, 2011.

12. RTD requested time to review and respond to information presented by Advisory Staff at the February 1, 2011 technical conference. Accordingly, a further technical conference was convened on February 17, 2011.

13. Also on February 17, 2011, a public comment session was convened pursuant to Decision No. R11-0120-I, issued on February 2, 2011. Notice of the public comment session

was also advertised in the local print media. The session was attended by approximately 65 people and the ALJ received the comments of 13 persons representing the interests of various entities<sup>2</sup> or their own personal interests.

14. Following the public comment session, on February 18, 2011, RTD filed a motion to continue the evidentiary hearing that had been scheduled for February 22, 2011. In the motion, RTD represented that it was requesting the continuance to permit time to respond to the information received at the public comment session. The motion was unopposed.

15. Pursuant to Decision No. R11-0197-I, issued on February 23, 2011, the ALJ granted the continuance requested by RTD. The evidentiary hearing was rescheduled to April 8, 2011.

16. At the hearing convened on April 8, 2011, the ALJ received the testimony of nine witnesses. Applicant presented the testimony of Jim Starling, P.E.,<sup>3</sup> Paul Von Fay, P.E.,<sup>4</sup> Claudia Folska,<sup>5</sup> Brenda Tierney,<sup>6</sup> Paul Ditson,<sup>7</sup> Robert Matthews,<sup>8</sup> David Baskett, P.E.,<sup>9</sup> and John Shonsey, P.E.<sup>10</sup> Intervenor 1283 Lamar and East-West, presented the testimony of Truel West.<sup>11</sup> Hearing Exhibits A through O were offered and admitted into evidence. In addition, the ALJ took administrative notice of the contents of the 11 applications and the

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<sup>2</sup> Including the City of Lakewood, Jefferson County School District, Eiber Neighborhood Association, Two Creeks Neighborhood Association, Colorado Center for the Blind, and National Federation of the Blind.

<sup>3</sup> Mr. Starling is the RTD West Corridor Project Manager.

<sup>4</sup> Mr. Von Fay is a Design Manager for RTD who has worked on the West Corridor Project.

<sup>5</sup> Ms. Folska is a dual-doctoral candidate at the University of Colorado (Denver and Boulder) researching the ways in which people without sight navigate the built environment. Ms. Folska is also legally blind.

<sup>6</sup> Ms. Tierney is employed by RTD as an Information Coordinator for the West Corridor Project.

<sup>7</sup> Mr. Ditson is a resident of Lakewood and President of the Eiber Neighborhood Association.

<sup>8</sup> Mr. Matthews is a consultant to RTD qualified as an expert witness in the areas of signal system design and at-grade crossing safety.

<sup>9</sup> Mr. Baskett is the Traffic Engineer for the City of Lakewood.

<sup>10</sup> Mr. Shonsey is the Senior Manager of Engineering and Chief Engineer for RTD.

<sup>11</sup> Mr. West is a partner in East-West Holdings, LLLP, and Manager of apartment residences at 1283 Lamar Street, 1183 Lamar Street, and 1203 Lamar Street.

attachments thereto. At the conclusion of the evidentiary hearing, RTD made a closing statement.<sup>12</sup>

17. The ALJ held the record open at the conclusion of the hearing to permit the ALJ and Advisory Staff to attend a demonstration of an audible pedestrian warning system that was described for the first time in the course of the hearing. The ALJ described the details of the demonstration and asked counsel for RTD to coordinate the logistics and scheduling of the demonstration to take place at one of the proposed crossings.

18. On April 19, 2011, the ALJ attended a demonstration of an audible pedestrian warning system in Lakewood at the proposed crossing at 13th Avenue and Teller Street.

19. In addition, the ALJ took administrative notice of the fact that the crossing at 13th Avenue and Independence Street in Lakewood lies within a school speed zone for auto traffic. The speed limit during school hours is 20 miles per hour (mph) in this zone.

20. At the conclusion of the demonstration on April 19, 2011, the ALJ closed the evidentiary record in this Docket. In accordance with, and pursuant to § 40-6-109, C.R.S., the ALJ transmits to the Commission the record and exhibits of the proceeding together with a written recommended decision.

## **II. FINDINGS OF FACT**

### **A. Overview of the West Corridor Project**

21. The West Corridor Project is an expansion of the existing RTD Light Rail System westward from Denver Union Station to the vicinity of Invesco Field in the City and County of Denver, through the Paco Sanchez Park area, and into the City of Lakewood. This alignment

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<sup>12</sup> The ALJ also permitted RTD to file a Written Position Statement, which it did on April 22, 2011.



formerly served as the West Side Line freight rail corridor, also known as the Associated Railroads Remaco Spur.

22. The trackways for the West Corridor Project parallel 12th Avenue between Newton Street and Benton Street, before shifting north in the area of Chase Street. West of that point, the trackways parallel 13th Avenue as far as Oak Street, where they start to curve south through the Federal Center area in Jefferson County.

23. The Light Rail System along the West Corridor will feature two sets of parallel tracks carrying trains in opposite directions.

24. Between Harlan Street and Oak Street, inclusive, the West Corridor line runs through a predominantly residential neighborhood. Many houses and apartments are situated very close to the 12th Avenue and 13th Avenue alignments.

25. When fully operational, RTD proposes to operate 294 trains per weekday along the West Corridor. On weekends, the count will be 150 trains per day. The Light Rail System will operate between the hours of 4:00 a.m. to 1:00 a.m.

#### **B. Configurations of the Proposed Crossings**

26. Each of the 11 crossings has a unique geometry in terms of how the surface street and the light rail trackway intersects, the number of active traffic lanes crossing the tracks, and whether there is one or more active traffic lanes paralleling the trackway. The width of each crossing, representing the distance measured from entrance gate to exit gate, varies between 30 and 45 feet.<sup>13</sup> The distinguishing characteristics of each crossing are detailed below.

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<sup>13</sup> For Knox Court, which does not have exit gates, the measurement is from one entrance gate to the other.

27. Each crossing features two, three, or four, crossing gates to prevent auto traffic from entering the trackway when a train is nearby. The crossing gates to be used throughout the West Corridor Project are detailed in Hearing Exhibit D. Each gate features a descending arm of variable length depending on the roadway geometry. These crossing arms are equipped with three lights. Pursuant to the requirements of the Manual on Uniform Traffic Control Devices, the light nearest the gate arm tip is constantly illuminated while the remaining two lights flash in unison with the post-mounted flashing lights during the entire time a train is detected in the vicinity. Each gate also features the standard R15-1 crossbuck rail crossing sign<sup>14</sup> and two large, post-mounted red lights below the crossbuck that also flash during the entire time a train is detected in the vicinity. Each crossing gate also features an active warning display with the words “CAUTION SECOND TRAIN APPROACHING.” This display is only illuminated when the gate arms are descended for a train and a second train is detected approaching from the opposite direction.

28. The crossing gates are typically specified in groups of two or four. In a two-gate configuration, the gates are positioned to prevent traffic from entering the crossing. This configuration includes raised medians to prevent drivers from straying out of their proper lane to drive around a descended entrance gate.<sup>15</sup> In a four-gate configuration, gate arms block both the entrance to, and the exit from the crossing. The purpose of the exit gates is to prevent drivers from using the opposing lane to drive through the crossing when the entrance gate arms are

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<sup>14</sup> On the standard crossing gate detail, Hearing Exhibit D, an additional R15-2 “2 TRACKS” sign is included below the R15-1 crossbuck that is not shown on the signing and striping plans for each crossing (*i.e.*, Hearing Exhibits C-2 and C-4). For the reasons stated in Paragraph No. 103, below, the R15-2 “2 TRACKS” sign will be required at each crossing.

<sup>15</sup> The medians are typically 60 to 100 feet in length and essentially “trap” cars in their proper lane while the crossing arm is down.

descended. An important consideration in a four-gate configuration is to ensure that the exit gates do not descend so quickly as to trap unsuspecting drivers within the crossing zone.<sup>16</sup> The three-gate configuration is a combination of the two-gate and four-gate configurations: one side of the crossing is configured with an entrance gate and median and the other side of the crossing is configured with an entrance and exit gate. Whether a two-gate, three-gate, or a four-gate configuration is specified largely depends on whether the roadway can accommodate the raised medians necessary for a two-gate system to function.

29. Each crossing gate is also equipped with a standard wayside warning bell that can be activated at the same time the flashing lights illuminate. As discussed below, RTD proposes that these wayside warning bells be de-activated to reduce the amount of noise experienced by residents in the area.

30. The only overhead lighting in the development plans for the West Corridor Project is included at stations where five foot-candles of illumination are specified. Otherwise, the subject crossings do not feature additional overhead lighting within the crossing or along the approaching trackway. The only additional light source is the headlamp on the front of the lead light rail vehicle. This lamp provides illumination for approximately 600 feet in front of the train.

### **1. Knox Court**

31. The crossing at Knox Court<sup>17</sup> features a two-gate configuration with raised medians within the traffic lanes. This crossing features standard railroad crossing striping in the traffic lanes. The Knox Station is immediately west of the crossing. The proximity of the station

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<sup>16</sup> The issue of exit gate timing is discussed below.

<sup>17</sup> U.S.D.O.T. Inventory No. 244709T.

affects the speeds of light rail vehicles in the area as discussed below. The width of the Knox Court crossing is 45 feet.<sup>18</sup> The average daily traffic count for Knox Court is 8,280.<sup>19</sup>

## **2. Perry Street**

32. The crossing at Perry Street<sup>20</sup> features a three-gate configuration with raised medians on the southern side of the crossing. Both directions of Perry Street are controlled by entrance gates. At this location, 12th Avenue parallels the light rail trackway, carrying eastbound and westbound vehicle traffic. Accordingly, the entrance gate for southbound Perry Street is separated from the stop-bar striping by the width of 12th Avenue. A sign is included for southbound traffic on Perry Street that reads “DO NOT BLOCK INTERSECTION.”<sup>21</sup> A third crossing gate immediately south of 12th Avenue prevents vehicle turning movements from 12th Avenue across the tracks when the warning systems are activated. In other respects, this crossing also features standard railroad crossing striping in the traffic lanes. The Perry Station is immediately west of the crossing. The proximity of the station affects the speeds of light rail vehicles in the area as discussed below. The width of the Perry Street crossing is 35 feet. The average daily traffic count for Perry Street is 8,030.

## **3. Lamar Street**

33. The crossing at Lamar Street<sup>22</sup> features a four-gate configuration with the gates positioned adjacent to the RTD right-of-way. South of the trackway, this means that the entrance

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<sup>18</sup> The width of each crossing correlates to the “Minimum Track Clearance Distance” from Hearing Exhibit J.

<sup>19</sup> ADT figures for cross-streets are taken from Hearing Exhibit E. Available ADT figures for 13th Avenue are taken from Hearing Exhibit B.

<sup>20</sup> U.S.D.O.T. Inventory No. 244714P.

<sup>21</sup> This crossing is in the City and County of Denver. Comparable configurations in the City of Lakewood specify a sign that reads “STOP HERE WHEN FLASHING.”

<sup>22</sup> U.S.D.O.T. Inventory No. 244722G.

gate for northbound Lamar is north of 13th Avenue, although the stop-bar striping for northbound Lamar is south of 13th Avenue. However, the signing plan includes a sign clearly indicating where northbound vehicles are to stop when the crossing lights are flashing.<sup>23</sup> In other respects the crossing features standard railroad crossing striping. Eastbound and westbound traffic on 13th Avenue is controlled by stop signs on either side of the intersection with Lamar Street. The Lamar Station is immediately east of the crossing. The proximity of the station affects the speeds of light rail vehicles in the area as discussed below. The width of the Lamar Street crossing is 45 feet. The average daily traffic count for Lamar Street is 3,060.

#### **4. Garrison Street**

34. The crossing at Garrison Street<sup>24</sup> features a four-gate configuration with the gates positioned adjacent to the RTD right-of-way. South of the trackway, this means that the entrance gate for northbound Garrison is north of 13th Avenue, although the stop-bar striping for northbound Garrison is south of 13th Avenue.<sup>25</sup> In other respects the crossing features standard railroad crossing striping. The signing plan does not specify an R8-10 “STOP HERE WHEN FLASHING” sign as is called for at Lamar Street. The Garrison Station is immediately east of the crossing. The proximity of the station affects the speeds of light rail vehicles in the area as discussed below. The width of the Garrison Street crossing is 30 feet. The average daily traffic count for Garrison Street is 12,600. A 2007 study estimated average daily traffic on 13th Avenue to the west of this crossing (near Everett Court) at 375 vehicles.

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<sup>23</sup> This sign is designated R8-10 and reads “STOP HERE WHEN FLASHING.”

<sup>24</sup> U.S.D.O.T. Inventory No. 244733U.

<sup>25</sup> 13th Avenue dead-ends into Garrison Street from the east.

## **5. Oak Street**

35. The crossing at Oak Street<sup>26</sup> features a four-gate configuration. There is no roadway parallel to the light rail tracks at this location. This crossing features standard railroad crossing signing and striping. The Oak Station is immediately west of the crossing. The proximity of the station affects the speeds of light rail vehicles in the area as discussed below. The width of the Oak Street crossing is 33 feet. The average daily traffic count for Oak Street is 5,270. A 2010 study estimated average daily traffic on 13th Avenue in this area to be 945 vehicles.

## **6. Harlan Street**

36. The crossing at Harlan Street<sup>27</sup> features a four-gate configuration with the gates positioned adjacent to the RTD right-of-way. South of the trackway, this means that the entrance gate for northbound Garrison is north of 13th Avenue. However, as 13th Avenue dead-ends into Harlan Street from the west (meaning that there is no through traffic on 13th Avenue east of the crossing), the stop-bar striping for northbound Harlan is within the intersection of the two streets. In other respects the crossing features standard railroad crossing signing and striping. The closest station at Lamar is more than 700 feet east of the Harlan Street crossing. This will not affect the speeds of light rail vehicles in the area. The width of the Harlan Street crossing is 35 feet. The average daily traffic count for Harlan Street is 3,260. The 2007 estimate of average daily traffic on 13th Avenue in this area was 427.

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<sup>26</sup> U.S.D.O.T. Inventory No. 244738D.

<sup>27</sup> U.S.D.O.T. Inventory No. 244719Y.

## **7. Pierce Street**

37. The crossing at Pierce Street<sup>28</sup> is different in that the RTD trackway runs down the middle of 13th Avenue with parallel two-way vehicle traffic on either side. The crossing features a four-gate configuration with the gates positioned adjacent to the RTD right-of-way. For both northbound and southbound traffic on Pierce Street, this means that the entrance gates are separated from the stop-bar striping by the width of 13th Avenue. However, the signing plan includes a sign clearly indicating where vehicles on Pierce Street are to stop when the crossing lights are flashing. Traffic in both directions on 13th Avenue is controlled by stop signs at the intersections with Pierce Street. In other respects the crossing features standard railroad crossing signing and striping. There is no station nearby that will affect the speeds of light rail vehicles in the area. The Pierce Street crossing is 40 feet wide. The average daily traffic count for Pierce Street is 3,570.

## **8. Teller Street**

38. The crossing at Teller Street<sup>29</sup> is very similar to the crossing at Pierce Street. The RTD trackway runs down the middle of 13th Avenue at this location, with traffic controls, signing, and striping substantially the same as described for Pierce Street. The nearest station at Wadsworth Boulevard does not appear to be close enough to affect the speeds of light rail vehicles in the area of the Teller Street crossing. All traffic on 13th Avenue is controlled by stop signs at the intersection with Teller Street. The width of the crossing at Teller Street is 39 feet. The average daily traffic count for Teller Street is 530. A 2007 study estimated average daily traffic on 13th Avenue to the west of this crossing (near Vance Street) at 656 vehicles.

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<sup>28</sup> U.S.D.O.T. Inventory No. 244725C.

<sup>29</sup> U.S.D.O.T. Inventory No. 244726J.

## **9. Carr Street**

39. The crossing at Carr Street<sup>30</sup> features a four-gate configuration with the gates positioned adjacent to the RTD right-of-way. South of the trackway, this means that the entrance gate for northbound Carr Street is north of 13th Avenue, although the stop-bar striping for northbound Carr Street is south of 13th Avenue. In other respects the crossing features standard railroad crossing striping. The signing plan does not specify an R8-10 “STOP HERE WHEN FLASHING” sign as is called for at Lamar, Pierce, and Teller Streets. Traffic on 13th Avenue parallels the RTD trackway in both directions. All traffic on 13th Avenue is controlled by stop signs at the intersection with Carr Street. There is no station nearby that will affect the speeds of light rail vehicles in the area. The width of the Carr Street crossing is 39 feet. The average daily traffic count on Carr Street is 4,410.

## **10. Estes Street**

40. The crossing at Estes<sup>31</sup> Street features a four-gate configuration with the gates adjacent to the RTD right-of-way. The 13th Avenue parallels the light rail alignment with two-way through traffic to the south of the RTD trackway. On the north side of the RTD trackway, 13th Avenue carries two-way traffic only on the east side of the intersection with Estes Street. The entrance gate for northbound traffic on Estes Street is separated from the stop-bar striping by the width of 13th Avenue. The signing plan does not specify an R8-10 “STOP HERE WHEN FLASHING” sign. For southbound Estes Street, the striping resembles northbound Harlan Street with the stop-bar in the middle of the intersection. The Estes Street crossing is not close enough to the Garrison Station that the speeds of light rail vehicles will be affected.

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<sup>30</sup> U.S.D.O.T. Inventory No. 244731F.

<sup>31</sup> U.S.D.O.T. Inventory No. 244732M.



The width of the Estes Street crossing is 30 feet. The average daily traffic count on Estes Street is 1,070. A 2007 study estimated average daily traffic on 13th Avenue to the west of this crossing (near Dudley Street) at 656 vehicles

## **11. Independence Street**

41. The crossing at Independence Street<sup>32</sup> features a four-gate configuration. The 13th Avenue is a two-way street west of Independence Street and south of the RTD alignment. The gates are positioned adjacent to the RTD right-of-way. South of the trackway, this means that the entrance gates for northbound Independence are north of 13th Avenue. However, as 13th Avenue dead-ends into Harlan Street from the west (meaning that there is no eastbound traffic on 13th Avenue east of the crossing), the stop-bar striping for northbound Independence Street is within the intersection of the two streets. In other respects the crossing features standard railroad crossing signing and striping. Of additional significance to the Independence Street crossing is the proximity of Eiber Elementary School just north and west of the crossing. Traffic speeds on Independence Street in the area of the crossing are limited to 20 mph during school hours.<sup>33</sup> At Pikeview Street, just west of the crossing, a pedestrian tunnel will permit children and others to access Eiber Elementary from the south without having to cross over the light rail trackway.<sup>34</sup> There is no station nearby that will affect the speeds of light rail vehicles in the area. The width of the Independence Street crossing is 30 feet. The average daily traffic count on Independence Street is 1,260.

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<sup>32</sup> U.S.D.O.T. Inventory No. 244735H.

<sup>33</sup> Mr. Von Fay testified that the school day runs from 7:55 a.m. to 2:30 p.m.

<sup>34</sup> Although the tunnel is not yet open, it will be opened before RTD begins operating light rail trains along the West Corridor.

### **C. Mode of Operation Proposed in the Applications**

#### **1. Crossing Gate Configuration and Operation**

42. The gates at each crossing will activate when a light rail train is approaching from either direction. For crossings no wider than 35 feet, the equipment is configured to detect an approaching train at least 20 seconds prior to the train's arrival at the crossing.<sup>35</sup> Where the crossing is wider than 35 feet, or where exit gates can impede a driver's progress through the crossing, additional warning time is added.

43. The American Railroad Engineering and Maintenance-of-Way Association (AREMA) recommends that for each 10 feet of crossing width beyond 35 feet, 1 additional second of warning time is appropriate. This is exemplified by the gate timing shown for the Knox Court crossing—the only crossing in this consolidated Docket with no exit gates—in Hearing Exhibit J. The crossing width is shown as 45 feet and the Total Approach Time is shown as 21 seconds. The column labeled “CT” on Hearing Exhibit J reflects the additional Clearance Time added due to crossing width exceeding 35 feet.

44. As discussed above, the presence of exit gates indicates a need for additional warning to drivers so that they have adequate time to clear the crossing and not be trapped on the tracks by the descended exit gate arm. In these applications, RTD has adopted a rationale based on the AREMA recommendation for the timing of exit gates. Under this method, RTD specified one second of additional warning time for each ten-foot increment of crossing width. This factor is reflected as Exit Gate Clearance Time (EGCT) in Hearing Exhibit J. Thus, for example, at Pierce Street (which features exit gates), an additional 4 seconds of warning time is prescribed based on a crossing width of 40 feet. The resulting Total Approach Time for Pierce Street is

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<sup>35</sup> This base or “Minimum Time” is reflected in the second column of Hearing Exhibit J.

24 seconds based on the 20-second minimum plus the 4- second EGCT.<sup>36</sup> The configurations of the subject crossings do not warrant the inclusion of Buffer Time based on device specifications or Additional Pre-emption Time related to traffic signal operation.

45. The operation of the crossing equipment is based on the Total Approach Time shown in the last column of Hearing Exhibit J. In the case of Lamar Street, a train will be detected at least 25 seconds before its arrival at the crossing. For the first three seconds after detection, the crossing lights and any audible warnings will activate without the gates starting to descend.<sup>37</sup> After that interval, the entrance gates would start to descend. Sticking with the example of Lamar Street, based on its EGCT of five seconds, the exit gates would start to descend five seconds after the entrance gates (or a total of eight seconds after detection). The entrance and exit gates will be fully descended for a minimum of five seconds before the train arrives at the crossing.

46. As noted above and depicted in Hearing Exhibit D, each crossing gate will be topped with a wayside warning bell. The bell emits sound in all directions from a point on top of the vertical structure of the crossing equipment. In normal operations, the wayside warning bells are activated during the same time when lights are flashing, and emit a series of tones at a level of 90 to 95 decibels measured at the source.

47. Although wayside warning bells will be installed, RTD requests that the operation of the crossings be approved without activation of the bells. In the course of analyzing and reporting environmental impacts during the planning stages of the West Corridor Project, RTD

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<sup>36</sup> Note that the one second of Clearance Time is not added into the Total Approach Time. Since drivers are afforded an extra four seconds of time to clear the exit gates, this already provides three seconds more time than would be dictated by the AREMA guidance for entrance gate clearance discussed in Paragraph No. 43.

<sup>37</sup> This interval is intended to allow drivers to “process” the warnings without having to react to descending gates at the same time.

determined that standard crossing bells will result in 80 severe and 40 moderate noise impacts to nearby properties. RTD contends that the visible warnings on the gate equipment (flashing lights), the physical barriers represented by the descending gate arms, and the noise of the trains themselves provide adequate warning of a train in the vicinity of the crossing.<sup>38</sup> Mr. Von Fay acknowledged that these gate configurations do not have the same safety impact for pedestrians as for vehicles.<sup>39</sup>

## **2. Light Rail Vehicle Equipment and Operation**

48. Light rail vehicles are equipped with bells as well as horns. Mr. Von Fay established that light rail operators are to sound the vehicle bells for five or six seconds as they approach and depart stations. This means that the vehicle bells will be actively used at the Knox Court, Perry Street, Lamar Street, Garrison Street, and Oak Street crossings. At all other crossings, RTD does not propose to require operators to sound the vehicle bells in order to reduce the noise experienced by residents in the area. The light rail vehicle bells emit a warning that is measured at 95 decibels at 10 feet and 81 decibels at 50 feet.

49. Light rail operators will have the discretion to use the train horns in response to a perceived hazard. Mr. Starling established that operators are instructed to use the horn any time they see a person or motor vehicle on or near trackway that they determine is likely to be struck

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<sup>38</sup> A four-gate configuration (or two-gates with medians) that also includes warning bells, constant warning time circuitry, and a 'power out' indicator on the signal bungalow, is one Supplemental Safety Measure described in rules promulgated by the Federal Railroad Administration (FRA). Heavy rail crossings of this type can be approved as part of a 'quiet zone' wherein trains will not sound their horns; however, audible wayside warning bells still sound when trains are detected within such crossings. The FRA rules do not address light rail applications.

<sup>39</sup> Hearing Exhibit F describes the sidewalk access available at each of the 11 crossings. It also lists the amount of clear distance (*i.e.*, not physically blocked by the gate arm or its counterweight) available for each pedestrian walkway while the crossing equipment is active.

by the train. The train horn is measured at 112 decibels at 10 feet in front of the light rail vehicle.

50. RTD will operate light rail trains along the West Corridor at a maximum speed of 35 mph. Mr. Von Fay established that the average speed of light rail vehicles through the non-station crossings in this corridor will be 30 mph. As trains prepare to stop at each station, they will slow to an approach speed of 15 mph.<sup>40</sup> As trains leave a station, they accelerate gradually from a stop. Thus at Knox Court, Perry Street, Lamar Street, Garrison Street, and Oak Street, light rail speeds through those crossings will be significantly slower than 30 mph.

51. As noted above, light rail trains are equipped with a headlamp that illuminates the trackway approximately 600 feet in front of the lead vehicle.

52. Hearing Exhibit M was introduced through Mr. Shonsey and sets forth the emergency braking requirements (in terms of time and distance) of light rail trains. This analysis assumes a 2.0 second time interval for an operator to perceive and react to a hazard that requires an emergency stop. It also includes a 30 percent safety factor to account for less-than-optimal braking performance due to brake wear, degraded braking conditions due to weather, and/or the operator not applying full braking power.

53. A light rail train moving at 30 mph covers 44.00 feet per second. Assuming an EWD4 light rail vehicle is fully loaded with 180 passengers, the vehicle will require 8.0 seconds and 291.29 feet to stop from this speed under emergency conditions, allowing for the factors cited in the previous paragraph. A train at 15 mph travels 22.0 feet per second. With similar parameters and assumptions related to perception/reaction time and vehicle characteristics,

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<sup>40</sup> A light rail train should be moving at 15 miles per hour or slower by the time the lead vehicle reaches the closest extent of the station platform.

a light rail vehicle requires 5.00 seconds and 102.08 feet to make an emergency stop from 15 miles per hour.

54. It is reasonable to assume that an operator will assess any potential hazards before proceeding from a stop at a station. For the five crossings in close proximity to a station, the risks of an accident at the crossing should be substantially reduced because the operator will not proceed from a stop, or will be slowing in preparation to stop.

### **3. System Testing and Operator Training**

55. Before commencing “revenue operations”<sup>41</sup> RTD has allocated three months after substantial completion of the West Corridor Project to fully test the system. This testing will include running trains along the system to verify proper operation of the crossing safety equipment. The proper operation of all active warning devices and the timing of the crossing gates will be confirmed.

56. Following the testing period, RTD will initiate one month of “simulated” service. During this time, the system will operate according to the procedures and schedule established for revenue service, only without carrying members of the public. Simulated service provides RTD a further opportunity to verify the operation of all safety devices and complete any necessary adjustments to the system.

57. Prior to driving trains in revenue service, every operator undergoes training for a particular light rail line. This will be true of the West Corridor. No operator will run a train with passengers until he or she has completed thorough training on the characteristics of the line, and has been certified in the safe operation of the train according to RTD’s procedures.

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<sup>41</sup> *i.e.*, operating the West Corridor light rail system with paying passengers.

58. Mr. Starling established that, currently, RTD's procedures specify that operators are to sound horns at all gated crossings. This procedure will be modified for operations along the West Corridor where all of the crossings are gated, but operators are not to sound horns unless they perceive a hazard as explained above. This is one example of the unique type of training that operators will receive before operating trains along the West Corridor line.

**D. Public Comment Regarding Proposed Quiet Crossings**

59. After the filing of the subject applications, the Commission solicited and recorded comments from the public regarding RTD's proposal. One letter was mailed, and 20 written comments were submitted to the Commission's internet website.

60. The one letter was addressed to the Commission by Mr. Bob Murphy, Mayor of the City of Lakewood. Mr. Murphy stated that the City of Lakewood had worked closely with RTD during the development and environmental approval process of the West Corridor Project. Safety of the system is the city's paramount concern. Mr. Murphy cited the traffic controls on 13th Avenue, alterations to the alignments of streets parallel to the RTD trackway to increase visibility and access for emergency vehicles, prohibitions on parking in the vicinity of crossings, and the protections of the crossing gate systems as key safety features of the project. Mr. Murphy stated that activation of wayside and vehicle-mounted bells would be extremely disruptive to the largely residential neighborhoods adjacent to the project. He believes that audible warnings are unnecessary in light of the safety features cited and the discretion afforded to operators to sound the train horn in response to hazards.

61. The 19 internet submittals largely echoed the sentiments of Mr. Murphy. Commenters<sup>42</sup> noted the quiet character of the surrounding neighborhoods and urged that RTD's proposal for quiet operation of crossings be approved. A number of submittals stated that activation of audible warnings would be very disruptive to the peace and quiet of the neighborhoods and characterized the prospect of such disruptions, especially at night, as "unbearable" and tending to decrease property values and quality of life. Although none of the commenters addressed the issue of whether quiet operation of crossings provides adequate safety protection for sight-impaired persons, they generally asserted that the gates and lights are sufficient safety measures. Two commenters believed that the activation of audible warnings at the Independence Street crossing would tend to disrupt classes at Eiber Elementary School.

62. Because of the impacts of these applications on the adjoining neighborhoods and the perceived safety implications of the quiet crossings proposal, the ALJ convened a public comment session. The Commission issued a press release on February 7, 2011, providing notice of the public comment session. The press release was posted on the Commission's internet website and was picked up by at least one local media source. As noted above, the Commission estimates that roughly 65 people attended the session on Thursday evening, February 17, 2011.

63. The ALJ received the comments of 13 persons. Among these commenters were Mr. Murphy, Mr. Baskett, Mr. Ditson, Ms. Folska, and Mr. West. The commenters represented their own interests as well as those of the City of Lakewood, the Eiber Neighborhood

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<sup>42</sup> One comment was submitted on behalf of the Eiber Neighborhood Association by Mr. Ditson. The other internet submittals represented the personal views of the commenter.



Association, the Two Creeks Neighborhood Association, the National Federation of the Blind, Jefferson County Schools, and the Colorado Center for the Blind.

64. Property owners and residents in the area of the West Corridor Project commented on the very quiet nature of the neighborhoods there. These commenters were concerned that audible warnings would be disruptive and potentially degrade the quality of life and sustainability of current character of the area. These same commenters generally asserted their belief that the configurations of the subject crossings, coupled with the operator discretion to use train horns, provided adequate safety for the quiet operation of the crossings. When asked about the possibility of using alternative audible warnings to enhance safety for pedestrians, Mr. Ditson and Ms. Sara Farrar Nagy<sup>43</sup> agreed that lower-volume warnings might be supported by the local residents.

65. Speaking on behalf of the Jefferson County School District, Mr. Tim Reed addressed the safety in the area of the Independence Street crossing near Eiber Elementary School and Lakewood High School. Mr. Reed stated that of the 435 students who attend Eiber Elementary, 338 come from the adjoining neighborhood. He stated that the District is on record as requesting more safety precautions at the Independence Street crossing.

66. Six other commenters focused their statements on pedestrian safety, particularly in reference to those pedestrians who are sight-impaired. These commenters urged a consistent and reliable system of audible warnings as a means of enhancing safety for children and/or blind pedestrians at all crossings. Light rail trains, being electric, are relatively quiet and can be masked by ambient noise until they are very close. At the time of the hearing,

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<sup>43</sup> An owner of property adjacent to the RTD right-of-way and a board member of the Two Creeks Neighborhood Association.

Ms. Folska testified that audible input is critical to a blind person's understanding of environmental risks and she underscored the importance of predictability for sight-impaired pedestrians. A number of people mentioned that a train bell is a distinctive and widely recognizable warning sound that is preferable to other audible indicators such as chirps or cuckoo sounds which may be difficult to interpret. Ms. Folska also noted that conversations regarding alternative forms of audible signals had not happened in the process of planning the West Corridor Project and advocated such a dialogue.

## **E. Alternative Audible Pedestrian Warning System**

### **1. Concept**

67. After the Public Comment Session, RTD requested a continuance of the then-scheduled hearing to engage in further discussions and re-evaluate pedestrian safety along the West Corridor. Ms. Tierney, Ms. Folska, and Mr. Ditson, among others, were involved in these discussions.

68. As part of this process, RTD re-examined readings of pre-construction ambient noise in the areas around the 11 proposed crossings.<sup>44</sup> Hearing Exhibit H sets forth the average ambient noise level over a 24-hour period at each of the crossing locations.<sup>45</sup> The highest daily average measurement was at Knox Court (62 dB) while the lowest was at Oak Street (51 dB). The remaining measurements ranged between these two values, evidencing the quiet character of the neighborhoods. Ms. Tierney testified that the subject neighborhoods are very quiet at night, with ambient sound measurements in the range of 35 decibels.

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<sup>44</sup> Construction on the West Corridor Project has increased ambient noise above what it will be once that construction is complete.

<sup>45</sup> This average is expressed as LDN, which stands for "Level Day/Night."

69. In the course of the hearing, RTD introduced the idea of an alternative form of audible warnings for pedestrians. The system presented is the DS100 Series manufactured by Novax Industries of British Columbia, Canada (Novax System). The Novax System is capable of emitting different audible warning tones at varying volume levels.<sup>46</sup> The Novax System is a directional speaker that can be mounted on the crossing gate equipment and wired to operate in conjunction with the other active warnings. Hearing Exhibit I.

70. Typically, the Novax System is calibrated to emit sound at 5 decibels above the detected level of ambient noise.<sup>47</sup> RTD indicated that if an alternative audible pedestrian warning system is required for the subject crossings, it would write specifications for a variant of the Novax System that would emit sound at 5 decibels above the detected ambient noise level, but would also be “capped” at a certain volume unique to each crossing.<sup>48</sup> The cap would be set at 5 decibels above the average daily measurement, or LDN, set forth in Hearing Exhibit H. For example, at the Harlan Street crossing where the LDN was measured at 61 dB, the Novax System would be capped at 66 decibels. If ambient noise was detected at 47 decibels, the system would emit warning tones at 52 dB. If ambient noise was detected at 64 decibels, the system would bump up against the cap and emit its warning at 66 dB.

## **2. Demonstrations**

71. Prior to the hearing, RTD conducted two demonstrations of the alternative audible pedestrian warning system. The first demonstration occurred at the Independence Street crossing in Lakewood. The second demonstration occurred at Civic Center Plaza near the intersection of

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<sup>46</sup> One of the tones is very similar to that emitted by a standard wayside warning bell.

<sup>47</sup> Ms. Tierney testified that a sound 5 dB louder than the ambient noise level does not amount to an environmental impact.

<sup>48</sup> This measurement and calibration would occur at the point where pedestrians would be expected to stop when the crossing was active—typically 20 feet from the crossing gate equipment.

Colfax Avenue and Lincoln Street in downtown Denver. After the hearing, at the request of the ALJ, RTD conducted another demonstration at the Teller Street crossing in Lakewood.<sup>49</sup>

72. At the Independence Street crossing in Lakewood, RTD conducted a demonstration of a wayside warning bell and an exemplar Novax unit. Ms. Folska, Mr. Ditson, and Ms. Tierney, testified to attending this demonstration.

73. The wayside warning bell was activated at its standard volume and the Novax System was activated in its “5 dB above ambient noise” mode. The Novax unit was pointed in various directions including perpendicular and parallel to the RTD right-of-way. The participants listened to both signals at 20 feet away and further from sidewalks on Independence Street.

74. The witnesses who described both the Independence Street and the Civic Center demonstrations (below) characterized the ambient noise in Lakewood to be comparatively lower. Mr. Ditson stated that the 60-decibel Novax System sound was “easy to hear.” Ms. Tierney stated that even with the Novax System directed along the trackway (*i.e.*, not toward the participants on the sidewalk) the unit still provided an adequate audible warning.

75. The demonstration in Denver took place on April 1, 2011. Ms. Folska, Mr. Ditson, Ms. Tierney, Mr. Starling, Mr. Baskett, and Mr. Von Fay (among others) were present. All of these witnesses established that the ambient noise was much higher than that experienced at the earlier Lakewood demonstration. Civic Center Plaza is adjacent to two busy streets and features a large transit terminal accommodating many local and regional bus routes. In addition, the witnesses commented that the ambient noise was affected by an airplane circling

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<sup>49</sup> All of the demonstrations were coordinated by Ms. Tierney.

the area with a towed banner.<sup>50</sup> Ms. Tierney testified that ambient noise in the area measured 75 to 80 decibels during the demonstration.

76. The demonstration involved playing pre-recorded sounds of the Novax System and the standard wayside bell, both calibrated to 60 decibels at 20 feet. The speaker was directed toward the participants.

77. Each of the witnesses named in Paragraph No. 75 stated that both sounds were audible and distinguishable as warnings from a listening position 20 feet away. Both sounds were replayed after the participants moved back to 40 feet away from the speaker. Ms. Folska, Mr. Baskett, and Mr. Starling each testified that they could still hear the signals. Ms. Folska described both playbacks in Denver as “adequate warnings.”

78. On April 19, 2011, the ALJ attended a demonstration of the alternative audible pedestrian warning system as detailed at the close of the evidentiary hearing. Ms. Fischhaber of the Commission Advisory Staff attended the demonstration as did Ms. Tierney, Mr. Starling, Mr. Von Fay, and Mr. Kane of RTD, as well as Ms. Folska, Mr. Baskett, and Mr. Murphy.

79. The April 19, 2011 demonstration was conducted in the immediate vicinity of the Teller Street crossing between roughly 10:00 and 10:30 a.m. A decibel meter measured the ambient noise in the area in the range of 50 to 55 dB on the southeast corner of Teller Street and 13th Avenue.

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<sup>50</sup> The test occurred on opening day for Major League Baseball.

80. Initially, a standard wayside bell of the type installed at each crossing was activated at its standard 90 decibel level.<sup>51</sup> This device is omni-directional. This sound was clearly audible over the ambient noise from the sidewalk south of 13th Avenue.

81. Next, a Novax audible pedestrian signal similar to the type shown in Hearing Exhibit I was activated from the same position. The Novax unit is uni-directional and was first activated with the speaker pointed due south and angled toward the ground. The tone of the signal was of a different pitch as compared to the wayside bell, but otherwise it resembled the wayside warning sound and was clearly distinguishable from the ambient noise from approximately 20 feet away.<sup>52</sup> A second demonstration of the Novax exemplar was conducted with the unit directed west, parallel to the trackway. Due to the directionality of the speaker, this was appreciably quieter from the same listening position.

82. Due to the fact that the Novax exemplar did not emit a constant volume as intended, RTD demonstrated a backup system. This consisted of a recording of a wayside bell and a recording of a Novax signal, both calibrated to 60 dB at 20 feet and played through a standard box speaker. The speaker was uni-directional and positioned on a cart that was around three feet tall. The two recorded sounds were played at least six times so that the ALJ could hear them from different listening positions and with the speaker facing in different directions.

83. With the speaker facing due south, both tones were clearly audible from the sidewalk 20 feet away. In this same configuration, both tones were also audible when the ALJ

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<sup>51</sup> This device was positioned on top of a ladder approximately eight feet above grade and in the general area of where the entrance gate for northbound Teller Street will be installed.

<sup>52</sup> The exemplar unit did not function exactly as intended by RTD. Although the first series of tones played 5 dB above the ambient noise level as intended, successive series increased in volume. The operational mode proposed by RTD is described in Paragraph No. 70 above.

moved 30 feet further south on Teller Street. From this position near the driveway to the Courtyard retirement property, the Novax signal tone was noticeably quieter but still detectable as a warning.<sup>53</sup>

84. The recorded tones were also played with the speaker directed to the west, comparable to the position of the second demonstration of the Novax exemplar. As with that earlier demonstration, the recorded tones were less audible on the sidewalk with the speaker facing 90 degrees away. In demonstrations with the speaker deflected less than 90 degrees from the listening position on the sidewalk, there was no significant difference in the quality or volume of the warning tones as compared to straight-on.

85. The ALJ asked that the speaker be directed to the north, across the area of the trackway. He then positioned himself north of the crossing near the closest corner of a residence on the west side of Teller Street. The two recorded tones were audible from that distance, but not audible over a normal conversation. When the tones were replayed while the ALJ sat inside a vehicle with the windows up<sup>54</sup> at the same location, the tones were only audible if there was no other noise inside the vehicle and the listener focused on trying to hear them.

### **3. Reaction**

86. The working group formed after the conclusion of the public comment session created a set of guidelines pertaining to the implementation of the alternative audible pedestrian warning system. Hearing Exhibit N. Mr. Ditson and the Eiber Neighborhood Association were

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<sup>53</sup> During the second of the two demonstrations described in Paragraph No. 83, the warning sounds were audible over a normal conversation but not “noisy” compared to the ambient sound level.

<sup>54</sup> The vehicle was parked with the ignition off.

instrumental in the development of the guidelines, although RTD reformatted them as presented during the hearing.<sup>55</sup>

87. At the time of the public comment session, Mr. Ditson expressed support for the “quiet crossing” proposal that included no audible warnings. He further stated that if audible warnings are required they should be adjusted to lower volumes.

88. During the hearing, Mr. Ditson testified on behalf of the Eiber Neighborhood Association that while no noise is preferable to the residents, the association understands the safety concerns posed by quiet crossings. He believes the guidelines for the alternative audible pedestrian warnings set forth in Hearing Exhibit N represent a reasonable solution that satisfies the needs of the community. Based on conversations he has had with individual neighbors, his attendance at the demonstrations, and deliberations of the board of the Eiber Neighborhood Association, Mr. Ditson expressed support for the alternative audible warnings so long as they are implemented consistent with the guidelines.

89. Ms. Folska also participated in the working group formed after the public comment session. She attended all of the demonstrations of the alternative audible warnings conducted by RTD. At the hearing she supported the Novax System based on her assessment that it provides adequate warning to pedestrians. She stated that the tone is distinctive and recognizable as a warning and that the proposed volume levels in the guidelines (Hearing Exhibit N) are clearly audible from a safe distance.

90. Although RTD maintains that the quiet mode of operations reflected in the original applications provides adequate safety to motorists and pedestrians, the testimony of the

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<sup>55</sup> Mr. Ditson stated that Hearing Exhibit N faithfully represents the guidelines he helped develop.



various RTD witnesses was generally favorable regarding an alternative system implemented consistent with Hearing Exhibit N. The Novax System was represented as responsive to the safety concerns expressed at the public comment session, faithful to RTD's commitment to avoid moderate or severe noise impacts to residents, and technically feasible.

91. No witness testified that the alternative audible pedestrian warnings were undesirable. Mr. Baskett was the only witness to say that the additional warnings are "unnecessary."<sup>56</sup>

#### **F. Other Safety Considerations**

92. RTD conducted observations of the Independence Street crossing near Eiber Elementary School on March 29 and 31, 2011. The purpose of these observations was to determine how many children walk to school on a typical day. Ms. Tierney established that the weather on both days was mild and pleasant and therefore conducive to walking to school. The observations occurred during the morning and afternoon of both days.

93. Both observations yielded the same results: three children walked across the Independence Street crossing to Eiber Elementary in the morning, and four walked back across the crossing in the afternoon. In addition, seven older children were observed using the crossing southbound one morning, and one older child using the crossing on the other morning. Presumably, these were high school students going to Lakewood High School which is south of the RTD corridor near Independence Street. No older children were observed using the crossing during the afternoon hours.

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<sup>56</sup> Mr. Baskett testified that the sound of the light rail trains would provide adequate audible safety cues. However, this testimony was not supported by the results of any testing or other factual foundation. Nor did Mr. Baskett indicate how close one would have to be to the tracks to hear an approaching train, or how close a train would have to be to a crossing before it is audible over the ambient noise.

94. Ms. Tierney also spoke to the principal of Eiber Elementary School. She confirmed that not many children walk to school on a typical day. She also stated that she felt that resources would be better utilized toward safety education for students as opposed to a guard assigned to the Independence Street crossing.

95. As noted above, the pedestrian tunnel under the light rail tracks is not currently open. It is reasonable to infer that students walking to and/or from school will make use of the tunnel when it is opened, rather than walking over the tracks.

96. Ms. Tierney established that RTD will undertake a safety education program at the local schools, including Eiber Elementary. This program will include coordination with the local parent-teacher organizations as well as outreach to children through distribution of flyers, posters, and coloring books. These materials will emphasize safe use of the crossings and, in the case of the Independence Street crossing, use of the Pikeview pedestrian tunnel. RTD will also attend school functions to provide safety education.

97. Ms. Tierney stated that the outreach program would be undertaken in conjunction with Operation Lifesaver, a nationwide non-profit organization promoting safety at rail crossings. RTD plans to initiate the safety outreach program as much as one year prior to the West Corridor becoming operational.

### **III. DISCUSSION AND CONCLUSIONS**

#### **A. Commission Jurisdiction and Burden of Proof**

98. Pursuant to § 40-4-106(1), C.R.S., the Commission is empowered to require public utilities to maintain and operate their facilities in such a manner as to promote and safeguard the health and safety of their employees, passengers, customers, and the public. More specifically, the Commission is charged with determining, ordering, and prescribing the just and reasonable

manner in which the tracks or other facilities or any railway corporation may be constructed across any public highway. § 40-4-106(2)(a), C.R.S. Such determination includes consideration of the particular point of crossing, the terms and conditions of installation and construction of the crossing, as well as the warning, signaling, or other safety appliances to be required in order to prevent accidents. *Id.*

99. Each of the cross-streets intersecting the subject crossings is a public highway within the meaning of § 40-4-106(2), C.R.S., in that the public has free and unrestricted access to use it to cross over the rail corridor.

100. As the proponent of a Commission order approving the Project, RTD has the burden of establishing that the configuration and mode of operation of each of the subject crossings will, indeed, promote and safeguard public safety. Rules of Practice and Procedure, 4 *Code of Colorado Regulations* 723-1-1500.

#### **B. Safety of Crossings for Vehicle Traffic**

101. The quiet crossing concept relies on visual cues to warn of an approaching train and physical barriers to minimize the possibility that a driver will be able to ignore warnings and cross the tracks when a train is nearby.

102. Many rail crossings commonly feature wayside warning bells as well as operational instructions that require an operator to sound train-mounted horns or bells as additional safety precautions. Given the quiet character of the West Corridor neighborhoods and the strong preference of residents to preserve that quality, the issue presented here is whether the crossing configurations and operational procedures are sufficient to safeguard safety without traditional audible warnings. Based on the following determinations, the ALJ concludes that the crossings, as-proposed, adequately safeguard the safety of vehicle traffic.

## 1. Configurations of Crossings and Safety Equipment

103. With the following exceptions, each crossing features standard roadway striping and signage to effectively inform drivers in the proximity of the crossing. At Garrison Street, Carr Street, and northbound Estes Street, the ALJ will require installation of R8-10 “STOP HERE WHEN CROSSING” signs in order to avoid any ambiguity that could be created by the distance between the roadway striping and the gate locations. This change will also promote consistency for drivers encountering the West Corridor crossings as such signs were originally specified for Lamar Street, Pierce Street, and Teller Street. Also, to provide accurate and adequate warning to motorists using the crossings,<sup>57</sup> RTD will be required to install R15-2 “2 TRACKS” signs below the R15-1 crossbuck sign as detailed on Hearing Exhibit D.

104. In addition, each crossing features active warning devices to alert drivers when a train is approaching. These active warning devices include two large post-mounted lights that flash, a descending gate arm, and three lights on the gate arm (two of which flash in unison with the post-mounted lights). An additional active warning display notifies drivers if a second train is approaching the crossing within ten seconds of the first.

105. Motorists must be reasonably attentive at all times, complete driver safety training, and also pass a vision screening to obtain a driver’s license.<sup>58</sup> In many situations, such as in the case of a rock or other foreign object in the traveled way, a driver must rely on visual cues alone to safely operate a vehicle. Thus, for a person behind the wheel of a car, visual warnings are appropriate. The record contains no evidence to dispute the adequacy of the visual warnings proposed by RTD for drivers.

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<sup>57</sup> And to clarify the apparent discrepancy with the various signing and striping plans.

<sup>58</sup> Every licensee must demonstrate a natural or corrected visual acuity of 20/40 or better. Colorado Driver’s Handbook, DR 2337 (02/02/11).

106. The configurations proposed by RTD for the 11 subject crossings all feature a combination of gates and/or raised curbs to restrain drivers from entering the crossings when trains are detected. In this way drivers are not only warned of, but are also physically separated from the potential hazard of an approaching train.

107. At each crossing where 12th Avenue and 13th Avenue carry traffic adjacent to the RTD trackway, that traffic will be controlled by stop signs. This design ensures that a vehicle traversing the crossings should not encounter cross-traffic on 12th Avenue or 13th Avenue that would impede the vehicle's ability to clear the crossing safely.

108. The alignments of the trackway through the West Corridor are generally tangent, with the exception of the horizontal curves in the area of Chase Street. This factor, together with the amount of clearance around the tracks should provide operators with substantially clear lines of sight ahead of light rail trains.

109. Based on the foregoing analysis, the ALJ finds that the fixtures and configurations of the light rail system proposed at each of the crossings are adequate to safeguard the safety of motorists using the roadways adjacent to and across the tracks. These features, even in the absence of audible devices, are sufficient to warn drivers and/or prevent them from entering the crossings when trains are approaching.

## **2. Operational Procedures**

110. The operational procedures that factor into the safety of the crossings for vehicle traffic consist of the gate timings, proposed speeds for light rail vehicles, training of light rail operators, and operator discretion to use train-mounted horns in response to perceived hazards or obstructions.

111. RTD established that the timing of the descents for entry and exit gates is appropriate.<sup>59</sup> The timings take into account the unique geometry of each crossing and the fact that vehicle cross-traffic will be controlled. The entry gate timings provide drivers a reasonable amount of time to react to active warning of an approaching train and either stop, or proceed through the crossing before the train arrives.<sup>60</sup> While there is no recognized national standard for exit gate timing, the factors considered by RTD here reasonably ensure that drivers will not be trapped in the crossing by a descending gate or cross-traffic beyond the crossing. All gates will be fully descended a minimum of five seconds before the arrival of a train at the crossing.

112. Consistent with the contents of Hearing Exhibit J, the prescribed exit gate timing for each crossing shall be as follows:

- a) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Perry Street;
- b) RTD will be required to use a five-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Lamar Street;
- c) RTD will be required to use a three-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Garrison Street;
- d) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Oak Street;
- e) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Harlan Street;

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<sup>59</sup> The Commission has performed separate calculations for the exit gate descent times using a different methodology than that used by RTD. Based on a comparison of the Commission's calculations to RTD's calculations, and with an understanding that some side streets may be blocked by vehicles stopped by gates at the crossings, the delay times proposed by RTD are appropriate.

<sup>60</sup> *i.e.*, if the vehicle is so near the crossing that it is safer to proceed than to stop.

- f) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Pierce Street;
- g) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Carr Street;
- h) RTD will be required to use a four-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Teller Street;
- i) RTD will be required to use a three-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Estes Street;
- j) RTD will be required to use a three-second delay between the time of start of descent of the entrance gate and the time of start of the descent of the exit gate for the crossing of Independence Street.

113. With one exception noted below,<sup>61</sup> the speeds proposed by RTD reasonably assure that motorists and light rail operators will have ample opportunity to perceive and react to any potential hazard resulting from the light rail operation. For the five crossings next to a station, trains will be slowing to prepare to stop or starting from a stop. In the latter case, the operator will have the opportunity to assess any potential hazard before leaving the station. For arriving trains, their speeds will be low enough to permit a full emergency stop within 5 seconds and approximately 100 feet. Taking the gate timing and available sight distance into account, a light rail operator should not be surprised by a vehicle obstruction near a station with inadequate time to react.

114. Away from stations, where light rail speeds are expected to average 30 mph, operators will need to be more alert for vehicle-related obstructions. Allowing for a fully-loaded train and the safety factor included in Hearing Exhibit M, an operator will require nearly 300 feet

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<sup>61</sup> See Paragraph No. 130.

and 8 seconds to accomplish an emergency stop. As this is more than the five-second minimum amount of time that the gates will be fully descended before the train reaches the crossing, it is possible that a vehicle could enter the crossing and stall or otherwise be in the trackway such that an operator will have to react. However, accounting for the available sight distance and headlight illumination of some 600 feet, an attentive operator has a reasonable opportunity to perceive such a hazard and initiate an emergency stop.

115. The preceding paragraphs underscore the importance of effective operator training along the West Corridor. RTD will train each operator to be aware of the particular characteristics of the system in the area of each crossing before the operator is certified to drive a train in passenger service. In addition, prior to beginning revenue service, RTD will evaluate warning device operations and gate timings during more than three months of tests and simulated service. This process will permit RTD to assess the efficacy of the systems and perform any necessary adjustments to operation of the equipment or the training of operators.

116. Light rail operators will be trained to use the train-mounted horn in response to a perceived hazard, such as a vehicle or person on the trackway. This procedure will afford an additional source of warning to drivers who may otherwise be unaware of an approaching train.

117. The ALJ finds that the totality of the operational procedures in evidence, in conjunction with the configuration of the crossings, provides an acceptable measure of safety for vehicle traffic without the necessity of wayside warning bells.

### **C. Safety of Crossings for Pedestrians**

118. Many of the characteristics above provide an equal measure of safety for pedestrians using the subject crossings. This is true for the visible static and active warnings and



the operational procedures such as light rail speeds, operator training, and train-mounted horn use.<sup>62</sup>

119. However, as elicited during the public comment session, while visible warnings are effective for drivers and many pedestrians, no warning signal is imparted to sight-impaired pedestrians by signs, flashing lights, and descending gate arms.

120. The ALJ is sensitive to the quiet character of the surrounding neighborhood and the desire of residents that this not be drastically altered by light rail operations. However, that desire must be reconciled with the Commission's mandate to ensure the safety of the crossings. Given that the surrounding neighborhoods are primarily residential, it is also reasonable to infer that many children live in close proximity to the light rail trackway. Thus, the adequacy of the warnings for pedestrians must account for the potential that a younger person may not be attentive to visible cues alone.

121. The ALJ is not convinced that the sound generated by a light rail trains is adequate to furnish a distinctive and consistently audible warning of potential hazard. The sound of a train may be masked by other ambient noise, such as a lawn mower. In addition, a train may not be audible until it is too close for the pedestrian or the operator to react appropriately. The essence of effective warning is to give the person warned sufficient time to understand and avoid the hazard without the need for a last-second, emergency reaction.

122. The ALJ finds that the quiet crossing operation proposed in the subject applications is inadequate to warn blind and child pedestrians of an approaching train.

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<sup>62</sup> RTD maintained that pedestrians may be physically blocked from entering the crossings by the descended gate arms or their counterweights. However, since some of the crossing gates do not block the entire sidewalk, and there is a strong likelihood that not all pedestrians will be using the approaching sidewalks, this evidence was unpersuasive. The ALJ concludes that the safety of pedestrians at the crossings depends on effective warning, not on the portion of a sidewalk that can be considered "blocked" by a descended gate arm.

123. The alternative audible pedestrian warning system demonstrated by RTD is an effective and viable safety precaution that does not unreasonably impact the quiet character of the adjacent neighborhoods. The tone is distinct and recognizable as a warning, and is audible above ambient noise. The system equipment can be installed on the proposed warning gate structure, using the same wiring and activation as standard wayside bells.

124. The demonstrations of the alternative system in Lakewood revealed that when calibrated to emit the warning tone only 5 decibels above the ambient noise level, the system is not likely to disturb the residents. Both the Eiber Neighborhood Association and the Two Creeks Association support the implementation of the alternative system so long as the operation is consistent with the provisions of Hearing Exhibit N.

125. The ALJ finds that the provisions of Hearing Exhibit N effectively promote pedestrian safety while reasonably assuring tranquility in the neighborhood. RTD will be required to install and operate an alternative audible pedestrian warning system at the 11 crossings in accordance with Hearing Exhibit N and the testimony offered to clarify Exhibit N. Specifically, the signal volume referenced in paragraphs 7 and 8 of Hearing Exhibit N shall be measured at the location described in paragraph 1 of Exhibit N. In addition, the directional speaker for the alternative system shall not be installed such that the unit is pointing more than 90 degrees (horizontally) away from the location described in paragraph 1 of Hearing Exhibit N.

126. The previous finding predict that the Novax-type system, operated in accord with the provisions of Hearing Exhibit N, will provide adequate safety for pedestrians using the subject crossings. However, the Commission's jurisdiction and mandate to ensure the safety of the public does not terminate with that finding. The experience of drivers, pedestrians, light rail

operators, and others responsible for the safe operation of the system (including Commission and RTD staff) must continue to inform future decisions about the safety of crossings along the West Corridor. If the provisions of Hearing Exhibit N, as approved in this Decision, prove to be inadequate after the system begins actual operations, then changes may be prescribed.

127. As RTD will be writing specifications for a Novax-type system to be installed and operated consistent with this Decision, it has the ability to dictate exactly what features must be present in the final product. In order to provide maximum flexibility to adapt to unforeseen safety needs, RTD should include in the specifications the ability for the system to operate as intended (*i.e.*, emitting sound at 5 dB above detected ambient noise, but never higher than a set cap) but also the ability for the system to emit sound at 5 dB above detected ambient noise with no cap. Thus, if it is later determined that the cap described in paragraph 8 of Hearing Exhibit N renders the alternative audible pedestrian warning ineffective, then the mode of operation could be altered to “no cap” with a minimum of expense and/or effort.

#### **D. Other Safety Considerations**

128. The proximity of Eiber Elementary School to the Independence Street crossing poses a special safety situation. Although during two days of observation very few students were seen walking to school, it is possible that more children do so in warmer months.

129. The safety outreach program proposed for the local schools will be a key component of the safe operation of light rail along the West Corridor. The ALJ agrees that initiating this program in advance of the opening of the West Corridor line is desirable. However, it will also be important to educate new children who enter the school during subsequent years as operations continue. RTD will therefore be required to partner with the Jefferson County School District, the Eiber Elementary administration, and the parent-teacher

organization<sup>63</sup> at the school to determine which grade will benefit from an ongoing, annual “refresher” education regarding rail crossing safety. For example, kindergarten students might be too young to benefit from such a program and the stakeholders agree that second grade is appropriate. RTD will be required to plan and execute an annual safety education program for the appropriate grade.

130. The opening of the Pikeview tunnel and the emphasis on using that facility as part of the outreach program should enhance safety for school children around the school. Nonetheless, the ALJ finds that it will be necessary for light rail trains to operate at slower speeds, as automobiles are required to do, in order to provide the necessary margin of safety during school hours. The ALJ will require trains to slow to 20 miles per hour during the hours of 7:30 a.m. to 3:00 p.m. on weekdays. The above speed zone will apply to an area extending from 600 feet in either direction from the center point of the Independence Street crossing.

#### **E. Conclusion**

131. The applications submitted by RTD for configuration and operation of the 11 subject crossings should be approved, conditioned on the installation of additional signage as detailed in Paragraph No. 103, above, inclusion of the alternative audible pedestrian warning system as specified in Paragraphs No. 123 through No. 127, above, and the implementation of the safety education outreach program and light rail speed limitation specified in Paragraphs No. 129 and No. 130.

132. Pursuant to § 40-6-109, C.R.S., it is recommended that the Commission enter the following order.

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<sup>63</sup> Or its equivalent.

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

1. The 11 applications consolidated within this Docket are approved subject to the conditions stated in Ordering Paragraphs No. 2 through No. 9, below.

2. With regard to all 11 crossings, the Regional Transportation District (RTD) will be required to install an alternative audible pedestrian warning system in compliance with the provisions of Paragraphs No. 123 through No. 127.

3. With regard to all 11 crossings, the RTD will be required to implement the warning gate timings in compliance with the determinations in Paragraphs No. 111 and No. 112.

4. With regard to all 11 crossings, RTD will be required to install R15-2 “2 TRACKS” signs in conjunction with installation of R15-1 Crossbuck signs as detailed on Hearing Exhibit D and discussed in Paragraph No. 103, above.

5. With regard to the application in Docket No. 10A-738R (Independence Street), RTD will be required to implement the safety education outreach program consistent with the findings in Paragraphs No. 96 and No. 97 as well as Paragraph No. 129.

6. With regard to the application in Docket No. 10A-738R (Independence Street) RTD will be required to implement the light rail vehicle speed limit in compliance with Paragraph No. 130.

7. With regard to the application in Docket No. 10A-742R (Garrison Street) RTD will be required to install R8-10 “STOP HERE WHEN FLASHING” signs at the appropriate locations in compliance with the determination in Paragraph No. 103.

8. With regard to the application in Docket No. 10A-736R (Carr Street) RTD will be required to install R8-10 “STOP HERE WHEN FLASHING” signs at the appropriate locations in compliance with the determination in Paragraph No. 103.

9. With regard to the application in Docket No. 10A-741R (Estes Street) RTD will be required to install an R8-10 “STOP HERE WHEN FLASHING” sign for northbound traffic at the appropriate locations in compliance with the determination in Paragraph No. 103.

10. RTD shall inform the Commission in writing that the work at each crossing is complete and operational within ten days of completion.

11. RTD shall file a copy of the crossing inventory form for the each crossing at the same time it makes the filing required in Ordering Paragraph No. 10.

12. This consolidated docket is now closed.

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

KEITH J. KIRCHUBEL

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Administrative Law Judge

ATTEST: A TRUE COPY

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

Doug Dean,  
Director