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Technical Memorandum

August 21, 2023 Project# 27003.011

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Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Final Tech Memorandum #6: Alternatives Analysis

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INTRODUCTION

This memorandum provides a summary of the transportation needs (Needs Statement) introduced to the Reedsport transportation system with the development of the Port of Coos Bay Pacific Coast Intermodal Port and associated increased train activity through the community. To address these needs, a set of potential alternative solutions are identified and initially evaluated to address transportation system deficiencies and mitigation impacts associated with the anticipated increased rail activity. From this evaluation, the top two most promising alternatives have been identified for further consideration and refinement.

NEEDS STATEMENT

Based on the existing and future conditions analysis and feedback from the Project Advisory Committee (PAC), Project Management Team (PMT), community member interviews, and Online Open House #1, the following deficiencies have been identified to date based on the projected increase in traffic demand and train activity associated with the Port of Coos Bay Pacific Coast Intermodal Port:

1) **Rail crossing delays and access/circulation barriers** – A 4,100-foot train traveling at 10 mph through downtown Reedsport during 30th highest hour traffic conditions will create the following operational and/or safety related deficiencies:
    a. Eastbound vehicular queues on OR 38 will spill back into the US 101/OR 38 intersection.

   b. Multiple cycles will be required at the US 101/OR 38 intersection to recover from the train event.
   c. Simultaneous delays of 5 ½ minutes or greater will occur at the OR 38 and Winchester Avenue rail crossings – the delays will increase response times for emergency service vehicles (fire, ambulance, and police).
   d. Local circulation and access delays exceeding 60 seconds (level-of-service F) will occur at cross streets to OR 38 (i.e., Myrtle Avenue, Laurel Avenue, W Railroad Avenue, E Railroad Avenue, Fir Avenue, North 6th Street, and North 5th Street) and Winchester Avenue (i.e., North 10th Street, W Railroad Avenue-River Bend Road, Elm Avenue, E Railroad Avenue, and North 7th Street).
   e. Traffic volumes will increase on the vertically and horizontal restricted Port Dock Road rail undercrossing, as well as E Railroad Avenue, W Railroad Avenue, and Riverfront Way.
2) **Increased train activity** – The forecasted increase from 2 to 14 trains per day is anticipated to create the following potential issues:
   a. Increased probability of delays to emergency service provider (fire, ambulance, and police) response time to areas east and west of the rail line as the police station and Fire Station 1 are located east of the rail line on 4th Avenue. The hospital and Fire Station 2 are located west of the rail line on Ranch Road and Frontage Road.
   b. Increased train horn use during school or nighttime hours leading to quality-of-life concerns from nearby residents and businesses.
   c. Increased pedestrian-train conflicts due to the lack of sidewalk gates on OR 38 and lack of sidewalks on Winchester Avenue.
   d. Peak hour queues on OR 38 and Winchester Avenue that create local circulation and access delays at cross streets, including W Railroad Avenue, River Bend Road, Elm Avenue, and E Railroad Avenue.
   e. Increased use of Port Dock Road undercrossing and related increases in cut-through traffic on local streets will create issues at the undercrossing as well as the OR 38/Riverfront Way-2nd Street and US 101/OR 38 intersections.
3) **US 101/OR 38 operations** – The signalized intersection is forecasted to operate at capacity (a volume-to-capacity [v/c] ratio of 1.0) in Year 2045 and exceed the Oregon Highway Plan mobility standard of 0.85. These operations will result in decreased mobility for motorists and freight and long delays during conditions exceeding the 30th highest peak hour.

Given the published high-level program associated with the proposed Port of Coos Bay container facility project and the inability to establish defined train schedules due to Port operations and rail operations throughout the western United States, the project team has focused on identifying the point at which the transportation system does not function effectively (a 4,100-foot train at 10 mph) nor meet the goals of the City of Reedsport's comprehensive plan and necessitate mitigation. However, the specific timing of the identified mitigation measures will be primarily driven by the availability of funding and the ramp up of rail operations at the proposed Port facility driven by market demands. In addition, the following factors have been identified that may further degrade or minimize the issues identified above:

Degradation factors:

- Longer trains – Exceeding 4,100 feet at 10 mph
- Slower trains – Traveling at speeds less than 10 mph
- Increased number of trains – Greater than 14 trains per day
- Traffic conditions exceeding the 30th highest peak hour demand on OR 38 – Higher peak hour volumes and proportion of trucks and recreation vehicles

Minimization factors:

- Shorter trains – Less than 4,100 feet at 10 mph
- Faster trains – Traveling in excess of 10 mph
- Reduced number of trains – Less than 14 trains per day

Other Considerations and Study Assumptions:

Train length – Ports and railroads are generally incentivized to operate fewer and longer trains to transport containers. There are operational and physical limitations to the maximum train length permitted along any railroad line. Operational limitations include the grade and horizontal curvature of the railroad alignment, which is directly related to the number and position of the locomotives required to move the train over the line segment. These limitations can be challenging to overcome, and some are impractical to change. Additional limitations to train length are typically physical constraints such as port/dock rail capacity, upstream/downstream switching yard capacity, and rail siding lengths. Based on the available program information for the proposed Port facility and a cursory review of the Coos Bay Rail Line infrastructure between Coos Bay and Eugene, ***trains are anticipated to be between 4,000 and 5,000 feet in length and potentially longer***. Future studies by the Port will better characterize the constraints to potential train length.

A 5,000-foot (or longer) train traveling at 10 mph through downtown Reedsport will further increase motor vehicle queues, crossing delays, emergency vehicle response times, access delays, and traffic volumes on the local street system. Table 1 shows how train length impacts motor vehicle queues and delays on OR 38 and Winchester Avenue. Attachment "A" contains the queuing analysis worksheets.

Table 1. Train Length versus Motor Vehicle Queues and Delays

Train Length (ft)	OR 38 Queue (ft)		OR 38 Delay (sec)	Winchester Avenue Queue (ft)		Winchester Avenue Delay (sec)
	Eastbound	Westbound		Eastbound	Westbound	
6,000	1,425	1,600	459.1	575	625	459.1
5,000	1,225	1,375	390.9	500	550	390.9
4,100	1,050	1,200	329.5	450	475	329.5
4,000	975	1,100	322.7	425	475	322.7
3,000	825	950	254.4	350	375	254.4
2,000	650	725	186.4	275	300	186.4
1,500	525	600	152.3	225	250	152.3

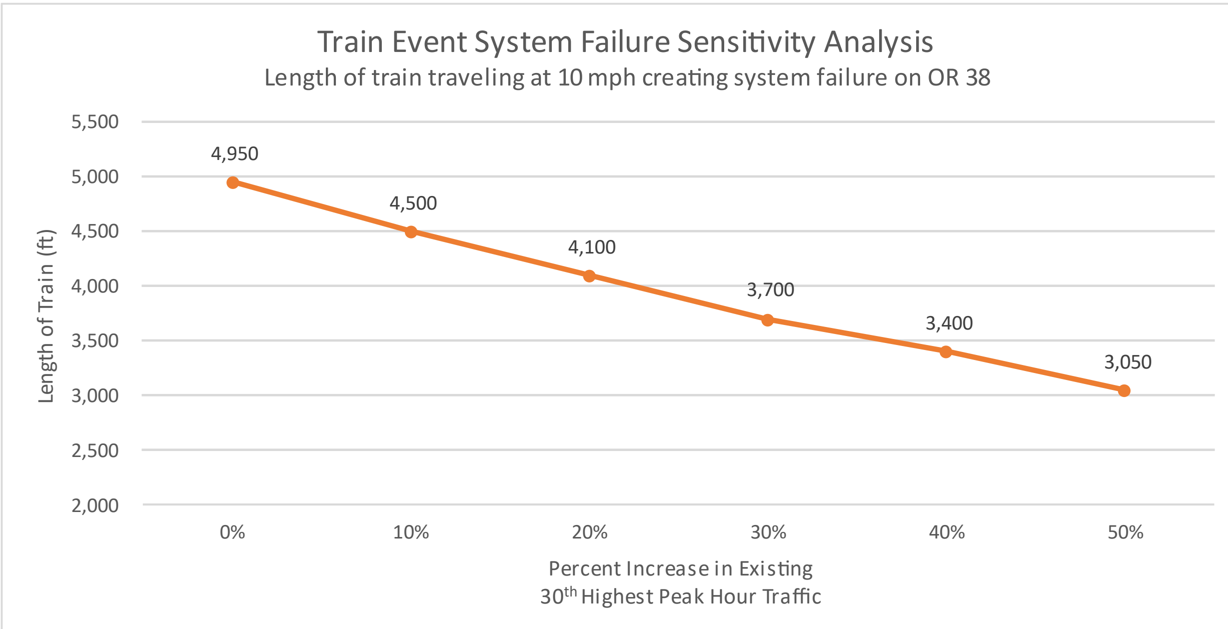
Potential for moving containers by truck vs. train – Port facilities are generally set up to transport containers by train, truck, or a mix of modes depending on their location and proximity to population centers, and availability of trucks to support the required transit. The Port of Coos Bay's remote nature (i.e., 185 miles south of Portland) and relatively limited access to the interstate freeway system will make it similar in nature to Port of Prince Rupert in British Columbia, Canada, which is primarily serviced by trains. Given the location, likely destination of containerized goods, and existing highway infrastructure capacity, nearly all containers will be transported by rail. Thus, ***significantly increased truck traffic through Reedsport via OR 38 and US 101 is <u>not anticipated</u> based on the project team's understanding of the proposed Port of Coos Bay container facility***.

Train speed – Due to the existing conditions of the Umpqua Bridge, horizontal curvature in the rail line both upstream and downstream of Reedsport, and magnitude of funding likely needed to improve existing rail tunnels and bridges, ***trains speeds through Reedsport are anticipated to remain in the 10 to 25 mph range***. Future studies by the Port will better characterize the constraints to potential train speeds within Reedsport.

OR 38 forecasted traffic growth and peak season conditions – The traffic forecasts used in the existing and future conditions analysis represent the 30th highest peak hour conditions that typically occur on an average weekday in August. The future forecasted 2045 traffic volumes are based on a 1 percent growth rate (23 percent total growth in traffic). While the vehicular queues and blockage delays at the OR 38 and

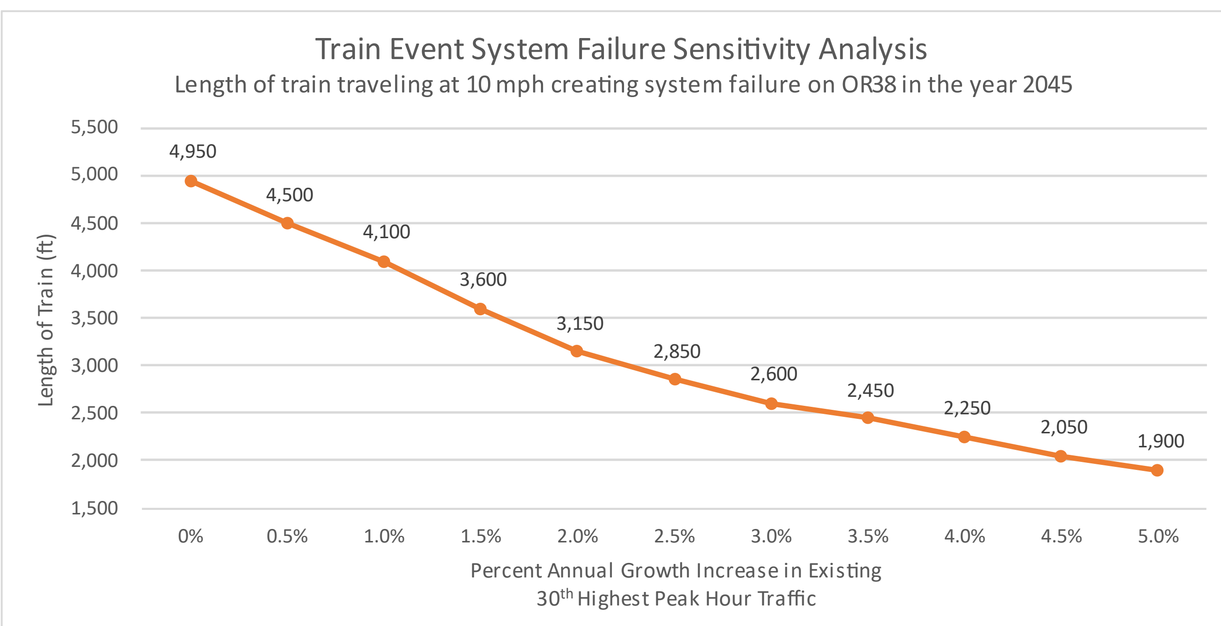
Winchester Avenue rail crossings are primarily driven by train length and speed, traffic volumes and vehicle types play a lesser role in the overall associated delay and queuing-related impacts to the community. To further understand the role that vehicular traffic plays, the following two exhibits provide a near- and long-term sensitivity analysis as to when the transportation system breaks down (i.e., eastbound vehicles on OR 38 spilling back into US 101).

Exhibit A. Percent Increase in Traffic Over Existing 30th Highest Peak Hour Conditions



As shown in Exhibit A, a 50 percent increase in traffic (over existing volumes) on OR 38 during the peak hour would lead to an approximately 3,050-foot train at 10 mph, extending queues into the US 101 intersection.

Exhibit B. Percent Annual Growth Rate in Over Forecasted Year 2045 30th Highest Peak Hour Conditions



As shown in Exhibit B, a theoretical annualized growth rate of 5 percent per year on OR 38 during the peak hour would lead to an approximately 1,900-foot train at 10 mph extending queues into the US 101 intersection in Year 2045. **However, it should be noted that traffic volumes between Years 2004 and 2022 have grown by approximately 1 percent per year, consistent with the study assumptions identified above.** Attachment "A" contains the queuing analysis worksheets.

ALTERNATIVES DEVELOPMENT

The following alternatives were developed to address these transportation needs. The alternatives were developed by the project team with input from the PMT and PAC and documented in the *Alternative Design Methodology & Assumptions and List of Initial Alternatives* memorandum (see Attachment "B").

No-Build Alternative

This alternative includes no improvements at the rail crossings, nor any improvements along OR 38 or Winchester Avenue. As indicated previously, the proposed Port facility is expected to increase train activity through downtown Reedsport, which will increase crossing delays, create access/circulation barriers, and impact traffic operations and safety on OR 38, Winchester Avenue, and other streets and intersections within the area. The level of impact varies based on the length and speed of the trains, as well as the frequency of train events; however, as indicated in previous memorandums and in the needs statement above, the impact is expected to be significant. This alternative establishes the baseline for evaluating and understanding the impacts of the increase in train activity of the goals and objectives of the City's Transportation System Plan (TSP) and the goals and objectives of this study.

No-Build Alternative Evaluation

The no-build alternative was evaluated based on the project evaluation criteria. Table 2 summarizes the average rating for each criterion and overall average rating for the alternative. Attachment "C" provides the full detailed rating for the alternative.

Table 2. No-Build Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
No-Build	-1.2	-0.8	-1.0	-1.3	-1.0	-1.0	-0.7	-1.0

At-Grade Rail Crossing Alternatives

There are well-established criteria for the protection of at-grade crossings, largely based upon established Manual of Uniform Traffic Control Device (MUTCD) standards.

The existing at-grade crossings on OR 38 and Winchester Avenue currently feature modern and appropriate crossing protection, with active warning features that include gate arms, warning bell, and flashers. Both crossings have been improved with new active warning hardware and crossing surfaces within the last decade as shown in the images below.


OR 38 Rail Crossing (Facing East)


Winchester Avenue Rail Crossing (Facing East)

Improvements can be made to the existing at-grade crossing(s) to further enhance their safety while also providing for the implementation of a quite-zone within Reedsport, which would limit the prescribed and regular use of train horns when trains approach and occupy the crossing(s).

The methodologies required for the application of a quiet zone generally provide for additional means of keeping vehicles and pedestrians away from the tracks as a train approaches. The two most common crossing enhancements are the installation of a centerline median or barrier that limits the ability of vehicles to circumvent the typical dual quadrant gate arms that are in place, or the installation of four quadrant gate arms that provide protection of all travel lanes in both directions and limit the access of vehicles into the crossing as a train approaches. Either approach could further enhance safety at the existing at-grade crossings while reducing train horn use by complying with quiet zone requirements.

A third less common but effective means of reducing train horn use is the installation of fixed wayside horn devices that are mounted at the crossing and focus their horn sounds upon the traffic lanes (as opposed to trains using their horns). Since the sound from the wayside horns are focused upon the roadway, the horn volume required is much less than that from the horn mounted upon the train, which generally radiates sound at not only a greater volume, but also within a widely radiating pattern around the tracks, often at considerable distance from the grade crossing in order to be effectively heard at the crossing.

In addition to the protections for vehicular traffic, gates and flashers across the pedestrian and/or combined-use crossings could be installed. These dedicated warning devices provide positive protection of the crossing similar to roadway gates and can be augmented with additional fixed fencing or elements that further limit the ability of pedestrian of bicycle traffic to circumvent the closed gate arms.

1A – Four-Quadrant Gated Rail Crossing on OR 38

This alternative would provide a four-quadrant gated rail crossing on OR 38 to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities. This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives. Exhibit 1A illustrates a four-quadrant gated rail crossing on OR 38.

Exhibit 1A. Four-Quadrant Gated Rail Crossing on OR 38

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the four-quadrant gated rail crossing on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $360,000.

1B – Median Barrier on OR 38

This alternative would provide a median barrier on OR 38 to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The median barrier would be provided at each approach to the rail crossing to prevent motorists from driving around the lowered gates. Exhibit 1B illustrates a median barrier on OR 38.

Exhibit 1B. Median Barrier on OR 38

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the median barrier on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $550,000.

1C – Four-Quadrant Gated Rail Crossing on Winchester Avenue

This alternative would provide a four-quadrant gated rail crossing on Winchester Avenue to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities. This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives. Exhibit 1C illustrates a four-quadrant gated rail crossing on Winchester Avenue.

Exhibit 1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the four-quadrant gated rail crossing on Winchester Avenue based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $285,000.

1D – Median Barrier on Winchester Avenue

This alternative would provide a median barrier on Winchester Avenue to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The median barrier would be provided at each approach to the rail crossing to prevent motorists from driving around the lowered gates. Exhibit 1D illustrates a median barrier on Winchester Avenue.

Exhibit 1D. Median Barrier on Winchester Avenue

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the median barrier on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $400,000.

At-Grade Rail Crossing Evaluation

The at-grade rail crossing alternatives were evaluated based on the project evaluation criteria. Table 3 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 3. At-Grade Rail Crossing Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
1A. Four-Quadrant Gated Rail Crossing on OR 38	-0.4	-0.8	0.0	-0.7	1.0	-0.7	0.7	-0.2
1B. Median Barrier on OR 38	-0.4	-0.8	-0.3	-1.0	0.0	-0.7	0.7	-0.4
1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue	-0.4	-0.8	0.0	-0.7	1.0	-0.7	0.7	-0.2
1D. Median Barrier on Winchester Avenue	-0.4	-0.8	-0.3	-1.0	0.0	-0.7	0.7	-0.4

While all the at-grade crossing alternatives can reduce train-related horn noise, none of the alternatives by themselves address the identified rail crossing delays and access/circulation barriers introduced by the proposed Port project. As such, an at-grade alternative at one rail crossing would likely need to be paired with a potential grade-separated rail crossing alternative at the other rail crossing.

Grade-Separated Rail Crossing Alternatives

Several alternatives were developed to provide a grade-separated rail crossing in downtown Reedsport. The alternatives consist of overcrossings and undercrossings with and without retaining walls (embankment only support). The alternatives vary by location and by type and their anticipated impacts on local street connectivity, traffic operations, and safety, as well as adjacent land uses. The following provides a brief description of the alternatives, their anticipated impacts, and how well they meet the goals and objectives of the study.

OR 38 Rail Overcrossing

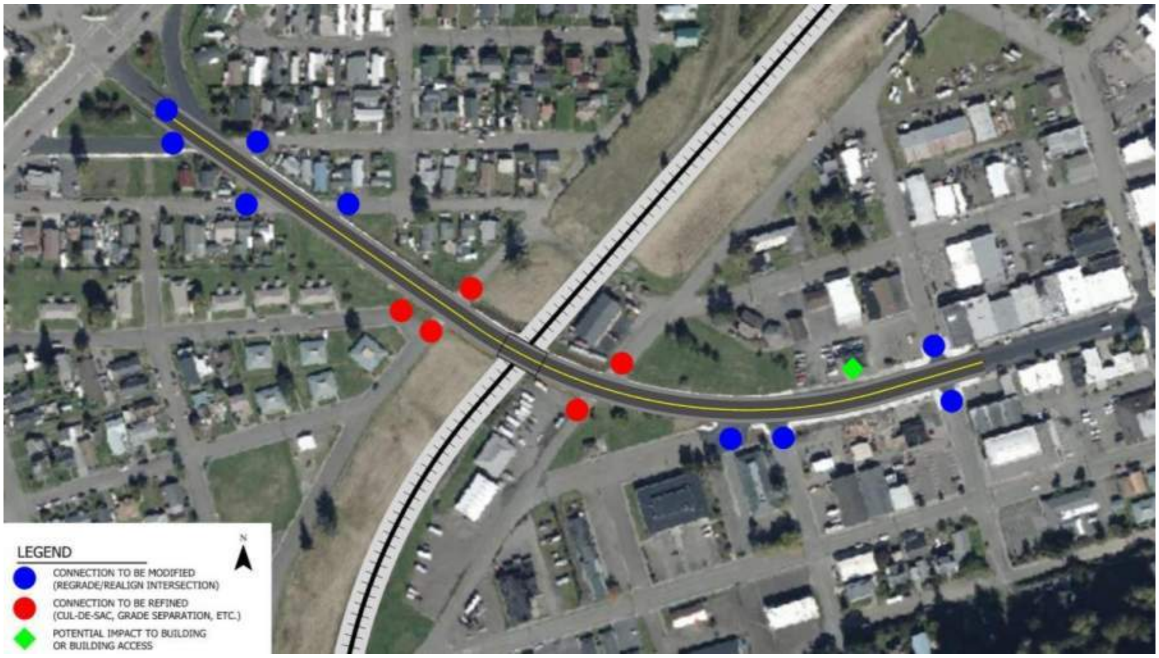
This alternative would provide a grade-separated rail crossing (overcrossing) on OR 38. Based on the preferred approach grade and minimum vertical clearance requirements, the overcrossing would require approaches of approximately 600 feet on both sides. Therefore, the overcrossing would extend from approximately Laurel Street to N 5th Street and all street connections and driveways would need to be reconfigured or closed; the Laurel Street intersection could be reconfigured to maintain its connection to OR 38 while the W Railroad Avenue, E Railroad Avenue, Fir Avenue, and N 6th Street intersections would potentially need to be closed. Box culvert-type structures or simple bridges could be provided to allow W Railroad Avenue and/or E Railroad Avenue to maintain connectivity and additional street connections could be explored to increase connectivity.

2A1 – With Retaining Walls

The design of the OR 38 rail overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes on adjacent properties and transportation facilities. Exhibit 2A1-1 and 2A1-2 illustrate the OR 38 rail overcrossing with retaining walls throughout the length of the overpass. As shown, several existing street connections would need to be modified or refined and one building or building access could be impacted.

Exhibit 2A1-1. OR 38 Rail Overcrossing with Retaining Walls – Aerial Perspective

Exhibit 2A1-2. OR 38 Rail Overcrossing with Retaining Walls



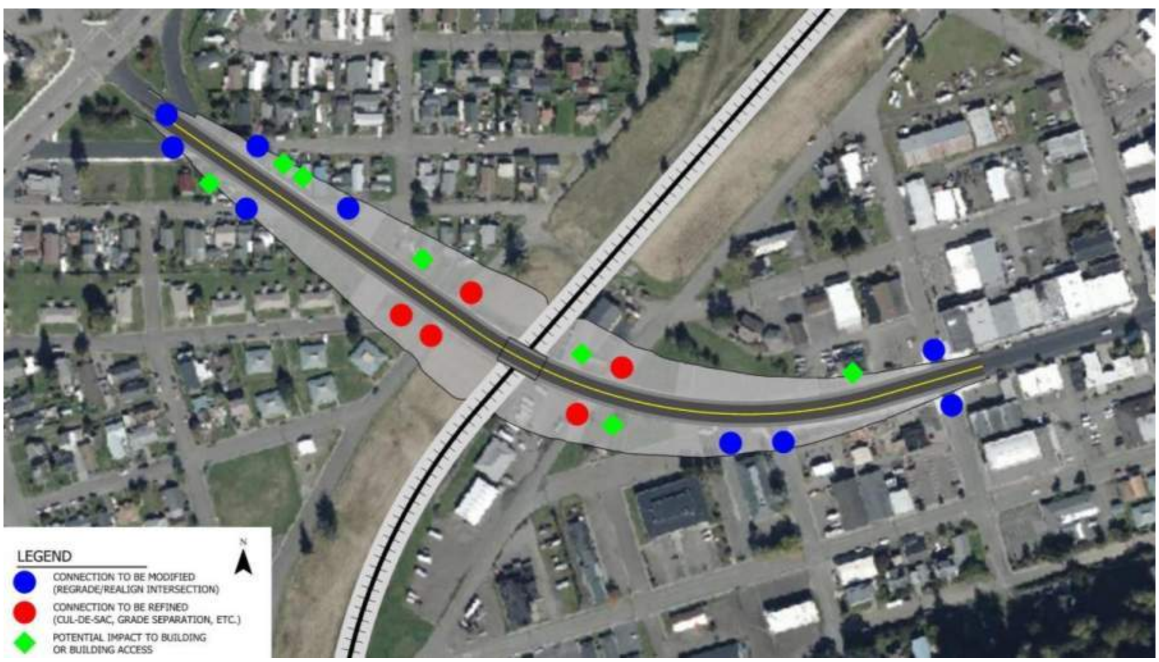
Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail overcrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $12.0M.

2A2 – Without Retaining Walls (Embankment Support)

The design of the OR 38 rail overcrossing may exclude retaining walls in certain areas and instead incorporate abutment side slopes, or embankment support. This alternative would have a greater impact on adjacent properties and transportation facilities. Exhibit 2A2-1 and Exhibit 2A2-2 illustrate the OR 38 rail overcrossing without retaining walls (embankment support) throughout the length of the overpass. As shown, a few existing structures (commercial and residential) would potentially need to be removed to accommodate the side slopes.

Exhibit 2A2-1. OR 38 Rail Overcrossing without Retaining Walls – Aerial Perspective

Exhibit 2A2-2. OR 38 Rail Overcrossing without Retaining Walls – Aerial



Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail overcrossing without retaining walls based on unit costs from similar projects in the northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $15.0M.

Winchester Avenue Rail Overcrossing

This alternative would provide a grade-separated rail crossing (overcrossing) on Winchester Avenue. Based on the desired maximum approach grade and minimum vertical clearance requirements, the overcrossing would require approaches of approximately 500 feet on both sides. Therefore, the overcrossing would extend from N 11th Street to N 6th Street and all street connections, and driveways would need to be reconfigured or closed; the N 10th street, W Railroad Avenue-Riverbend Road, Elm Avenue, E Railroad Avenue, and N 7th Street intersections would need to be potentially closed. Box culverts or simple bridge structures could be potentially provided to allow W Railroad Avenue-Riverbend Road, Elm Avenue, and E Railroad Avenue to maintain connectivity to the area south of Winchester Avenue. Additional street connections could be explored to increase connectivity, such as an extension of Scholefield Drive to River Bend Road.

2B1 – With Retaining Walls

The design of the Winchester Avenue overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes on adjacent properties and transportation facilities. Exhibit 2B1-1 and Exhibit 2B1-2 illustrate the Winchester Avenue rail overcrossing with retaining walls throughout the length of the overpass. As shown, a few existing street connections would need to be modified or refined and several buildings or building accesses could be impacted.

Exhibit 2B1-1. Winchester Avenue Rail Overcrossing with Retaining Walls – Aerial Perspective

Exhibit 2B1-2. Winchester Avenue Rail Overcrossing with Retaining Walls

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail overcrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $12.5M.

2B2 – Without Retaining Walls (Embankment Support)

The design of the Winchester Avenue rail overcrossing may exclude retaining walls and instead incorporate abutment side slopes, or embankment support. This alternative would have greater impact on adjacent properties and transportation facilities. Exhibit 2B2-1 and Exhibit 2B2-2 illustrate the Winchester Avenue rail overcrossing without retaining walls (embankment support) throughout the length of the overpass. As shown, several existing structures would need to be removed to accommodate the side slopes.

Exhibit 2B2-1. Winchester Avenue Rail Overcrossing without Retaining Walls – Aerial Perspective

Exhibit 2B2-2. Winchester Avenue Rail Overcrossing without Retaining Walls

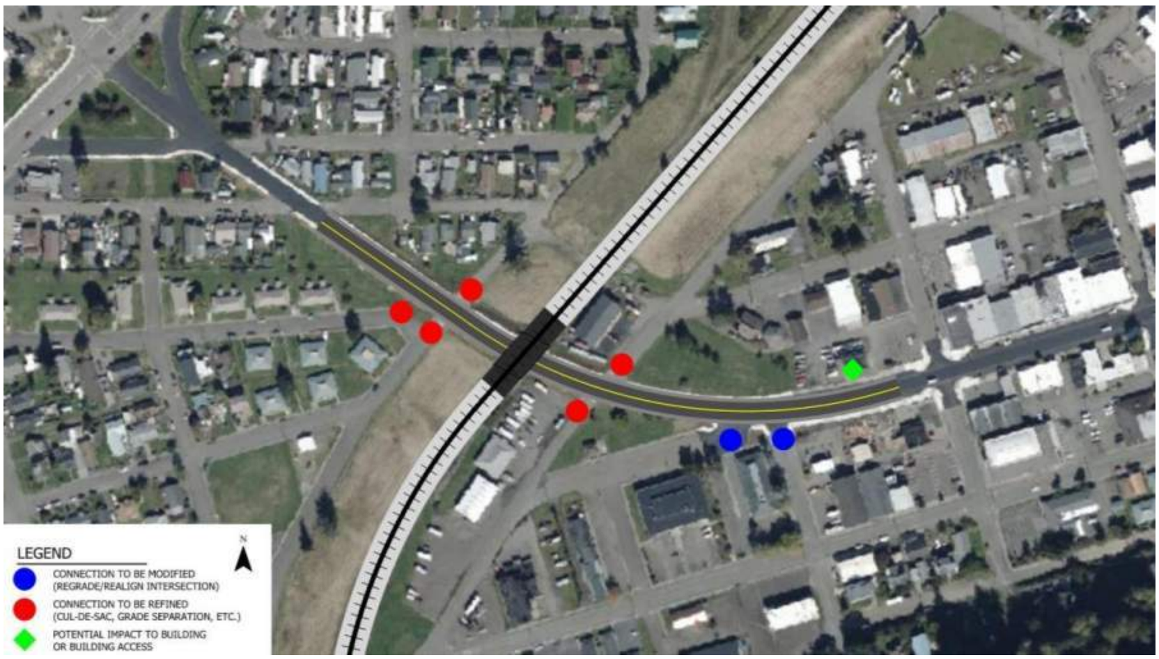
Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail overcrossing without retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $15.0M.

Other considerations: Implementation of an overcrossing on Winchester Avenue may require additional roadway upgrades to create a suitable alternate freight access route due to potential truck diversions identified in the traffic study. Further evaluation is required to determine the impact of the upgrades on adjacent properties and transportation facilities.

2C – OR 38 Rail Undercrossing with Retaining Walls

This alternative would provide a grade-separated rail crossing (undercrossing) on OR 38. Based on the preferred approach grade and minimum vertical clearance requirements, the undercrossing would require approaches of approximately 450 feet on both sides. Therefore, the undercrossing would extend from Laurel Street to N 5th Street and all street connections, and driveways would need to be reconfigured or closed; the N 6th Street intersection could be reconfigured to maintain its connection to OR 38 while the W Railroad Avenue and E Railroad Avenue intersections would be closed. Additional street connections could be explored to increase connectivity. A new rail bridge would be needed to span the undercrossing. Exhibit 2C illustrates the OR 38 rail undercrossing with retaining walls.

Exhibit 2C. OR 38 Rail Undercrossing with Retaining Walls



Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail undercrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $13.0M.

Other considerations: Implementation of an undercrossing on OR 38 would also require additional study to mitigate potential flooding risks due to the creation of a new low point. Based on preliminary feedback from the city, this alternative is likely not feasible. The construction of a new rail bridge would require additional coordination and specialized construction methods to maintain normal rail operations.

2D – Winchester Avenue Rail Undercrossing with Retaining Walls

This alternative would provide a grade-separated rail crossing (undercrossing) on Winchester Avenue. Based on the desired maximum approach grade and minimum vertical clearance requirements, the undercrossing would require approaches of approximately 350 feet on both sides, depending on the thickness of the structure needed to support the existing railroad. Therefore, the undercrossing would extend from N 10th Street to N 7th Street, and all street connections and driveways would need to be reconfigured or closed, including the W Railroad Avenue-Riverbend Road, Elm Avenue, and E Railroad Avenue intersections. Additional street connections would be required to provide connectivity to areas south of Winchester Avenue. Exhibit 2D illustrates the Winchester Ave rail undercrossing with retaining walls.

Exhibit 2D. Winchester Avenue Rail Undercrossing with Retaining Walls

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail undercrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $10.5M.

Other considerations: Implementation of an undercrossing on Winchester Avenue would also require additional study to mitigate potential flooding risks and install an adequate drainage and pumping systems, as well as the challenge of maintaining continuous rail access during construction.

Other Crossing Locations

Adjustments to the street alignments and network could potentially be made to upgrade the existing grade-separated rail crossings north of OR 38 or along Port Dock Road. The potential locations would seek to minimize the overall impacts of grade-separation and consider improvements to overall circulation.

2E1 – Port Dock Road Undercrossing Upgrade

The existing Port Dock Road undercrossing is located below the west end of the Umpqua River Bridge. The existing undercrossing includes a narrow (one-lane) roadway with a 13-foot vertical clearance. Access from the south is provided by Riverfront Way that connects to OR 38 across from Winchester Avenue, while access from the north is provided by Port Dock Road that connects to US 101 across from OR 38. The existing undercrossing would need to be upgraded to provide one lane in each direction. The existing roadway would be lowered by approximately 5 feet to provide adequate vertical clearance, and a new structure would be constructed to replace the existing bridge, as well as construction of a new bulkhead due to the proximity of the river to the undercrossing. The alignment of Riverfront Way and Port Dock Road would also need to be upgraded to provide a more direct connection from OR 38 to US 101. Exhibit 2E1 illustrates the Port Dock Road undercrossing and Riverfront Way realignment.

Exhibit 2E1. Port Dock Road Undercrossing Upgrade

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Port Dock Road undercrossing upgrade based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $7.5M.

Other considerations: upgrading the Port Dock Road undercrossing would also require additional study to review the water tables, consider the need for stormwater facilities, mitigate potential flooding risks, and install an adequate drainage and pumping systems.

2E2 – Northerly OR 38 Undercrossing Upgrade

The northerly OR 38 undercrossing is located approximately 230 feet north of OR 38. The undercrossing includes a narrow (one-lane) roadway with a 13-foot vertical clearance. Access from the south is provided by E Railroad Avenue and Greenwood Avenue, while access from the north is provided by W Railroad Avenue and Laurel Avenue. The existing undercrossing would need to be upgraded to provide one lane in each direction, and the roadways would need to be upgraded to meet maximum approach grade and minimum vertical clearance requirements. The existing roadway would be lowered by approximately 6 feet to provide adequate vertical clearance, and a new structure would be constructed to replace the existing bridge. The alignment of several roadways surrounding the crossing would also need to be upgraded to provide a more direct connection to the undercrossing. Exhibit 2E2 illustrates the northerly OR 38 undercrossing upgrade and roadway realignment.

Exhibit 2E2. Northerly OR 38 Undercrossing Upgrade

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the northerly OR 38 undercrossing upgrades based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $7.0M.

Grade-Separated Rail Crossing Evaluation

The grade-separated rail crossing alternatives were rated based on the project evaluation criteria. Table 4 summarizes the ratings for each criterion and overall average ratings for each alternative. As shown, the OR 38 overcrossing with retailing walls has the highest overall average rating among the at-grade rail crossing alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 4. Grade-Separated Rail Crossing Evaluation Summary

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
2A1. OR 38 Rail Overcrossing with Retaining Wall	2.0	-0.1	1.7	1.0	1.0	1.7	1.0	1.2
2A2. OR 38 Rail Overcrossing without Retaining Wall	1.2	-0.5	1.3	0.8	0.5	0.7	1.0	0.7
2B1. Winchester Avenue Rail Overcrossing with Retaining Walls	1.1	-0.3	1.7	1.0	1.0	1.7	0.7	0.9
2B2. Winchester Avenue Rail Overcrossing without Retaining Walls	0.4	-0.5	1.3	0.8	0.5	0.7	0.7	0.5
2C. OR 38 Rail Undercrossing with Retaining Walls	0.2	-0.5	1.3	0.8	0.5	0.7	0.7	0.5

2D. Winchester Avenue Rail Undercrossing with Retaining Walls	-0.2	-0.5	1.3	0.8	0.5	0.7	0.7	0.4
2E1. Port Dock Road Rail Undercrossing Upgrade	0.1	0.5	1.0	0.3	0.0	0.7	0.5	0.4
2E2. Northerly OR 38 Rail Undercrossing Upgrade	0.1	0.5	1.0	0.3	0.0	0.7	0.5	0.4

Rail Line Upgrade Alternatives

Current rail traffic operates at a reduced speed along the majority of the Coos Bay Rail Line. Given the level of service and tonnage, this slower operation is an economic trade-off against the physical plant improvements required along the line. It is expected that in parallel with the development of the container terminal, considerable improvements will be made to the railroad track, bridges, and geometry along the majority of the line. These investments will improve the rails, ties, and ballast along the line to allow a dramatic increase in aggregate tonnage from the container traffic. An expected benefit of the track improvements is the ability of the railroad line to support increased speeds.

3A1 – Increase Rail Speeds through Reedsport to 40 MPH

Within the immediate area of Reedsport, the existing railroad has favorable horizontal curvature and gradient due to the water level route through the area. The horizontal curvature at the south end of town would be considered the most restrictive at 4 degrees and 46 minutes, however. This existing curvature can readily support speeds of up to 40 mph with an increase in superelevation through the curve, without any horizontal modifications to the rail alignment. For a design speed of approximately 40 mph, superelevation of 2.5 inches (with an unbalance of 3 inches) would be required through the existing curve, which is within industry norms and would likely be provided as part of the basic track structure improvements along the railroad.

Planning level cost opinion: The significant nature and scope of the rail enhancements to achieve 40 mph rail speeds through the City of Reedsport is beyond the scope of this study as it requires investigating many facets of the rail line north and south of Reedsport, including bridges (e.g., Umpqua River Bridge) and tunnels. However, for the purposes of this study, the magnitude of these investments would be several times that of any of the other alternatives discussed, including Alternative 3A2 – Increase Rail Speeds through Reedsport to 25 MPH.

3A2 – Increase Rail Speeds through Reedsport to 25 MPH

The other significant consideration for train speeds is the existing Umpqua River swing span, which currently has speed restrictions due to the age of the structure. As noted previously, for the rail line to provide for the increased tonnage of traffic brought by the container terminal, this bridge will require considerable investment in the structural capacity, which will in turn allow for increased speeds across the structure. The achievement of lower speeds could likely be done at lower cost, with 25 mph likely achieved with no additional costs beyond the improvements required to handle the increased gross tonnage of the additional traffic (e.g., no new or significantly reconstructed structures).

Planning level cost opinion: The significant nature and scope of the rail enhancements to achieve 25 mph rail speeds through the City of Reedsport is beyond the scope of this study as it requires investigating many facets of the rail line north and south of Reedsport, including bridges (e.g., Umpqua River Bridge) and tunnels. However, for the purposes of this study, the magnitude of these investments would be several times that of any of the other alternatives discussed herein and lower in magnitude compared to Alternative 3A1 – Increase Rail Speeds through Reedsport to 40 MPH.

Rail Line Upgrade Evaluation

The rail line upgrade alternatives were rated based on the project evaluation criteria. Table 5 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 5. Elevated Rail Line Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
3A1. Increase Rail Speeds through Reedsport to 40 MPH	0.8	0.1	0.5	0.8	0.5	0.3	0.7	0.5
3A2. Increase Rail Speeds through Reedsport to 25 MPH	0.8	0.1	0.5	0.8	0.5	0.3	0.7	0.5

Elevated Rail Line Alternative

Another option to consider to grade-separate the rail and highway traffic would be to elevate the rail line grade through the extent of both at-grade crossings. Considering the Umpqua River bridge to be a fixed limitation in elevating the line, with OR 38 at approximately 1,600 linear feet away from the bridge and a moderate railway grade of 1.41 percent over that distance, an increase in rail elevation of approximately 22 feet, 6 inches could be achieved. This elevation would be sufficient to provide for normal vertical roadway clearances of 16 feet, 6 inches below the railroad undercrossing structure that would require approximately 6 feet of structure depth.

With nearly 2,700 linear feet of track to the south before crossing the next railroad bridge structure, a favorable railroad gradient of just 0.84 percent would be required to achieve vertical clearance upon the undercrossing.

4A – Elevated Rail Line

Construction associated with the elevated rail line would require significant effort and costs. Phasing of the construction for the embankment required to elevate the tracks would be difficult while maintaining railroad operations along the same right-of-way. The use of retaining walls would limit the base width of the embankment, however, would add to the cost. Depending upon the final elevation of the railroad track, the use of retaining walls may be required to keep the embankment within the existing railroad right-of-way. For the planning level cost opinion provided, we have assumed retaining walls are required for the majority of the alignment.

Regardless of the construction method, the embankment created for the railroad would practically and visually bisect downtown Reedsport, and may detract from community livability. Exhibits 4A-1 and 4A-2 illustrate the elevated rail line alternative.

Exhibit 4A-1. Elevated Rail Line Alternative

Exhibit 4A-2. Elevated Rail Line Alternative – Aerial Perspective

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the elevated rail line alternative based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors, but additional costs may be incurred due to railroad access requirements during construction. Potential right-of-way and property costs are not included at this time. The cost opinion is $24.5M.

Elevated Rail Line Evaluation

The elevated rail line alternative was rated based on the project evaluation criteria. Table 6 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternative.

Table 6. Elevated Rail Line Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
4A. Elevated Rail Line	1.6	0.6	1.3	1.0	0.5	1.3	0.7	1.1

OR 38/US 101 Intersection Operation Alternative

To address the forecasted future mobility issues at the OR 38/US 101 signalized intersection, alternative signal phasing and timing were explored at the intersection.

5A – OR 38/US 101 East-West Split Phasing

Due to the substantial difference in westbound and eastbound volumes, modifying the approaches from permissive (left-turning vehicles yield to oncoming traffic) to split phasing (left, thru, and right-turning vehicles travel through the intersection one approach at a time) was found to reduce the Year 2045 v/c ratio from 1.0 to 0.52. *Attachment "D" contains the year 2045 traffic operations analysis worksheets with east-west split phasing.*

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38/US 101 intersection East-West Split Phasing Alternative based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $40,000.

OR 38/US 101 Intersection Operation Evaluation

The east-west split phasing alternative was rated based on the project evaluation criteria. Table 7 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternative.

Table 7. OR 38/US 101 Intersection Operation Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
5A. OR 38/US 101 East-West Split Phasing	0.6	0.3	0.3	0.8	0.5	0.3	1.0	0.5

EVALUATION RESULTS

The alternatives presented and described in the previous section were evaluated against the project goals and objectives described in *Memorandum #2: Purpose and Need* and the evaluation. Table 8 below provides an initial high-level comparison and ranking of the alternatives.

Table 8. Summary Comparison of Rail Alternatives

Alternative	Average Evaluation Score	Order-of-Magnitude Cost	Preliminary Rank
No-Build	-1.0	$0.00	17
1A. Four-Quadrant Gated Rail Crossing on OR 38	-0.2	$360,000	13
1B. Median Barrier on OR 38	-0.4	$550,000	15
1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue	-0.2	$285,000	13
1D. Median Barrier on Winchester Avenue	-0.4	$400,000	15
2A1. OR 38 Rail Overcrossing with Retaining Walls	1.2	$12,000,000	**1**
2A2. OR 38 Rail Overcrossing without Retaining Walls	0.7	$15,000,000	4
2B1. Winchester Avenue Rail Overcrossing with Retailing Walls	0.9	$12,500,000	**3**
2B2. Winchester Avenue Rail Overcrossing without Retailing Walls	0.5	$15,000,000	8
2C. OR 38 Rail Undercrossing with Retaining Walls	0.5	$13,000,000	9
2D. Winchester Avenue Rail Undercrossing with Retaining Walls	0.4	$10,500,000	12
2E1. Port Dock Road Undercrossing Upgrade	0.4	$7,500,000	10
2E2. Northerly OR 38 Rail Undercrossing Upgrade	0.4	$7,000,000	10
3A1. Increase Rail Speeds through Reedsport to 40 MPH	0.5	NA	5
3A2. Increase Rail Speeds through Reedsport to 25 MPH	0.5	NA	5
4A. Elevated Rail Line	1.1	$24,500,000	**2**
5A – OR 38/US 101 East-West Split Phasing	0.5	$40,000	5

Alternatives Considered but Dismissed

The following alternatives were found to score lower against the evaluation criteria; only partially address the identified needs; and have potentially substantial environmental and/or right-of-way impacts, constructability issues, and/or high costs.

Alternative	Consideration
1A. Four-Quadrant Gated Rail Crossing on OR 38	– Does not address the identified Rail Crossing Delays and Access/Circulation Barriers issues

1B. Median Barrier on OR 38	– Does not address the identified Rail Crossing Delays and Access/Circulation Barriers issues
1D. Median Barrier on Winchester Avenue	– Due the close proximity of the E Railroad Avenue-Elm Avenue intersection, a median cannot be effectively placed to ensure vehicles do not attempt to avoid the westbound rail crossing gate
2A2 – OR 38 Rail Overcrossing without Retaining Walls	– Impacts up to 7 properties (6 residential and 1 commercial)
2B1 - Winchester Avenue Rail Overcrossing with Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Impacts access up to 11 properties
2B2 - Winchester Avenue Rail Overcrossing without Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Impacts up to 15 properties (1 residential and 14 commercial)
2C - OR 38 Rail Undercrossing with Retaining Walls	– Introduces potential roadway flooding and pumping concerns – Significantly impacts circulation by eliminating the W Railroad Avenue and E Railroad Avenue north-south connectivity – Impacts access up to 1 property
2D - Winchester Avenue Rail Undercrossing with Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Introduces potential roadway flooding and pumping concerns. – Significantly impacts circulation by eliminating access to W Railroad Avenue and E Railroad Avenue and precluding access to properties served by River Bend Road – Impacts access up to 11 properties
2E1 – Port Dock Road Undercrossing Upgrade	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Introduces significant out of direction travel on Port Dock Road, W Railroad Avenue, E Railroad Avenue, and Riverfront Way – Requires significant underpass improvements and exposes lower roadway to increased Umpqua River flooding
2E2 – Northerly OR 38 Undercrossing Upgrade	– Introduces significant out of direction travel on W Railroad Avenue, E Railroad Avenue, Laurel Avenue, and Greenwood Avenue – Requires significant underpass improvements and exposes lower roadway to flooding – Creates queuing and road spacing issues due to the out of direction travel to/from OR 38
3A1 and 3A2 - Rail Line Upgrade Alternatives (Increase Rail Speeds)	– Retrofit improvement to or replacement of the Umpqua River swing bridge as well as track enhancements north and south of Reedsport to accommodate higher speeds present significant constructability issues; rail downtime; and feasibility analysis, engineering, and construction costs at a scale of magnitude significantly higher than other higher performing alternatives – Does not fully address the related impacts to upstream and downstream cross streets on OR 38 and Winchester Avenue or increased train activity issues

Alternatives Still Under Consideration

The following alternatives were found to score higher against the evaluation criteria; partially or fully address the identified needs; and have manageable potential environmental and/or right-of-way impacts, constructability issues, and/or construction costs.

Alternative	Consideration
1C - Four-Quadrant Gated Railing Crossing on Winchester Avenue 	– Addresses noise related Issues with train activity at Winchester Avenue – Feasible to construct with minimal to potential no right-of-way nor environmental impacts – Economically feasible at a magnitude cost of $285,000 – Requires grade separated improvements on OR 38 to meet all identified needs – Can work in tandem with ***Alternative 2A1 - OR 38 Rail Overcrossing with Retaining Walls***
2A1 - OR 38 Rail Overcrossing with Retaining Walls 	– Addresses the identified Rail Crossing Delays and Access/Circulation Barriers issues – Addresses the increase train activity issues – Addresses queuing related impacts to upstream and downstream cross streets on OR 38 – Partially addresses queuing related impacts to upstream and downstream cross streets on Winchester Avenue – Addresses noise related issues with increased train activity at OR 38 – Further refinements needed to minimize potential right-of-way and/or environmental impacts and assess construction costs – Can work in tandem with ***Alternative 1C - Four-Quadrant Gate on Winchester Avenue***
4A – Elevated Rail Line 	– Addresses queuing related impacts to upstream and downstream cross streets on OR 38 and Winchester Avenue – Addresses Noise Related Issues with Train Activity at OR 38 and Winchester Avenue – Further refinements needed to understand potential constructability and visual barrier issues and assess construction costs
5A - OR 38/US 101 East-West Split Phasing 	– Addresses the Year 2045 mobility issues at the OR 38/US 101 signalized intersection – ***Needed under all alternatives to address future OR 38/US 101 mobility issues***

TOP TWO MOST PROMISING ALTERNATIVES

Based on the evaluation contained herein, the project team preliminary recommends the following top two most promising alternative improvement packages to address the identified transportation needs associated with increase rail activity from the proposed Port of Coos Bay container facility:

Most Promising Improvement Package I

- Alternative 1C - Four-Quadrant Gated Rail Crossing on Winchester Avenue
- Alternative 2A1 - OR 38 Rail Overcrossing with Retaining Walls
- Alternative 5A – OR 38/US 101 East-West Split Phasing

Most Promising Improvement Package II

- Alternative 4A - Elevated Rail Line
- Alternative 5A – OR 38/US 101 East-West Split Phasing

Exhibits C and D Illustrate the two most promising improvement packages.

Exhibit C. Most Promising Improvement Package I

Exhibit D. Most Promising Improvement Package II

These two most promising alternative improvement packages provide the ability to maintain and/or enhance the community's transportation system while promoting healthy lifestyles; reducing barriers to access; improving vehicular, freight, pedestrian, bicycle, transit, and traffic mobility and safety; and minimizing environmental impacts. These two alternative improvement packages will be further refined following feedback from the PMT, PAC, City Planning Commission, and City Council. Specific areas of focus in the refinement process will include but are not limited to:

- Understanding the visual impacts associated with the vertical elements of the overpass structures and considering a viaduct type design with columns versus retaining walls to provide the ability to see through the structure.
- Understanding and identifying local roadway and driveway tie-ins to modified roadways,
- Identifying necessary localized pedestrian, bicycle, and transit enhancements throughout the study area to support the improvements (e.g., local roadway connections, pedestrian bicycle connections to the city's trail system, potential pedestrian/bicycle enhancements at Port Dock Road and the northerly OR 38 undercrossing, etc.)
- Addressing stormwater impacts
- Evaluating potential Title VI impacts
- Evaluating potential National Environmental Protection Act 4F (park and recreational lands, wildlife and waterfowl refuges, and historic sites) and 6F (park land) impacts
- Considering westbound dual-left turn lanes at the OR 38/US101 intersection
- Developing refined cost estimates including potential right-of-way and property impacts and verifying structure cost needs based on additional geotechnical information.

NEXT STEPS

The information and preliminary recommendations for the most promising two alternative improvement packages will be presented to the PMT, PAC, City Planning Commission, and City Council for review and feedback. Based on this feedback, additional analysis and refinement will be conducted to select a preferred alternative improvement package to address the identified transportation needs. This subsequent work will be documented in future *Technical Memorandum #7 – Preferred Alternative*.

REFERENCES

1. Oregon Department of Transportation. *Analysis Procedures Manual*, 2018.
2. Transportation Research Board. *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, 2014.
3. Oregon Department of Transportation. *Oregon Highway Plan*, 2015.
4. Oregon Department of Transportation. *Highway Design Manual*, 2023.
5. Transportation Research Board. *Highway Capacity Manual, 7th Edition*, 2022.

ATTACHMENTS

A. Queuing Analysis Worksheets
B. Alternative Design Methodology and Assumptions and List of Initial Alternatives Memorandum
C. Evaluation Matrix
D. Year 2045 Traffic Operations Analysis Worksheets

Attachment A: Queuing Analysis Worksheets

PM	EB	2045 @ 10 mph	
2.5	minutes/train	1500 ft train	
357	vehicles/hour		
15	vehicles/train		
525	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.1%		0.1%
5	0.2%		0.3%
6	0.5%		0.8%
7	1.1%		1.9%
8	2.1%		4.0%
9	3.4%		7.4%
10	5.1%		12.5%
11	6.9%		19.3%
12	8.5%		27.8%
13	9.7%		37.5%
14	10.3%		47.9%
15	10.2%		58.1%
16	9.5%		67.6%
17	8.3%		75.9%
18	6.9%		82.8%
19	5.4%		88.2%
20	4.0%		92.2%
21	2.8%		95.1%
22	1.9%		97.0%
23	1.2%		98.2%
24	0.8%		99.0%
25	0.5%		99.4%
26	0.3%		99.7%
27	0.1%		99.8%
28	0.1%		99.9%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%
43	0.0%		100.0%
44	0.0%		100.0%
45	0.0%		100.0%
46	0.0%		100.0%
47	0.0%		100.0%

PM	WB	2045 @ 10 mph
2.5	minutes/train	1500 ft train
407	vehicles/hour	
17	vehicles/train	
600	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.1%	0.1%
6	0.1%	0.2%
7	0.3%	0.6%
8	0.7%	1.3%
9	1.4%	2.7%
10	2.3%	5.0%
11	3.6%	8.6%
12	5.1%	13.7%
13	6.6%	20.4%
14	8.1%	28.4%
15	9.1%	37.5%
16	9.7%	47.2%
17	9.6%	56.8%
18	9.1%	65.9%
19	8.1%	74.0%
20	6.9%	80.8%
21	5.5%	86.4%
22	4.3%	90.7%
23	3.2%	93.8%
24	2.2%	96.0%
25	1.5%	97.5%
26	1.0%	98.5%
27	0.6%	99.1%
28	0.4%	99.5%
29	0.2%	99.7%
30	0.1%	99.9%
31	0.1%	99.9%
32	0.0%	100.0%
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139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
3.1	minutes/train	2000 ft train
357	vehicles/hour	
18	vehicles/train	
650	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.1%	0.1%
7	0.1%	0.2%
8	0.3%	0.5%
9	0.7%	1.2%
10	1.2%	2.4%
11	2.1%	4.5%
12	3.2%	7.6%
13	4.5%	12.1%
14	5.9%	18.0%
15	7.3%	25.3%
16	8.4%	33.7%
17	9.1%	42.8%
18	9.3%	52.1%
19	9.0%	61.1%
20	8.3%	69.4%
21	7.3%	76.8%
22	6.1%	82.9%
23	4.9%	87.8%
24	3.8%	91.6%
25	2.8%	94.4%
26	2.0%	96.4%
27	1.4%	97.7%
28	0.9%	98.6%
29	0.6%	99.2%
30	0.3%	99.5%
31	0.2%	99.7%
32	0.1%	99.9%
33	0.1%	99.9%
34	0.0%	100.0%
35	0.0%	100.0%
36	0.0%	100.0%
37	0.0%	100.0%
38	0.0%	100.0%
39	0.0%	100.0%
40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%

PM	WB	2045 @ 10 mph
3.1	minutes/train	2000 ft train
407	vehicles/hour	
21	vehicles/train	
725	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.1%	0.1%
9	0.2%	0.3%
10	0.3%	0.6%
11	0.7%	1.3%
12	1.2%	2.4%
13	1.9%	4.3%
14	2.8%	7.1%
15	3.9%	11.0%
16	5.1%	16.1%
17	6.4%	22.5%
18	7.4%	30.0%
19	8.2%	38.2%
20	8.7%	46.9%
21	8.7%	55.5%
22	8.3%	63.8%
23	7.6%	71.4%
24	6.6%	78.0%
25	5.6%	83.6%
26	4.5%	88.1%
27	3.5%	91.6%
28	2.6%	94.3%
29	1.9%	96.2%
30	1.3%	97.5%
31	0.9%	98.5%
32	0.6%	99.1%
33	0.4%	99.4%
34	0.2%	99.7%
35	0.1%	99.8%
36	0.1%	99.9%
37	0.0%	99.9%
38	0.0%	100.0%
39	0.0%	100.0%
40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%

48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.2	minutes/train	3000 ft train	
357	vehicles/hour		
25	vehicles/train		
825	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.1%
11	0.1%		0.1%
12	0.2%		0.3%
13	0.3%		0.7%
14	0.6%		1.2%
15	1.0%		2.2%
16	1.6%		3.8%
17	2.3%		6.1%
18	3.2%		9.2%
19	4.2%		13.4%
20	5.2%		18.6%
21	6.2%		24.8%
22	7.0%		31.8%
23	7.6%		39.5%
24	8.0%		47.4%
25	8.0%		55.4%
26	7.6%		63.0%
27	7.1%		70.1%
28	6.3%		76.4%
29	5.4%		81.8%
30	4.5%		86.4%
31	3.7%		90.0%
32	2.9%		92.9%
33	2.2%		95.0%
34	1.6%		96.6%
35	1.1%		97.8%
36	0.8%		98.6%
37	0.5%		99.1%
38	0.3%		99.4%
39	0.2%		99.7%
40	0.1%		99.8%
41	0.1%		99.9%
42	0.1%		99.9%
43	0.0%		100.0%
44	0.0%		100.0%
45	0.0%		100.0%
46	0.0%		100.0%
47	0.0%		100.0%

PM	WB		2045 @ 10 mph
4.2	minutes/train		3000 ft train
407	vehicles/hour		
28	vehicles/train		
950	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.1%	0.1%
14		0.1%	0.2%
15		0.2%	0.4%
16		0.4%	0.8%
17		0.6%	1.4%
18		1.0%	2.5%
19		1.5%	4.0%
20		2.2%	6.1%
21		2.9%	9.1%
22		3.8%	12.9%
23		4.7%	17.6%
24		5.6%	23.1%
25		6.4%	29.5%
26		7.0%	36.5%
27		7.4%	43.8%
28		7.5%	51.3%
29		7.4%	58.7%
30		7.0%	65.7%
31		6.4%	72.1%
32		5.7%	77.8%
33		4.9%	82.7%
34		4.1%	86.9%
35		3.4%	90.2%
36		2.7%	92.9%
37		2.1%	94.9%
38		1.5%	96.5%
39		1.1%	97.6%
40		0.8%	98.4%
41		0.6%	99.0%
42		0.4%	99.3%
43		0.2%	99.6%
44		0.2%	99.7%
45		0.1%	99.8%
46		0.1%	99.9%
47		0.0%	99.9%

48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5	minutes/train	4000 ft train	
357	vehicles/hour		
30	vehicles/train		
975	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.1%		0.1%
15	0.1%		0.2%
16	0.2%		0.4%
17	0.4%		0.8%
18	0.6%		1.4%
19	1.0%		2.4%
20	1.5%		3.9%
21	2.1%		5.9%
22	2.8%		8.7%
23	3.6%		12.3%
24	4.5%		16.8%
25	5.3%		22.1%
26	6.1%		28.2%
27	6.7%		34.9%
28	7.1%		42.1%
29	7.3%		49.4%
30	7.3%		56.7%
31	7.0%		63.6%
32	6.5%		70.1%
33	5.8%		75.9%
34	5.1%		81.0%
35	4.3%		85.4%
36	3.6%		89.0%
37	2.9%		91.8%
38	2.3%		94.1%
39	1.7%		95.8%
40	1.3%		97.1%
41	0.9%		98.0%
42	0.7%		98.7%
43	0.5%		99.1%
44	0.3%		99.5%
45	0.2%		99.7%
46	0.1%		99.8%
47	0.1%		99.9%

PM	WB		2045 @ 10 mph
5	minutes/train		4000 ft train
407	vehicles/hour		
34	vehicles/train		
1100	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.0%
16		0.0%	0.0%
17		0.1%	0.1%
18		0.1%	0.2%
19		0.2%	0.4%
20		0.3%	0.7%
21		0.5%	1.2%
22		0.8%	2.0%
23		1.1%	3.1%
24		1.6%	4.7%
25		2.2%	6.9%
26		2.9%	9.8%
27		3.6%	13.4%
28		4.3%	17.7%
29		5.1%	22.8%
30		5.7%	28.5%
31		6.3%	34.8%
32		6.7%	41.4%
33		6.8%	48.3%
34		6.8%	55.1%
35		6.6%	61.7%
36		6.2%	68.0%
37		5.7%	73.7%
38		5.1%	78.8%
39		4.4%	83.2%
40		3.8%	87.0%
41		3.1%	90.1%
42		2.5%	92.6%
43		2.0%	94.6%
44		1.5%	96.1%
45		1.2%	97.2%
46		0.8%	98.1%
47		0.6%	98.7%

48	0.1%	99.9%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	0.4%	99.1%
49	0.3%	99.4%
50	0.2%	99.6%
51	0.1%	99.8%
52	0.1%	99.9%
53	0.1%	99.9%
54	0.0%	99.9%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%
143	0.0%	100.0%	143	0.0%	100.0%
144	0.0%	100.0%	144	0.0%	100.0%
145	0.0%	100.0%	145	0.0%	100.0%
146	0.0%	100.0%	146	0.0%	100.0%
147	0.0%	100.0%	147	0.0%	100.0%
148	0.0%	100.0%	148	0.0%	100.0%
149	0.0%	100.0%	149	0.0%	100.0%
150	0.0%	100.0%	150	0.0%	100.0%

PM	EB	2045 @ 10 mph
5.5	minutes/train	4100 ft train
357	vehicles/hour	
33	vehicles/train	
1050	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.1%	0.1%
17	0.1%	0.2%
18	0.2%	0.4%
19	0.3%	0.7%
20	0.5%	1.2%
21	0.8%	2.0%
22	1.2%	3.1%
23	1.6%	4.8%
24	2.2%	7.0%
25	2.9%	10.0%
26	3.7%	13.7%
27	4.5%	18.2%
28	5.3%	23.4%
29	5.9%	29.3%
30	6.5%	35.8%
31	6.8%	42.6%
32	7.0%	49.6%
33	6.9%	56.5%
34	6.7%	63.2%
35	6.2%	69.4%
36	5.7%	75.1%
37	5.0%	80.1%
38	4.3%	84.4%
39	3.6%	88.0%
40	3.0%	91.0%
41	2.4%	93.3%
42	1.8%	95.2%
43	1.4%	96.6%
44	1.0%	97.6%
45	0.8%	98.4%
46	0.5%	98.9%
47	0.4%	99.3%

PM	WB	2045 @ 10 mph
5.5	minutes/train	4100 ft train
407	vehicles/hour	
37	vehicles/train	
1200	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.0%	0.0%
17	0.0%	0.0%
18	0.0%	0.0%
19	0.0%	0.1%
20	0.1%	0.1%
21	0.1%	0.3%
22	0.2%	0.5%
23	0.3%	0.8%
24	0.5%	1.4%
25	0.8%	2.2%
26	1.1%	3.3%
27	1.6%	4.9%
28	2.1%	7.0%
29	2.7%	9.7%
30	3.4%	13.1%
31	4.1%	17.1%
32	4.7%	21.9%
33	5.3%	27.2%
34	5.9%	33.1%
35	6.3%	39.3%
36	6.5%	45.8%
37	6.5%	52.3%
38	6.4%	58.8%
39	6.1%	64.9%
40	5.7%	70.6%
41	5.2%	75.8%
42	4.6%	80.5%
43	4.0%	84.5%
44	3.4%	87.9%
45	2.8%	90.7%
46	2.3%	93.0%
47	1.8%	94.8%

48	0.3%	99.5%	48	1.4%	96.2%
49	0.2%	99.7%	49	1.1%	97.3%
50	0.1%	99.8%	50	0.8%	98.1%
51	0.1%	99.9%	51	0.6%	98.7%
52	0.0%	99.9%	52	0.4%	99.1%
53	0.0%	100.0%	53	0.3%	99.4%
54	0.0%	100.0%	54	0.2%	99.6%
55	0.0%	100.0%	55	0.1%	99.7%
56	0.0%	100.0%	56	0.1%	99.8%
57	0.0%	100.0%	57	0.1%	99.9%
58	0.0%	100.0%	58	0.0%	99.9%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
6.5	minutes/train	5000 ft train	
357	vehicles/hour		
39	vehicles/train		
1225	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.0%
17	0.0%		0.0%
18	0.0%		0.0%
19	0.0%		0.0%
20	0.0%		0.1%
21	0.1%		0.1%
22	0.1%		0.3%
23	0.2%		0.5%
24	0.3%		0.8%
25	0.5%		1.3%
26	0.7%		2.0%
27	1.1%		3.1%
28	1.5%		4.6%
29	2.0%		6.5%
30	2.5%		9.1%
31	3.2%		12.2%
32	3.8%		16.0%
33	4.5%		20.5%
34	5.1%		25.6%
35	5.6%		31.2%
36	6.0%		37.2%
37	6.3%		43.5%
38	6.4%		49.9%
39	6.4%		56.3%
40	6.2%		62.5%
41	5.8%		68.3%
42	5.3%		73.6%
43	4.8%		78.4%
44	4.2%		82.7%
45	3.6%		86.3%
46	3.1%		89.3%
47	2.5%		91.9%

PM	WB	2045 @ 10 mph
6.5	minutes/train	5000 ft train
407	vehicles/hour	
44	vehicles/train	
1375	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.0%	0.0%
17	0.0%	0.0%
18	0.0%	0.0%
19	0.0%	0.0%
20	0.0%	0.0%
21	0.0%	0.0%
22	0.0%	0.0%
23	0.0%	0.0%
24	0.0%	0.1%
25	0.1%	0.1%
26	0.1%	0.2%
27	0.2%	0.4%
28	0.3%	0.6%
29	0.4%	1.0%
30	0.6%	1.6%
31	0.8%	2.4%
32	1.1%	3.5%
33	1.5%	5.0%
34	1.9%	7.0%
35	2.5%	9.4%
36	3.0%	12.5%
37	3.6%	16.0%
38	4.2%	20.2%
39	4.7%	24.9%
40	5.2%	30.0%
41	5.6%	35.6%
42	5.8%	41.5%
43	6.0%	47.4%
44	6.0%	53.4%
45	5.9%	59.3%
46	5.6%	65.0%
47	5.3%	70.3%

48	2.0%	93.9%
49	1.6%	95.5%
50	1.2%	96.7%
51	0.9%	97.7%
52	0.7%	98.4%
53	0.5%	98.9%
54	0.4%	99.2%
55	0.3%	99.5%
56	0.2%	99.7%
57	0.1%	99.8%
58	0.1%	99.9%
59	0.1%	99.9%
60	0.0%	99.9%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	4.9%	75.1%
49	4.4%	79.5%
50	3.9%	83.3%
51	3.3%	86.7%
52	2.8%	89.5%
53	2.4%	91.8%
54	1.9%	93.8%
55	1.5%	95.3%
56	1.2%	96.5%
57	0.9%	97.5%
58	0.7%	98.2%
59	0.5%	98.7%
60	0.4%	99.1%
61	0.3%	99.4%
62	0.2%	99.6%
63	0.1%	99.7%
64	0.1%	99.8%
65	0.1%	99.9%
66	0.0%	99.9%
67	0.0%	99.9%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
7.7	minutes/train	6000 ft train	
357	vehicles/hour		
46	vehicles/train		
1425	95% queue length		
k	P	Cumulative	
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.0%
16		0.0%	0.0%
17		0.0%	0.0%
18		0.0%	0.0%
19		0.0%	0.0%
20		0.0%	0.0%
21		0.0%	0.0%
22		0.0%	0.0%
23		0.0%	0.0%
24		0.0%	0.0%
25		0.0%	0.1%
26		0.0%	0.1%
27		0.1%	0.2%
28		0.1%	0.3%
29		0.2%	0.5%
30		0.3%	0.9%
31		0.5%	1.3%
32		0.7%	2.0%
33		0.9%	3.0%
34		1.3%	4.2%
35		1.7%	5.9%
36		2.1%	8.1%
37		2.6%	10.7%
38		3.2%	13.9%
39		3.7%	17.6%
40		4.3%	21.9%
41		4.8%	26.7%
42		5.2%	31.9%
43		5.6%	37.4%
44		5.8%	43.2%
45		5.9%	49.1%
46		5.9%	55.0%
47		5.7%	60.7%

PM	WB	2045 @ 10 mph	
7.7	minutes/train	6000 ft train	
407	vehicles/hour		
52	vehicles/train		
1600	95% queue length		
k	P	Cumulative	
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.0%
16		0.0%	0.0%
17		0.0%	0.0%
18		0.0%	0.0%
19		0.0%	0.0%
20		0.0%	0.0%
21		0.0%	0.0%
22		0.0%	0.0%
23		0.0%	0.0%
24		0.0%	0.0%
25		0.0%	0.0%
26		0.0%	0.0%
27		0.0%	0.0%
28		0.0%	0.0%
29		0.0%	0.0%
30		0.0%	0.1%
31		0.0%	0.1%
32		0.1%	0.2%
33		0.1%	0.3%
34		0.2%	0.5%
35		0.3%	0.7%
36		0.4%	1.1%
37		0.6%	1.7%
38		0.8%	2.4%
39		1.0%	3.5%
40		1.3%	4.8%
41		1.7%	6.5%
42		2.1%	8.6%
43		2.5%	11.1%
44		3.0%	14.1%
45		3.5%	17.6%
46		4.0%	21.6%
47		4.4%	26.1%

48	5.5%	66.2%
49	5.1%	71.3%
50	4.7%	76.0%
51	4.2%	80.2%
52	3.7%	83.9%
53	3.2%	87.1%
54	2.7%	89.8%
55	2.3%	92.0%
56	1.9%	93.9%
57	1.5%	95.4%
58	1.2%	96.6%
59	0.9%	97.5%
60	0.7%	98.2%
61	0.5%	98.7%
62	0.4%	99.1%
63	0.3%	99.4%
64	0.2%	99.6%
65	0.1%	99.7%
66	0.1%	99.8%
67	0.1%	99.9%
68	0.0%	99.9%
69	0.0%	99.9%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	4.8%	30.9%
49	5.1%	36.0%
50	5.4%	41.4%
51	5.5%	46.9%
52	5.5%	52.4%
53	5.4%	57.8%
54	5.3%	63.1%
55	5.0%	68.1%
56	4.7%	72.8%
57	4.3%	77.0%
58	3.8%	80.9%
59	3.4%	84.3%
60	3.0%	87.2%
61	2.5%	89.8%
62	2.1%	91.9%
63	1.8%	93.7%
64	1.4%	95.1%
65	1.2%	96.3%
66	0.9%	97.2%
67	0.7%	97.9%
68	0.6%	98.5%
69	0.4%	98.9%
70	0.3%	99.2%
71	0.2%	99.5%
72	0.2%	99.6%
73	0.1%	99.7%
74	0.1%	99.8%
75	0.1%	99.9%
76	0.0%	99.9%
77	0.0%	99.9%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
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141	0.0%	100.0%
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146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
2.5	minutes/train	1500 ft Train length	
128	vehicles/hour		
5	vehicles/train		
225	95% queue length		
k	P	Cumulative	
0	0.5%		0.5%
1	2.6%		3.1%
2	6.9%		9.9%
3	12.2%		22.1%
4	16.3%		38.4%
5	17.4%		55.8%
6	15.4%		71.2%
7	11.8%		83.0%
8	7.8%		90.8%
9	4.6%		95.4%
10	2.5%		97.9%
11	1.2%		99.1%
12	0.5%		99.7%
13	0.2%		99.9%
14	0.1%		100.0%
15	0.0%		100.0%
16	0.0%		100.0%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
2.5	minutes/train	1500 ft Train length	
141	vehicles/hour		
6	vehicles/train		
250	95% queue length		
k	P	Cumulative	
0	0.3%		0.3%
1	1.7%		1.9%
2	4.8%		6.8%
3	9.5%		16.3%
4	13.9%		30.2%
5	16.4%		46.6%
6	16.0%		62.6%
7	13.5%		76.1%
8	9.9%		86.0%
9	6.5%		92.4%
10	3.8%		96.2%
11	2.0%		98.3%
12	1.0%		99.2%
13	0.4%		99.7%
14	0.2%		99.9%
15	0.1%		100.0%
16	0.0%		100.0%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
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26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
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35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

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70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
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80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%

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141	0.0%	100.0%
142	0.0%	100.0%

93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
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143	0.0%	100.0%
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149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
3.1	minutes/train	2000 ft Train length	
128	vehicles/hour		
7	vehicles/train		
275	95% queue length		
k	P	Cumulative	
0	0.1%		0.1%
1	0.9%		1.0%
2	2.9%		4.0%
3	6.5%		10.4%
4	10.7%		21.1%
5	14.2%		35.3%
6	15.6%		50.9%
7	14.7%		65.6%
8	12.2%		77.8%
9	9.0%		86.7%
10	5.9%		92.7%
11	3.6%		96.2%
12	2.0%		98.2%
13	1.0%		99.2%
14	0.5%		99.7%
15	0.2%		99.9%
16	0.1%		99.9%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
3.1	minutes/train	2000 ft Train length	
141	vehicles/hour		
7	vehicles/train		
300	95% queue length		
k	P	Cumulative	
0	0.1%		0.1%
1	0.5%		0.6%
2	1.8%		2.4%
3	4.4%		6.8%
4	8.0%		14.9%
5	11.7%		26.6%
6	14.2%		40.8%
7	14.8%		55.6%
8	13.5%		69.1%
9	10.9%		80.0%
10	8.0%		88.0%
11	5.3%		93.3%
12	3.2%		96.5%
13	1.8%		98.3%
14	0.9%		99.2%
15	0.5%		99.6%
16	0.2%		99.9%
17	0.1%		99.9%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
4.2	minutes/train	3000 ft Train length	
128	vehicles/hour		
9	vehicles/train		
350	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.1%		0.1%
2	0.5%		0.6%
3	1.5%		2.2%
4	3.4%		5.6%
5	6.2%		11.8%
6	9.2%		21.0%
7	11.8%		32.9%
8	13.2%		46.1%
9	13.2%		59.3%
10	11.8%		71.1%
11	9.6%		80.7%
12	7.2%		87.9%
13	4.9%		92.8%
14	3.2%		96.0%
15	1.9%		97.9%
16	1.1%		98.9%
17	0.6%		99.5%
18	0.3%		99.8%
19	0.1%		99.9%
20	0.1%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
4.2	minutes/train	3000 ft Train length	
141	vehicles/hour		
10	vehicles/train		
375	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.1%		0.1%
2	0.3%		0.3%
3	0.8%		1.1%
4	2.0%		3.2%
5	4.0%		7.2%
6	6.6%		13.9%
7	9.4%		23.2%
8	11.5%		34.8%
9	12.7%		47.4%
10	12.5%		59.9%
11	11.2%		71.1%
12	9.2%		80.4%
13	7.0%		87.4%
14	4.9%		92.3%
15	3.2%		95.6%
16	2.0%		97.6%
17	1.2%		98.7%
18	0.6%		99.4%
19	0.3%		99.7%
20	0.2%		99.9%
21	0.1%		99.9%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
5.4	minutes/train	4000 ft Train length	
128	vehicles/hour		
12	vehicles/train		
425	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.1%		0.1%
3	0.3%		0.3%
4	0.7%		1.1%
5	1.7%		2.7%
6	3.2%		6.0%
7	5.3%		11.3%
8	7.6%		18.9%
9	9.8%		28.7%
10	11.3%		39.9%
11	11.8%		51.7%
12	11.3%		63.1%
13	10.0%		73.1%
14	8.3%		81.4%
15	6.3%		87.7%
16	4.6%		92.3%
17	3.1%		95.4%
18	2.0%		97.3%
19	1.2%		98.5%
20	0.7%		99.2%
21	0.4%		99.6%
22	0.2%		99.8%
23	0.1%		99.9%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
5.4	minutes/train	4000 ft Train length	
141	vehicles/hour		
13	vehicles/train		
475	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.1%		0.1%
4	0.3%		0.5%
5	0.8%		1.3%
6	1.8%		3.1%
7	3.2%		6.3%
8	5.1%		11.5%
9	7.2%		18.7%
10	9.2%		27.9%
11	10.6%		38.5%
12	11.2%		49.8%
13	11.0%		60.7%
14	9.9%		70.6%
15	8.4%		79.0%
16	6.7%		85.7%
17	5.0%		90.7%
18	3.5%		94.2%
19	2.3%		96.5%
20	1.5%		98.0%
21	0.9%		98.9%
22	0.5%		99.4%
23	0.3%		99.7%
24	0.2%		99.9%
25	0.1%		99.9%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB		2045 @ 10 MPH
5.5	minutes/train		4100 ft Train length
128	vehicles/hour		
12	vehicles/train		
450	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.1%		0.1%
3	0.2%		0.3%
4	0.6%		0.9%
5	1.5%		2.4%
6	2.9%		5.3%
7	4.9%		10.2%
8	7.1%		17.3%
9	9.3%		26.6%
10	10.9%		37.6%
11	11.7%		49.2%
12	11.4%		60.6%
13	10.3%		70.9%
14	8.6%		79.6%
15	6.7%		86.3%
16	4.9%		91.3%
17	3.4%		94.7%
18	2.2%		96.9%
19	1.4%		98.3%
20	0.8%		99.1%
21	0.5%		99.5%
22	0.2%		99.8%
23	0.1%		99.9%
24	0.1%		99.9%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB		2045 @ 10 MPH
5.5	minutes/train		4100 ft Train length
141	vehicles/hour		
13	vehicles/train		
475	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.1%		0.1%
4	0.3%		0.4%
5	0.7%		1.1%
6	1.6%		2.7%
7	2.9%		5.6%
8	4.7%		10.3%
9	6.8%		17.1%
10	8.7%		25.8%
11	10.3%		36.1%
12	11.1%		47.1%
13	11.0%		58.1%
14	10.1%		68.3%
15	8.7%		77.0%
16	7.1%		84.1%
17	5.4%		89.5%
18	3.9%		93.3%
19	2.6%		95.9%
20	1.7%		97.6%
21	1.0%		98.7%
22	0.6%		99.3%
23	0.3%		99.6%
24	0.2%		99.8%
25	0.1%		99.9%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
6.5	minutes/train	5000 ft Train length	
128	vehicles/hour		
14	vehicles/train		
500	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.1%
4	0.1%		0.2%
5	0.4%		0.6%
6	0.9%		1.5%
7	1.9%		3.4%
8	3.2%		6.6%
9	5.0%		11.6%
10	6.9%		18.5%
11	8.7%		27.1%
12	10.0%		37.2%
13	10.7%		47.9%
14	10.6%		58.5%
15	9.8%		68.2%
16	8.5%		76.7%
17	6.9%		83.7%
18	5.3%		89.0%
19	3.9%		92.9%
20	2.7%		95.6%
21	1.8%		97.4%
22	1.1%		98.5%
23	0.7%		99.2%
24	0.4%		99.6%
25	0.2%		99.8%
26	0.1%		99.9%
27	0.1%		99.9%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
6.5	minutes/train	5000 ft Train length	
141	vehicles/hour		
15	vehicles/train		
550	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.1%		0.1%
5	0.2%		0.2%
6	0.4%		0.6%
7	0.9%		1.5%
8	1.7%		3.2%
9	2.9%		6.1%
10	4.4%		10.6%
11	6.1%		16.7%
12	7.8%		24.5%
13	9.2%		33.7%
14	10.0%		43.8%
15	10.2%		54.0%
16	9.8%		63.7%
17	8.8%		72.5%
18	7.4%		80.0%
19	6.0%		85.9%
20	4.6%		90.5%
21	3.3%		93.8%
22	2.3%		96.1%
23	1.5%		97.7%
24	1.0%		98.6%
25	0.6%		99.2%
26	0.3%		99.6%
27	0.2%		99.8%
28	0.1%		99.9%
29	0.1%		99.9%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%

43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%

93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
7.7	minutes/train	6000 ft Train length	
128	vehicles/hour		
16	vehicles/train		
575	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.1%		0.1%
6	0.2%		0.3%
7	0.5%		0.8%
8	1.0%		1.7%
9	1.8%		3.5%
10	2.9%		6.4%
11	4.3%		10.7%
12	5.9%		16.6%
13	7.5%		24.1%
14	8.8%		32.9%
15	9.6%		42.5%
16	9.9%		52.4%
17	9.5%		61.9%
18	8.7%		70.6%
19	7.5%		78.1%
20	6.2%		84.3%
21	4.8%		89.1%
22	3.6%		92.7%
23	2.6%		95.3%
24	1.8%		97.1%
25	1.2%		98.2%
26	0.7%		99.0%
27	0.4%		99.4%
28	0.3%		99.7%
29	0.1%		99.8%
30	0.1%		99.9%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
7.7	minutes/train	6000 ft Train length	
141	vehicles/hour		
18	vehicles/train		
625	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.1%		0.1%
7	0.2%		0.3%
8	0.4%		0.7%
9	0.8%		1.5%
10	1.4%		2.9%
11	2.4%		5.3%
12	3.6%		8.8%
13	5.0%		13.8%
14	6.4%		20.2%
15	7.7%		27.9%
16	8.7%		36.7%
17	9.3%		46.0%
18	9.4%		55.3%
19	8.9%		64.2%
20	8.1%		72.3%
21	6.9%		79.3%
22	5.7%		85.0%
23	4.5%		89.5%
24	3.4%		92.9%
25	2.5%		95.3%
26	1.7%		97.0%
27	1.1%		98.2%
28	0.7%		98.9%
29	0.5%		99.4%
30	0.3%		99.6%
31	0.2%		99.8%
32	0.1%		99.9%
33	0.1%		99.9%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

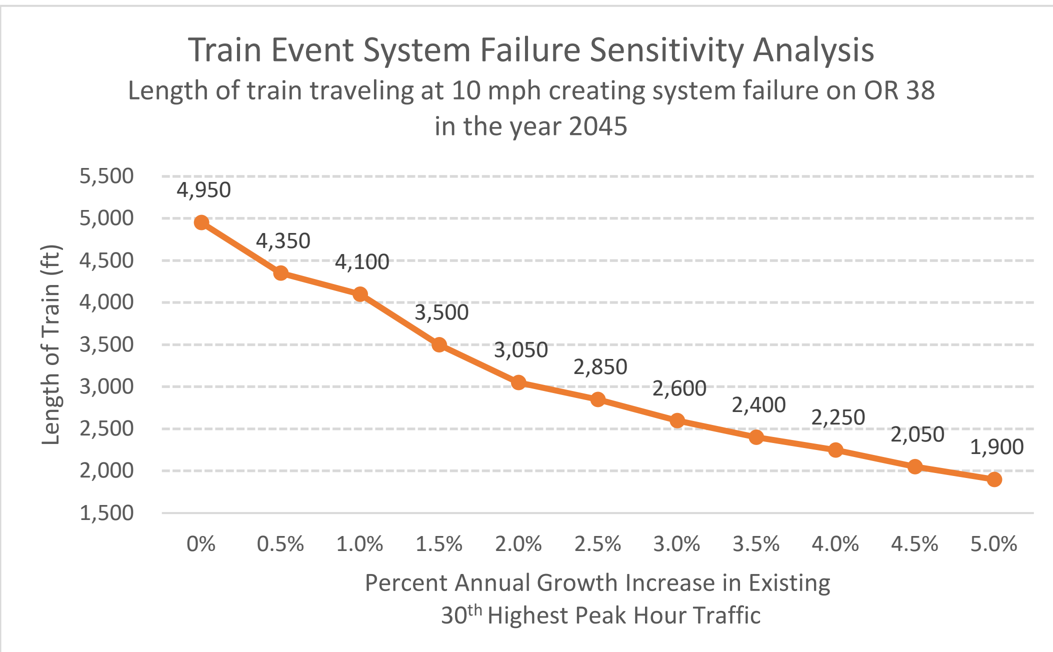
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

Sensitivity Analysis - Annual Increase in Existing 30th Highest Peak Hour Traffic into Year 2045

Percent Increase %	Traffic	Length of Train @ 10 MPH creating system failure
0%	291	4,950
0.5%	324	4,350
1.0%	358	4,100
1.5%	391	3,500
2.0%	425	3,050
2.5%	458	2,850
3.0%	492	2,600
3.5%	525	2,400
4.0%	559	2,250
4.5%	592	2,050
5.0%	626	1,900



PM	EB	2045 @ 10 mph	
6.5	minutes/train	0% Increase Existing	
291	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		1.9%
21	1.2%		3.1%
22	1.7%		4.8%
23	2.3%		7.1%
24	3.0%		10.2%
25	3.8%		14.0%
26	4.7%		18.7%
27	5.4%		24.1%
28	6.1%		30.2%
29	6.7%		36.9%
30	7.0%		43.9%
31	7.1%		51.0%
32	7.0%		58.0%
33	6.7%		64.7%
34	6.2%		70.9%
35	5.6%		76.5%
36	4.9%		81.4%
37	4.2%		85.6%
38	3.5%		89.0%
39	2.8%		91.8%

40	2.2%	94.0%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
5.8	minutes/train	0.5% Annual Increase Existing
324	vehicles/hour	
31	vehicles/train	
1025	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.1%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.3%	0.7%
19	0.5%	1.3%
20	0.8%	2.1%
21	1.3%	3.4%
22	1.8%	5.2%
23	2.5%	7.6%
24	3.2%	10.8%
25	4.0%	14.8%
26	4.8%	19.7%
27	5.6%	25.2%
28	6.3%	31.5%
29	6.8%	38.3%
30	7.1%	45.3%
31	7.1%	52.5%
32	7.0%	59.5%
33	6.6%	66.1%
34	6.1%	72.2%
35	5.5%	77.6%
36	4.8%	82.4%
37	4.0%	86.4%
38	3.3%	89.7%
39	2.7%	92.4%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.1%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5.5	minutes/train	1.0% Annual Increase Existing	
358	vehicles/hour		
33	vehicles/train		
1075	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.1%
17	0.1%		0.2%
18	0.2%		0.4%
19	0.3%		0.6%
20	0.5%		1.1%
21	0.8%		1.9%
22	1.1%		3.0%
23	1.6%		4.6%
24	2.2%		6.8%
25	2.9%		9.7%
26	3.6%		13.3%
27	4.4%		17.7%
28	5.2%		22.9%
29	5.9%		28.8%
30	6.4%		35.2%
31	6.8%		42.0%
32	7.0%		49.0%
33	6.9%		55.9%
34	6.7%		62.6%
35	6.3%		68.8%
36	5.7%		74.5%
37	5.1%		79.6%
38	4.4%		84.0%
39	3.7%		87.7%

40	3.0%	90.7%
41	2.4%	93.1%
42	1.9%	95.0%
43	1.4%	96.4%
44	1.1%	97.5%
45	0.8%	98.3%
46	0.6%	98.9%
47	0.4%	99.2%
48	0.3%	99.5%
49	0.2%	99.7%
50	0.1%	99.8%
51	0.1%	99.9%
52	0.0%	99.9%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.8	minutes/train	1.5% Annual Increase Existing	
391	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.9%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.7%
24	3.2%		10.9%
25	4.0%		15.0%
26	4.9%		19.8%
27	5.6%		25.5%
28	6.3%		31.8%
29	6.8%		38.5%
30	7.1%		45.6%
31	7.1%		52.8%
32	7.0%		59.7%
33	6.6%		66.3%
34	6.1%		72.4%
35	5.4%		77.9%
36	4.7%		82.6%
37	4.0%		86.6%
38	3.3%		89.9%
39	2.6%		92.5%

40	2.1%	94.6%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.0%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.3	minutes/train	2.0% Annual Increase Existing	
425	vehicles/hour		
30	vehicles/train		
1000	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.1%
15	0.1%		0.2%
16	0.2%		0.3%
17	0.3%		0.6%
18	0.5%		1.1%
19	0.8%		1.8%
20	1.1%		3.0%
21	1.7%		4.6%
22	2.3%		6.9%
23	3.1%		10.0%
24	3.9%		13.9%
25	4.7%		18.6%
26	5.5%		24.1%
27	6.2%		30.4%
28	6.8%		37.1%
29	7.1%		44.3%
30	7.2%		51.5%
31	7.1%		58.6%
32	6.8%		65.4%
33	6.2%		71.6%
34	5.6%		77.2%
35	4.9%		82.1%
36	4.1%		86.2%
37	3.4%		89.6%
38	2.7%		92.3%
39	2.1%		94.5%

40	1.6%	96.1%
41	1.2%	97.3%
42	0.9%	98.2%
43	0.6%	98.8%
44	0.4%	99.2%
45	0.3%	99.5%
46	0.2%	99.7%
47	0.1%	99.8%
48	0.1%	99.9%
49	0.0%	99.9%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.1	minutes/train	2.5% Annual Increase Existing	
458	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.9%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.7%
24	3.2%		10.9%
25	4.0%		14.9%
26	4.8%		19.8%
27	5.6%		25.4%
28	6.3%		31.7%
29	6.8%		38.4%
30	7.1%		45.5%
31	7.1%		52.6%
32	7.0%		59.6%
33	6.6%		66.2%
34	6.1%		72.3%
35	5.4%		77.8%
36	4.7%		82.5%
37	4.0%		86.5%
38	3.3%		89.8%
39	2.6%		92.5%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.8	minutes/train	3.0% Annual Increase Existing	
492	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.4%		0.8%
19	0.6%		1.3%
20	0.9%		2.2%
21	1.3%		3.6%
22	1.9%		5.5%
23	2.6%		8.0%
24	3.3%		11.3%
25	4.1%		15.5%
26	5.0%		20.4%
27	5.7%		26.2%
28	6.4%		32.5%
29	6.8%		39.4%
30	7.1%		46.5%
31	7.1%		53.6%
32	7.0%		60.6%
33	6.6%		67.1%
34	6.0%		73.2%
35	5.4%		78.5%
36	4.6%		83.2%
37	3.9%		87.1%
38	3.2%		90.3%
39	2.6%		92.8%

40	2.0%	94.8%
41	1.5%	96.3%
42	1.1%	97.5%
43	0.8%	98.3%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.0%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.6	minutes/train	3.5% Annual Increase Existing	
525	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		2.0%
21	1.2%		3.1%
22	1.7%		4.9%
23	2.3%		7.2%
24	3.1%		10.3%
25	3.9%		14.1%
26	4.7%		18.8%
27	5.5%		24.3%
28	6.1%		30.4%
29	6.7%		37.1%
30	7.0%		44.1%
31	7.1%		51.2%
32	7.0%		58.2%
33	6.7%		64.9%
34	6.2%		71.1%
35	5.6%		76.7%
36	4.9%		81.5%
37	4.2%		85.7%
38	3.4%		89.1%
39	2.8%		91.9%

40	2.2%	94.1%
41	1.7%	95.8%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.6	minutes/train	4.0% Annual Increase Existing	
559	vehicles/hour		
34	vehicles/train		
1075	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.1%
17	0.1%		0.1%
18	0.1%		0.2%
19	0.2%		0.5%
20	0.4%		0.8%
21	0.6%		1.4%
22	0.9%		2.3%
23	1.3%		3.6%
24	1.8%		5.4%
25	2.4%		7.8%
26	3.1%		10.9%
27	3.9%		14.8%
28	4.6%		19.4%
29	5.4%		24.7%
30	6.0%		30.7%
31	6.5%		37.2%
32	6.8%		44.0%
33	6.9%		50.9%
34	6.8%		57.7%
35	6.5%		64.2%
36	6.1%		70.3%
37	5.5%		75.8%
38	4.9%		80.6%
39	4.2%		84.8%

40	3.5%	88.3%
41	2.9%	91.2%
42	2.3%	93.5%
43	1.8%	95.3%
44	1.4%	96.6%
45	1.0%	97.6%
46	0.7%	98.4%
47	0.5%	98.9%
48	0.4%	99.3%
49	0.3%	99.5%
50	0.2%	99.7%
51	0.1%	99.8%
52	0.1%	99.9%
53	0.0%	99.9%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.2	minutes/train	4.5% Annual Increase Existing	
592	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.3%
18	0.3%		0.6%
19	0.5%		1.1%
20	0.8%		1.9%
21	1.2%		3.1%
22	1.7%		4.7%
23	2.3%		7.0%
24	3.0%		10.0%
25	3.8%		13.8%
26	4.6%		18.5%
27	5.4%		23.9%
28	6.1%		29.9%
29	6.6%		36.6%
30	7.0%		43.6%
31	7.1%		50.7%
32	7.0%		57.7%
33	6.7%		64.4%
34	6.2%		70.6%
35	5.6%		76.2%
36	4.9%		81.2%
37	4.2%		85.4%
38	3.5%		88.9%
39	2.8%		91.7%

40	2.2%	93.9%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	97.9%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3	minutes/train	5.0% Annual Increase Existing	
626	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.9%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.7%
24	3.2%		10.9%
25	4.0%		14.9%
26	4.8%		19.7%
27	5.6%		25.4%
28	6.3%		31.6%
29	6.8%		38.4%
30	7.1%		45.5%
31	7.1%		52.6%
32	7.0%		59.6%
33	6.6%		66.2%
34	6.1%		72.3%
35	5.5%		77.8%
36	4.7%		82.5%
37	4.0%		86.5%
38	3.3%		89.8%
39	2.6%		92.5%

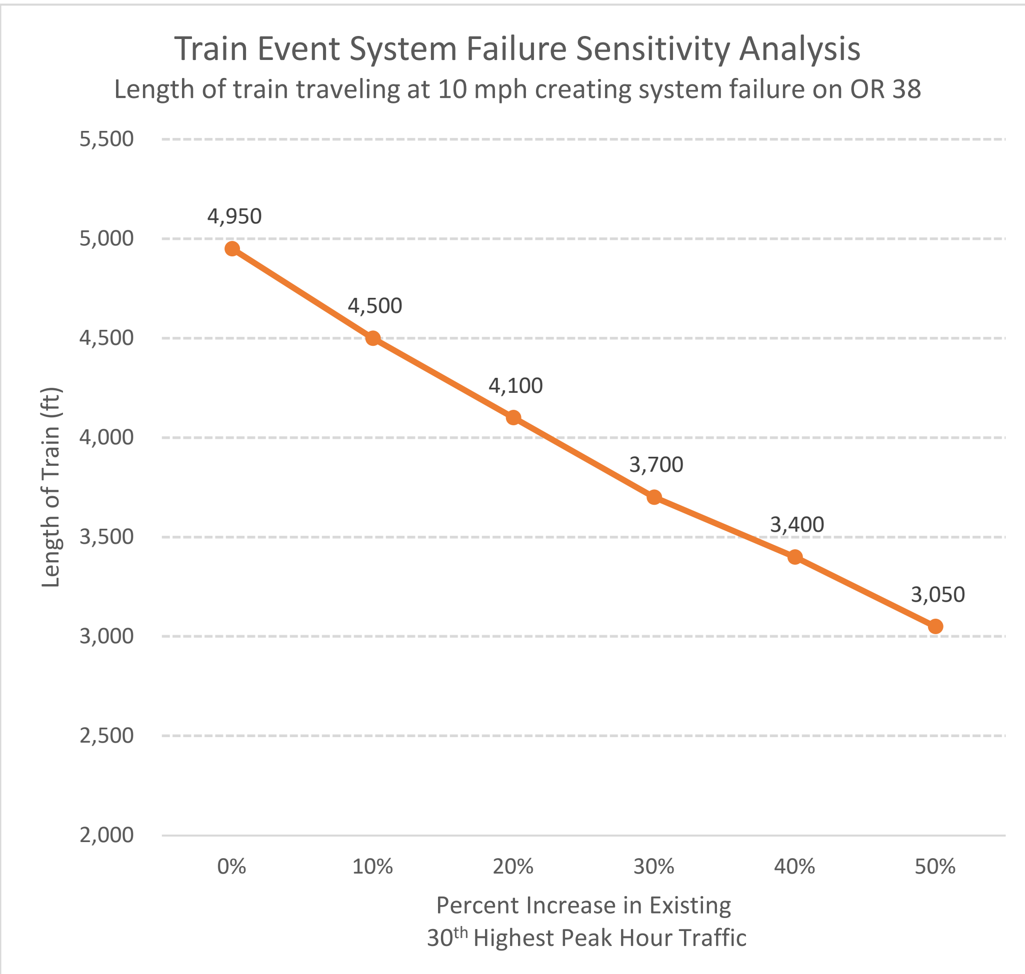
40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

Sensitivity Analysis - Percent Incrase in Existing 30th Highest Peak Hour Traffic

Percent Increase %	Traffic	Length of Train @ 10 MPH creating system failure
0%	291	4,950
10%	320	4,500
20%	349	4,100
30%	378	3,700
40%	407	3,400
50%	437	3,050



PM	EB	2045 @ 10 mp
6.5	minutes/train	
291	vehicles/hour	
32	vehicles/train	
1025	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.3%	0.7%
19	0.5%	1.2%
20	0.8%	1.9%
21	1.2%	3.1%
22	1.7%	4.8%
23	2.3%	7.1%
24	3.0%	10.2%
25	3.8%	14.0%
26	4.7%	18.7%
27	5.4%	24.1%
28	6.1%	30.2%
29	6.7%	36.9%
30	7.0%	43.9%
31	7.1%	51.0%
32	7.0%	58.0%
33	6.7%	64.7%
34	6.2%	70.9%
35	5.6%	76.5%
36	4.9%	81.4%
37	4.2%	85.6%
38	3.5%	89.0%
39	2.8%	91.8%

40	2.2%	94.0%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5.9	minutes/train	10% Increase Existing	
320	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		2.0%
21	1.2%		3.2%
22	1.7%		4.9%
23	2.4%		7.3%
24	3.1%		10.4%
25	3.9%		14.2%
26	4.7%		19.0%
27	5.5%		24.4%
28	6.2%		30.6%
29	6.7%		37.3%
30	7.0%		44.3%
31	7.1%		51.4%
32	7.0%		58.4%
33	6.7%		65.1%
34	6.2%		71.3%
35	5.6%		76.8%
36	4.9%		81.7%
37	4.1%		85.8%
38	3.4%		89.2%
39	2.8%		92.0%

40	2.2%	94.2%
41	1.7%	95.8%
42	1.2%	97.1%
43	0.9%	98.0%
44	0.7%	98.7%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5.5	minutes/train	20% Increase Existing	
349	vehicles/hour		
32	vehicles/train		
1050	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.1%
17	0.1%		0.3%
18	0.2%		0.5%
19	0.4%		0.9%
20	0.7%		1.6%
21	1.0%		2.6%
22	1.5%		4.1%
23	2.0%		6.1%
24	2.7%		8.8%
25	3.5%		12.3%
26	4.3%		16.6%
27	5.1%		21.7%
28	5.8%		27.5%
29	6.4%		33.9%
30	6.8%		40.7%
31	7.0%		47.7%
32	7.0%		54.7%
33	6.8%		61.6%
34	6.4%		68.0%
35	5.9%		73.8%
36	5.2%		79.1%
37	4.5%		83.6%
38	3.8%		87.4%
39	3.1%		90.5%

40	2.5%	93.0%
41	1.9%	94.9%
42	1.5%	96.4%
43	1.1%	97.5%
44	0.8%	98.3%
45	0.6%	98.8%
46	0.4%	99.2%
47	0.3%	99.5%
48	0.2%	99.7%
49	0.1%	99.8%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
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61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
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67	0.0%	100.0%
68	0.0%	100.0%
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70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
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102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
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117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
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136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5	minutes/train	30% Increase Existing	
378	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		2.0%
21	1.2%		3.1%
22	1.7%		4.9%
23	2.3%		7.2%
24	3.1%		10.3%
25	3.9%		14.1%
26	4.7%		18.8%
27	5.5%		24.3%
28	6.1%		30.4%
29	6.7%		37.1%
30	7.0%		44.1%
31	7.1%		51.2%
32	7.0%		58.2%
33	6.7%		64.9%
34	6.2%		71.1%
35	5.6%		76.7%
36	4.9%		81.5%
37	4.2%		85.7%
38	3.4%		89.1%
39	2.8%		91.9%

40	2.2%	94.1%
41	1.7%	95.8%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.7	minutes/train	40% Increase Existing	
407	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.1%
17	0.1%		0.3%
18	0.3%		0.6%
19	0.4%		1.0%
20	0.7%		1.7%
21	1.0%		2.7%
22	1.5%		4.2%
23	2.1%		6.3%
24	2.8%		9.1%
25	3.6%		12.7%
26	4.4%		17.1%
27	5.2%		22.2%
28	5.9%		28.1%
29	6.5%		34.6%
30	6.9%		41.4%
31	7.1%		48.5%
32	7.0%		55.5%
33	6.8%		62.3%
34	6.4%		68.7%
35	5.8%		74.5%
36	5.1%		79.6%
37	4.4%		84.1%
38	3.7%		87.8%
39	3.0%		90.8%

40	2.4%	93.2%
41	1.9%	95.1%
42	1.4%	96.5%
43	1.1%	97.6%
44	0.8%	98.4%
45	0.5%	98.9%
46	0.4%	99.3%
47	0.3%	99.5%
48	0.2%	99.7%
49	0.1%	99.8%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
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66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
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92	0.0%	100.0%
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94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
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134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.3	minutes/train	50% Increase Existing	
437	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.8%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.6%
24	3.2%		10.8%
25	4.0%		14.8%
26	4.8%		19.7%
27	5.6%		25.3%
28	6.3%		31.5%
29	6.8%		38.3%
30	7.1%		45.3%
31	7.1%		52.5%
32	7.0%		59.5%
33	6.6%		66.1%
34	6.1%		72.2%
35	5.5%		77.7%
36	4.8%		82.4%
37	4.0%		86.4%
38	3.3%		89.7%
39	2.7%		92.4%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.1%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
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102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
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108	0.0%	100.0%
109	0.0%	100.0%
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121	0.0%	100.0%
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123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
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Attachment B: Alternative Design Methodology and Assumptions and List of Initial Alternatives Memorandum

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

June 23, 2023

Project# 27003.011

To: Project Management Team

From: Jon Gerlach, PE, Nicholas Polenske, PE, and Marc Butorac, PE, PTOE, PMP

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Alternative Design Methodology & Assumptions and List of Initial Alternatives

INTRODUCTION

The Oregon International Port of Coos Bay is proposing to construct a new multi-modal container facility, which is anticipated to create an increase in rail activity at the existing OR 38 (Umpqua Highway No. 45) and Winchester Avenue at-grade railroad crossings in Reedsport. Several alternatives are being considered to provide safe access and reduce vehicle queueing at the crossing locations with three general approaches: improvements to the existing at-grade crossings, constructing a new grade-separated crossing, and/or adjusting rail operations/vertical alignment. This memorandum summarizes the proposed methodology and assumptions for the conceptual design elements to make improvements at existing crossing locations, and provides an overview of the initially identified alternatives which the project team plans to consider in *Technical Memorandum #6 – Transportation System Improvement Alternative Analysis.*

Methodology & Assumptions

- Apply design standards from AASHTO: A Policy of Geometric Design of Highways and Streets 2018, Douglas County Roadway Standards, Reedsport Transportation System Plan (TSP), Oregon Department of Transportation Highway Design Manual (ODOT HDM), and Union Pacific Railroad – BNSF Railway Guidelines for Railroad Grade Separation Projects.
- Assume a roadway design speed of 30 mph on OR 38 and Winchester Avenue.
- Assume 4% maximum roadway grade on OR 38 to accommodate truck usage, consider up to 7% maximum roadway grade on Winchester Avenue.
- Assume existing roadway cross sections to be upgraded to comply with the Reedsport TSP and ODOT HDM if necessary.
- Assume a minimum 23.5' of clearance from the railroad tracks to bottom of bridge is required for railroad overcrossings, and a minimum 17.5'of clearance from the roadway surface to bottom of bridge is required for railroad undercrossings.
- Assume any grade separation to span the entire 50' wide railroad right-of-way (e.g., an overcrossing would need a bridge a minimum of 50 feet long to span the rail right-of-way).

Existing Conditions

OR 38 is a statewide highway and a designated ORS 366.215 Freight Route running east-west and terminating at US 101 in Reedsport. Currently the crossing at OR 38 is for a single track, but additional parallel tracks may be built in the future (e.g., to lengthen the existing track siding to the south). The existing typical cross-section along the OR 38 near the railroad crossing is 48' wide: one 12' wide vehicle travel lane in each direction, one 6’ wide shoulder/bike lane in each direction, and a 6’ wide sidewalk on each side of the road, which meets the standards in the Reedsport TSP and ODOT HDM. The traffic control treatments at the existing crossing are crossbuck signs (MUTCD R15-1), automatic vehicular gates, flashing-light signals, and detectable warning units on the sidewalk. Both the eastbound and westbound approaches have advance warning pavement marking symbols and signage (MUTCD W10-1).

Winchester Avenue is classified as a Major Collector running northeast-southwest and connects from OR 38 east of the railroad crossing to US 101 south of the signalized OR 38 intersection. The current crossing at Winchester Avenue is for two tracks and is not expected to increase or decrease in the future. The existing typical cross-section along Winchester Avenue near the railroad crossing is 46’ wide: one 12’ wide vehicle travel lane in each direction, one 8’ wide shoulder/bike lane in each direction, and a 6’ wide sidewalk on the south side of the road. An additional sidewalk on the north side of the road was identified as part of the Reedsport TSP. The treatments at the existing crossing are crossbuck signs (MUTCD R15-1), automatic vehicular gates, flashing-light signals, and detectable warning units on the sidewalk. Both the eastbound and westbound approaches have advance warning pavement marking symbols and signage (MUTCD W10-1).

Initial Alternatives to Consider

Based on the findings in Technical Memorandums #4 and #5 and feedback from the Project Management Team, Project Advisory Committee, and the community through the online open house and interviews, the following initial alternatives have been identified for evaluation:

1) **At-Grade Rail Crossing Alternatives**
    a. Four-Quadrant Quiet Zone Gate at OR 38
    b. Four-Quadrant Quiet Zone Gate at Winchester Avenue

2) **Grade Separated Rail Crossing Alternatives**

    a. <u>OR 38 Rail Overcrossing</u>
        i. With Retaining Walls
        ii. Without Retaining Walls (Embankment Support)

    Since OR 38 is classified as an Oregon Highway Plan (OHP) Freight Route, it is strongly preferred to limit the ramp gradient to 4% or less. To provide the minimum 23.5’ vertical clearance below the overcrossing to the railroad tracks at a 4% grade would require approaches of at least 600’ in both directions. The design of the overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes.

    b. <u>Winchester Avenue Rail Overcrossing</u>
        i. With Retaining Walls
        ii. Without Retaining Walls (Embankment Support)

    Since Winchester Avenue is not currently a designated truck route, the approach grades may be increased to a desired maximum of 5%, or an absolute maximum of 7%. To achieve the minimum 23.5’ vertical clearance below the overcrossing would require approaches of at least 500’ to achieve the desired maximum grade of 5% but could be reduced to approximately 350’ with a maximum grade of 7%. The design of the overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes. Implementation of an overcrossing on

Winchester Avenue may require additional roadway upgrades to create a suitable alternate freight access route due to potential truck diversions identified in the traffic study.

c. <u>OR 38 Rail Undercrossing with Retaining Wall</u>

To provide the minimum 17.5' vertical clearance below the railroad tracks at a 4% grade would require approaches at least 450' long, depending on the thickness of the structure which would be needed to support the existing railroad. The undercrossing would also require additional study to mitigate potential flooding risks and install an adequate drainage system, as well as the challenge of maintaining continuous rail access during construction.

d. <u>Winchester Avenue Rail Undercrossing with Retaining Wall</u>

Creation of a railroad undercrossing on Winchester Ave would require approaches of at least 350' at a 5% grade or 250' at a 7% grade, depending on the thickness of the structure needed to support the existing railroad. The undercrossing would also require additional study to mitigate potential flooding risks and install an adequate drainage system, as well as the challenges of maintaining continuous rail access during construction.

e. <u>Other Crossing Locations (e.g., OR38 realignment)</u>
   i. Port Dock Road Undercrossing Upgrades and Riverfront Way Intersection Realignment
   ii. Northerly OR38 Undercrossing Upgrade

Adjustments to the street alignments and network could be made to upgrade an existing grade-separated crossing at a new location north of OR 38 or near Port Dock Road. The potential route would seek to minimize the overall impacts of grade-separation and consider improvements to the overall circulation.

3) Rail Line Upgrade Alternatives

a. <u>Increase Rail Speeds through Reedsport to 25 MPH</u>
b. <u>Increase Rail Speeds through Reedsport to 40 MPH</u>

Increased rail speeds could shorten the duration of rail crossings and thereby reduce the queue lengths of at-grade crossings. The current maximum train speed in Reedsport is limited to 10 mph due to the existing Umpqua River Bridge, but it is under consideration to raise the speed limit to 25 mph or 40 mph, depending on additional safety improvements, bridge upgrades, and other geometric constraints associated with the existing horizontal track curvature. ***While this alternative evaluation is not directly scoped in the study and will be evaluated by the railroad and Port of Coos Bay under a future evaluation for feasibility and suitability, the benefits (i.e., reduced delays and queuing) will be documented qualitatively.***

4) Elevated Rail Line Alternative

As an alternate approach to roadway undercrossings or overcrossings, the entire rail line could theoretically be raised with a series of rail bridge replacements and earthwork to pass above the existing roads at the crossing locations. The finished track profile is limited to a maximum grade of 1.5%, which would require additional investigation into the extents of the track replacement north of the Umpqua River, including the bridge, and south of the southerly water crossing. ***While this alternative is likely unfeasible from a cost and environmental perspective compared to other alternatives, it will be documented qualitatively.***

Next Steps

The Project Management Team and Project Advisory Committee will review and confirm the methodology and assumptions and initial alternatives presented herein. Once confirmed, the project team will move forward in preparing *Technical Memorandum #6 – Transportation System Improvement Alternative Analysis.*

Attachment C: Evaluation Matrix

Objective	Evaluation Criteria	Evaluation Score	Criteria are applied relative to the no-build and with consideration to future conditions with increased rail activity	No-Build	2A1. OR 38 Rail Overcrossing with Retaining Wall	2A2. OR 38 Rail Overcrossing without Retaining Wall	2B1. Winchester Avenue Rail Overcrossing with Retailing Walls	2B2. Winchester Avenue Rail Overcrossing without Retailing Walls	2C. OR 38 Rail Undercrossing with Retaining Walls	2D. Winchester Avenue Rail Undercrossing with Retaining Walls	2E1. Port Dock Road Rail Undercrossing Upgrade	2E2. Northerly OR 38 Rail Undercrossing Upgrade	3A1. Increase Rail Speeds through Reedsport to 40 MPH	3A2. Increase Rail Speeds through Reedsport to 25 MPH	4A. Elevated Rail Line	5A – OR 38/US 101 East-West Split Phasing
Goal #1: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.																
Objective 1.a	Concept maintains the livability of Reedsport through proper location and design of transportation facilities.	(-2 to +2)	(+2) Concept improves transportation facilities (0) Concept maintains existing transportation facilities (-2) Concept degrades existing transportation facilities	-2	2	-1	0.5	-2	-2	-2	0.5	0.5	1	1	1	1
Objective 1.b	Concept consider noise impacts in the design, redesign, and reconstruction of arterial streets immediately adjacent to residential neighborhoods.	(-2 to +2)	(+2) Concept reduces noise impacts of arterial streets (0) Concept maintains existing noise impacts (-2) Concept increases noise impacts of arterial streets	-2	2	2	2	2	2	2	1	1	1	1	2	0
Objective 1.c	Concept protects neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas.	(-2 to +2)	(+2) Concept minimizes cut-through traffic (0) Concept maintains existing cut-through traffic (-2) Concepts increases cut-through traffic	-1	2	1	1	0.5	1	0.5	-0.5	-0.5	0.5	0.5	1	1
Objective 1.e	Concept cooperates with ODOT to maintain and improve US 101 and OR 38 consistent with the Oregon Highway Plan (OHP).	(-2 to +2)	(+2) Concept improves state facilities per the OHP (0) Concept maintains state facilities (-2) Concept degrades state facilities	-1	2	2	1	0.5	2	0.5	0.5	0.5	0.5	0.5	2	1
Objective 1.f	Concept ensures that transportation improvements minimize impacts to storm drainage, particularly in the City's downtown.	(-2 to +2)	(+2) Concept improves storm drainage (0) Concept maintains existing storm drainage (-2) Concept degrades storm drainage	0	2	2	1	1	-2	-2	-1	-1	1	1	2	0
Goal #2: Create a balanced transportation system																
Objective 2.b	Concept provides connectivity to each area of Reedsport to ensure pedestrian, bicycle, and vehicle access to schools, parks, employment, and recreational areas.	(-2 to +2)	(+2) Concept improves connectivity (0) Concept maintaines existing connectivity (-2) Concept degrades connectivity	-1	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Objective 2.c	Concept develops neighborhood and local connections to provide adequate circulation into and out of neighborhoods.	(-2 to +2)	(+2) Concept develops neighborhood and local connections (0) Concept maintains existing neighborhood and local connections (-2) Concept degrades existing neighborhood and local connections	-1	-0.5	-1	-0.5	-1	-1	-1	0.5	0.5	0	0	0.5	0
Objective 2.f	Concept ensures that local connections are maintained or enhanced to minimize reliance on major street connections	(-2 to +2)	(+2) Concept reduces reliance on major street connections (0) Concept maintains reliance on major street connectinons (-2) Concept increases reliance on major street connections	0	-0.5	-0.5	-1	-0.5	-0.5	-0.5	0.5	0.5	0	0	1	0
Objective 2.g	Concept improves roadway connectivity and/or parallel routes on the location transportation network.	(-2 to +2)	(+2) Concept improves connectivity through parallel routes (0) Concept maintaines existing connectivity (-2) Concept degrades connectivity	-1	-0.5	-1	-0.5	-1	-1	-1	0.5	0.5	0	0	0.5	0
Goal #3: Improve the safety of the transportation system																
Objective 3.e	Concept maintains access management standards for streets to reduce conflicts between vehicles and trucks, and between vehicles and bicycles and pedestrians.	(-2 to +2)	(+2) Concept increases access spacing (0) Concept maintains existing access spacing (-2) Concept decreases access spacing	0	1	1	1	1	1	1	0	0	0	0	0	0
Objective 3.f	Concept ensures that adequate access for emergency services vehicles is provided throughout the city.	(-2 to +2)	(+2) Concept improves emergency access (0) Concept maintains existing emergency access (-2) Concept degrades emergency access	-2	2	1	2	1	1	1	1	1	1	1	2	1
Objective 3.g	Concept meets federal and state safety standards for rail crossings.	(-2 to +2)	(+2) Concept meets safety standards for rail crossings (0) Concept does not impact a rail crossing (0) Concept does not meet safety standards for rail crossings	-1	2	2	2	2	2	2	2	2	0.5	0.5	2	0
Goal #4: Develop an efficient transportation system that will handle future traffic growth																
Objective 4.d	Concept implements the bicycle, pedestrian, and vehicle improvements to create a multi-modal transportation system.	(-2 to +2)	(+2) Concept improves multimodal transportation system (0) Concept maintains the existing multimodal transportation system (-2) Concept degrades the existing multimodal transportation system	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	1	0.5
Objective 4.e	Concept maintains levels of service consistent with the Oregon Transportation Plan.	(-2 to +2)	(+2) Concept improves levels of service per the OTP (0) Concept maintains levels of service (-2) Concept degrades levels of service	-1	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Objective 4.g	Concept considers fluctuations in traffic volumes on weekends, holidays, and during the summer season when developing transportation improvements.	(-2 to +2)	(+2) Concept improves conditions during peak season events (0) Concept maintains existing conditions during peak season events (-2) Concept degrades conditions during peak season events	-2	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Goal #5: Provide a transportation system that is accessible to all members of the community.																
Objective 5.a	Concept constructs transportation facilities to meet the requirements of the Americans with Disabilities Act.	(-2 to +2)	(+2) Concept improves accessibility for people with disabilities (0) Concept maintains maintains existing levels of accessibility (-2) Concept degrades existing levels of accessibility	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	0.5	0.5
Objective 5.b	Concept supports service to respond to the transportation needs of disadvantaged individuals.	(-2 to +2)	(+2) Concept improves access for transportation disadvantaged (0) Concept maintains existing levels of access (-2) Concept degrades existing levels of access	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	0.5	0.5
Goal #6: Develop a transportation system to provide for efficient freight movement.																
Objective 6.a	Truck routes and highway access are essential for efficient movement of goods. Concept designs these facilities and adjacent land uses to reflect the needs of freight movement.	(-2 to +2)	(+2) Concept improves access for freight trucks (0) Concept maintains existing levels of access for freight trucks (-2) Concept degrades access for freight trucks	-1	2	1	2	1	1	1	0.5	0.5	0	0	1	1
Objective 6.b	Concept considers the impact on railroad facilities in land use decisions.	(-2 to +2)	(+2) Concept reduces impact of rail facilities on adjacent land uses (0) Concept has no impact on adjacent land uses (-2) Concept increases impact of rail facilities on adjacent land uses	-1	1	-1	1	-1	-1	-1	0.5	0.5	0	0	1	0
Objective 6.c	Concept protects the function of rail facilities and develop and implement strategies that minimize conflicts with other travel modes and adjacent land uses, including strategies that support a "No Horn Ordinance."	(-2 to +2)	(+2) Concept imrpoves the function of rail facilities (0) Concept does not impact the function of rail facilities (-2) Concept degrades the function of rail facilities	-1	2	2	2	2	2	2	1	1	1	1	2	0
Goal #7: Create a funding system to implement the recommended transportation system improvement projects.																
Objective 7.a	Concept partners with ODOT and other jurisdictions to develop a long-range financial strategy to make needed improvements to the transportation system and support operational and maintenance requirements.	(-2 to +2)	(+2) Concept has a long-range financial strategy (0) Concept's financial strategy is uncertain (-2) Concept does not have a long-range financial strategy	0	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Objective 7.b	Concept is coordinated with transportation projects, policy issues, and development actions with all affected governmental units in the area. Key agencies for coordination include Douglas County and ODOT.	(-2 to +2)	(+2) Concept was developed in coordination with other agencies (0) Concept does not require coordination with other agencies (-2) Concept is not supported by other agencies	-2	2	2	1	1	1	1	1	1	1	1	1	2
Objective 7.h	Concept ensures that the Transportation System Plan is consistent with other state and local plans and that it reflects the City's overall development plan.	(-2 to +2)	(+2) Concept is consistent with existing plans (0) Concept is not included in any existing plans (-2) Concept is inconsistent with existing plans	0	0	0	0	0	0	0	0	0	0	0	0	0
			Livability	-1.2	2.0	1.2	1.1	0.4	0.2	-0.2	0.1	0.1	0.8	0.8	1.6	0.6
			Connectivity	-0.8	-0.1	-0.5	-0.3	-0.5	-0.5	-0.5	0.5	0.5	0.1	0.1	0.6	0.3
			Safety	-1.0	1.7	1.3	1.7	1.3	1.3	1.3	1.0	1.0	0.5	0.5	1.3	0.3
			Efficiency	-1.3	1.0	0.8	1.0	0.8	0.8	0.8	0.3	0.3	0.8	0.8	1.0	0.8
			Accessibility	-1.0	1.0	0.5	1.0	0.5	0.5	0.5	0.0	0.0	0.5	0.5	0.5	0.5
			Freight	-1.0	1.7	0.7	1.7	0.7	0.7	0.7	0.7	0.7	0.3	0.3	1.3	0.3
			Funding	-0.7	1.0	1.0	0.7	0.7	0.7	0.7	0.5	0.5	0.7	0.7	0.7	1.0
			Average	-1.0	1.2	0.7	0.9	0.5	0.5	0.4	0.4	0.4	0.5	0.5	1.1	0.5

Attachment D: Year 2045 Traffic Operations Analysis Worksheets

Intersection Level Of Service Report
Intersection 1: US 101 / OR 38

Control Type:	Signalized	Delay (sec / veh):	20.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.517

Intersection Setup

Name	US 101			US 101			Port Dock Rd			OR 38		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [ft]	150.00	100.00	100.00	225.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	320.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			No			Yes			No		
Crosswalk	Yes			Yes			Yes			No		

Volumes

Name	US 101			US 101			Port Dock Rd			OR 38		
Base Volume Input [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	18.00	9.00	5.00	2.00	6.00	0.00	0.00	50.00	11.00	9.00	20.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	79	70	14	90	5	4	3	9	78	2	15
Total Analysis Volume [veh/h]	23	317	280	54	362	18	17	11	36	313	7	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	3	10	0	3	10	0	0	5	0	0	7	0
Maximum Green [s]	15	45	0	15	45	0	0	35	0	0	35	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.8	0.0
All red [s]	1.8	1.0	0.0	1.8	1.5	0.0	0.0	1.8	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	2.5	4.5	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	0	0	0	7	0	0	7	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	19	0	0	20	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.3	2.8	0.0	3.3	3.3	0.0	0.0	3.3	0.0	0.0	3.8	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	C	C	R
C, Cycle Length [s]	54	54	54	54	54	54	54	54	54	54
L, Total Lost Time per Cycle [s]	5.05	4.80	4.80	4.80	5.30	5.30	5.30	5.30	5.80	5.80
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.80	2.80	2.80	0.00	3.30	3.30	3.30	3.80	3.80
g_i, Effective Green Time [s]	20	13	13	13	20	14	14	4	13	13
g / C, Green / Cycle	0.38	0.25	0.25	0.25	0.38	0.26	0.26	0.07	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.02	0.12	0.12	0.12	0.04	0.11	0.11	0.06	0.21	0.04
s, saturation flow rate [veh/h]	1147	1765	1614	1518	1240	1810	1776	1033	1525	1615
c, Capacity [veh/h]	402	442	404	380	420	476	467	69	381	404
d1, Uniform Delay [s]	15.33	17.14	17.19	17.19	16.80	16.30	16.32	24.95	19.11	15.71
k, delay calibration	0.19	0.19	0.19	0.19	0.19	0.08	0.19	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.10	1.37	1.56	1.73	0.23	0.41	0.97	29.59	3.75	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.06	0.48	0.49	0.50	0.13	0.40	0.40	0.93	0.84	0.15
d, Delay for Lane Group [s/veh]	15.43	18.51	18.75	18.92	17.03	16.71	17.28	54.54	22.86	15.84
Lane Group LOS	B	B	B	B	B	B	B	D	C	B
Critical Lane Group	No	No	No	Yes	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.16	2.15	2.03	1.96	0.38	1.78	1.83	1.33	3.84	0.56
50th-Percentile Queue Length [ft/ln]	4.00	53.65	50.69	49.01	9.55	44.52	45.86	33.24	95.96	14.06
95th-Percentile Queue Length [veh/ln]	0.29	3.86	3.65	3.53	0.69	3.21	3.30	2.39	6.91	1.01
95th-Percentile Queue Length [ft/ln]	7.20	96.57	91.24	88.22	17.19	80.14	82.54	59.84	172.72	25.31

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.43	18.59	18.87	17.03	16.98	17.28	54.54	54.54	54.54	22.86	22.86	15.84
Movement LOS	B	B	B	B	B	B	D	D	D	C	C	B
d_A, Approach Delay [s/veh]	18.60			17.00			54.54			21.72		
Approach LOS	B			B			D			C		
d_I, Intersection Delay [s/veh]	20.46											
Intersection LOS	C											
Intersection V/C	0.517											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	-5.8	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	16886.05	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.90	32.88	16.90	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.640	2.459	1.759	0.000
Crosswalk LOS	B	B	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1681	1681	1308	1308
d_b, Bicycle Delay [s]	0.68	0.68	3.21	3.21
I_b,int, Bicycle LOS Score for Intersection	2.071	1.918	1.665	2.190
Bicycle LOS	B	A	A	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-