

Northstar Commuter Rail Extension Feasibility Assessment

Appendix A – Technical Memorandum on Existing Constraints

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Photo Credit: Dave Gonzalez

Prepared for



by



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1. Introduction

This Technical Memorandum documents existing conditions that may constrain the extension of Northstar commuter rail service to St. Cloud.

2. Corridor Capacity Constraints

2.1. Accommodating High-Priority Freight Trains

Northstar commuter rail service operates over BNSF's busy Northern Transcon route between Chicago and the Pacific Northwest. Northstar commuter trains currently share the corridor with over 50 BNSF, Union Pacific, Canadian Pacific, and short line freight trains per day. Amtrak's long-distance Empire Builder Train Numbers 7 and 8 between Chicago, the Twin Cities, and the Pacific Northwest also operate in the corridor.

Many of BNSF's trains are high-speed intermodal trains providing premium service for double-stack containers, Container-on-Flat-Car (COFC) and Trailer-on-Flat-Car (TOFC) traffic on long-distance high-performance schedules. Train density and the complexity of the train operations in the Northstar corridor are both important limiting factors which directly affect the ability to add new passenger train service in the corridor.

The long-distance high-performance intermodal trains have complex schedules which include deadlines for shippers tendering freight to the railroad at origin, specific loading and departure times from rail yards, and pick-up times at junctions with other railroads where cars are added to the trains. The trains must all travel over the railroad at their scheduled speeds without delays so that they arrive in the yards at each city on schedule. At those cities, unloading crews are scheduled to make the trailers, containers and/or vehicles available to the customers' highway transport connections at specific times so that the carriers can deliver the priority shipments to the customers on time. In some cases, the cargo is parcel shipments that must be delivered to customers awaiting the packages by specific times for their business needs. Other cargo may be shipping containers to be transferred to one or more ocean vessels before their sailing times from ports. New vehicles must make the connections to scheduled vehicle transport destined to car dealers so that vehicles are delivered to customers when promised.

The railroad schedules its operations and the maintenance of the railroad and equipment to prioritize the high-priority trains, ensuring that other trains are organized to run without causing delays to these trains. A delay incurred by one train at one point in its trip can cause domino-effect delays to other trains in the network and the failure to make guaranteed or promised deliveries. When scheduling the proposed revisions and additions to Northstar commuter trains as a part of the study, these constraints were carefully considered to ensure that BNSF's ability to provide its rail service would not be unduly impaired by the proposed extension of service to St. Cloud.

As a result of BNSF's needs to maintain the schedule performance of its trains and the need to maintain its infrastructure to support the operations, proposing additional Northstar trains with closer service frequencies and during certain time periods was not feasible. The Service Alternatives were developed

to maintain BNSF’s ability to operate and maintain its railroad while providing alternatives to extend service to St. Cloud in ways that would meet the requests expressed by the public.

2.2. Capacity Needs

Along BNSF’s Staples Subdivision, Northstar and Amtrak trains operate an average of 19 MPH faster than the fastest freight trains. Due to the difference in operating speeds, passenger trains cannot operate behind freight trains without receiving a speed-limiting signal indication which prevents them from maintaining their schedule. To optimize speeds for both passenger and freight traffic, during peak periods, freight trains typically operate on one track, while passenger trains operate on the other. Extending Northstar service to St. Cloud will likely increase the overall number of passenger trains operating in the corridor at a time. Service Alternatives proposing the operation of two passenger trains in opposing directions at the same time would consume capacity on both tracks, resulting in freight trains holding outside of the passenger territory and encountering delay to their schedules. Capacity improvements are proposed in areas where two passenger trains operate in opposing directions to mitigate the impact to freight operations.

2.3. Congestion near Northtown Yard

BNSF’s Northtown Yard is located along the Staples Subdivision between railroad control points at University (MP 11.5) and Interstate (MP 15.5). The Yard serves as an origination and termination point for trains to and from other major system yards on the BNSF network and originates and terminates local freight trains and switch runs that service local industries. Northtown Yard is also an interchange point between BNSF and trains of other railroads. Northtown Yard also serves as a through-train crew change point and a maintenance point for BNSF locomotives. Currently, a significant number of trains stop and dwell on the main tracks adjacent to Northtown Yard including the following:

- BNSF through freight trains changing crews on the mainline near Fridley Station (15 to 20 minutes of dwell per train)
- BNSF trains setting off and/or picking up cars in Northtown Yard and occupying the mainline near Fridley Station
- Westbound BNSF freight trains waiting for eastbound Northstar trains to pass at CP 21-Coon Creek (20 to 40 minutes of dwell per train)

In the existing two-track area surrounding Northstar’s Fridley Station, BNSF trains stopping and waiting on the main tracks create a single-track configuration for other freight trains, Northstar commuter trains, and Amtrak to use for through movements. On occasion, BNSF freight trains in both directions stop to change crews at the same time leaving no main track clear for other trains. Because BNSF must maintain the on-time performance of passenger rail operations in the corridor, freight trains experience the bulk of the impact from the dwelled trains. However, Amtrak and Northstar trains also experience delays.

Freight trains dwelling on the mainline and the movements into and out of Northtown Yard exacerbate an already-congested segment of track and additional Northstar trains could impact BNSF’s operations, driving the need for a third track in this area.

3. FRA Regulations

The Federal Railroad Administration (FRA) of the United States Department of Transportation (USDOT) regulates most safety aspects of railroad operations. FRA’s regulations apply to BNSF as the owner and operating manager of the railroad in the Northstar corridor and the operator of Northstar commuter trains. The FRA rules also apply to Metro Transit as the entity that maintains the Northstar locomotives and passenger cars and maintains Northstar commuter stations. Bodies of FRA rules apply to train crew and certain other workers qualifications and hours of service limitations. They apply to track, bridge, and signal safety standards including Positive Train Control, locomotive and passenger car inspection and maintenance standards, blue signal safety for locomotive and car workers, roadway worker protection, grade crossing safety, and many others. Several of these standards are discussed below.

3.1. Hours of Service Limitations

3.1.1. FRA Regulations

FRA regulation of train crew hours of service affects scheduling and operating expenses for the proposed extension to St. Cloud. FRA’s rule limits train crews to a maximum of twelve hours on duty in one duty period. Twelve hours are not enough to work both the early morning and late afternoon peak period commuter trains without exceeding the 12-hour maximum. A provision in the FRA rules allows crews that work a few hours in the morning peak period and have an undisturbed midday rest period where the crews are relieved from duty for at least four hours off duty at a qualified (quiet) location, to return to service to operate late afternoon peak hours trains. The crew’s actual on duty working hours must not exceed 12 hours, but the total number of compensated duty hours may exceed 12 hours.

3.1.2. Constraints on Proposed Northstar Service

Using this rule, a Northstar’s crew may work 3 hours in the morning peak period, have 8 hours off duty at Target Field Station midday, and then work 3 hours in the afternoon peak period. Total on duty working hours are 6, but total compensated hours are 14. However, when the crew goes off duty at the end of the workday, FRA rules require that the crew must have at least 10 hours off duty undisturbed rest before returning to duty the following day. In this case, if the crew regularly went on duty at Big Lake at 4:00 A.M., worked 3 hours until 7:00 A.M., took 8 hours off at Target Field Station until 3:00 P.M., and then worked 3 more hours and completed its afternoon peak period trip back to Big Lake by 6:00 P.M., it would have used 14 hours and would have only the minimum 10-hour rest period available before returning to duty at the same time (4:00 A.M.) the next day. Because of the additional time needed to operate to and from St. Cloud, this crew would not be able to have its morning and afternoon trip extended to St. Cloud. As a result, the workday would have to be split, and two train crews would have to be used to operate extended service. For this reason, three of the four service alternatives presented each use two additional crews to extend commuter train service to St. Cloud.

3.2. Locomotive and Passenger Car Maintenance

3.2.1. FRA Regulations

FRA regulations require the periodic safety inspections of locomotives and passenger cars. These begin with a required daily inspection of each vehicle in service and continue at specific intervals such as 92-day inspections and additional time-based inspections specific to locomotives and passenger cars. In addition to the FRA requirements, other mileage-based maintenance requirements, normally specified by the manufacturer or by service experience, are required.

3.2.2. Constraints on Proposed Northstar Service

Metro Transit forces accomplish nearly all the inspection and maintenance requirements at the Big Lake Vehicle Maintenance Facility. Certain specialized functions requiring specialized shop facilities, such as locomotive wheel-truing, are accomplished by BNSF at Northtown Yard or by other contractors available to Metro Transit.

To maintain Northstar performance reliability and comply with FRA regulations, one or more locomotives and passenger cars are scheduled to undergo periodic inspection and maintenance at the Big Lake Vehicle Maintenance Facility each day. In addition, other locomotives, cab control cars, or commuter coaches may have to be brought to the Maintenance Facility for unscheduled repairs. As a result, Metro Transit maintains several pieces of spare equipment to replace those units held for maintenance so that it can maintain the number of train sets in service required by the Northstar schedules.

Metro Transit also maintains the Positive Train Control (PTC) equipment on Northstar locomotives and cab control commuter coaches. The BNSF crews that operate Northstar trains, and the Metro Transit crews that maintain the PTC equipment are specially trained and qualified to do so.

3.3. Track Safety Standards

3.3.1. FRA Regulations

FRA has established track safety standards that apply to the condition and spacing of track ties and fastenings, the condition of rail, the surface and alignment of track, and many other specific details of track. All standards must be met for the segment of track to qualify for a specific speed for passenger and freight trains.

Under FRA rules, if a segment of track met all the requirements for FRA Class 4 track, then the maximum speed for passenger trains would be 80 miles per hour and the maximum speed for freight trains would be 60 miles per hour. If any aspect of the track in the segment fails to meet the minimum standard for the track class, then the segment of track drops to the next lower track class and the maximum permissible train operating speeds drop accordingly. For example, if a segment of track were classified by the railroad as FRA Class 4 track, but inspection revealed a section of deteriorated ties in the segment that did not meet the standard for FRA Class 4, then the segment of track would be reduced to FRA Class 3, and train speeds would be reduced to 60 miles for passenger trains and 40 miles per hour for freight

trains. Train delays, train congestion, and the failure to meet service performance standards would result.

3.3.2. Constraints on Proposed Northstar Service

As a policy, BNSF normally builds and maintains the track in its mainline corridors to one FRA track class higher than the posted speeds require. This allows for the normal deterioration of track between scheduled maintenance cycles without resulting slow orders and associated speed reductions. This policy is key to maintaining maximum train speeds which are necessary to maintain system train schedules and performance.

BNSF achieves its required track maintenance through scheduled inspection and maintenance activities that occur during the midday in order to avoid interfering with Northstar service. The midday maintenance window is a critical and short period of daylight when BNSF maintenance forces must conduct most of their maintenance activities. The replacement of ties, dumping of track ballast, track surfacing, changeout of switches and switch components, and repairs to signal and communications equipment occurs primarily during this midday window. When one track is out of service for maintenance, all trains in both directions must use the single remaining main track between available control points and past the work areas. This causes extreme congestion and train delays.

Adding new passenger trains during this midday maintenance window would only increase the congestion and train delays. It would also result in passenger dissatisfaction with the Northstar service. Additional trains would also shorten the maintenance time available, degrade maintenance productivity, and extend the time needed to perform maintenance activities. This would increase the cost of the maintenance work, a portion of which is allocated to the agencies operating the passenger trains. The inability to complete needed maintenance can also contribute to track and signal failures which can delay all trains in the corridor.

BNSF requested that Northstar crews from the existing crew base location at Northtown Yard, which go on and off duty at Big Lake, be used to operate any Northstar service extension. This is an important factor in preserving service dependability and maintaining control of operating expenses. Continuing to use the Northtown crew base, with crews reporting at Big Lake, will require trains to deadhead 27 miles north to St. Cloud before inbound service begins. For each train operating to or from St. Cloud, an additional 54 miles would be traveled. The increased train mileage could result in the need for more frequent equipment maintenance.

4. Existing Rolling Stock Limitations

Northstar's existing equipment fleet of six locomotives and 18 passenger coaches and cab cars can accommodate one round trip to and from St. Cloud each day. Service Alternatives proposing more than one round trip to St. Cloud will require an additional trainset to operate. Purchasing one additional trainset drives the need for an additional track at the Big Lake Maintenance Facility and additional train crews. Target Field Station can accommodate four trainsets with its existing configuration. No improvements are needed to accommodate the additional trainset because, in all four of the proposed Service Alternatives, no more than four train sets are scheduled into Target Field Station at the same

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time. At Big Lake, a new storage track is proposed north of the existing track to accommodate an additional trainset.

Northstar’s existing fleet consists of six MP36PH-3C locomotives and 18 Bombardier bilevel coaches and cab cars. Consistency of the fleet is key to the current equipment maintenance plan. The current and future availability of additional locomotives and cars matching the existing fleet is uncertain. To maintain a homogenous fleet of cars and locomotives, the entire fleet may need to be replaced. For the purposes of the Feasibility Assessment, it is assumed that an additional trainset, matching the existing fleet, can be leased or purchased.