APPENDIX C-1

CORRIDOR ASSESSMENT
LEVEL 1 SCREENING REPORT

NORTHERN LIGHTS EXPRESS
PASSENGER RAIL PROJECT

LEVEL 1 SCREENING - FINAL REPORT

Alternatives Analysis Of
Rail Lines within Intercity Rail Corridor

MINNEAPOLIS/ST. PAUL, MN to DULUTH, MN

In Accordance with
FEDERAL RAILROAD ADMINISTRATION
RAIL CORRIDOR TRANSPORTATION PLANS
A Guidance Manual, Section II

Prepared By
Quandel Consultants, LLC
For SRF Consulting Group, Inc.

December 31, 2009

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Alternatives Analysis Level 1 Screening

- Step 1 – Route Alternatives Identification
- Step 2 – Preliminary Analysis
- Step 3 – Detailed Analysis
  - Speed Profiles and Route Travel Times
  - Intermodal Stations
  - Ridership Potential
  - Cost of Improvements

LEVEL 1 SCREENING SUMMARY

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Technical Report

Subject:	**Minnesota Northern Lights Express Project** **Level 1 Screening Final Report**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**December 29, 2009**

Introduction

This report summarizes the evaluation process and the results of the Northern Lights Express Level 1 screening. The Northern Lights Express will provide passenger rail service between the metropolitan areas of Minneapolis/St. Paul and Duluth/Superior. The Level 1 screening employs proprietary software developed by Quandel Consultants, LLC to identify the alternative rail routes for further evaluation in the Northern Lights Express Environmental Assessment (NLX Project).

Background

In 2007, members of several regional rail authorities and local, county, and state government officials from the states of Minnesota and Wisconsin, joined together to form the NLX Alliance. The Alliance was formed to explore options for restoring high-speed intercity rail service between Minneapolis/St Paul, MN and Duluth, MN/Superior, WI. The Alliance commissioned Transportation Economics & Management Systems, Inc. (TEMS) to perform a feasibility study and prepare a business plan for implementing this service.

The TEMS Feasibility Study, officially titled the 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan', investigated the implementation of service along the 155-mile Burlington Northern Santa Fe owned freight rail route between downtown Minneapolis and downtown Duluth. The TEMS study concluded that the implementation of a passenger rail system within the BNSF right of way would enhance mobility in the region, reduce auto congestion and emissions, and stimulate economic growth in towns along

the corridor. It also concluded that intercity rail service would meet the need for a competitive alternative to automotive travel with respect to travel time, pricing, and travel experience.

Environmental Review

In 2009, the NLX Alliance retained SRF Consulting Group, Inc., in association with Quandel Consultants, LLC and TEMS, to provide complete environmental review and documentation for NLX service implementation. The environmental documentation process ensures compliance with the National Environmental Protection Act and National Historic Preservation Act needed to meet FRA requirements for the startup of passenger rail service. The initial phase of the environmental process defines the purpose and need of the project. The Purpose and Need of the NLX project has been defined to offer passenger rail service between Minneapolis/St. Paul and Duluth/Superior that will:

- Meet Corridor Travel Demand
- Provide a Competitive Travel Alternative vs. Auto Travel
- Be Safe and Reliable
- Provide Travel Amenities that provide Quality and Comfort
- Provide System Continuity

Environmental documentation process tasks also include alternatives analysis of existing or abandoned rail routes between the metropolitan areas and performing conceptual engineering on routes surviving the Level 1 screening.

The purpose of the Alternatives Analysis is to work through a systematic evaluation process that leads to the identification of a preferred alternative(s) that meets the project Purpose and Need. This preferred alternative(s) is then more formally studied in an Environmental Assessment, or an Environmental Impact Statement.

LEVEL 1 SCREENING SUMMARY AND DOCUMENTATION

Level 1 screening is an initial screening of rail alternatives according to criteria defined in Section II of the Federal Railroad Administration's (FRA) Rail Corridor Transportation Plan. The results of the Level 1 screening are a reduced set of viable rail alternatives that are subjected to a more detailed process in Levels 2 and 3.

Level 2 will be undertaken in the event that the Level 1 screening identifies another promising rail alternative(s) in addition to the BNSF route described above. The Level 2 screening is similar to the process used in the "Minneapolis-Duluth/Superior – Restoration of Intercity passenger Rail Service Comprehensive Feasibility Study and Business Plan".

Level 3 screening is a detailed alternative analysis evaluation of the rail alternatives surviving Levels 1 and 2 screening with other transportation modes such as intercity bus and the No Build alternative.

Table 1 lists the screening steps used for Level 1 Screening of the NLX.

Table 1 – Summary of Level 1 Screening Steps

Screening Step	Screening Tasks	Description and Results	Documentation
Step 1	Alternative Routes Identification	Identification of all route alternatives *Result:* Thirteen Potential Route Alternatives Identified	Technical Memorandum 1 October 9, 2009
Step 2	Preliminary Analysis of Rail Routes	Preliminary Analysis of route alternatives *Result*: Five of Thirteen Route Alternatives Survive Screening Step 2	Technical Memorandum 2 November 6, 2009
Step 3	Quantitative Analysis	Analysis of route alternatives surviving Step 2, including speed profiles, travel times, ridership, intermodal stations, and capital costs *Result:* analysis and documentation developed for use in Level 1 Screening Workshop	Technical Memorandum 3 Technical Memorandum 4 Technical Memorandum 5 Technical Memorandum 6 November 6, 2009
Level 1 Screening Workshop	NLX Stakeholder Workshop	Evaluation and scoring of route alternatives by stakeholders *Result:* Quantitative route evaluations	Level 1 Screening Report December 14, 2009
Level 1 Screening Report	Summary of Alternatives Analysis Level 1 Screening	Summary and Results of Screening Process *Result*: recommendation of route alternative for next level of screening	Level 1 Screening Report December 14, 2009

LEVEL 1 SCREENING WORKSHOP

Twenty-five stakeholders participated in a Level 1 Screening workshop on November 23rd, 2009 at the offices of SRF Consulting Group in Plymouth, MN. The purpose of the workshop was to select the one or more alternatives that would be subjected to the next level screening. Prior to the meeting Technical Memoranda 3, 4, 5, and 6, which detail the quantitative analysis performed in Step 3, were distributed to the workshop participants. The agenda for the workshop is attached as Appendix A and the list of the participants is attached as Appendix B to this report.

Introduction

The workshop was facilitated by Charles Quandel of Quandel Consultants, LLC. The workshop began by discussing the reason for the workshop, and the need for the route alternatives analysis. The current draft purpose and need of the NLX project was stated, which is to:

- Meet Corridor Travel Demand
- Provide a Competitive Travel Alternative vs. Auto
- Provide Safe and Reliable Rail Service
- Provide Travel Amenities that provide Quality and Comfort
- Provide System Connectivity

The stakeholders were asked if any of the needs should be modified, or if any additional needs should be added. No changes or additions were suggested.

Step 1 and Step 2 Screening

The group reviewed a map of the thirteen route alternatives that resulted from the Step 1 screening process. In Step 1, thirteen rail route alternatives between Minneapolis/St. Paul and Duluth were identified. Rail route alternatives were comprised of various segments, which included existing tracks currently owned by private freight railroads, and abandoned rail rights-of-way. The entire Step 1 process and its results are described in Technical Memorandum 1.

The Step 2 process was presented and discussed with the participants. The entire Step 2 process and its results are described in Technical Memorandum 2. Step 2 is a preliminary route analysis of the routes identified in Step 1, and screens those routes not suitable for passenger service, thus removing them from the more detailed analysis in Step 3. In Step 2, each of the thirteen route alternatives were screened according to four criteria:

1. *Route distance (and travel time)* – distances were measured using mapping software, and used as a proxy for travel times. Travel times were calculated using the average estimated running speeds of five proposed routes in the Midwest Regional Rail System. The five MWRRS corridors are proposed to run at maximum speeds of 110 mph, as is the NLX.

2. *Population and population centers* – route corridor populations were compiled and used as an estimate of potential ridership. Corridor populations were calculated using GIS software from the year 2000, and included populations within a 20-mile band of each route (10-mile each side), and within a 20-mile radius of each of the terminal stations in Minneapolis and Duluth.
3. *The presence of route defects* – conditions that would make the construction or operation of a passenger rail particularly costly or difficult were identified as route defects. Any defects that would effectively prohibit rail line construction or operation and could not be mitigated were considered 'untenable defects' and eliminated a route from further screening.
4. *Order of magnitude capital costs* –In the early stages of a project, costs to plan, design, and construct rail transportation infrastructure are difficult to estimate, since project features and site conditions are not well understood. In this case, 'Order of Magnitude' capital costs were employed based on costs in previous similar projects or historical unit costs. Order of magnitude capital costs were estimated based on the existing track and freight traffic conditions.

Based on the analysis, each route was assessed as either 'comparable' or 'unfavorable' with respect to each of the criteria. The comparable/unfavorable assessments were tallied for each route, and a recommendation was made that five routes be evaluated further in Level 3 screening. A map of the routes recommended for Level 3 screening is shown in Appendix C.

The workshop participants reviewed a map showing the five remaining routes: Routes 8, 9, 10, 11, and 12. For ease of discussion during the workshop, the routes were given the names shown in Table 2. Though these names correspond with the route's primary right-of-way owner(s), names were used only for reference purposes at the meeting.

Table 2

Route Names Used in Level 1 Screening Workshop

Route	Route Name
8	BNSF/Munger
9	BNSF
10	St. Croix Valley/Munger
11	St. Croix Valley/BNSF
12	Gandy Dancer

Step 3 Analysis

Step 3 analysis provides more detailed route information that is used to evaluate the five remaining route alternatives, and select one or more routes that will advance to the next level of screening in Level 2 or Level 3.

Slides of the Step 3 analysis were presented to the participants. Copies of memorandum detailing the analysis were also distributed and discussed. Step 3 analysis presents information on the following:

- *Speed Profiles and Route Travel Times* - Travel times and speed profiles were developed using a spreadsheet-based train performance calculator. Data input into the TPC includes track curvature, number of tracks, grades, acceleration and deceleration speeds, using information obtained from railroad track charts and typical modern passenger train performance characteristics. Graphs depicting route speed profiles and travel times, freight density, curvature, and the number of tracks on each route are also included as part of this analysis. Speed profile and travel time analysis are presented in Technical Memorandum 3.
- *Intermodal Stations* – the locations of existing and potential intermodal stations along each route. Intermodal stations are discussed in Technical Memorandum 4.
- *Ridership Potential* – route populations were calculated using GIS software from the year 2000, and included populations within a 20-mile band of each route, and within a 20-mile radius of each of the terminal stations in Minneapolis and Duluth. Ridership potential is presented in Technical Memorandum 5.
- *Cost of Improvements* – cost estimates were developed based on unit costs used in the Midwest Regional Rail Initiative. Costs were estimated specifically for each route using existing track conditions, track geometry, and bridge and crossing data. The estimated cost of Improvements is presented in Technical Memorandum 6.

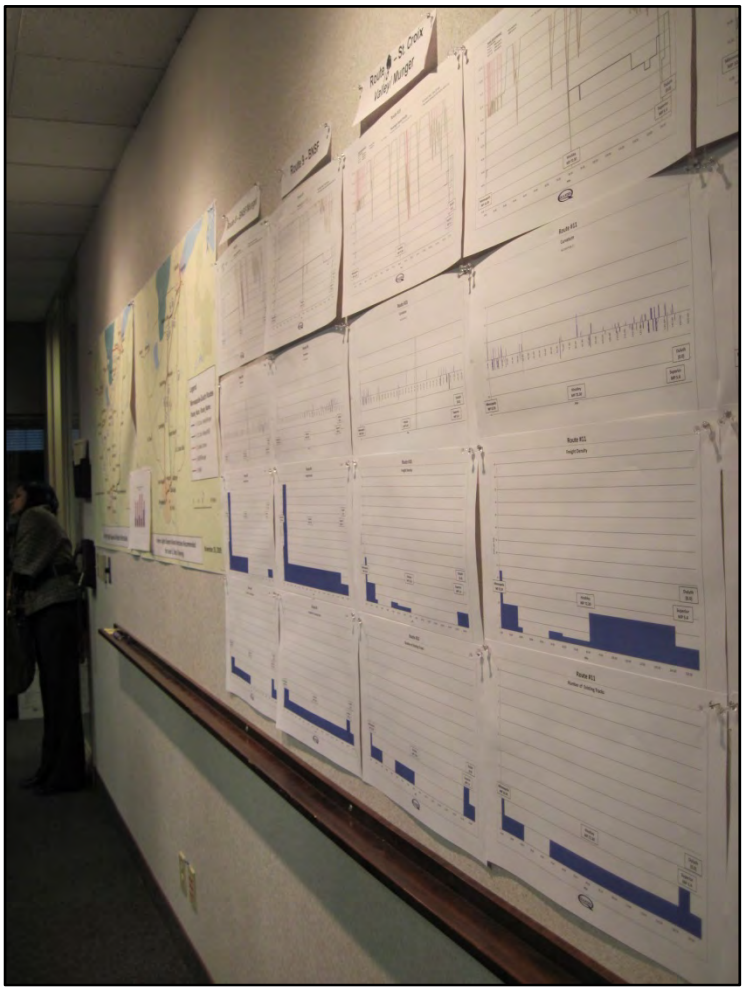
The information presented in Step 3 was used as the basis for developing route evaluation criteria. The participants score the routes with respect to each evaluation criteria, and then scores are totaled to select the best route alternative(s).

The workshop participants discussed and debated which criteria should be used, and ultimately decided on the following criteria for evaluating the five route alternatives:

- *Travel time* – the estimated route travel time between end points, which included time for one intermediate station stop. Travel times and speed profiles were available from the Step 3 analysis presented in Technical Memorandum 3.
- *Proximity to Markets (Ridership)* – maps and tables depicting route population information is presented Technical Memorandum 5.
- *Conflicts with Freight or Future Rail Purposes* – existing freight traffic data is provided Technical Memorandum 3.
- *Conflicts with Existing Ownership* – this is the potential for future conflicts with existing right-of-way owners

- *System Connectivity* – system connectivity refers to intermodal connections such as Amtrak, bus, commuter rail, Light Rail Transit, air, and intra-state connectivity (i.e. connections to Rochester, Eau Claire, Mankato)
- *Capital Costs* – Estimated cost of improvement are provided in Technical Memorandum 6.
- *Political/Public Support* - the perceived level of political/public support, either for or against, that a route has or would have should it be selected.

The photograph below shows one wall of information containing travel times, speed profiles, location of multiple tracks, freight capacity information, and maps that were utilized by the workshop participant in evaluating and scoring the 5 alternative rail routes .



To facilitate route scoring, the twenty-five participants were divided into five teams. Each team developed a weighting factor for each of the seven criteria. The weighting scale ranges from 1 to 10, with higher weighting factors indicating criteria of higher importance. Weighting factors were averaged across all teams, and were entered into a scoring matrix. The scoring matrix showing route criteria and criteria weights is shown in Table 3.

Evaluation Criteria	Criteria Weight	Route 8 BNSF/ Munger		Route 9 BNSF		Route 10 St. Croix Valley Munger		Route 11 St. Croix Valley BNSF		Route 12 Gandy Dancer	
Travel time	9										
Proximity to Markets / Ridership	9										
Conflict w/Freight, Future Rail Use	5.4										
Conflict w/Existing Ownership	7.6										
System Connectivity	6.6										
Capital Cost	8.8										
Political and Public Support	6.4										
Totals											
Weighted Average											

Table 3
Route Alternatives Criteria Weight

Pre-Scoring Discussion

1. State or County Owned Recreational Trails

   The workshop participants discussed whether any routes located on state recreational trails possess legal rights or clauses that make them more or less favorable for passenger rail service. This information helped to score the route criteria *Conflicts with Existing Ownership*. Three route alternatives have route segments located on public recreational trails. Routes 8 and 10 are on a segment of the Willard Munger State Trail in Minnesota; Route 12 is located on the Gandy Dancer Trail in Wisconsin.

WisDOT representatives stated that some segments of Route 13 are publicly held in fee title by the State of Wisconsin with rail banking rights, while other segments on Route 13 are privately held. Some stakeholders suggested that Route 12 may be similarly owned. The group did not have any relevant information regarding the legal status of the state-owned Willard Munger State Trail in Minnesota.

The environmental and legal issues involved with the potential future rail usage on a publicly managed recreational trail can be complex. The federal government and some states, including Minnesota and Wisconsin, have rail banking programs. Rail banking preserves railroad rights-of-way for possible future rail use after a rail line has been deactivated. In the interim, the rights-of-way are often converted to trails for recreational use. Thus there are primarily three types of trail ownership:

1. *Fee title publicly held*
2. *Fee title publicly held, rail banked*
3. *Fee title privately held*

According to information obtained from WisDOT and the WisDOT website, the Gandy Dancer State Trail, which occupies a large segment of Route 12, is publicly held in fee title, and does not belong to a state or federal rail bank program. The Minnesota DOT website also publishes a list of Minnesota state rail banked corridors. Neither the Munger Trail nor the Soo Line Trail state recreational trails, both of which occupy segments of Routes 8 and 10, are listed as state rail banked corridors on the Minnesota DOT website.

Since this information does not favorably support rail service on either Routes 8, 10, or 12, it would not have improved the overall scores had it been known by the participants at the time of the Workshop. As described below, Routes 8, 10, and 12 received the lowest three of the five scores in the evaluation.

Route Scoring and Results

The teams comparatively scored each route on a scale from 1 to 5 against each criterion. Scores were characterized as: 1=very poor, 2=poor, 3=good, 4=very good and 5=excellent. Scores were collected from each team, averaged, and tallied in the scoring matrix.

Total scores were then tallied for each of the five routes. The scoring results are shown in Table 4. Route 9 was the highest scoring route with an average weighted score of 4.15, with Route 11 the second highest with a score of 3.51. Routes 8, 10, and 12 scored significantly lower.

Evaluation Criteria	Criteria Weight	Route 8 BNSF/Munger		Route 9 BNSF		Route 10 St. Croix Valley/Munger		Route 11 St. Croix Valley/BNSF		Route 12 Gandy Dancer	
Travel time	9	3.4	30.6	5	45.0	2.2	19.8	4	36.0	2	18.0
Proximity to Markets / Ridership	9	4	36.0	3.8	34.2	4	36.0	4	36.0	2.4	21.6
Conflict w/Freight, Future Rail Use	5.4	2.8	15.1	2.2	11.9	4.2	22.7	3.2	17.3	4.2	22.7
Conflict w/Existing Ownership	7.6	1.4	10.6	4.2	31.9	1.2	9.1	3.2	24.3	1.4	10.6
System Connectivity	6.6	4	26.4	3.8	25.1	3.2	21.1	3.2	21.1	2	13.2
Capital Cost	8.8	2.4	21.1	5	44.0	1.2	10.6	3	26.4	1.2	10.6
Political and Public Support	6.4	1.8	11.5	4.2	26.9	1.8	11.5	3.8	24.3	1.4	9.0
Total			**151.4**		**219.0**		**130.8**		**185.4**		**105.6**
Weighted Average			***2.87***		***4.15***		***2.48***		***3.51***		***2.00***

Table 4

Final Route Alternatives Scoring Matrix

The participants agreed that Routes 8, 10, and 12 did not score high enough to warrant further consideration. One participant questioned whether either Route 8 or Route 10 would be scored higher if these routes continued along the Munger Trail into Duluth. It was agreed that, although the newly identified route segment would not likely increase the score such that either Routes 8 or 10 were one of the two highest scoring routes, this new segment should be analyzed in order to thoroughly evaluate all alternatives. This analysis is documented in Appendix D.

Since routes 8, 10, and 12 were no longer to be considered, the participants were asked if they were satisfied with the scoring results of routes 9 and 11, and if not satisfied what changes or considerations should be made. The participants discussed issues related to the scoring of routes 9 and 11. Specifically, the participants focused on the scoring for two of the criteria: *System Connectivity* and *Proximity to Markets (Ridership)*. These two criteria were further subjected to a sensitivity analysis.

Sensitivity Analysis

a. Terminal Station Locations and criterion *System Connectivity*

   As discussed in Technical Memoranda 2-6, one assumption used throughout Level 1 screening is that the Minneapolis/St. Paul and Duluth/Superior metro areas are each considered one location that will have one terminal station. These station locations have not yet been determined. However, specific terminal locations were chosen so that analysis could be performed in Steps 2 and 3 of Level 1 Analysis. For example, in order to calculate route distances, an end point must be selected at each end of the corridor. The terminal locations used in the analysis were the Minneapolis Downtown Intermodal Station and the Duluth Union Depot.

   Some workshop participants stated that the scoring process was complicated by the fact that the locations of terminal stations within the Minneapolis/St. Paul and Duluth/Superior regions were not to be considered during route scoring, despite the fact that terminal stations were previously identified for analysis purposes in Step 2 and Step 3 analysis. Some participants also suggested that the location of terminal stations within the metropolitan regions needed to be considered for proper scoring and comparison.

   One argument presented during the workshop discussion was that if specific terminal locations in the Minneapolis/St. Paul region were not to be considered, the scores for *System Connectivity* should be similar for Routes 9 and 11. This is because, as described in Technical Memorandum 3, most of the potential for intermodal system connectivity is within the Minneapolis/St. Paul region.

To allow for possible inconsistencies in scoring, a sensitivity analysis was performed to see what impact the inconsistencies can have. Under each of these scenarios, *System Connectivity* scores are adjusted by doing the following:

1) increase all *System Connectivity* scores up to the highest score received
2) decrease all *System Connectivity* scores down to the lowest score received
3) give a score of 5 to the second-highest scoring route (Route 11)

The results of the sensitivity analysis scoring are shown in Exhibits 1, 2, and 3 in Appendix E. The scores show that, even when allowances are made to account for possible inconsistencies in scoring *System Connectivity*, under each scenario Route 9's total score is higher than Route 11.

b. Proximity to Markets

The participants discussed the effect the issue of 'Terminal Station Locations and criterion *System Connectivity*' (discussed above) has on the scoring of criteria *Proximity to Markets*. Each team was asked to discuss within their team whether considering the location at either the Minneapolis Downtown Intermodal Station or at St Paul Depot would alter their previous scoring of this criterion. Each team stated that they would not alter their original score. As a result, the score for the criteria *Proximity to Markets (Ridership)* was accepted as final.

CONCLUSION AND RECOMMENDATION

The workshop participants scored each of the five routes based on all the route evidence presented in Step 3, and have given Route 9 the highest route score. Route 9's score of 4.15 is considerably higher than the score of the second-highest score of 3.51 received by Route 11. The difference of .64 points on a five-point scale is significant. This difference is not materially impacted by the sensitivity analysis. Therefore Route 9 is recommended for the next step of screening in Level 3 since Level 2 is needed only when more than one alternative route survives Level 1 screening.

Appendix A

Agenda: NLX Alternatives Analysis Level 1 Screening Workshop

November 23, 2009

AGENDA
NLX ALTERNATIVES ANALYSIS LEVEL 1 SCREENING WORKSHOP
NOVEMBER 23, 2009
SRF Consulting Group, Inc.
One Carlson Parkway North, Suite 150
Minneapolis, MN 55447-4443

Purpose of Level 1 Screening Task:

The purpose of this task is to undertake a preliminary analysis of rail routes within the corridor between Minneapolis/St Paul and Duluth/Superior as called for in the FRA Railroad Corridor Transportation Plans (RCTP); A Guidance Manual, Section II.

Purpose of Workshop:

To select one or more routes between the greater metropolitan area of Minneapolis/St Paul and Duluth/Superior on which a high speed passenger rail system will be constructed This workshop will not select the terminal within the Minneapolis/St Paul and Duluth/Superior or the routes within that will be used to serve the terminals.

1. Introduction
2. Description of Workshop Process
3. Project Description
4. Identification of Key Stakeholders
5. Review of Purpose and Needs
6. Speculation of Additional Needs and Desires of Project
7. Presentation of Route Alternatives (Level 1, Step 1 – Tech Memo #1)
8. Presentation of Level 1, Step 2 Analysis Results (Tech Memo #2)
9. Presentation of Step 3 Analysis of Routes Surviving Step 2
    - 9.1 Speed Profiles and Route Travel Times (Tech Memo #3)
    - 9.2 Intermodal Stations (Tech Memo #4)
    - 9.3 Ridership Potential (Tech Memo #5)
    - 9.4 Cost of Improvements (Tech Memo #6)
10. Evaluation Phase
    - 10.1 Establish criteria for evaluation of alternatives
    - 10.2 Weight Criteria
    - 10.3 Evaluate Routes
    - 10.4 Review Evaluation Results
11. Next Steps
    - 11.1 Documentation of Evaluation Process
    - 11.2 Preparation of Summary Alternatives Analysis Report
    - 11.3 Meeting with the Federal Railroad Administration

Appendix B
List of Participants

Northern Lights Express Environmental Assessment: "Down Select" Workshop

10:00 AM– 3:00 PM, Tuesday, November 23, 2009

SRF Consulting Group offices, 1 Carlson Pkwy, Plymouth

Participant Name	Affiliation
Bob Manzoline	NLX Alliance
Jeanne Witzig,	Kimley Horn
Dan Krom	Mn/DOT
Praveena Pidaparthi	Mn/DOT
Dave Christianson	Mn/DOT
Jennie Ross	Mn/DOT
Frank Pafko	Mn/DOT
Tom Beekman	WisDOT
Jeff Abboud	WisDOT
Jon Olson	Anoka County
Kate Garwood	Anoka County
Joe Gladke	Hennepin County
Mike Rogers	Ramsey County
John Onargo	St. Louis County
Ann Pung-Terwedo	Washington County
Ron Chicka	Duluth-Superior MIC
Beth Bartz	SRF
Chuck Gonderinger	SRF
Kelcie Young	SRF
Charlie Quandel	Quandel Consultants
Jim Jennings	Quandel Consultants
Rich Ojard	Krech & Ojard
Dave Moore	Krech & Ojard

Appendix C

Routes Recommended for Level 1 Screening, Step 3

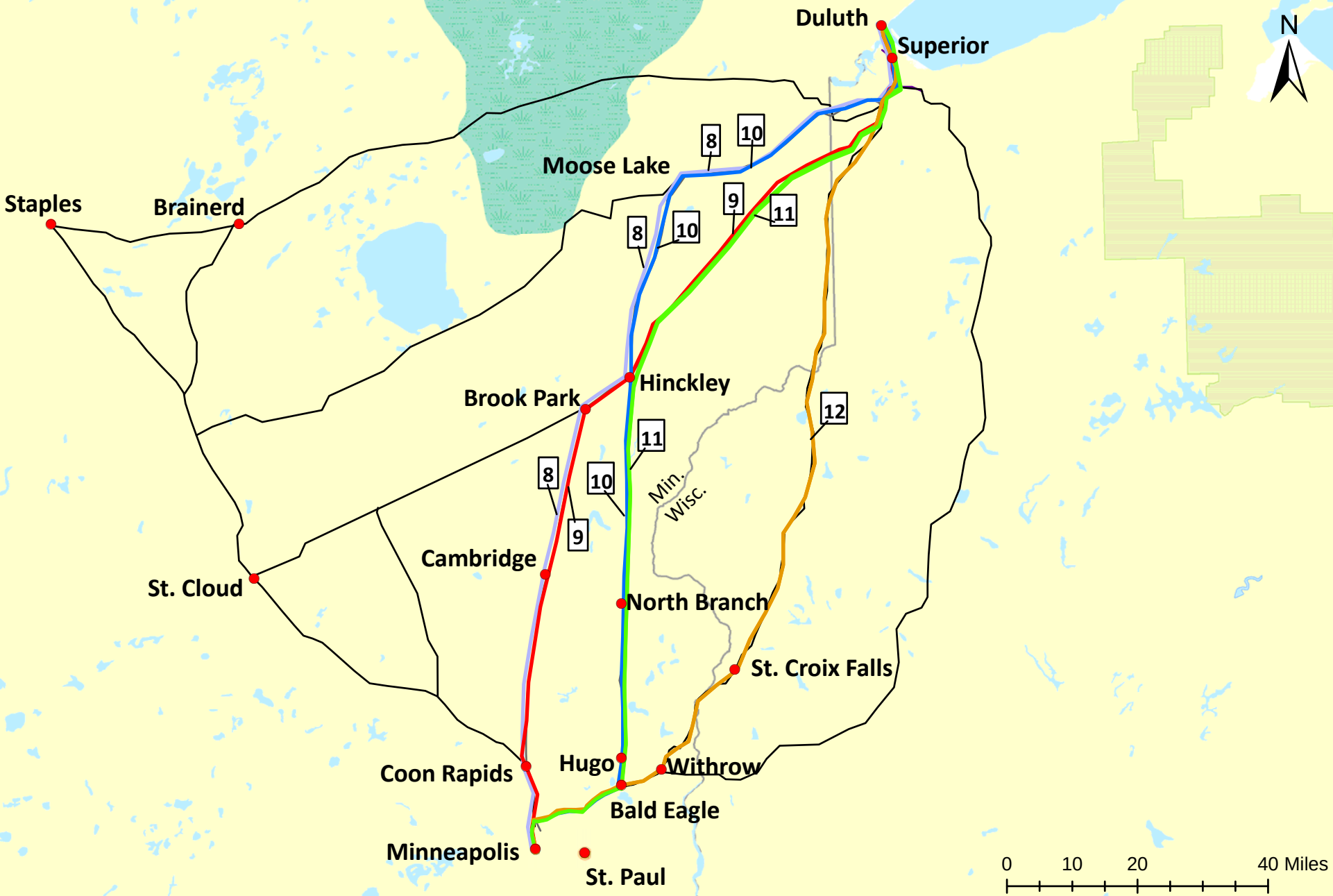


Figure 1
Northern Lights Express Route Alternatives Recommended for Level 1, Step 3 Screening

November 20, 2009

Appendix D

New Route Segment Analysis

Munger Trail

A newly identified route segment is the Munger State Trail between Moose Lake, MN and Duluth, MN. This new route segment creates two new route alternatives, Routes 8A and 10A. As shown in the table below, these new routes share 72% of their total length in common with Routes 8 and 10. North of Moose Lake, MN Routes 8 and 10 continue into Duluth, MN via Superior, WI along the Soo Line Trail.

Comparison of Routes 8 and 10 Including New Munger Trail Segment

Route	***8***	***Route 8A (Route 8 using new Munger Trail segment)***	***10***	***Route 10A (Route 10 using new Munger Trail segment)***
Route Distance (miles)	*161.7*	*152.2*	*162.4*	*152.9*
Common Distance	*109.7*	*109.7*	*110.4*	*110.4*
Common Distance as Percentage of Route Total	*68%*	*72%*	*68%*	*72%*

The segments that distinguish Routes 8 and 10 from Route 8A and 10A are both state-owned recreational trails, with the new Munger Trail segment into Duluth on Routes 8A and 10A being 9.5 miles shorter than the Soo Line Trail into Duluth on Routes 8 and 10.

Since the new Munger Trail segment is shorter than the Soo Line Trail segment, one presumption is that Routes 8A and 10A could have shorter travel times than Routes 8 and 10. Other than route distance, the routes are similar. It is reasonable to expect that scores for Routes 8A and 10A would be similar to the scores for Routes 8 and 10 for all criteria other than travel time.

A hypothetical scoring scenario is created to assess the impacts of the new routes. Using a conservative approach to assess the scoring impact, Routes 8A and 10A are given the highest score of 5 for the criteria Travel Time. As Figure 3 shows, the higher travel time scores do not change the rankings of the route alternatives. Routes 9 and 11 still have the highest scores. The hypothetical scoring is shown in the table below.

New Segment Analysis
Munger Trail from Moose Lake, MN to Duluth, MN

Hypothetical Scoring of Routes 8A and 10A

		Route 8		Route 8A		Route 9		Route 10		Route 10A		Route 11		Route 12	
Criteria	Criteria Weight	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score
Travel Time	9	3.4	30.6	**5**	45	5	45	2.2	19.8	**5**	45	4	36	2	18
Proximity to Markets (Population)	9	4	36	4	36	3.8	34.2	4	36	4	36	4	36	2.4	21.6
Conflicts w future rail purposes	5.4	2.8	15.12	2.8	15.12	2.2	11.88	4.2	22.68	4.2	22.68	3.2	17.28	4.2	22.68
Conflict w Existing Ownership	7.6	1.4	10.64	1.4	10.64	4.2	31.92	1.2	9.12	1.2	9.12	3.2	24.32	1.4	10.64
System Connectivity	6.6	4	26.4	4	26.4	3.8	25.08	3.2	21.12	3.2	21.12	3.2	21.12	2	13.2
Capital Costs	8.8	2.4	21.12	2.4	21.12	5	44	1.2	10.56	1.2	10.56	3	26.4	1.2	10.56
Political/Public Support	6.4	1.8	11.52	1.8	11.52	4.2	26.88	1.8	11.52	1.8	11.52	3.8	24.32	1.4	8.96
Total Score		*151.40*		***165.80***		*218.96*		*130.80*		***156.00***		*185.44*		*105.64*	
Weighted Average Score		***2.87***		***3.14***		***4.15***		***2.48***		***2.95***		***3.51***		***2.00***	

Appendix E
Sensitivity Analysis

		Route 9		Route 11	
Criteria	Criteria Weight	Raw Score	Weighted Score	Raw Score	Weighted Score
Travel Time	9	5	45	4	36
Proximity to Markets (Population)	9	3.8	34.2	4	36
Conflicts w future rail purposes	5.4	2.2	11.88	3.2	17.28
Conflict w Existing Ownership	7.6	4.2	31.92	3.2	24.32
System Connectivity	6.6	**4**	26.4	**4**	26.4
Capital Costs	8.8	5	44	3	26.4
Political/Public Support	6.4	4.2	26.88	3.8	24.32
Total Score		***220.28***		***190.72***	
Weighted Average Score		***4.17***		***3.61***	
Original Difference vs. Highest Score		-		*-0.63*	
New Difference vs. Highest Score		-		***-0.56***	

Exhibit 1

Sensitivity Analysis Scoring of Routes 9 and 11

Increase System Connectivity Score to Highest Score

		Route 9		Route 11	
Criteria	Criteria Weight	Raw Score	Weighted Score	Raw Score	Weighted Score
Travel Time	9	5	45	4	36
Proximity to Markets (Population)	9	3.8	34.2	4	36
Conflicts w future rail purposes	5.4	2.2	11.88	3.2	17.28
Conflict w Existing Ownership	7.6	4.2	31.92	3.2	24.32
System Connectivity	6.6	**2**	13.2	**2**	13.2
Capital Costs	8.8	5	44	3	26.4
Political/Public Support	6.4	4.2	26.88	3.8	24.32
Total Score		*207.08*		*177.52*	
Weighted Average Score		**3.92**		**3.36**	
Original Difference vs. Highest Score		**-**		-0.63	
New Difference vs. Highest Score		**-**		**-0.56**	

Exhibit 2

Sensitivity Analysis Scoring of Routes 9 and 11

Decrease System Connectivity Score to Lowest Score

		Route 9		Route 11	
Criteria	Criteria Weight	Raw Score	Weighted Score	Raw Score	Weighted Score
Travel Time	9	5	45	4	36
Proximity to Markets (Population)	9	3.8	34.2	4	36
Conflicts w future rail purposes	5.4	2.2	11.88	3.2	17.28
Conflict w Existing Ownership	7.6	4.2	31.92	3.2	24.32
System Connectivity	6.6	3.8	25.08	**5**	33
Capital Costs	8.8	5	44	3	26.4
Political/Public Support	6.4	4.2	26.88	3.8	24.32
Total Score		*218.96*		***197.32***	
Weighted Average Score		***4.15***		***3.74***	
Original Difference vs. Highest Score		-		*-0.63*	
New Difference vs. Highest Score		-		***-0.41***	

Exhibit 3

Sensitivity Analysis Scoring of Routes 9 and 11

Give Score of 5 to Second-Highest Scoring Route (Route 11)

Appendix F

Purpose and Need Statement

Purpose and Need Statement

Sept. 25, 2009

1.0 Proposed Action

The Northern Lights Express Passenger Rail Alliance, in cooperation with the Federal Railway Administration (FRA) and the Minnesota Department of Transportation, proposes to construct and operate a high speed passenger rail service between Minneapolis/ St. Paul and Duluth, Minnesota. FRA will serve as the lead federal agency for the project.

The existing transportation system in this corridor include highway (auto and bus) and air modes. Limited passenger rail service had previous served this corridor, but was discontinued in 1985.

2.0 Project Purpose

The purpose of the Northern Lights Express project and the proposed action is provide a means to meet future transportation needs through the creation of a passenger rail service between Minneapolis/St. Paul and Duluth. The proposed action offers an opportunity to provide reliable and competitive passenger rail service as a viable alternative to vehicular travel by:

- Decreasing travel times;
- Providing safe and reliable transit service; and
- Providing amenities to improve passenger travel quality and comfort.

In addition, the project can provide:

- An alternative to vehicular travel
- Improved overall system continuity in the regional transportation network (wording from statewide transportation plan)
- Opportunities for Transit Oriented Development – land use patterns that encourage more efficient development of land in combination with more efficient use of transportation facilities; while
- Provide an impetus for station-area joint development, downtown redevelopment and conomic development for growth in travel and tourism in all the communities along the reroute, contributing to the viability and vitality of the region.

ALTERNATIVES ANALYSIS LEVEL 1 SCREENING

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Technical Memorandum

Subject:	**Minnesota Northern Lights Express (NLX) Project** **Technical Memorandum 1 – Alternative Routes Depiction**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**October 9, 2009**

Summary

This technical memorandum summarizes the findings from the development of the rail route alternatives that could potentially serve the Minneapolis-Duluth/Superior NLX corridor. The development of these route alternatives is Step 1 of the Level 1 screening of the project Alternatives Analysis, and is consistent with the guidelines for implementing high-speed intercity rail service set forth in Section II of the Federal Railroad Administration's (FRA) Rail Corridor Transportation Plan.

As shown in Figure 2 and Table 2, thirteen different route alternatives have been identified. These routes will next undergo a preliminary analysis in Step 2 of Level 1 screening. Step 2 will screen each route on the basis of its population centers served, route distance, estimated travel time, order of magnitude capital cost, and the presence of untenable defects. Based on the results of Step 2, routes that are not suitable for passenger rail service, and are not consistent with the defined purpose and need of the NLX Corridor project, will not be considered for further study.

Background

In 2007, members of several regional rail authorities and local, county, and state government officials from the states of Minnesota and Wisconsin, joined together to form the NLX Alliance. The Alliance was formed to explore options for restoring high-speed intercity rail service between Minneapolis, MN and Duluth, MN/Superior, WI. That same year the Alliance hired Transportation Economics & Management Systems, Inc. (TEMS) to perform a feasibility study for implementing this service.

The TEMS Feasibility Study, officially titled the 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan', investigated the implementation of service along the 155-mile Burlington Northern Santa Fe owned single track corridor between downtown Minneapolis and downtown Duluth, also known as the BNSF Hinckley subdivision. The Hinckley subdivision route has many practical advantages, including a direct route between the cities and well-maintained track, and thus was a logical choice for consideration in the study. The study concluded that a passenger rail system would enhance mobility in the region, reduce auto congestion and emissions, and stimulate economic growth in towns along the corridor. It also concluded that intercity rail service would meet the need for a competitive alternative to automotive travel with respect to travel time, pricing, and travel experience.

Environmental Review and Alternatives Analysis

In 2009, the NLX Alliance retained SRF Consulting Group, Inc. to provide complete environmental review and documentation for NLX service implementation. The environmental documentation process will ensure compliance with the National Environmental Protection Act, National Historic Preservation Act, and several others needed to meet FRA requirements for the startup of passenger rail service. This environmental documentation process also includes tasks such as defining the project purpose and need, considering alternatives routes, and performing conceptual engineering. The draft Purpose and Need of the NLX project is to offer a viable alternative to vehicular travel by providing reliable and competitive passenger rail service between Minneapolis/St. Paul and Duluth that offers:

- Corridor travel times competitive with automobile travel
- Safe and reliable rail service
- Amenities that improve passenger travel quality and comfort

The purpose of the Alternatives Analysis is to work through a systematic evaluation process that leads to the identification of a preferred alternative that meets the project Purpose and Need. This preferred alternative is then more formally studied in an Environmental Assessment, or an Environmental Impact Statement. The Alternative Analysis first identifies alternative rail routes that could serve the NLX corridor, and then evaluates these routes for their ability to support the purpose and need of the NLX project. The complete set of alternatives includes the new routes indentified in this memorandum, the BNSF Hinckley Subdivision route, and the no-action/no build alternative.

Development of Route Alternatives

The route alternatives were developed by first identifying track 'segments'. For the purpose of this memorandum, a segment is a track defined by logical end points, junctions, or population centers. The track segments include existing tracks currently owned by private freight railroads, or abandoned rail rights-of-way with or without existing track.

Information was gathered using Railway Station Productions 'North American Railroad Map' software, which provides current and historic railroad and rail map information compiled from the Bureau of Transportation Statistics National Rail Network, the Federal Railroad Administration, the US Geological Survey, and the North American Transportation Atlas. The TEMS Feasibility Study was also used as a reference. Information was then verified using internet searches. These project segments are shown and described in Figure 1 and Table 1, respectively. These segments were then analyzed to develop all possible route alternatives for the project. These route alternatives are described in Table 2 and shown in Figure 2. All routes previously identified for inclusion in this study, including the St. Croix Valley, Canadian Pacific (Soo Line), Canadian National (WC), and the BNSF Hinckley Subdivision, are included in Table 2.

TABLE 1

Northern Lights Express - Track Segment Descriptions

Track Segment	Approximate Limits	Owner(s)	No. of Existing Track(s)	Note
A	Bald Eagle, MN to Ambridge, WI	Canadian National; Canadian Pacific; Abandoned	1/None	Canadian Pacific owned (1 existing track) from Bald Eagle to Withrow; Canadian National owned (1 existing track) from Withrow, MN to New Richmond, WI. Abandoned C&NW line north of New Richmond, WI. Approximately 6 of the 130+ miles on the abandoned segment owned by the Wisconsin Great Northern RR
B	Bald Eagle, MN to Boylston, WI	Canadian National; Canadian Pacific; Abandoned	1/None	Canadian Pacific owned (1 existing track) from Bald Eagle to Withrow, WI. Canadian National owned (1 existing track) from Withrow, MN to Dresser, WI. Abandoned north of Dresser.
C	Bald Eagle, MN to Hinckley, MN	Minnesota Commercial; St. Croix Valley; Abandoned	1/None	Existing 'Rush Line' corridor. 1 existing track owned by Minnesota Commercial between Bald Eagle and Hugo; no existing track between Hugo and North Branch, MN; 1 existing track owned by St. Croix Valley north of North Branch, MN
D	Hinckley, MN to Boylston, WI	BNSF	1	Segment was studied in the 2007 report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan' by TEMS Inc.
E	Coon Creek, MN to Brook Park, MN	BNSF	1	Segment was studied in the 2007 report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan' by TEMS Inc.
F	Brook Park, MN to Hinckley, MN	BNSF	1	Segment was studied in the 2007 report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan' by TEMS Inc.
G	Hinckley, MN to Moose Lake, MN	Abandoned	None	Formerly owned by Northern Pacific Railroad; now the Willard Munger Trail
H	Minneapolis, MN to St. Cloud, MN	BNSF	2	Minneapolis-Coon Creek subsegment was studied in the 2007 report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service Comprehensive Feasibility Study and Business Plan' by TEMS Inc.
I	Elk River, MN to Milaca, MN	Abandoned	None	Formerly owned by Great Northern Railroad

Track Segment	Approximate Limits	Owner(s)	No. of Existing Track(s)	Note
J	St. Cloud, MN to Milaca, MN	Abandoned	None	Formerly owned by Soo Line
K	Royalton, MN - Moose Lake, MN	Abandoned	None	Formerly owned by Soo Line
L	Little Falls, MN to Brainerd, MN	BNSF/Abandoned	1/None	1 existing track owned by BNSF between Little Falls and Camp Ripley; no existing track between Camp Ripley, MN and Brainerd, MN
M	Brainerd, MN to Boylston, WI	BNSF	1	
N	Moose Lake, MN to Boylston, WI	Abandoned	None	Formerly owned by Soo Line
O	Little Falls, MN to Staples, MN	BNSF	2	
P	Staples, MN to Brainerd, MN	BNSF	1	
Q	Milaca, MN to Brook Park, MN	St. Croix Valley/ Abandoned	1/None	1 existing track owned by St. Croix Valley between Mora, MN and Brook Park, MN; no existing track between Milaca, MN and Mora, MN
R	St. Cloud, MN to Royalton, MN	BNSF	2	
S	Royalton, MN to Little Falls, MN	BNSF	2	

TABLE 2

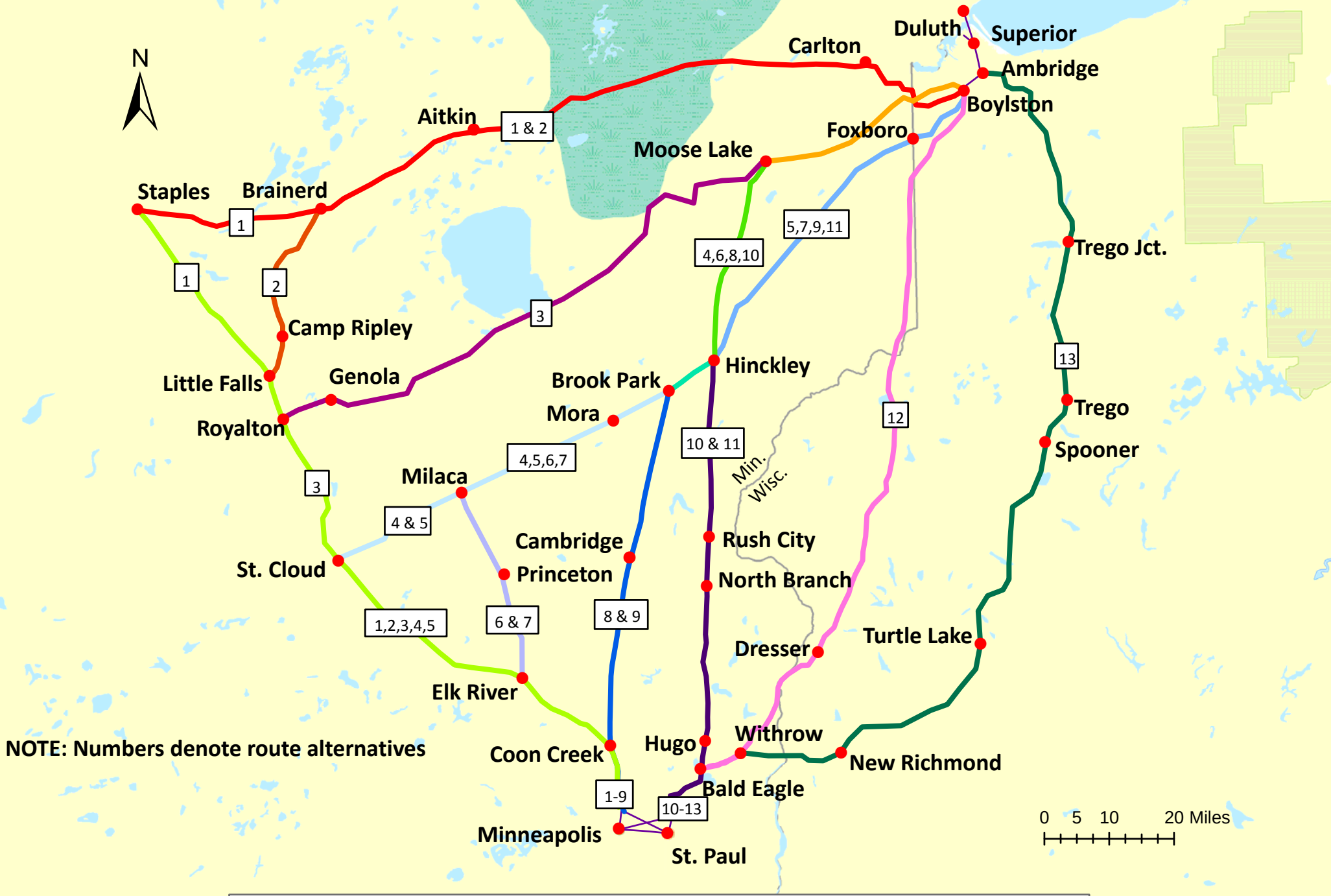
Northern Lights Express Route Alternatives

Route No.	Track Segments	Cities Served	Track Owner(s)
1	H-R-S-O-P-M	Minneapolis/St. Paul, MN St. Cloud, MN Little Falls, MN Staples, MN Brainerd, MN Aitkin, MN Superior, WI Duluth,MN	BNSF
2	H-R-S-L-M	Minneapolis/St. Paul, MN St. Cloud, MN Little Falls, MN Brainerd, MN Aitkin, MN Superior, WI Duluth, MN	BNSF; Abandoned
3	H-R-K-N	Minneapolis/St. Paul, MN St. Cloud, MN Genola, MN Moose Lake, MN Superior, WI Duluth, MN	BNSF; Abandoned
4	H-J-Q-F-G-N	Minneapolis/St. Paul, MN St. Cloud, MN Hinckley, MN Moose Lake, MN Superior, WI Duluth, MN	BNSF; St. Croix Valley; Abandoned
5	H-J-Q-F-D	Minneapolis/St. Paul, MN St. Cloud, MN Hinckley, MN Superior, WI Duluth, MN	BNSF; St. Croix Valley; Abandoned
6	H-I-Q-F-G-N	Minneapolis/St. Paul, MN Elk River, MN Milaca, MN Hinckley, MN Moose Lake, MN Superior, WI Duluth, MN	BNSF; St. Croix Valley; Abandoned
7	H-I-Q-F-D	Minneapolis/St. Paul, MN Elk River, MN Milaca, MN Hinckley, MN Superior, WI Duluth, MN	BNSF; St. Croix Valley; Abandoned

Route No.	Track Segments	Cities Served	Track Owner(s)
8	E-F-G-N	Minneapolis/St. Paul, MN Cambridge, MN Hinckley, MN Moose Lake, MN Superior, WI Duluth, MN	BNSF; Abandoned
9	E-F-D	Minneapolis/St. Paul, MN Cambridge, MN Hinckley, MN Superior, WI Duluth, MN	BNSF
10	C-G-N	Minneapolis/St. Paul, MN Rush City, MN Hinckley, MN Moose Lake, MN Superior, WI Duluth, MN	Minnesota Commercial; St. Croix Valley; Abandoned
11	C-D	Minneapolis/St. Paul, MN Rush City, MN Hinckley, MN Superior, WI Duluth, MN	Minnesota Commercial; St. Croix Valley; BNSF; Abandoned
12	B	Minneapolis/St. Paul, MN Dresser, WI Superior, WI Duluth, MN	Canadian National; Canadian Pacific; Abandoned
13	A	Minneapolis/St. Paul, MN New Richmond, MN Turtle Lake, WI Spooner, WI Superior, WI Duluth, MN	Canadian Pacific; Canadian National; Wisconsin Great – Northern; Abandoned

Figure 1
Northern Lights Express Track Segments

October 9, 2009



NOTE: Numbers denote route alternatives

Figure 2
Northern Lights Express Route Alternatives

October 9, 2009

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Technical Memorandum

Subject:	**Minnesota Northern Lights Express Project** **Technical Memorandum 2 - Preliminary Analysis**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**November 20, 2009**

Purpose of Technical Memorandum

This technical memorandum summarizes the findings from Step 2 of the Level 1 screening of the route alternatives that have been identified for the Minneapolis-Duluth/Superior Northern Lights Express (NLX) corridor. These route alternatives were screened for basic suitability for high-speed passenger rail service and for the ability of each route to meet the purpose and need of the NLX project.

Background and Assumptions

The draft Purpose and Need of the NLX project is to provide passenger rail service between Minneapolis/St. Paul and Duluth that offers:

- Corridor travel times competitive with automobile travel
- Safe and reliable rail service
- Amenities that improve passenger travel quality and comfort
- System continuity with the existing and planned transportation network

Step 2 uses several assumptions as the basis for route screening. These assumptions are taken from the 2007 TEMS Inc. report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service' (the 'TEMS Feasibility Study'), and include:

- Maximum operating speeds of 110 mph
- 8 round-trips per day
- A southern terminal station at the Minneapolis downtown Intermodal Station
- A northern terminal station at the Duluth Union Depot

The TEMS Feasibility Study also describes terminal stations and feasible routes within the Minneapolis/St. Paul and Duluth/Superior regions. The terminals described in the Feasibility Study are used in this report for the preliminary analysis. In Minneapolis/St. Paul, the Minneapolis downtown Intermodal Station near Target Field is the southern terminus. All routes initially proceed northeast out of the Intermodal Station to Minneapolis Junction, and then proceed north on the BNSF Midway Subdivision. North of University Avenue, the routes begin to diverge, with Routes 1-9 proceeding north on the BNSF Hinckley subdivision, and Routes 10-13 proceeding north on the Canadian Pacific Withrow Subdivision. In the Duluth area, all routes use 'Alternate 1' as described in the Feasibility Study, entering Duluth via Superior, WI, and terminating at the Duluth Union Depot. A graphical depiction of the routes in the corridor is shown in Figure 1.

The route studied in the TEMS Feasibility Study is along the entire length of the BNSF Hinckley Subdivision, and is the same route as Route 9 in this report. Because Route 9 is the shortest and most direct route, and because it was cited in the Feasibility Study, Route 9 is used as a baseline for comparison and evaluation of the routes within the corridor.

Step 2 Process

The screening process of identifying the preferred alternative for the Northern Lights Express project builds upon the Technical Memorandum 1 'Alternative Routes Depiction', dated October 9, 2009. In Technical Memorandum 1, Step 1 of the screening process identifies all the rail route alternatives that could potentially serve the NLX passenger rail corridor. Step 2 is a preliminary analysis of the route alternatives that screens routes not suitable for passenger service, thus removing them from the more detailed step 3 analysis.

Both Step 1 and Step 2 are parts of the Alternatives Analysis, a systematic evaluation process that leads to the identification of a preferred alternative that meets the Purpose and Need of the NLX Project. This process of identifying the preferred alternative follows the guidelines for implementing high-speed intercity passenger rail service set forth in Section II of the FRA's July 8, 2005 publication, "Rail Corridor Transportation Plans: A Guidance Manual".

In Step 2, each of the route alternatives from Step 1 is assessed according to four simple criteria:

1. route distance (and travel time)
2. population and population centers
3. the presence of route defects
4. order of magnitude capital costs

Each proposed route is analyzed based on these criteria and compared to a pre-selected baseline route. The route is then assessed as 'comparable' to other routes, or 'unfavorable' in comparison to other routes. The route criteria screenings are then summarized in Table 5. This comparison and evaluation of the routes enables the screening of the weakest alternatives in a systematic and well documented, but cost effective manner.

Screening Criteria 1: Route Distance (and Travel Time)

As the travel time between any two points is directly proportional to the distance between the points, the route distances can be used to develop estimates of travel times for comparative purposes. In order for a route to serve the purpose and need of the project, an NLX route must be able to offer travel times competitive with automobile travel between the Minneapolis/St. Paul and Duluth, estimated at two hours and 27 minutes by auto on I-35 via direct route from downtown Minneapolis to downtown Duluth using an average speed of 64 mph over the 156 mile trip distance.

Rail route distances were calculated from the Minneapolis downtown Intermodal Station to Duluth Union Depot using "North American Railroad Map" software, published by Railway Station Productions, LLC. The travel time for each rail alternative route is calculated by dividing the route distance by 74 mph, which is the average passenger speed of five 110 MPH corridors in the Midwest Regional Rail System. The average speed is defined as the total trip time, including station stops, divided by the total trip distance.

Table 1 summarizes the distances and travel times for each of the route alternatives and compares the route distance and travel time against the baseline. The shortest routes 9, 11, and 12 are the most direct routes from Minneapolis to Duluth, with distances just over 150 miles. Route Nos. 1, 2, 3, 4, 5, 6, and 13 each has a route distance greater than 180 miles long, which results in travel times greater than both automobile travel and Baseline Route 9. In addition to having greater travel times, longer distance routes will also have greater operating and maintenance costs than the more direct route alternatives.

Table 1 – Route Distances and Travel Times

Route	Route Distance (Miles)	Increase/ (Decrease) vs. Auto (Miles)	Increase/ (Decrease) vs. Baseline (Miles)	Travel Time	Increase/ (Decrease) vs. Auto	Increase/ (Decrease) vs. Baseline	*Assessment -- Comparable or Unfavorable*
Auto	*156.0*	-	-	*2 hrs 27 min*	-	-	-
Baseline (Route 9)	*151.2*	-	-	*2 hrs 2 min*	-	-	-
1	283.0	127.0	131.8	3 hrs 48 min	1 hr 21 min	1 hr 46 min	**Unfavorable**
2	249.5	93.5	98.3	3 hrs 21 min	54 min	1 hr 19 min	**Unfavorable**
3	224.0	68.0	72.8	3 hrs 0 min	33 min	58 min	**Unfavorable**
4	217.2	61.2	66.0	2 hrs 55 min	28 min	53 min	**Unfavorable**
5	206.7	50.7	55.5	2 hrs 46 min	19 min	44 min	**Unfavorable**
6	186.5	30.5	35.3	2 hrs 30 min	3 min	28 min	**Unfavorable**
7	176.0	20.0	24.8	2 hrs 22 min	(5 min)	20 min	**Unfavorable**
8	161.7	5.7	10.5	2 hrs 10 min	(17 min)	8 min	Comparable
9	151.2	(4.8)	-	2 hrs 2 min	(25 min)	-	-
10	162.4	6.4	11.2	2 hrs 11 min	(16 min)	9 min	Comparable
11	151.9	(4.1)	0.7	2 hrs 2 min	(25 min)	0 min	Comparable
12	151.2	(4.8)	0.0	2 hrs 2 min	(25 min)	0 min	Comparable
13	185.7	29.7	34.5	2 hrs 30 min	3 min	28 min	**Unfavorable**

Screening Criteria 1 Conclusion: As shown in Table 1 above, Routes 1, 2, 3, 4, 5, 6, and 13 each have a travel time that is longer than both the travel time for auto travel and the Baseline Route 9 travel time. These routes would not offer competitive travel times between Minneapolis and Duluth due to longer route distances, and are assessed as 'unfavorable' with respect to route distance and travel time.

Route 7 is approximately 25 miles longer than the baseline. The estimated travel time for Route 7 is only 5 minutes shorter than estimated travel time for auto traffic, and is 20 minutes longer than the baseline. Because of this significant difference with the baseline, Route 7 is characterized as 'unfavorable' with respect to route distance.

Screening Criteria 2: Population and Population Centers

A reasonable assumption for estimating ridership is that potential ridership in a passenger rail corridor is directly related to the population within the service area. Based on this assumption, route populations were calculated for each route alternative using GIS software and US census data from the year 2000. The route populations for each route include cities and towns within a 20-mile band of each route, and within a 20 mile radius of each of the terminal stations in Minneapolis and Duluth. Maps depicting these population bands for each of these route alternatives are shown in Appendix A.

As noted in the background section of this technical memorandum, the terminals identified in the TEMS Feasibility Report are used in this preliminary analysis. Therefore, each of the route alternatives serves both the Minneapolis/St. Paul and the Duluth/Superior regions. Each of the routes can access either Minneapolis or St. Paul directly or indirectly via the BNSF St Paul subdivision that runs between the two cities. In addition, the 20-mile radius area surrounding the Minneapolis downtown Intermodal includes the entire city limits of St. Paul. For these reasons it is assumed that Minneapolis/St. Paul is one population center served by one terminal. The Superior/Duluth region is similar, where each of the routes is able to serve both the adjacent cities of Superior, WI, and Duluth, MN. This type of preliminary analysis does not allow selection of a terminal or end point within the termini locations.

Table 2 shows a summary of the population screening results. Route 1 serves roughly 2.86 million people, and is the most populous route due mainly to the inclusion of the populations along the I-94 corridor toward St. Cloud, and in the greater Brainerd area. The least populous route, Route No. 12 serves only approximately 2.64 million people. However, with a combined population of 2.53 million people, the greater Minneapolis/St. Paul and Duluth regions contribute the majority of each route's total population, ranging from 88% of the total population of Route 1, up to almost 96% of the population of Route 12.

Table 2 – Route Populations

Route	Population	Increase/(Decrease) vs. Baseline	*Assessment – Comparable or Unfavorable*
Baseline (Route 9)	*2,642,111*	-	-
1	2,860,394	218,283	Comparable
2	2,848,001	205,890	Comparable
3	2,810,262	168,151	Comparable
4	2,817,626	175,515	Comparable
5	2,812,083	169,972	Comparable
6	2,694,543	52,432	Comparable
7	2,686,167	44,056	Comparable
8	2,647,166	5,055	Comparable
9	2,642,111	-	-
10	2,653,959	11,848	Comparable
11	2,646,352	4,241	Comparable
12	2,641,686	(425)	Comparable
13	2,662,720	20,609	Comparable

Screening Criteria 2 Conclusion: Each of the route alternatives serves the greater Minneapolis/St. Paul and Duluth/Superior regions, which have the highest populations of any of the towns or regions in the corridor, and make up between 88% and 96% of the total population of each route. Since the Purpose and Need does not identify any other cities or towns as required stops in the Minneapolis-Duluth corridor, no routes can be eliminated from further consideration in Step 3, and no routes can be assessed as 'unfavorable' based on the estimated populations served.

Screening Criteria 3: Route Defects

Site conditions that make the construction and operation of a passenger rail line particularly costly or difficult may be considered route defects. When these conditions effectively prohibit rail line construction or operation and cannot be mitigated, these defects are considered 'untenable defects', and would eliminate the route from further screening.

The defects that were found among the 13 identified routes are shown in Table 3. On several routes, private dwellings and/or commercial property would need to be purchased in order to implement rail service where existing buildings are now present on abandoned track rights-of-way. These are considered route defects because of the additional purchasing costs, and the potential disruption to the existing environment. However, at this screening stage these defects are not considered untenable, and do not preclude the routes from further analysis.

Table 3 –Route Defects

Route No.	Defects	*Assessment – Comparable or Unfavorable*
1	None Identified	Comparable
2	None Identified	Comparable
3	Abandoned Track right-of-way has been sold or is under long-term lease in the town of Onamia, MN south of Main St. between Elm and Rte 169; and in the town of Isle, MN, south of Isle St. between 3rd Ave. and 5th Ave. Residential and/or commercial properties are located in the abandoned track right-of-way at these locations.	**Unfavorable**
4	Abandoned track right-of-way has been sold or is under long-term lease in the town of Foley, MN. Dozens of residential dwellings and commercial properties are located in the abandoned track right-of-way along Grand and Main Streets, between Norman Ave. and Holdridge St.	**Unfavorable**
5	Abandoned track right-of-way has been sold or is under long-term lease in the town of Foley, MN. Dozens of residential dwellings and commercial properties are located in the abandoned track right-of-way along Grand and Main Streets, between Norman Ave. and Holdridge St.	**Unfavorable**
6	Abandoned track right-of-way has been sold or is under long-term lease in the town of Princeton, MN. Dozens of residential dwellings are located in the abandoned track right-of-way west of 10th Avenue between 3rd St. and Branch St.	**Unfavorable**
7	Abandoned track right-of-way has been sold or is under long-term lease in the town of Princeton, MN. Dozens of residential dwellings are located in the abandoned track right-of-way west of 10th Avenue between 3rd St. and Branch St.	**Unfavorable**
8	None Identified	Comparable
9	None Identified	-
10	None Identified	Comparable
11	None Identified	Comparable
12	None Identified	Comparable
13	In several locations along this route, the abandoned track right-of-way has been sold or is under long-term lease. Several residential dwellings and businesses are now located in the track right-of-way in the Wisconsin towns of Clear Lake (between Deposition Dr. and 5th St), Turtle Lake (South of Martin Ave between Elm St, and Willow St.), and Cumberland (west of 1st Ave between 4th Ave and Marshall St.)	**Unfavorable**

Screening Criteria 3 Conclusion: None of the thirteen routes has an untenable defect that would eliminate it from further screening. Routes 3, 4, 5, 6, 7 and 13 each have unfavorable route defects in the form of private property located on the track right-of-way.

Screening Criteria 4: Order of Magnitude Capital Costs

Costs to plan, design and construct rail transportation infrastructure and rolling stock are considered capital costs. Such costs are estimated by engineers throughout the development of a project. During the early stages, when the project features are not well defined and site conditions are not well understood, it is difficult to estimate the capital cost accurately. However, engineers may employ "order of magnitude" capital costs which are based on previous costs in similar projects, or historical unit costs, rates and quantities for common construction elements that can be assembled to meet the requirements of the project.

Order of magnitude capital costs are estimated based on the existing track and freight traffic conditions along each of the thirteen identified routes, and the upgrades needed to provide 110mph and 8 round-trips per day as described in the TEMS Feasibility Study. The order of magnitude capital cost range is estimated at between $5 million and $10 million per mile to construct a new track within an existing railroad right of way to support high speed passenger service. Thus each of the routes shown in Table 4 below has a low-end and high-end estimate. These costs do not reflect the cost of stations, maintenance and layover facilities, property procurement, and rolling stock. Routes 9 and 12, with the shortest route distances, are shown to have the lowest estimated costs.

Screening Criteria 4 Conclusion: Routes 1, 2, 3, 4, 5, 6, 7, and 13 are considered 'unfavorable' with respect to order of magnitude capital cost. These routes are estimated to be 16% greater or more than the baseline estimate, which translates to an increase in capital costs of between $125 and $250 million more than the baseline estimate. Routes 8, 9, 10, 11, and 12 have costs that are considered 'comparable', and are all within 7% of the baseline estimate.

Table 4 – Order of Magnitude Capital Costs

Route	Order of Magnitude Capital Cost Range (millions)		Difference Vs. Baseline Cost (millions)		Increase Over Baseline	*Assessment – Comparable or Unfavorable*
	Low Estimate	High Estimate	Increase/ (Decrease) vs. Baseline	Increase/ (Decrease) vs. Baseline		
Baseline (Route 9)	*756*	*1,512*	-	-	-	-
1	1,415	2,830	659	1,318	87%	**Unfavorable**
2	1,248	2,495	492	983	65%	**Unfavorable**
3	1,120	2,240	364	728	48%	**Unfavorable**
4	1,086	2,172	330	660	44%	**Unfavorable**
5	1,034	2,067	278	555	37%	**Unfavorable**
6	933	1,865	177	353	23%	**Unfavorable**
7	880	1,760	124	248	16%	**Unfavorable**
8	809	1,617	53	105	7%	Comparable
9	756	1,512	-	-	-	-
10	812	1,624	56	112	7%	Comparable
11	760	1,519	3	7	0%	Comparable
12	756	1,512	0	0	0%	Comparable
13	929	1,857	173	345	23%	**Unfavorable**

Summary of Findings

The summary of results from the four screening criteria is shown below in Table 5. The key finding of this preliminary analysis is that five of the thirteen identified routes – Route Nos. 8, 9, 10, 11, and 12 – are recommended for further analysis in Step 3 of Level 1 screening. These routes are shown in Figure 2.

Table 5 – Summary of Route Alternative Screening, Step 2

	Screening Criteria				
Route	**Distance and Travel Time**	**Route Population**	**Route Defects**	**Order of Magnitude Capital Costs**	**Recommendation**
1	**Unfavorable**	Comparable	Comparable	**Unfavorable**	**Eliminate**
2	**Unfavorable**	Comparable	Comparable	**Unfavorable**	**Eliminate**
3	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**
4	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**
5	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**
6	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**
7	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**
8	Comparable	Comparable	Comparable	Comparable	Level 3 Screening
9	-	-	-	-	Level 3 Screening
10	Comparable	Comparable	Comparable	Comparable	Level 3 Screening
11	Comparable	Comparable	Comparable	Comparable	Level 3 Screening
12	Comparable	Comparable	Comparable	Comparable	Level 3 Screening
13	**Unfavorable**	Comparable	**Unfavorable**	**Unfavorable**	**Eliminate**

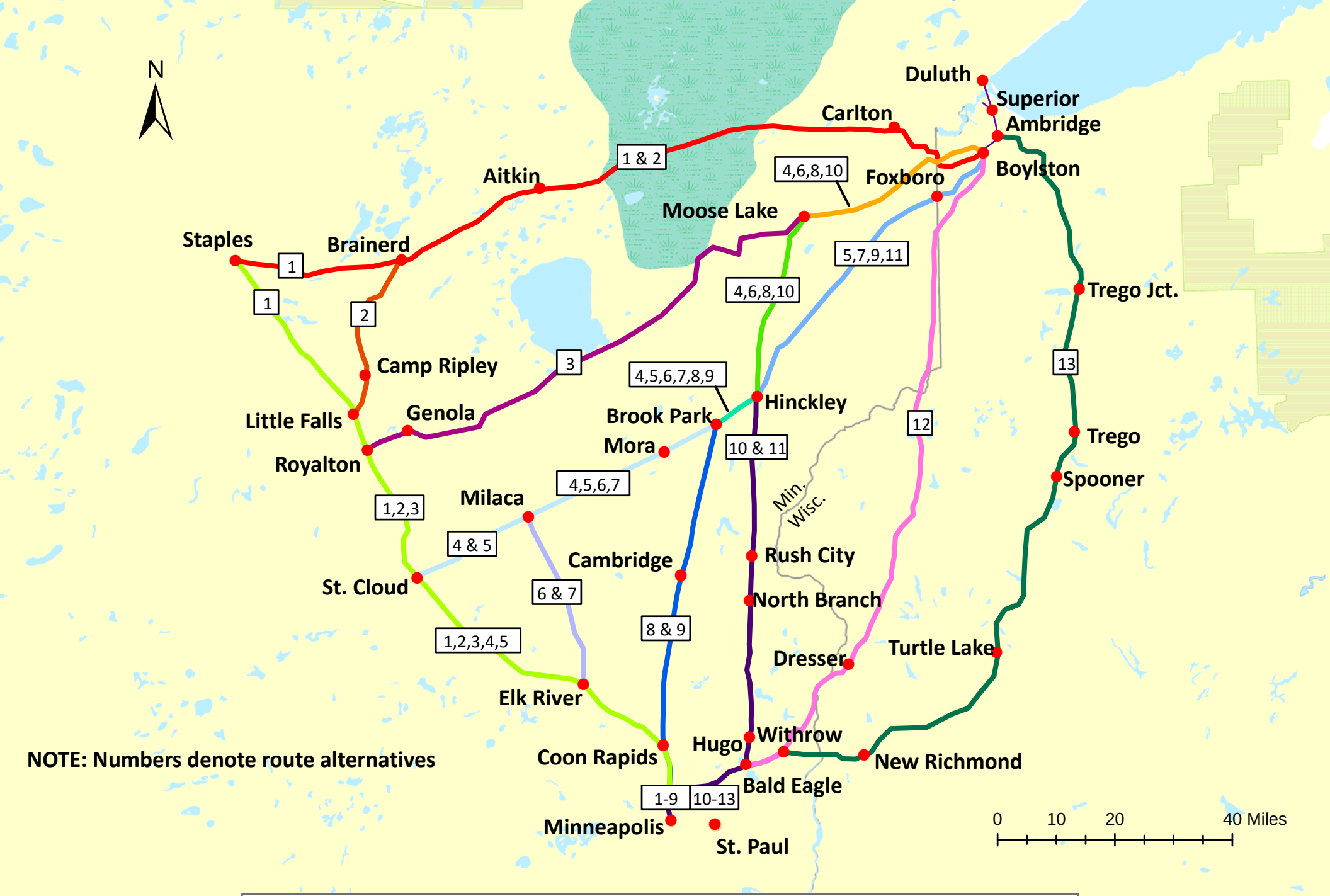


Figure 1
Northern Lights Express Route Alternatives

November 20, 2009

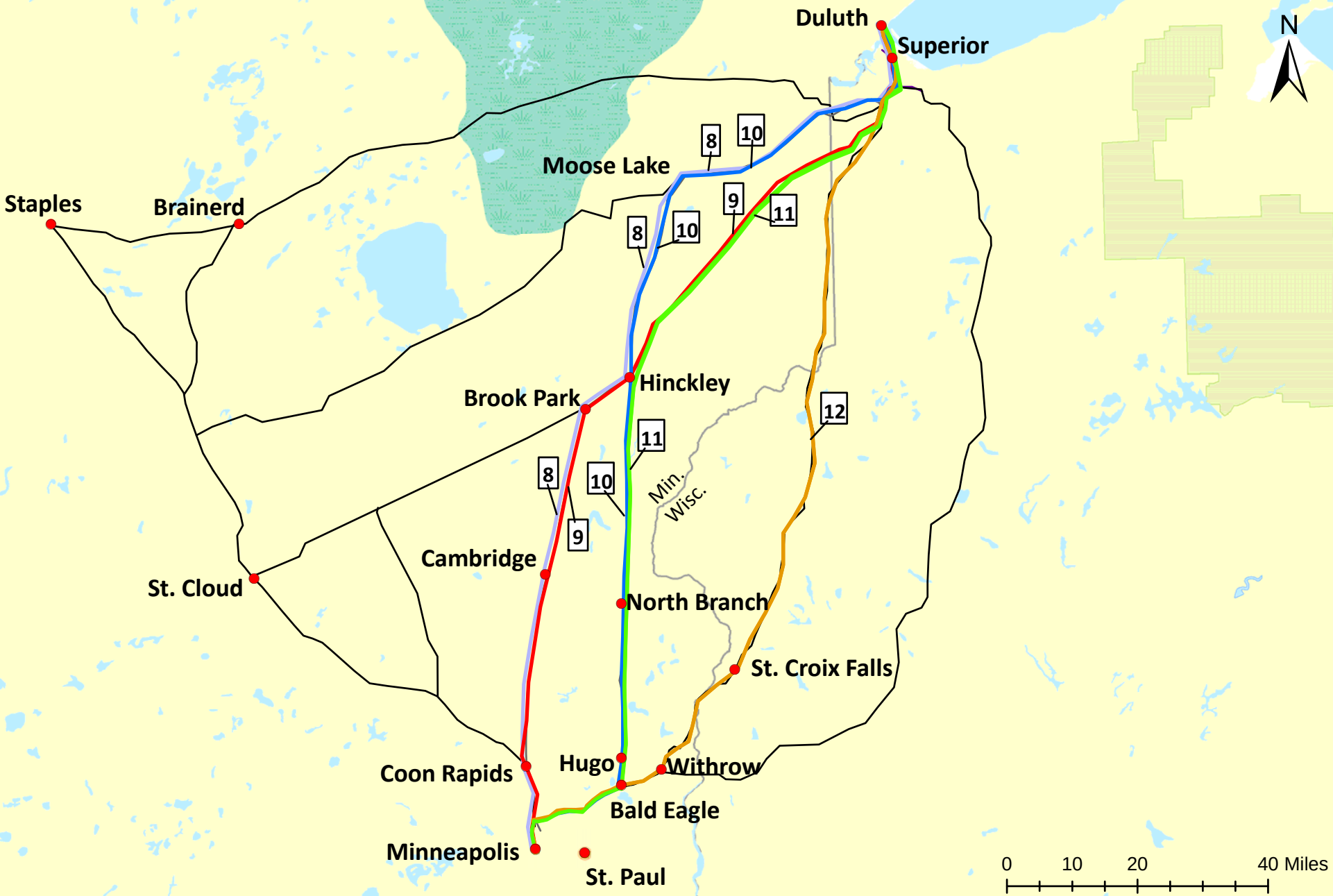
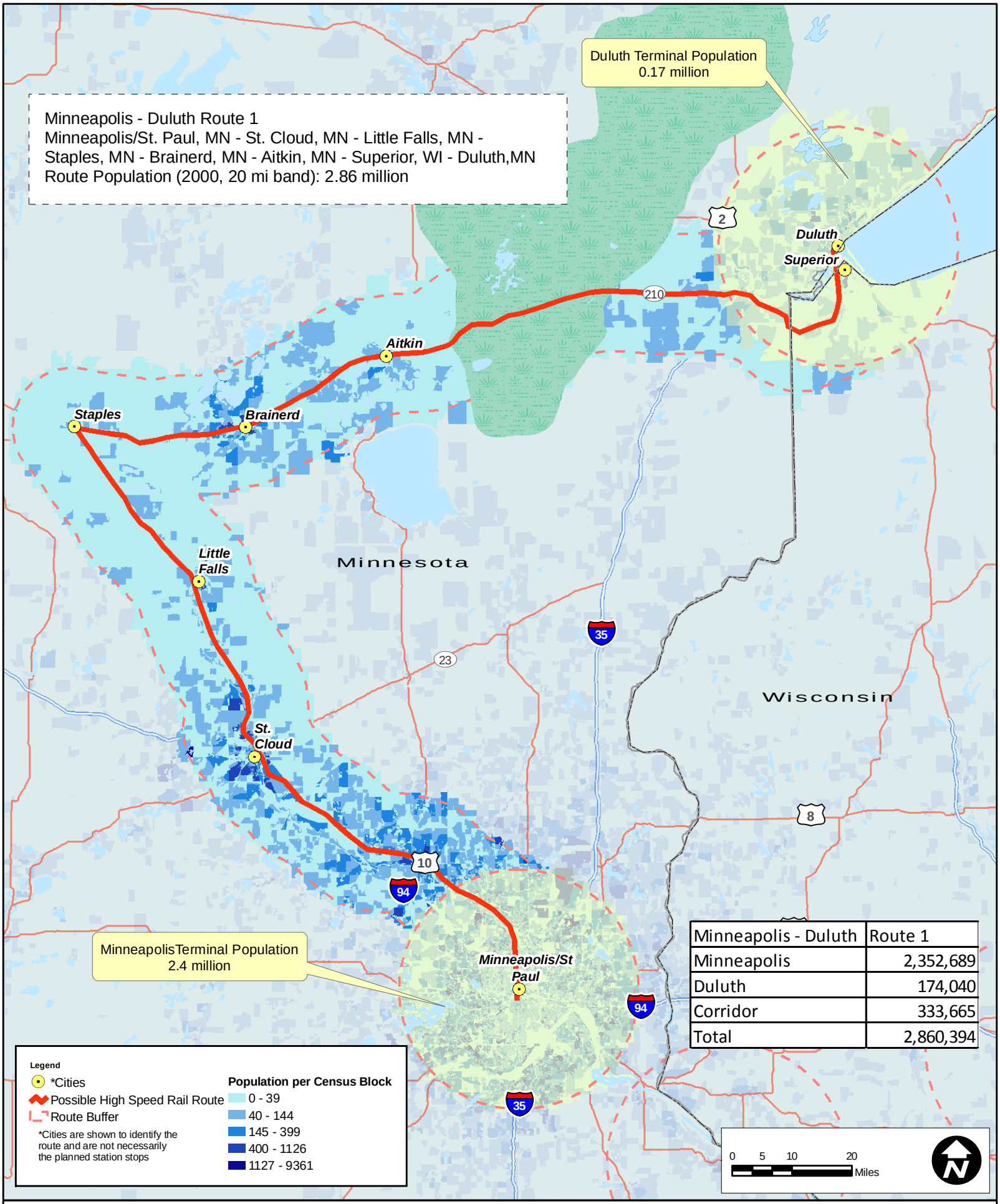


Figure 2
Northern Lights Express Route Alternatives Recommended for Level 1, Step 3 Screening

November 20, 2009

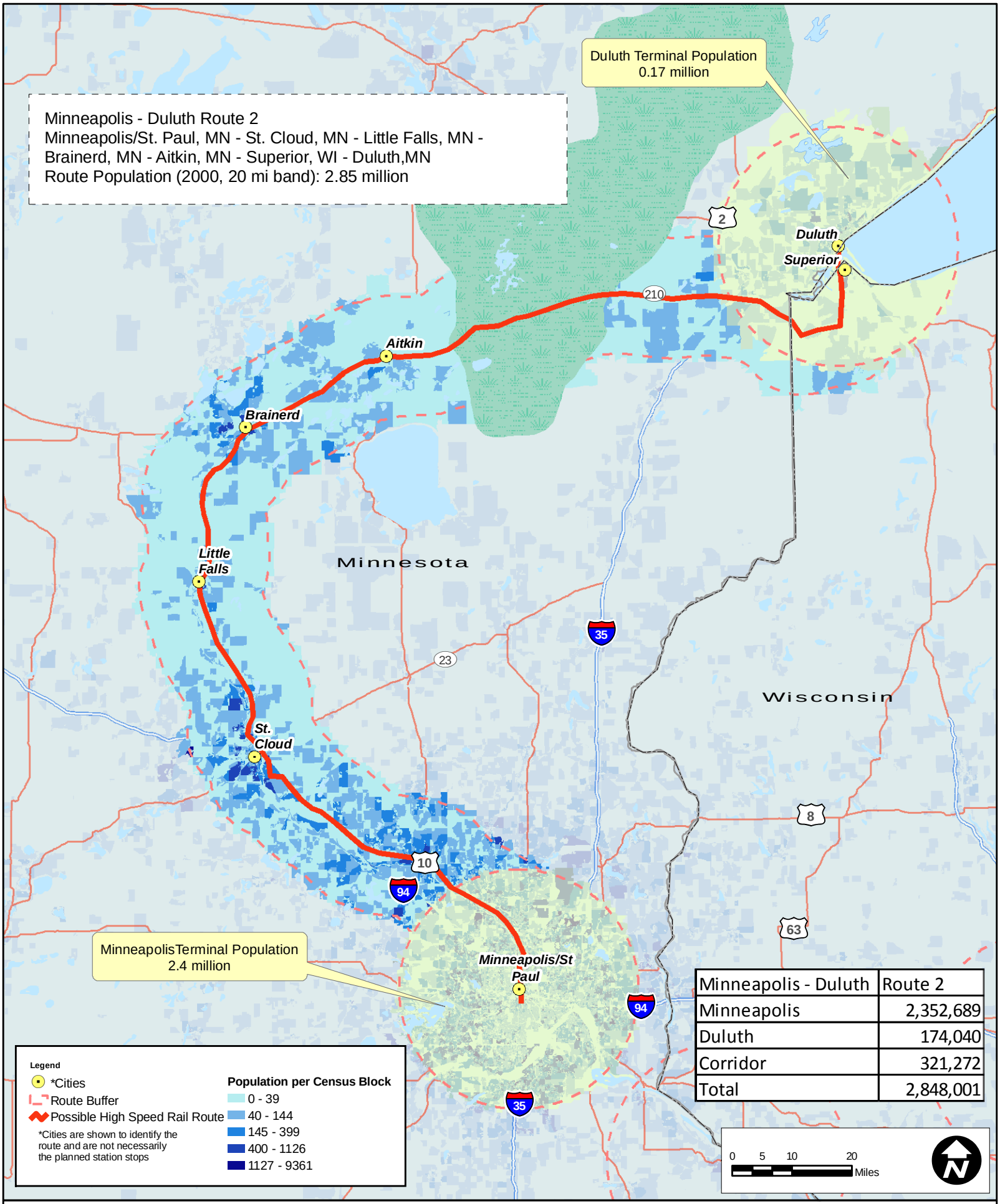
Appendix A

Corridor Populations of Route Alternatives



Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data

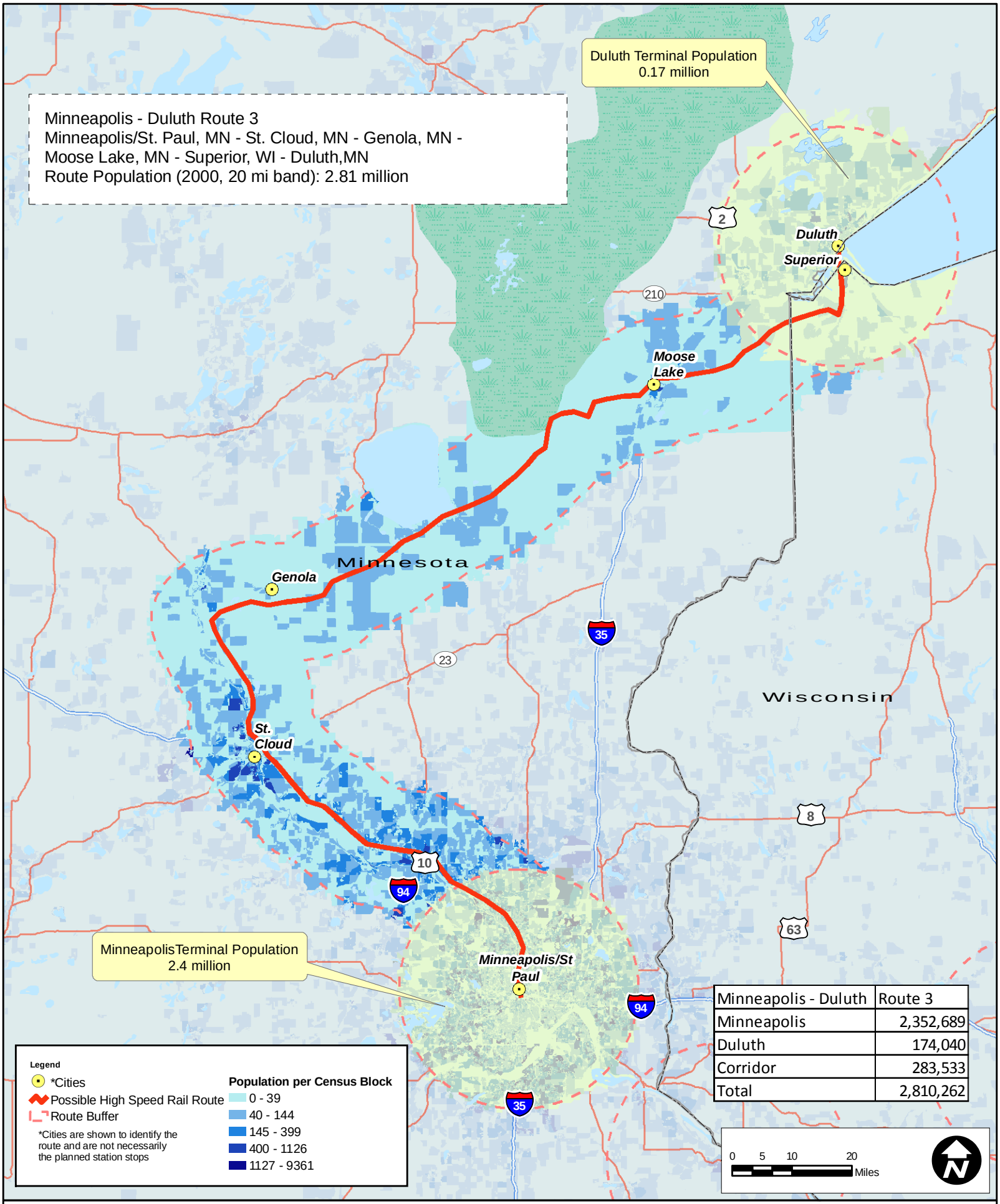


Minneapolis - Duluth	Route 2
Minneapolis	2,352,689
Duluth	174,040
Corridor	321,272
Total	2,848,001

QUANDEL

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 3
Minneapolis	2,352,689
Duluth	174,040
Corridor	283,533
Total	2,810,262

Northern Light Express Alternatives Analysis

Data Sources
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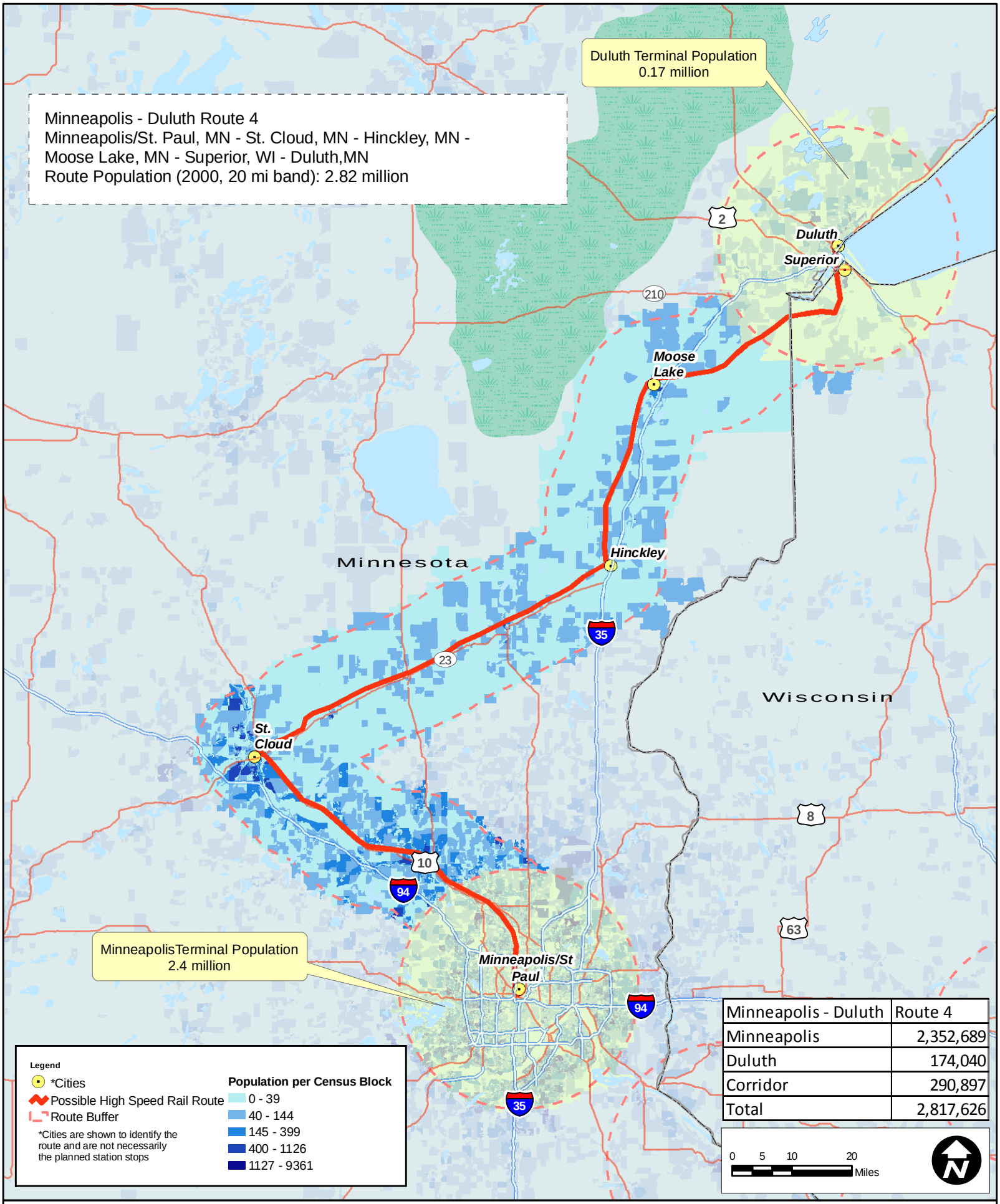
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 4
Minneapolis	2,352,689
Duluth	174,040
Corridor	290,897
Total	2,817,626

Northern Light Express Alternatives Analysis

Data Sources
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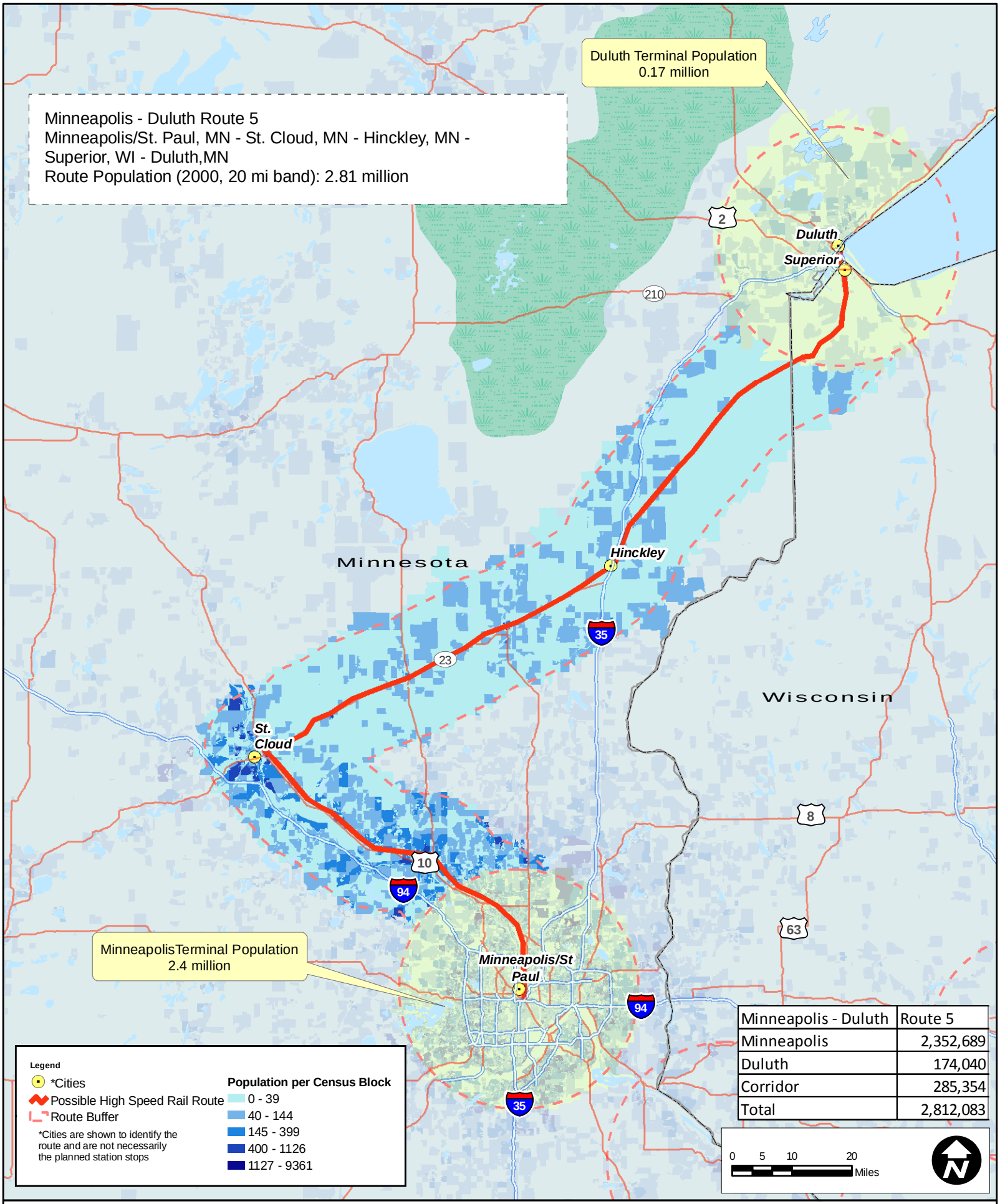
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 5
Minneapolis	2,352,689
Duluth	174,040
Corridor	285,354
Total	2,812,083

Northern Light Express Alternatives Analysis

Data Sources
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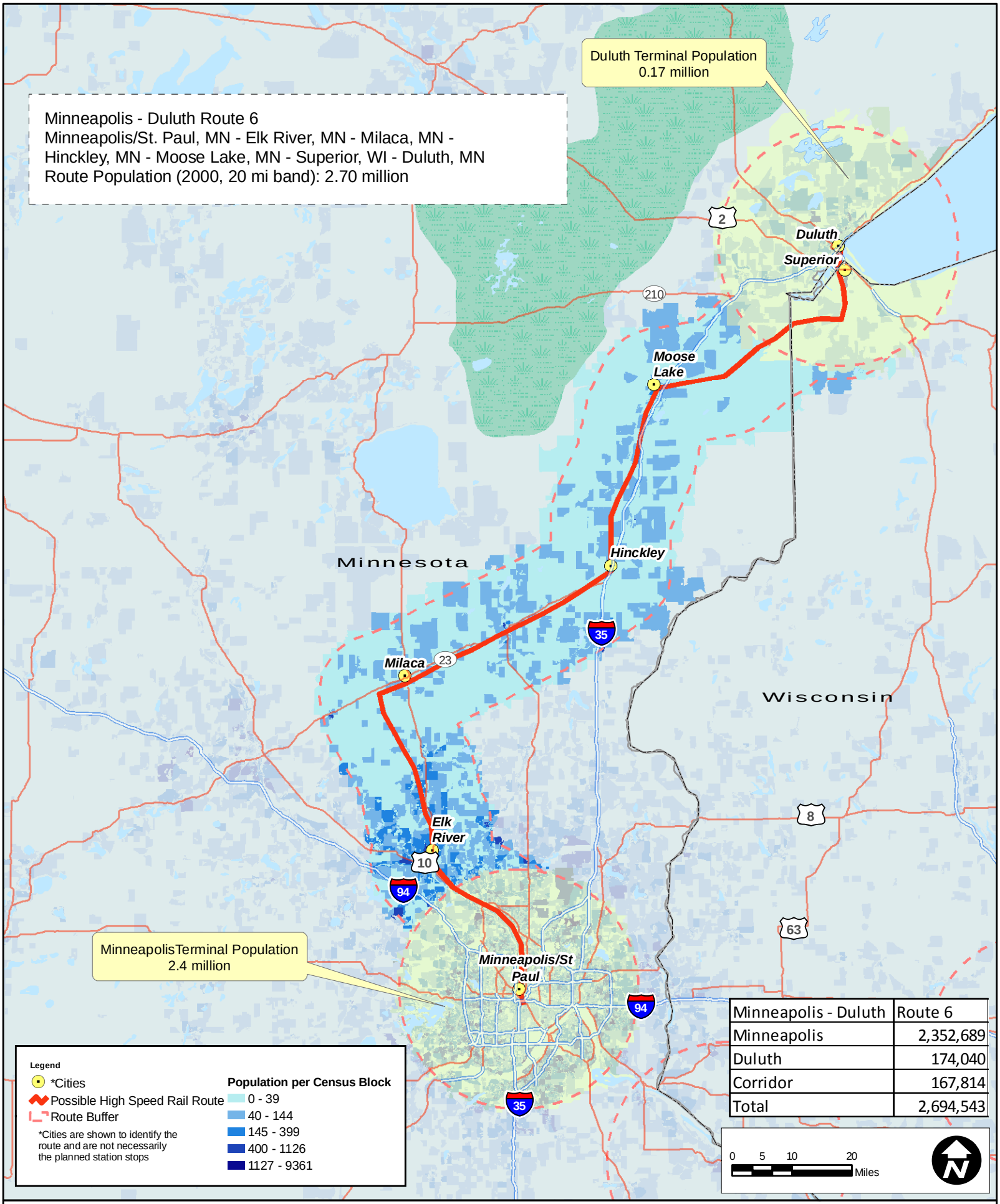
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 6
Minneapolis	2,352,689
Duluth	174,040
Corridor	167,814
Total	2,694,543

Northern Light Express Alternatives Analysis

Data Sources
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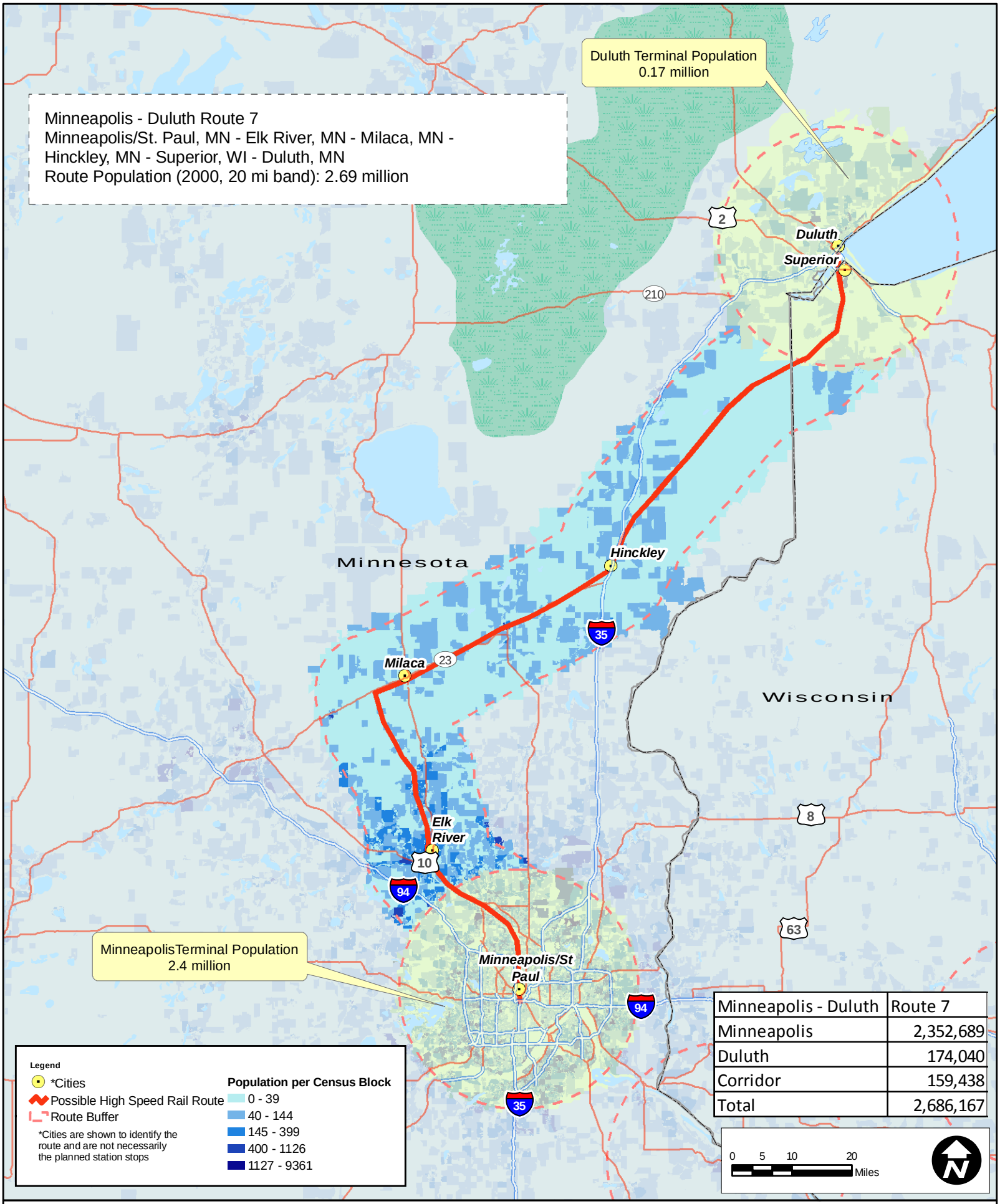
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 7
Minneapolis	2,352,689
Duluth	174,040
Corridor	159,438
Total	2,686,167

QUANDEL

Northern Light Express Alternatives Analysis

Data Sources
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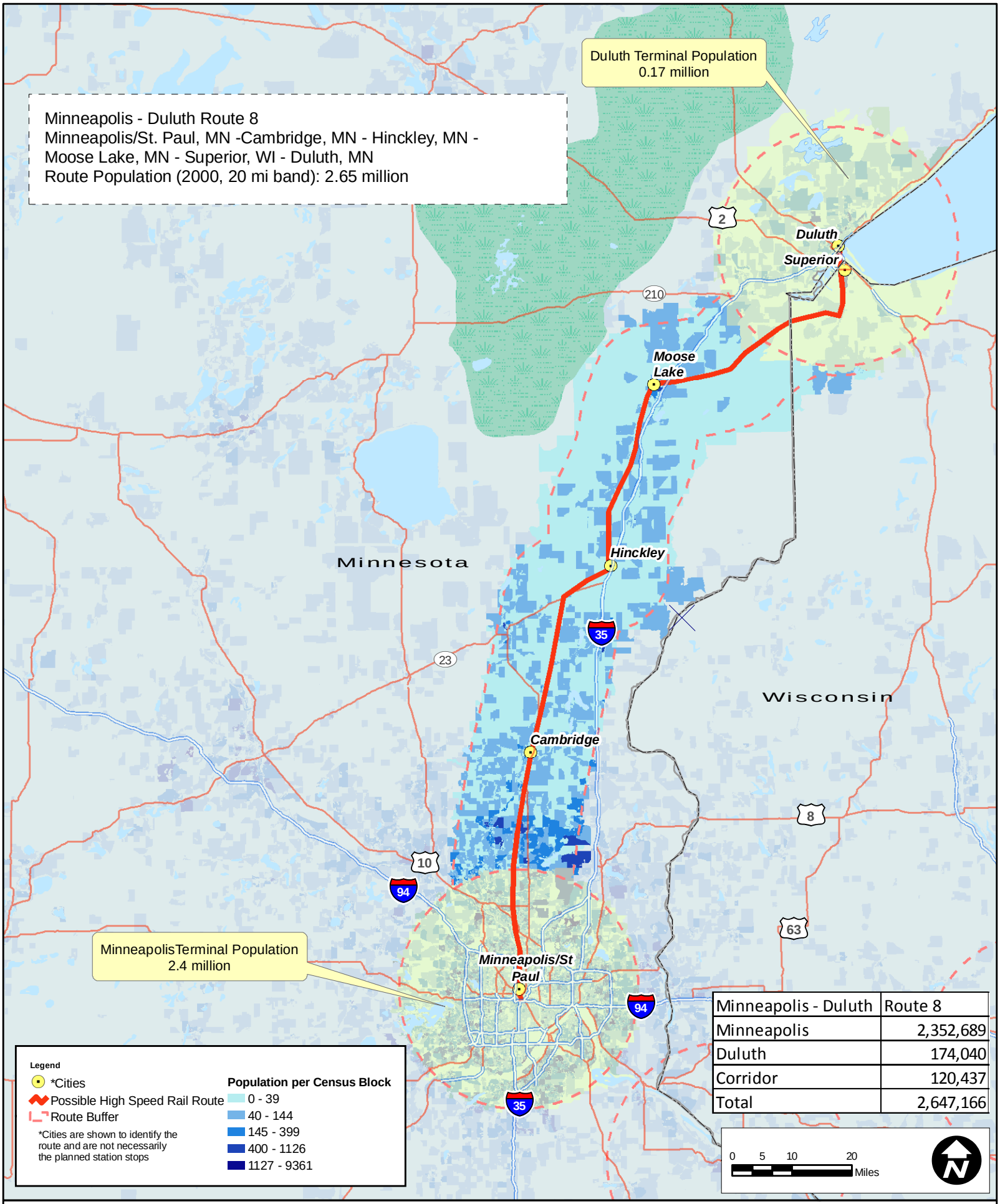
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 8
Minneapolis	2,352,689
Duluth	174,040
Corridor	120,437
Total	2,647,166

Northern Light Express Alternatives Analysis

Data Sources
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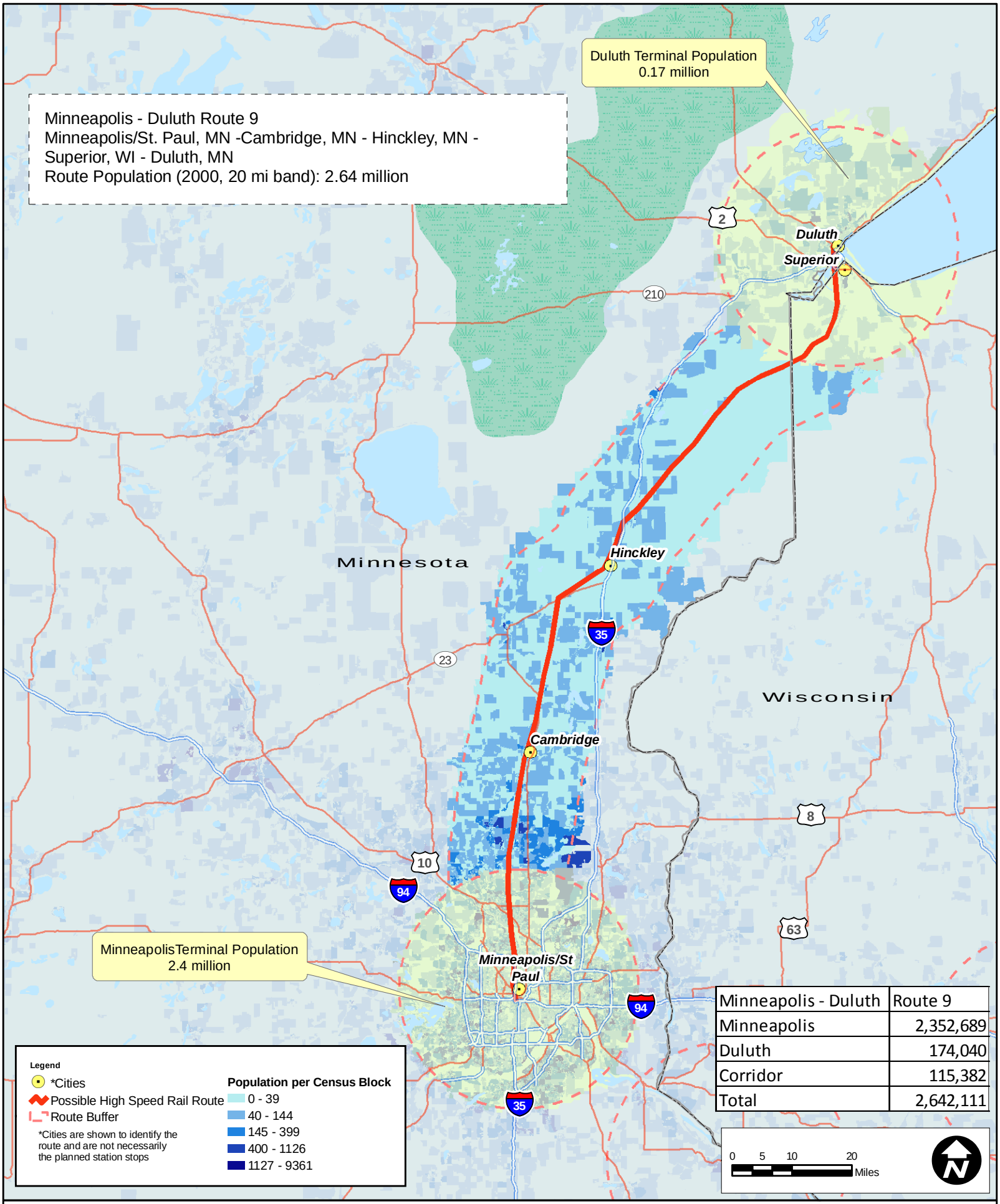
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 9
Minneapolis	2,352,689
Duluth	174,040
Corridor	115,382
Total	2,642,111

Northern Light Express Alternatives Analysis

Data Sources
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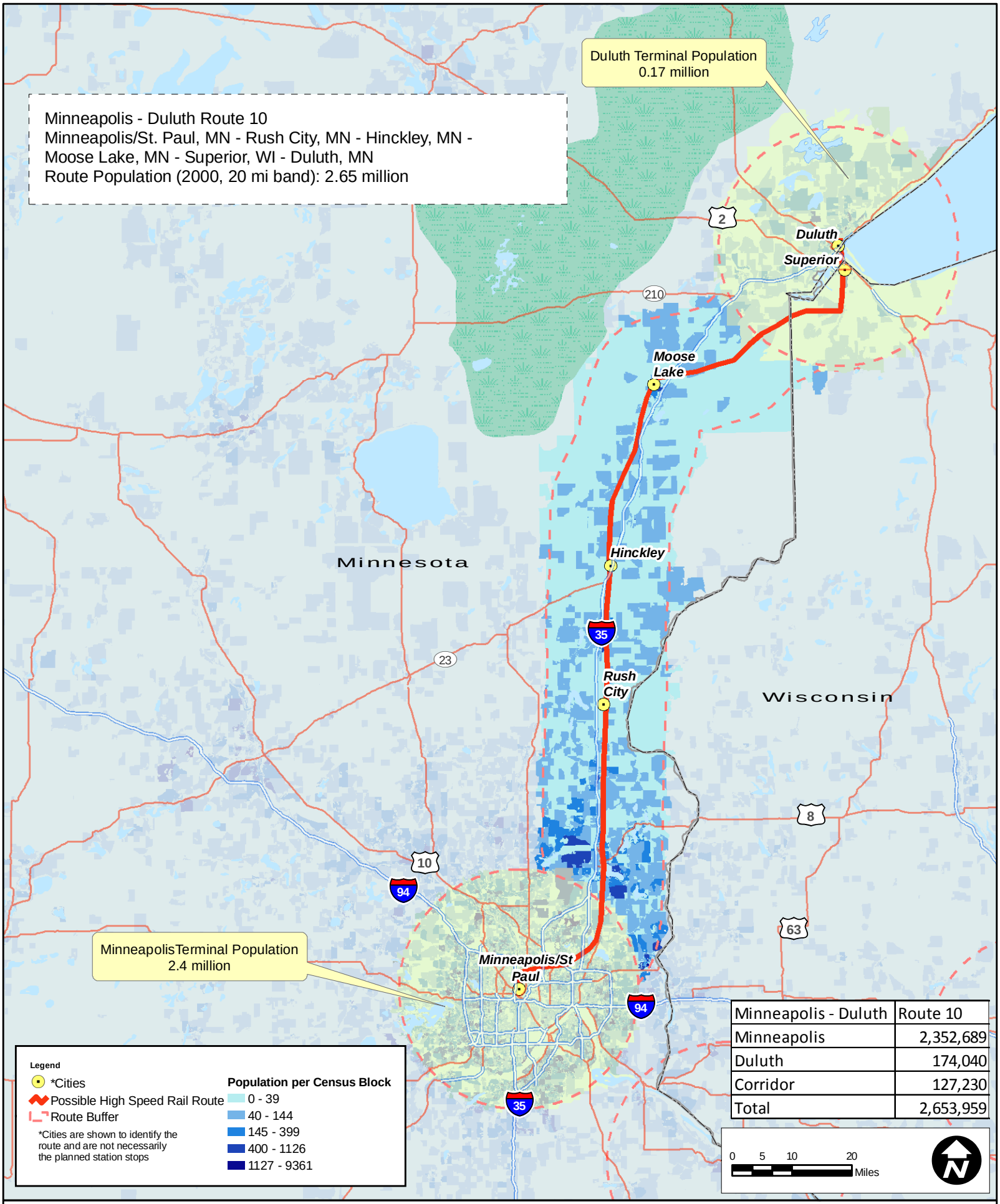
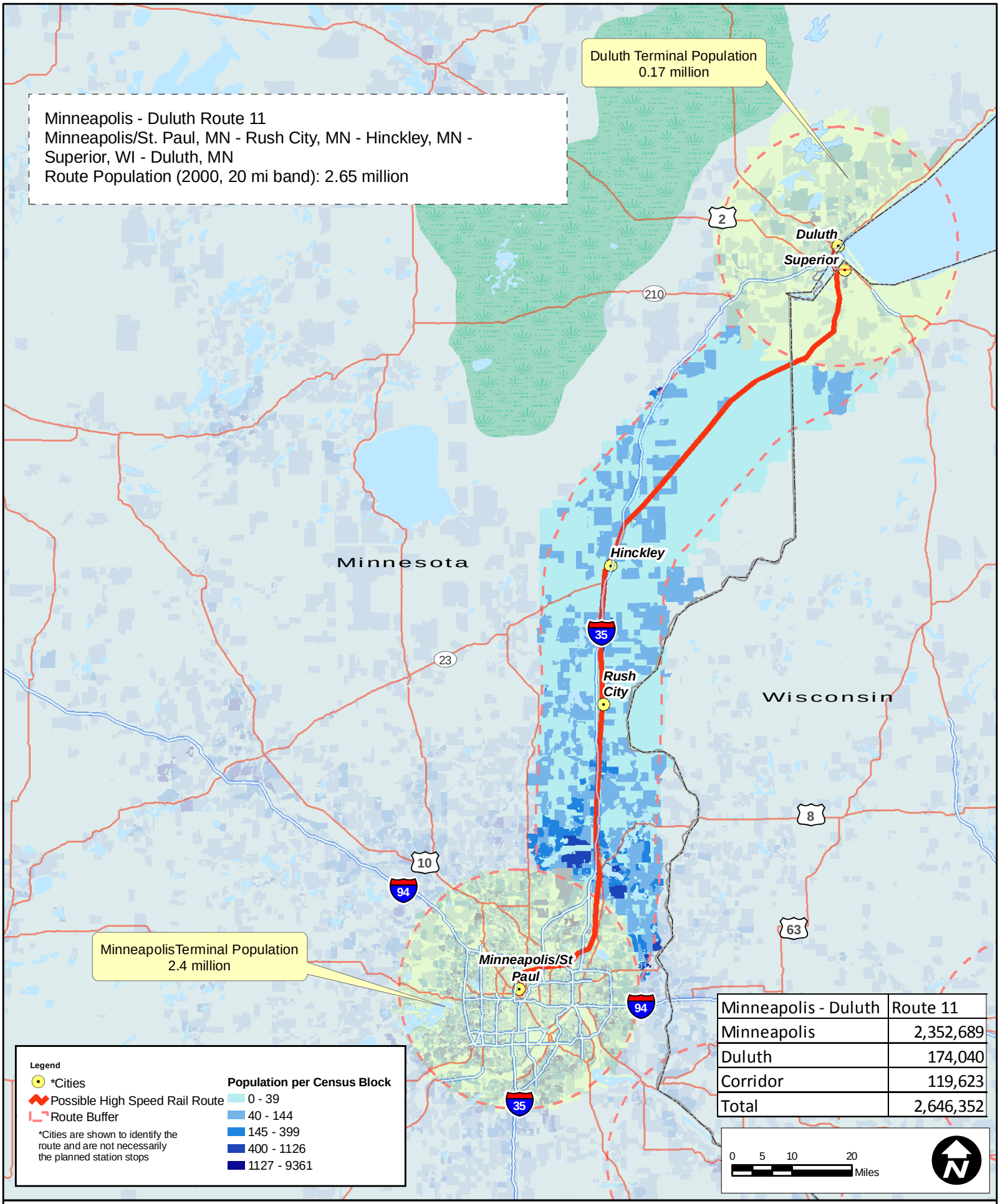
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 10
Minneapolis	2,352,689
Duluth	174,040
Corridor	127,230
Total	2,653,959

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 11
Minneapolis	2,352,689
Duluth	174,040
Corridor	119,623
Total	2,646,352

Northern Light Express Alternatives Analysis

Data Sources
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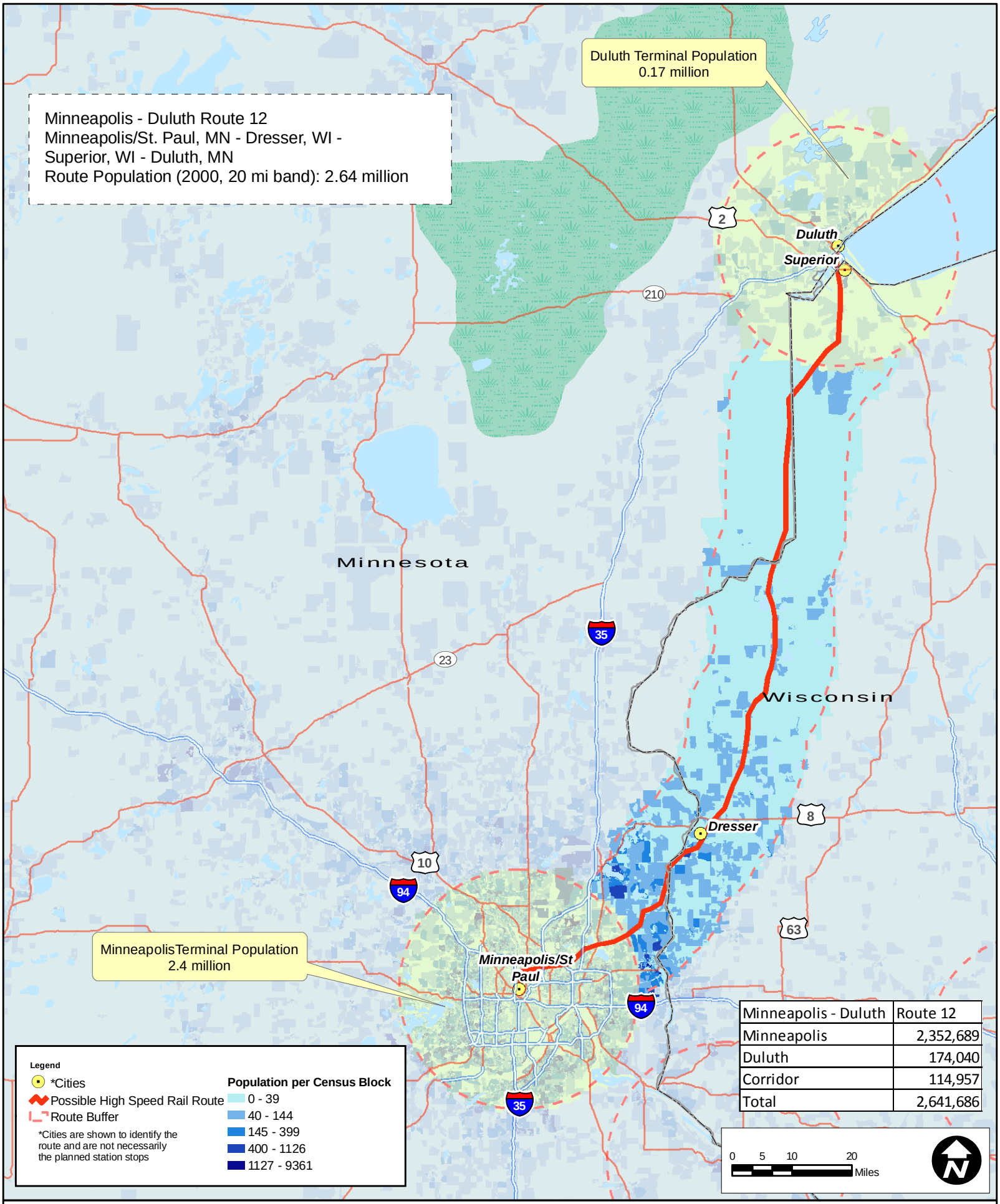
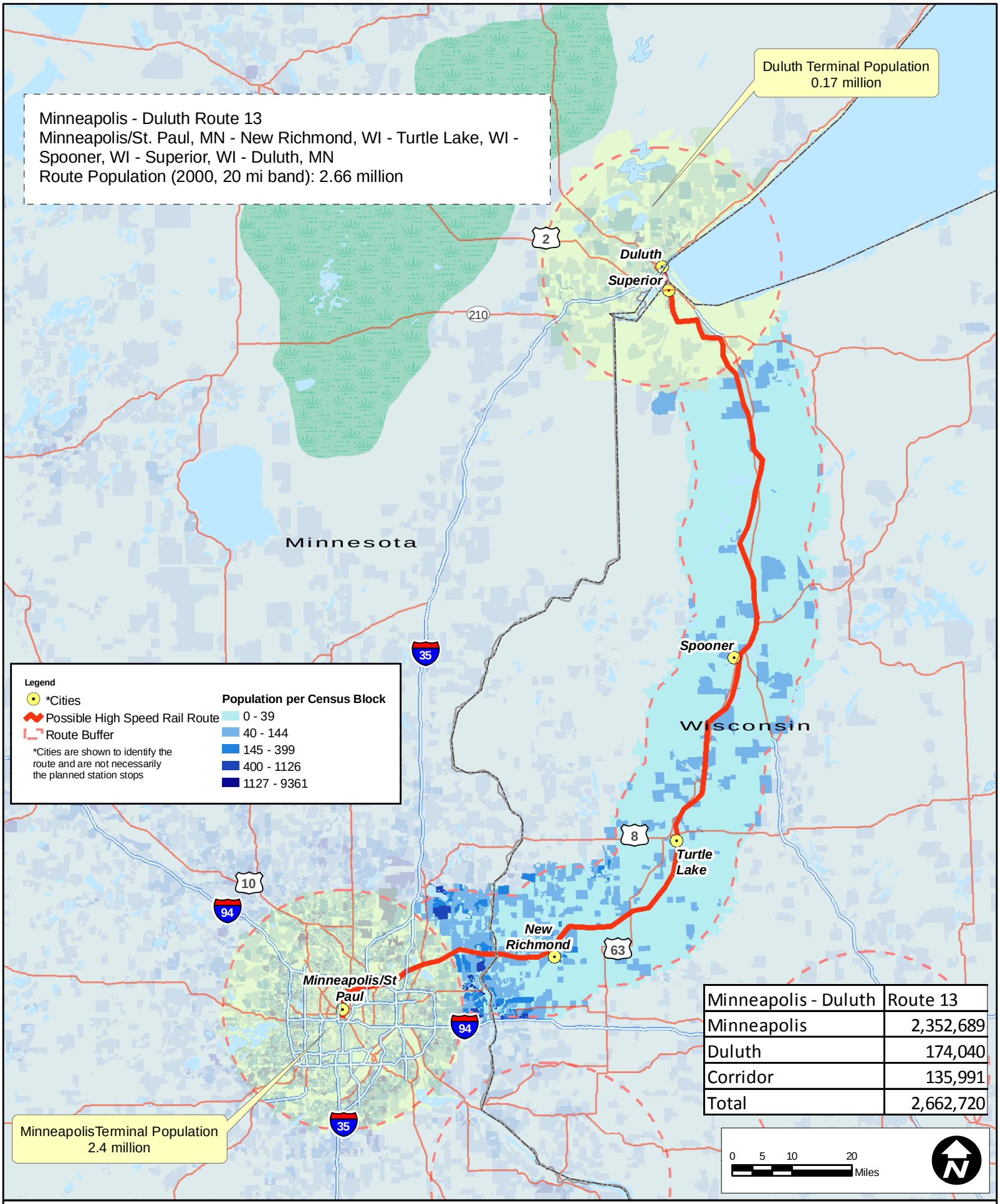
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 12
Minneapolis	2,352,689
Duluth	174,040
Corridor	114,957
Total	2,641,686

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 13
Minneapolis	2,352,689
Duluth	174,040
Corridor	135,991
Total	2,662,720

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data

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www.quandel.com

Technical Memorandum

Subject:	**Technical Memorandum 3 – Speed Profiles and Route Travel Times** **Minnesota Northern Lights Express Project** **Alternatives Analysis – Level 1, Step 3 Screening**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**November 20, 2009**

Purpose

This technical memorandum presents the passenger rail speed profiles and travel time comparison for the five routes being considered in the Level 1 Step 3 screening of route alternatives in the Northern Lights Express passenger rail corridor. The screening results are presented here to help select the best passenger rail route from Minneapolis/St. Paul to Duluth for further study.

Background

The draft Purpose and Need of the NLX project is to provide passenger rail service between Minneapolis/St. Paul and Duluth that offers:

- Corridor travel times competitive with automobile travel
- Safe and reliable rail service
- Amenities that improve passenger travel quality and comfort
- System continuity with the existing and planned transportation network

The five remaining route alternatives are screened for their ability to best meet the project Purpose and Need. Whereas Step 2 compared all thirteen of the route alternatives, Step 3 only considers the five routes - Routes 8, 9, 10, 11, and 12 - that survived Step 2 screening. These routes are shown in Figure 1.

Methodology

A simple spreadsheet based train performance calculator is used to determine the best theoretical travel time along each route for comparison. The train performance calculator employs the following parameters and assumptions. These assumptions are likely to prove aggressive in actual implementation, as speeds may be further restricted for operational and safety considerations.

- Typical modern passenger train performance characteristics are modeled including:
    - Acceleration allowing 0-110 mph in 4.6 miles
    - Deceleration at 1 mile per hour per second from 110-0 mph
- Passenger equipment will tilt, allowing operations at 6 inches total unbalance
- Enhanced superelevation (not exceeding 4.0 inches) is employed in curves on all tracks used by passenger trains
- Municipal speed restrictions are eliminated, as the corridor will be "sealed" with 4 quadrant gates at public crossings in high speed territory
- Passenger speed on the BNSF from Minneapolis to Coon Creek is limited to 79 mph, except as restricted by curvature.
- Passenger speed on the CP from Minneapolis to Hugo and Withrow is limited to 79 mph, except as restricted by curvature.
- Passenger speed between Superior and Duluth is limited to 30 and 60 mph.
- All other route segments allow a maximum passenger speed of 110 mph, except as limited by curvature
- Possible degradation in performance due to grades is not considered
- Travel times are calculated including a schedule pad as recommended by the FRA. Typically, the pad ranges from 7% for a double track alignment to approximately 15-20% for a single track with passing sidings.
- The speed profiles and travel times are computed with no freight interference. Sufficient freight infrastructure must be constructed to allow relatively independent operations.

Railroad track charts have been used to identify the track geometric features including tangent segments, grades and curves. The track charts provide the approximate location, length and magnitude of each. This data has been loaded into a spreadsheet for use in computing theoretical passenger train travel times under the assumptions noted above. Where track charts could not be obtained, such as for abandoned railroad rights-of-way, curvature was measured using aerial photography and geometric calculations in CAD software, while grades are assumed to be less than 1%.

Theoretical travel times (including pad) are calculated for each route between Minneapolis and Duluth with 2 minute station stops at Hinkley/Danbury and Superior. Additional intermediate station stops will increase travel times.

The specific routing for each of the five route alternatives is shown in Figures 1-3. For the purpose of comparing route travel times, each of the routes has its terminal station at the Minneapolis downtown Intermodal Station, and at the Duluth Union Depot. The use of these terminals for comparing route alternatives is consistent throughout Level 3 screening.

Graphical Presentation of Data

Track characteristics and train performance data including Curvature, Number of Existing Tracks, Freight Density, Passenger Speed Profile and Grade Crossing Quantity are presented for each route in Appendix A.

Curvature is a key parameter in determining the suitability of a rail alignment for high speed passenger service. The maximum permissible speed is primarily a function of the track curvature, installed superelevation and permissible unbalance of the operating equipment. Curvature up to approximately 1.0 degrees will permit the maximum speed of 110 mph for tilting passenger equipment. Greater curvature will serve to restrict the speeds and increase the travel times. Due to the existence of natural features such as waterways, wetlands and mountains and man-made structures, it is often difficult to realign railroads to reduce curvature. The actual curvature of the alternative routes is presented in the Curvature graphs. By inspection, the location, length and magnitude of speed restricting curves can be determined and compared among the route alternatives.

A rough determination of the route capacity can be determined by considering the Number of Existing Tracks and the existing Freight Density (in trains per day), each of which is plotted for the alternative routes. The MnDOT Office of Freight and Commercial Vehicle Operations publishes freight traffic data along many routes within the state. Freight density data shown in these charts is as of May, 2009.

The FRA tabulates Grade Crossing data in a national database. Grade crossings present both a safety and cost issue. The FRA has recommended mitigating the risk posed by grade crossings by employing active warning systems including gates and flashers. A sealed corridor concept is recommended for 110 mph high speed rail service, which generally includes four quadrant gates (or other similar measures) at public crossings and two quadrant gates at private crossings. The quantities of private and public crossings are tabulated for each route, allowing a simple comparison.

Steep grades may impact the acceleration and braking performance of trains, as trains typically employ relatively low power to weight rations as compared to other modes of transportation. Freight train routes seek to employ grades not exceeding 1% so as to enable the movement of large loads with relatively few locomotives. Since passenger trains are relatively light compared to freight trains and employ relatively powerful locomotives to achieve high speeds, grades less than 1% do not significantly impact travel times. The grades found along the selected route alternatives are generally less than 1%, so are not considered in this analysis.

Passenger Speed Profiles and Travel Times (including pad) have been developed for modern passenger equipment operating on each of the route alternatives. The graphs depict the theoretical speeds achieved as a passenger train moves from Minneapolis to Duluth subject to geometric throughout the system and imposed speed limits in the vicinity of Minneapolis and Superior/Duluth as noted in the assumptions above. For ease in determining where speed limits are proposed to be increased, the existing timetable speeds are also depicted in graphs.

Summary results of TPC travel times are shown below in Table 1. The frequency and magnitude of curvature along Route 12 between Minneapolis and Danbury decreases speeds in this segment, and results in Route 12 having the longest travel time relative to the baseline Route 9. This is despite Route 12 being the shortest of all five routes.

Table 1 – Train Performance Calculator (TPC) Travel Time Comparison

Route	Route Distance (Miles)	TPC Travel Time	Increase/ (Decrease) vs. Baseline TPC Travel Time
Baseline (Route 9)	*151.2*		-
8	161.7	2 hr 8 min	12 min
9	151.2	1 hr 56 min	-
10	162.4	2 hr 15 min	19 min
11	151.9	2 hr 4 min	8 min
12	151.2	2 hr 16 min	20 min

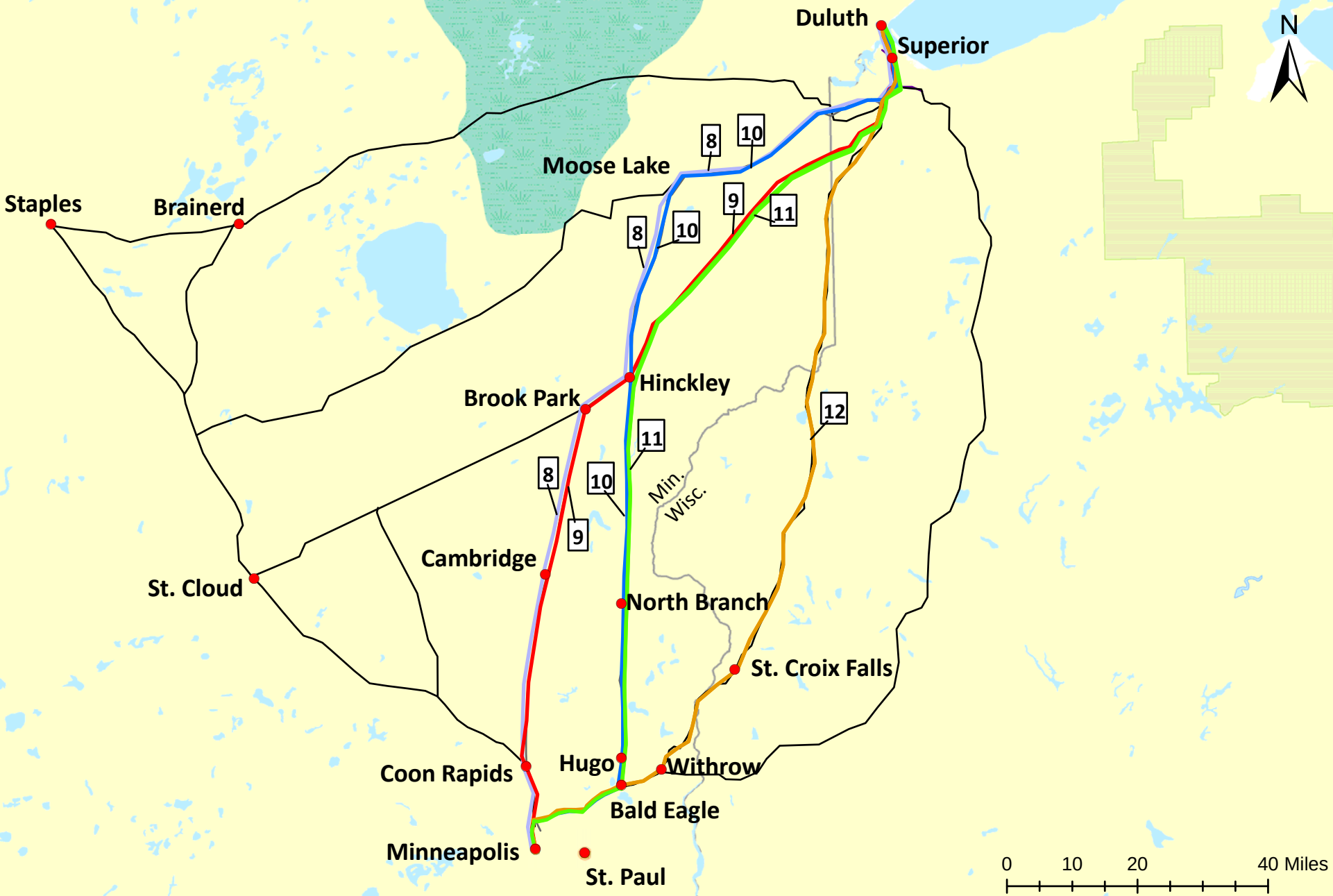


Figure 1
Northern Lights Express Route Alternatives Recommended for Level 1, Step 3 Screening

November 20, 2009

Figure 2 - Route Alternatives Within Greater Minneapolis

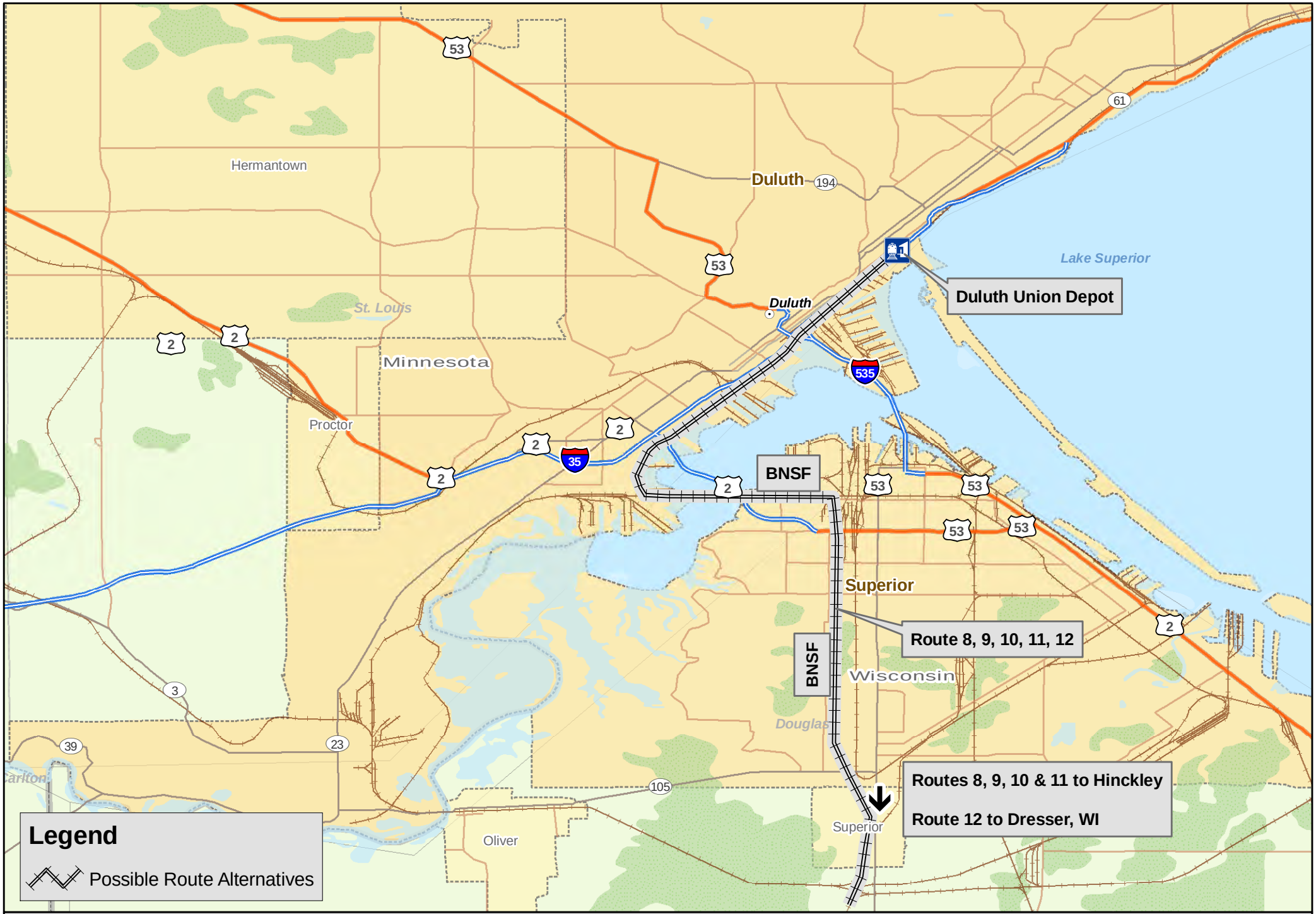
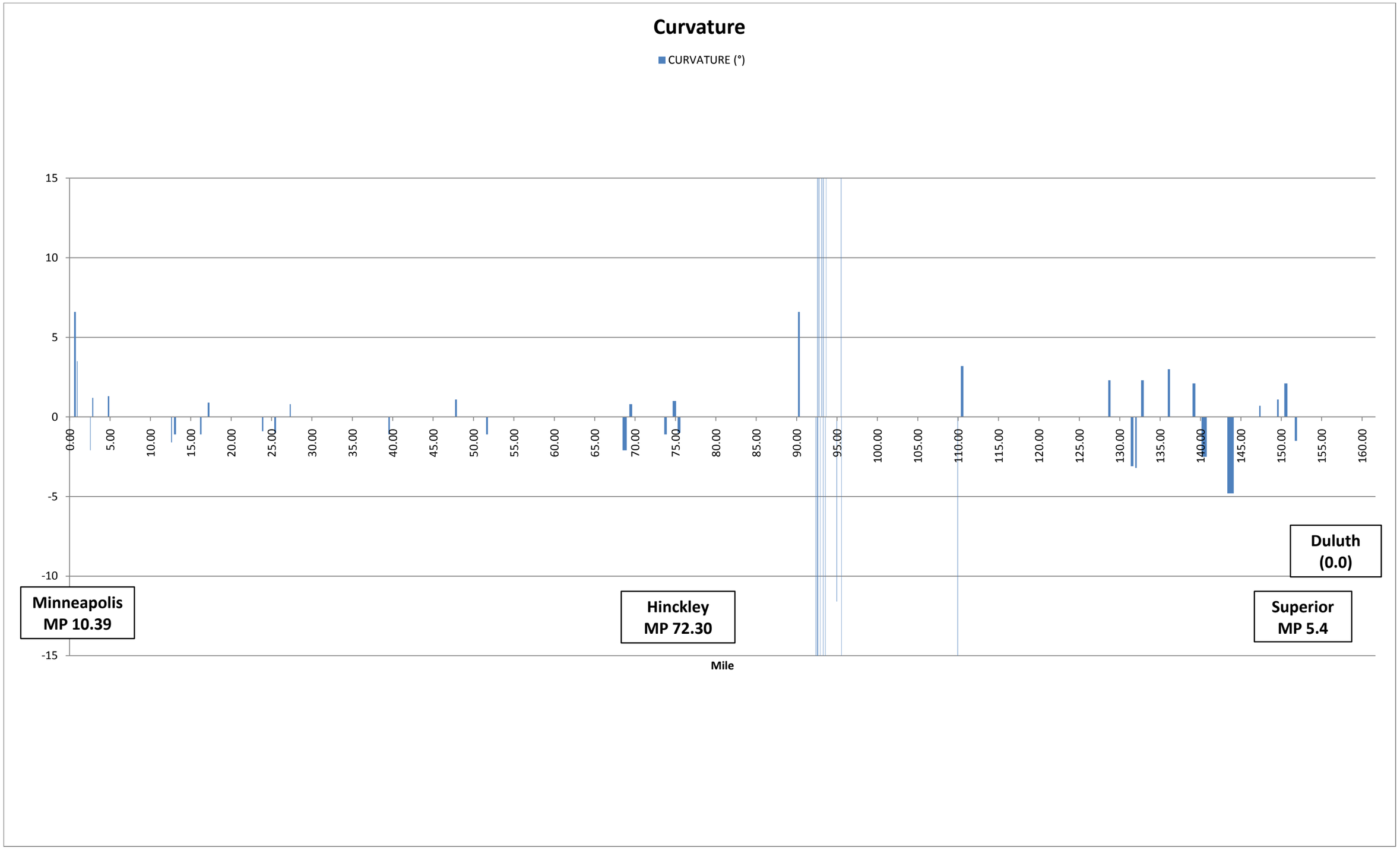


Figure 3 - Route Alternatives Within Greater Duluth

Appendix A
Route Alternatives Speed Profiles

Route #8


Curvature
CURVATURE (°)
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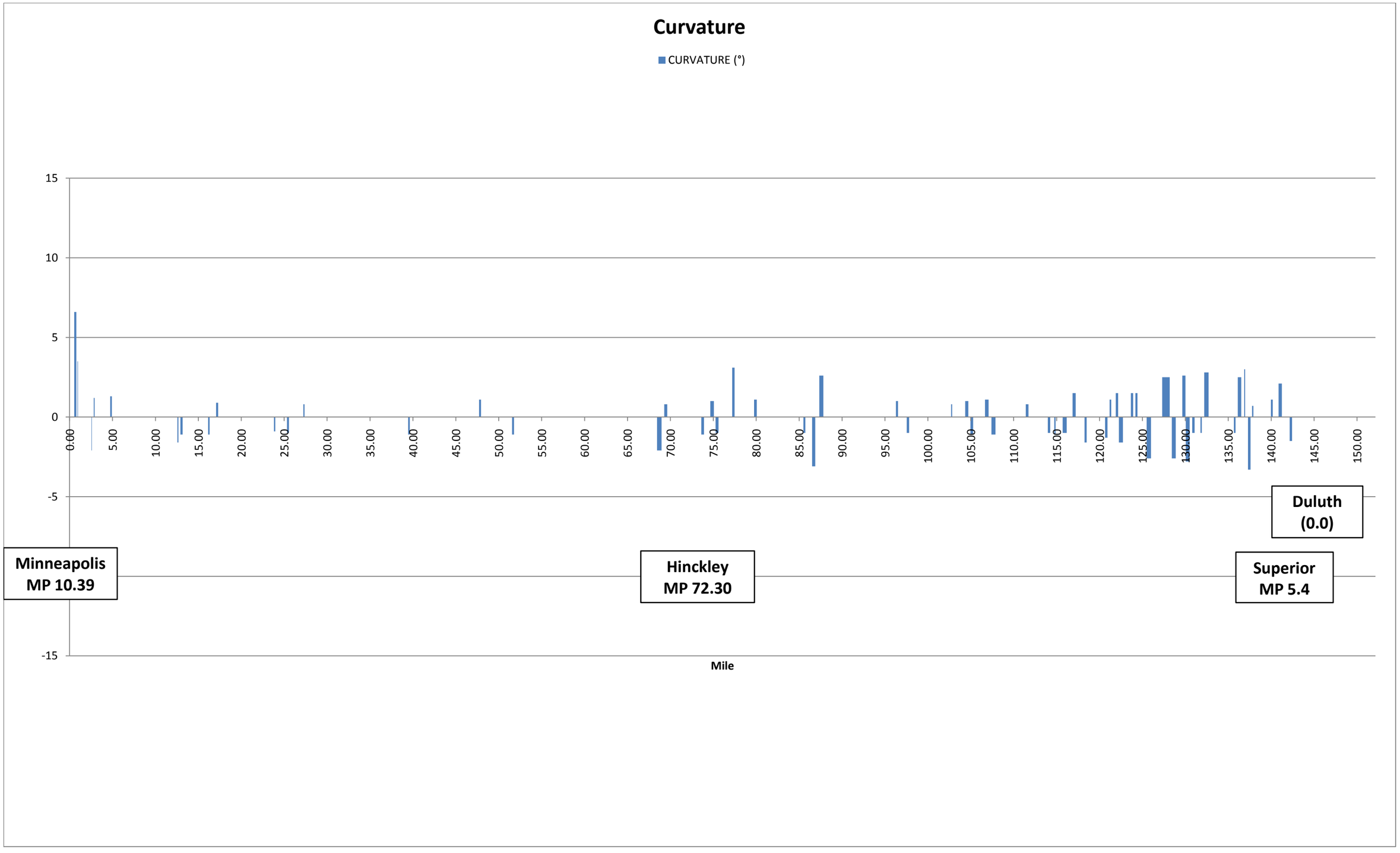
5
0
-5
-10
-15
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
55.00
60.00
65.00
70.00
75.00
80.00
85.00
90.00
95.00
100.00
105.00
110.00
115.00
120.00
125.00
130.00
135.00
140.00
145.00
150.00
155.00
160.00
Minneapolis
MP 10.39
Hinckley
MP 72.30
Duluth
(0.0)
Superior
MP 5.4
Mile

Route #9


Curvature
CURVATURE (°)
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10
5
0
-5
-15
0.00
5.00
10.00
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30.00
35.00
40.00
45.00
50.00
55.00
60.00
65.00
70.00
75.00
80.00
85.00
90.00
95.00
100.00
105.00
110.00
115.00
120.00
125.00
130.00
135.00
140.00
145.00
150.00
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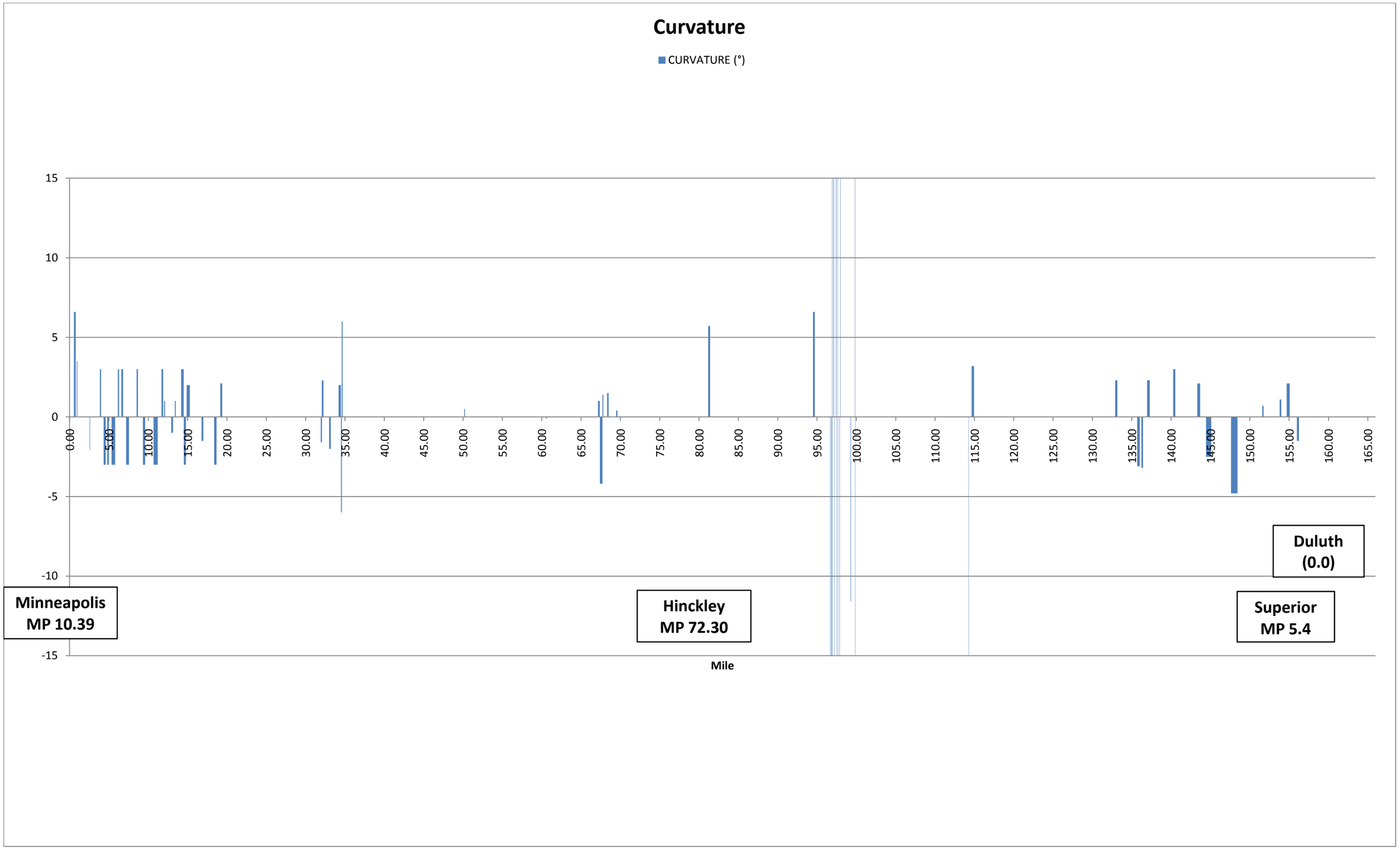
MP 10.39
Hinckley
MP 72.30
Superior
MP 5.4
Duluth
(0.0)
Mile

Route #10


Curvature
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80.00
85.00
90.00
95.00
100.00
105.00
110.00
115.00
120.00
125.00
130.00
135.00
140.00
145.00
150.00
155.00
160.00
165.00
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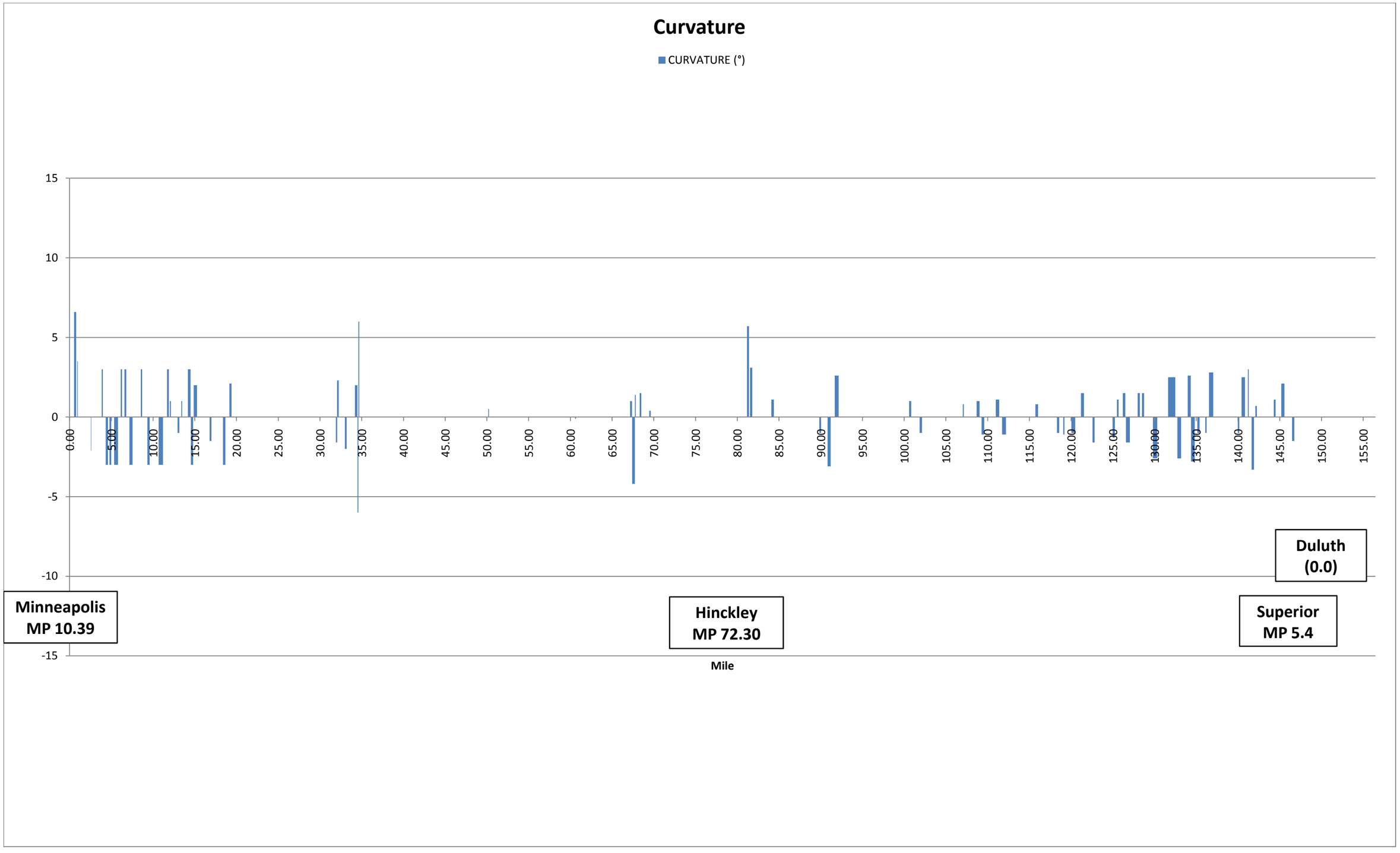
MP 10.39
Hinckley
MP 72.30
Duluth
(0.0)
Superior
MP 5.4
Mile

Route #11


Curvature
CURVATURE (°)
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-10
-15
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5.00
10.00
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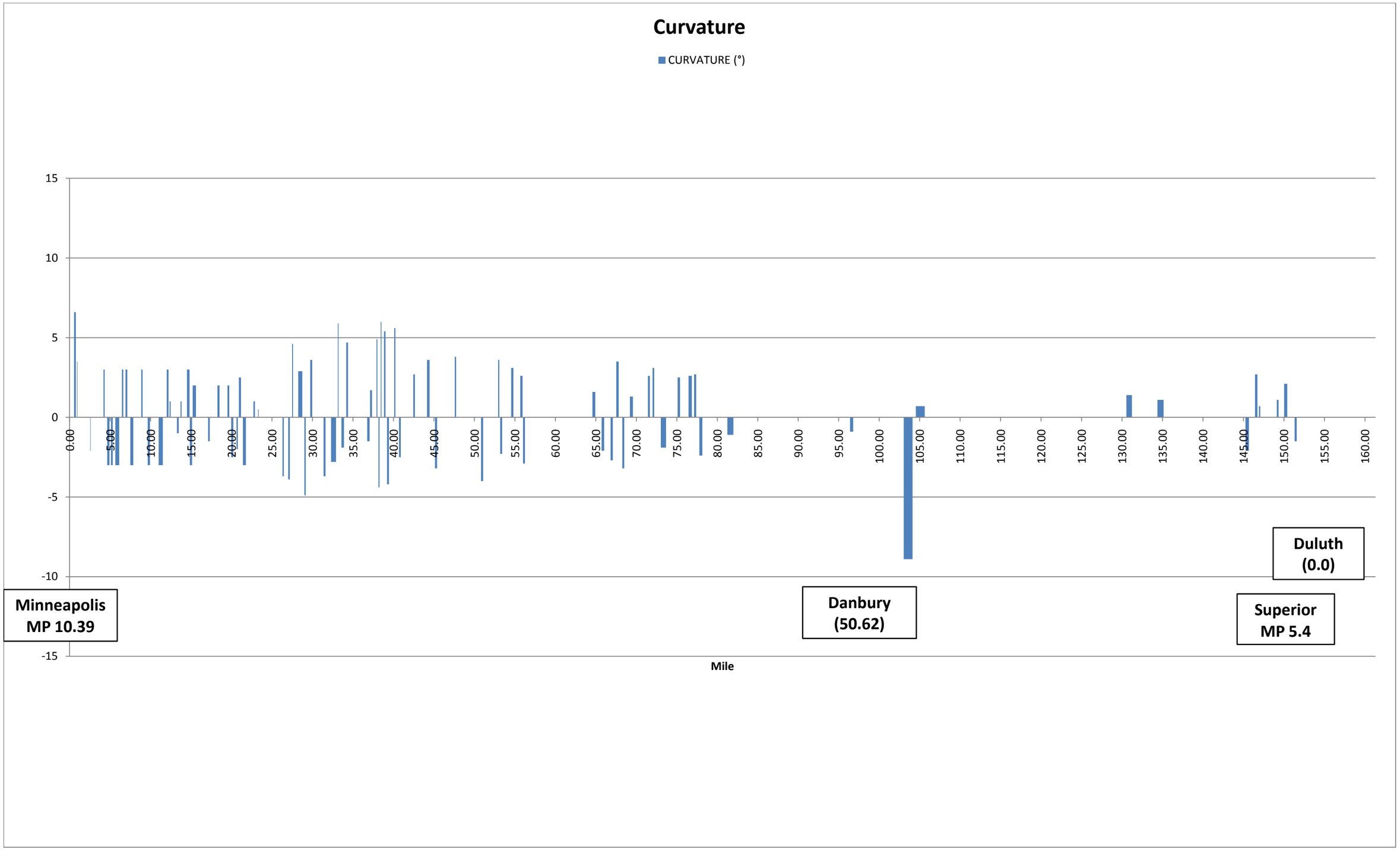
90.00
95.00
100.00
105.00
110.00
115.00
120.00
125.00
130.00
135.00
140.00
145.00
150.00
155.00
Minneapolis
MP 10.39
Hinckley
MP 72.30
Duluth
(0.0)
Superior
MP 5.4
Mile

Route #12


Curvature
CURVATURE (°)
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Duluth
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Superior
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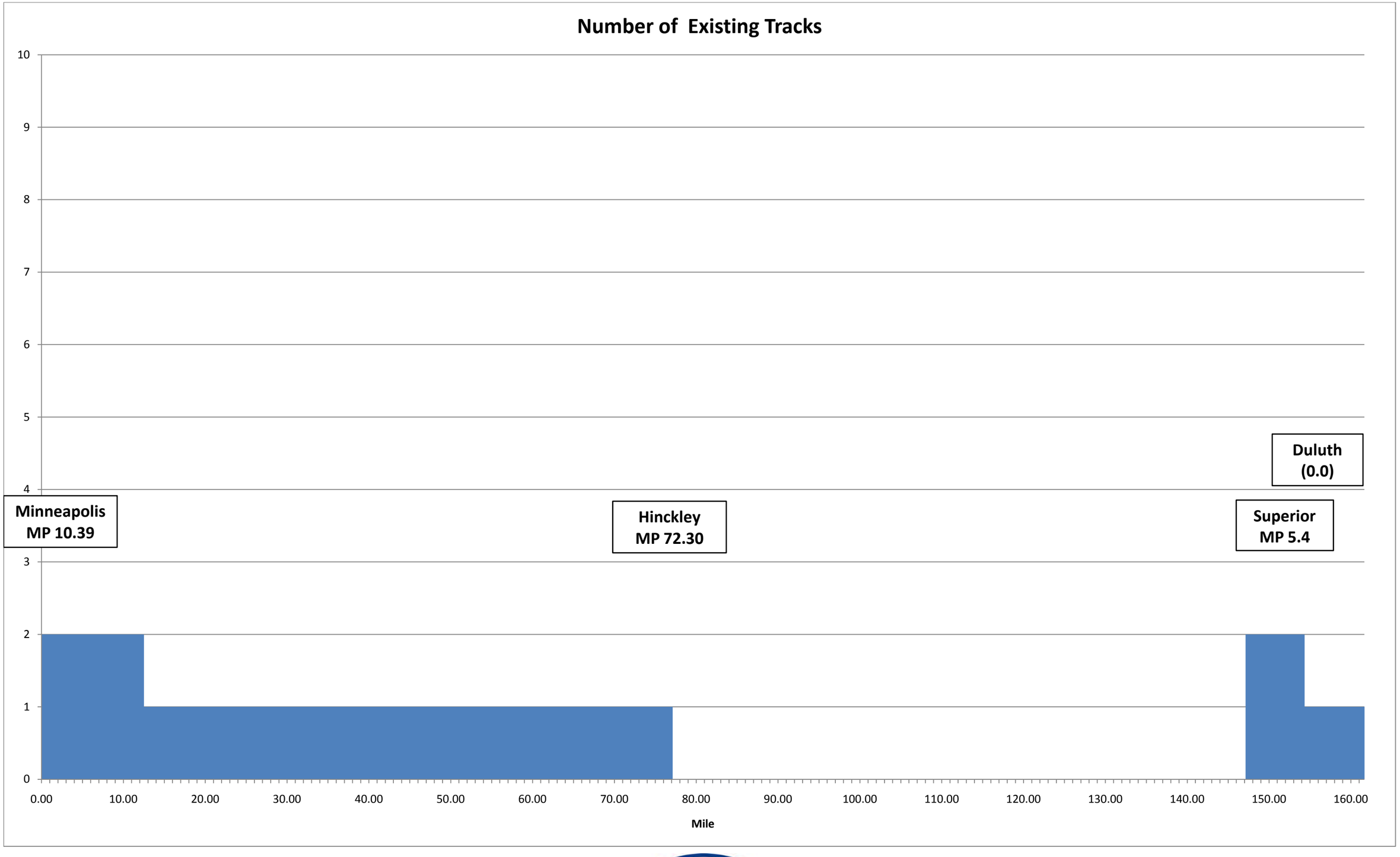
Route #8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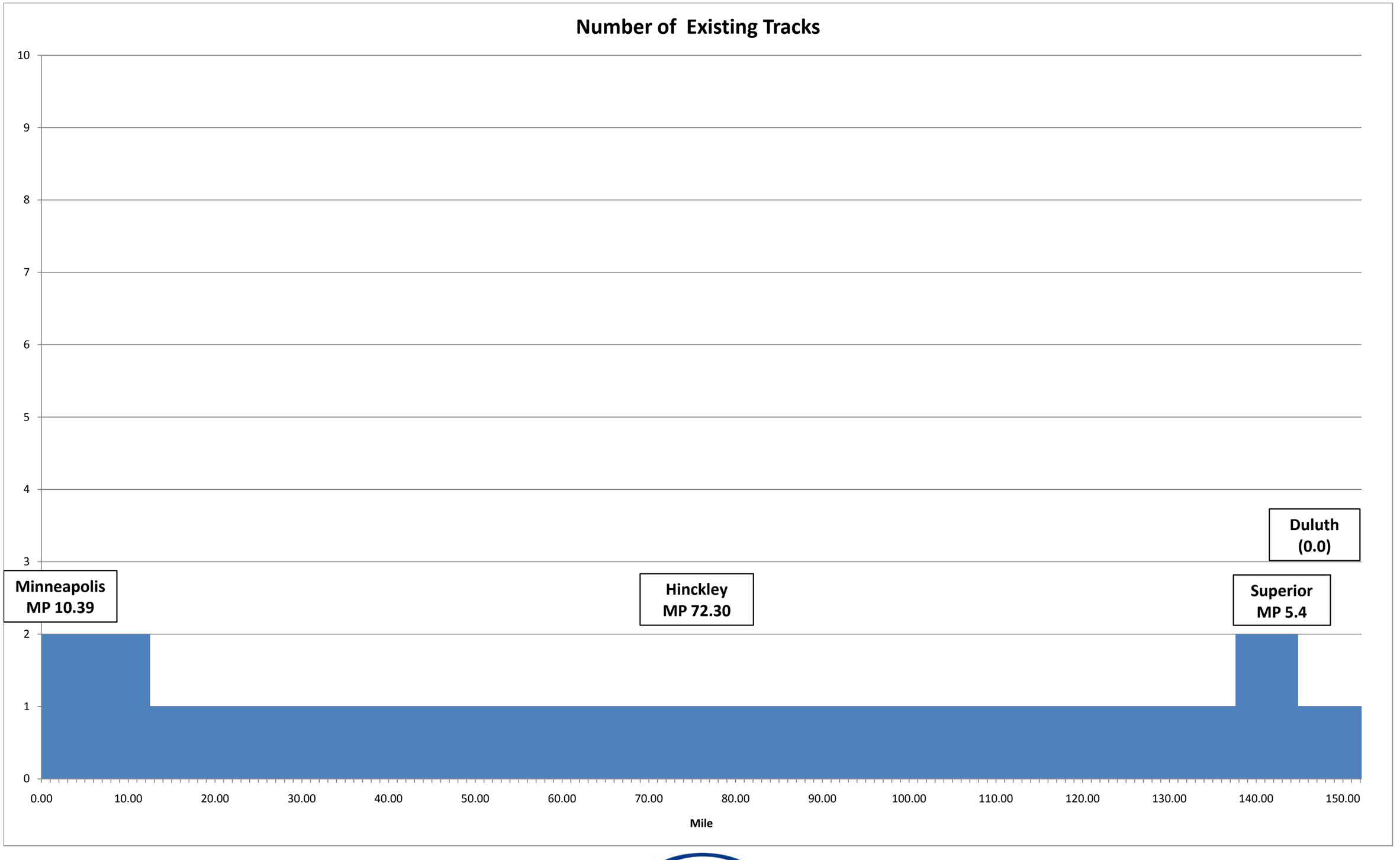
Route #9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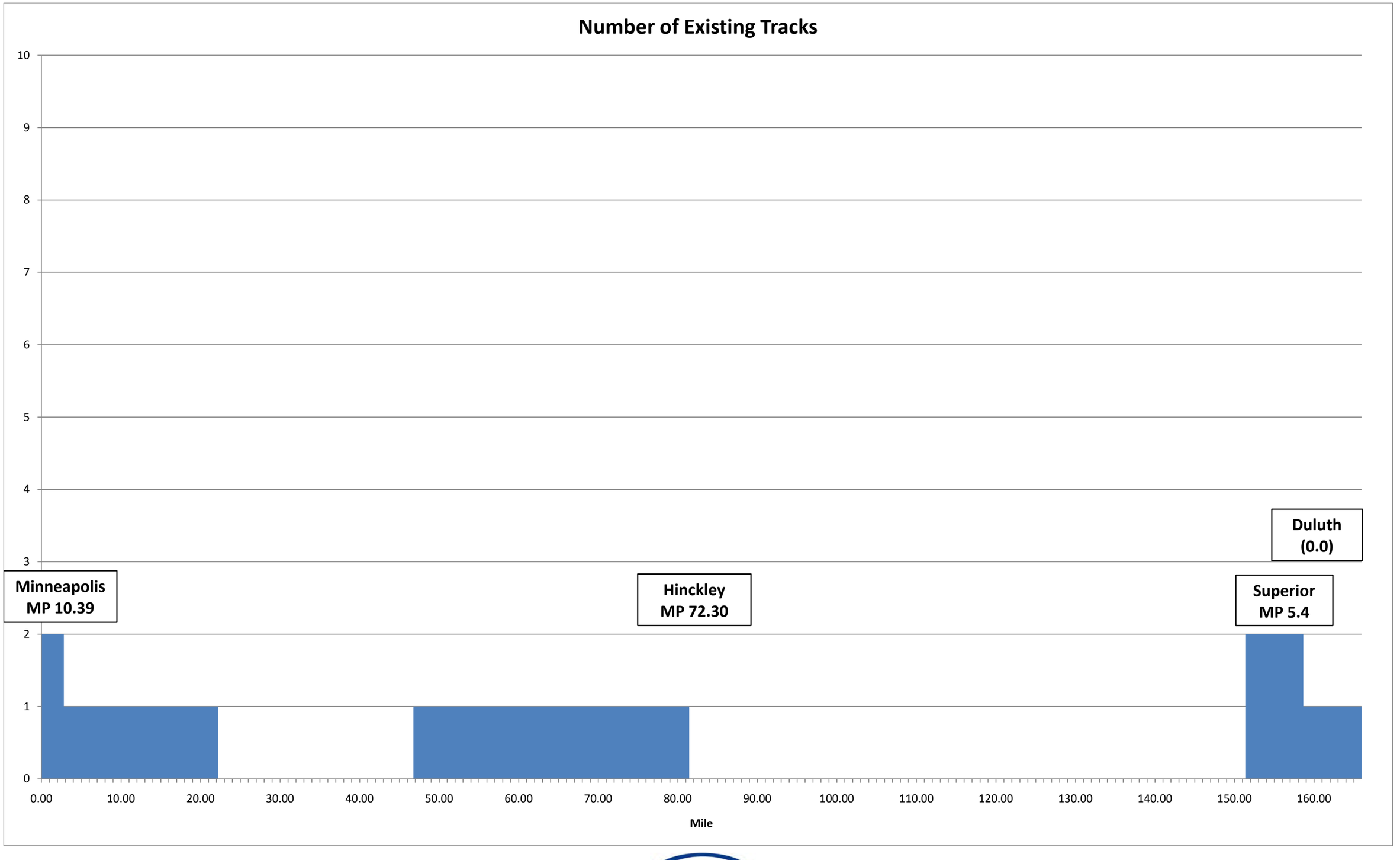
Route #10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Duluth
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Superior
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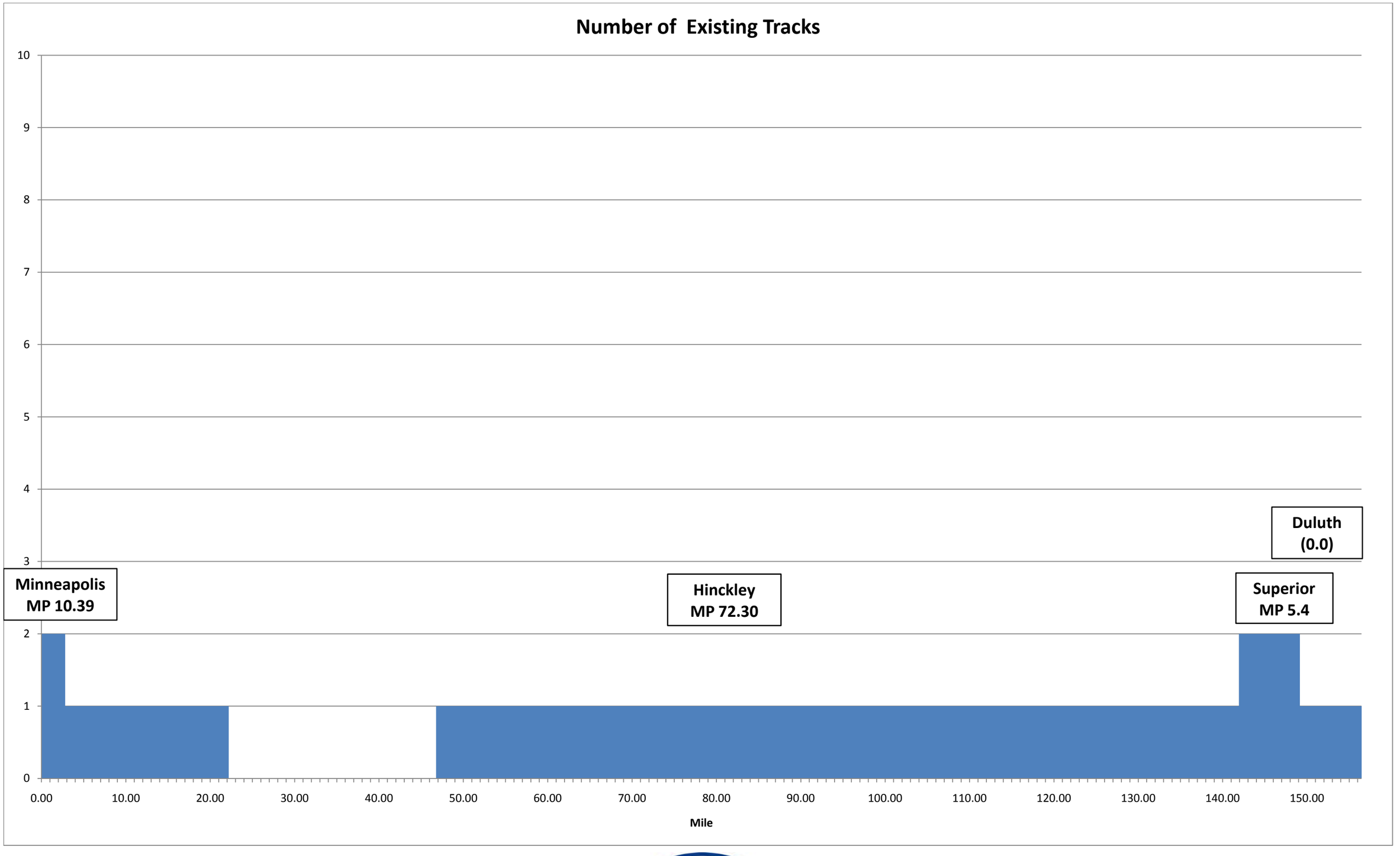
Route #11


Number of Existing Tracks
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Hinckley
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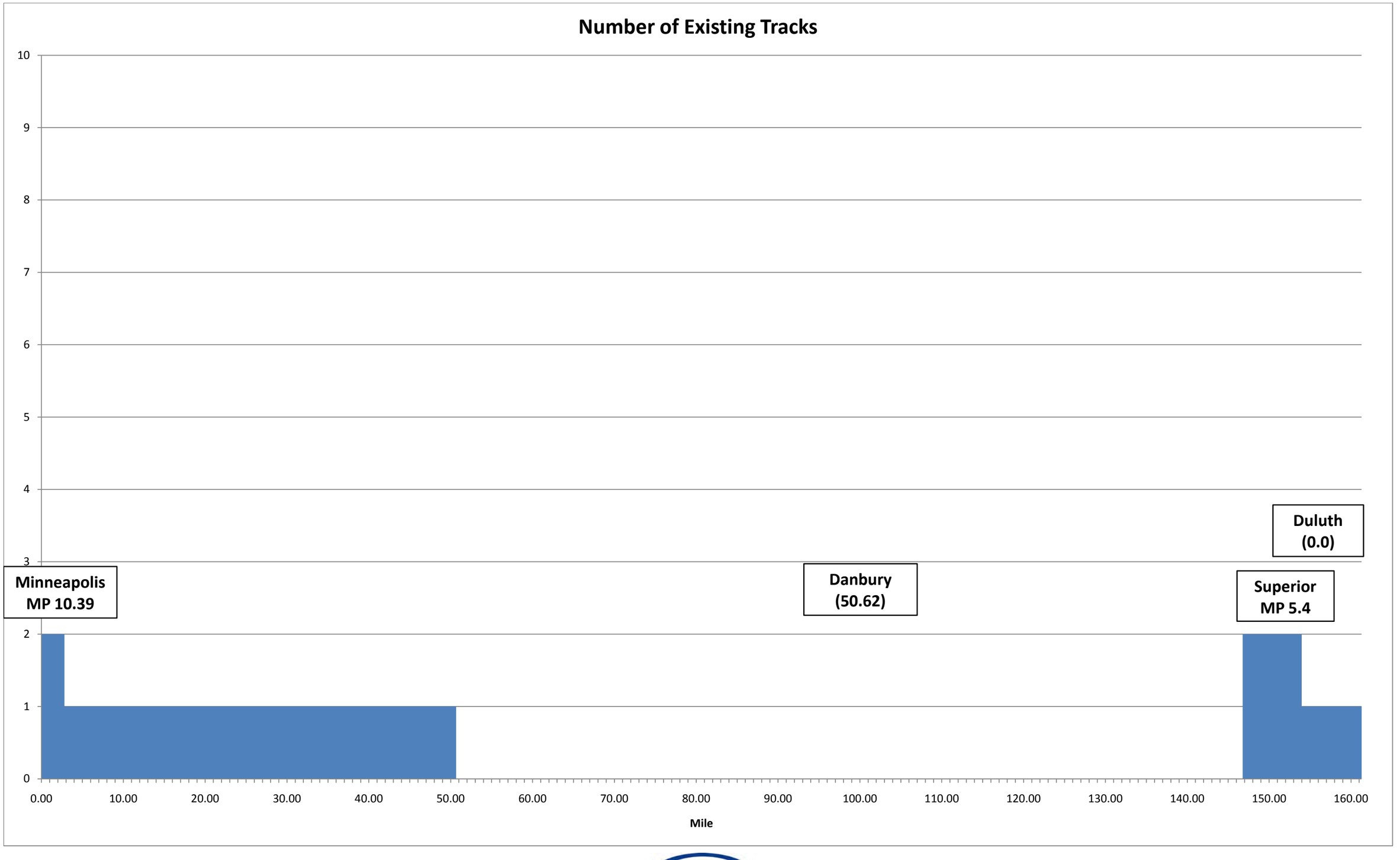
Route #12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Danbury
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Superior
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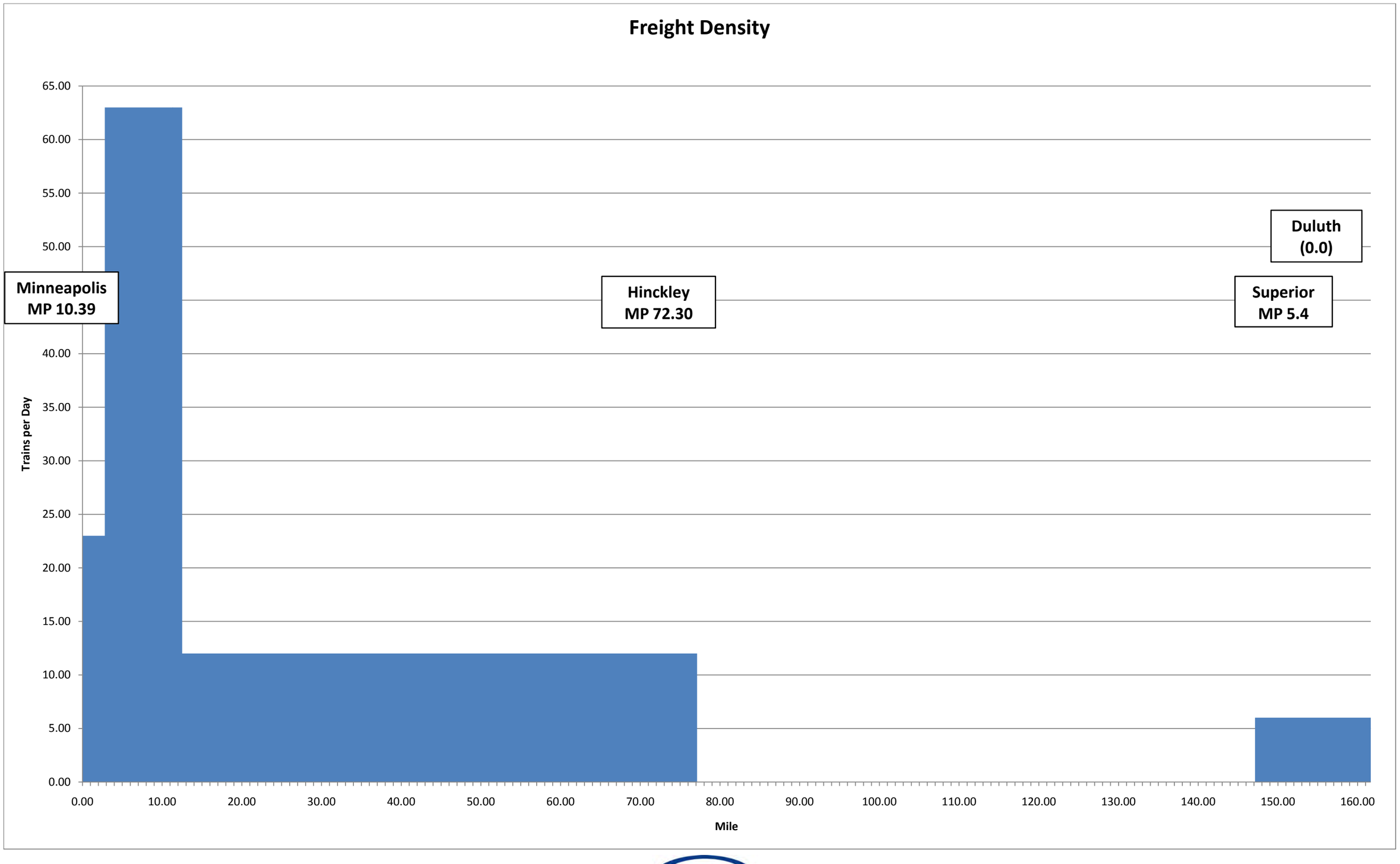
Route #8


Freight Density
Trains per Day
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Minneapolis
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Hinckley
MP 72.30
Duluth
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Superior
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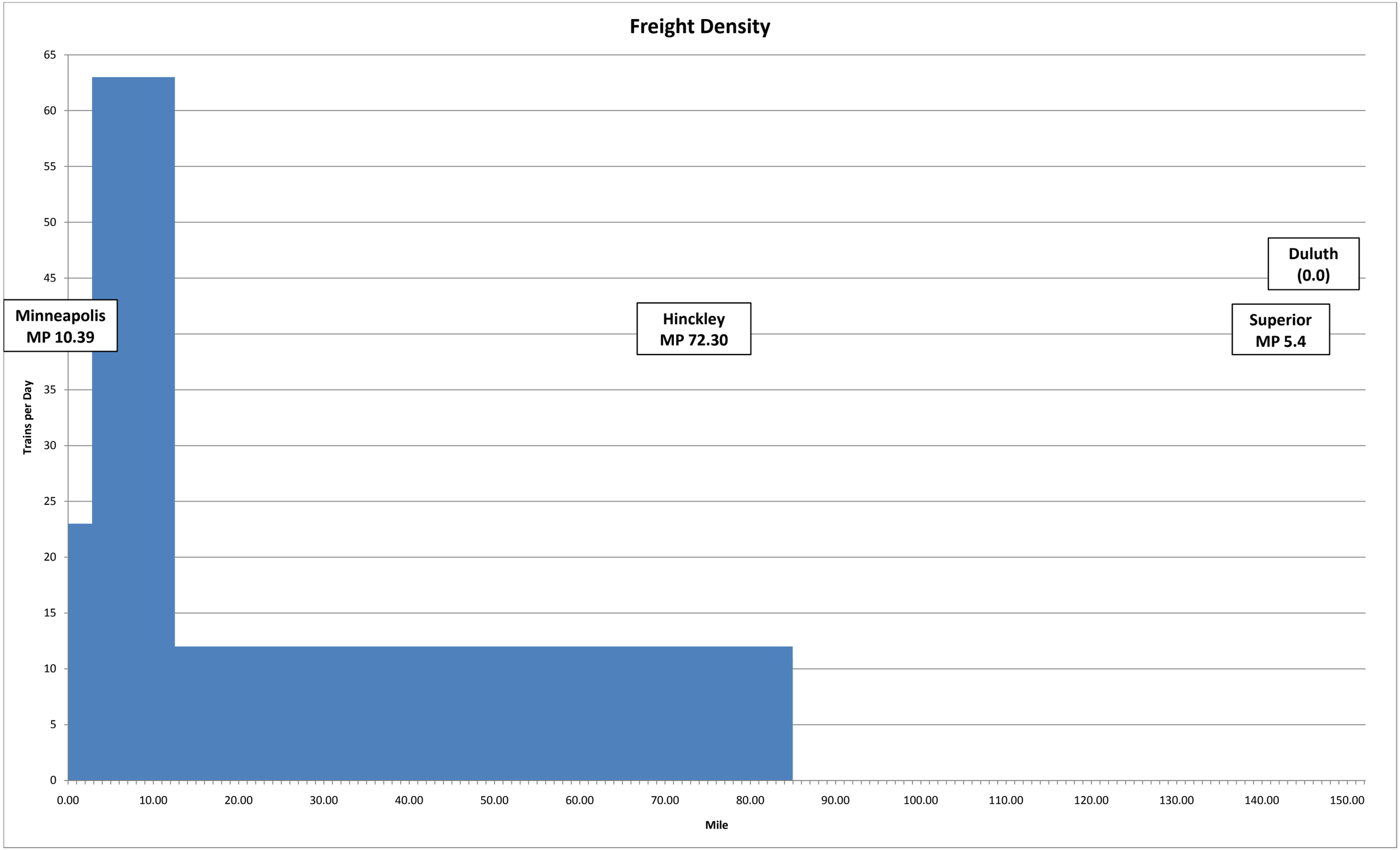
Route #9


Freight Density
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Trains per Day
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MP 10.39
Hinckley
MP 72.30
Duluth
(0.0)
Superior
MP 5.4
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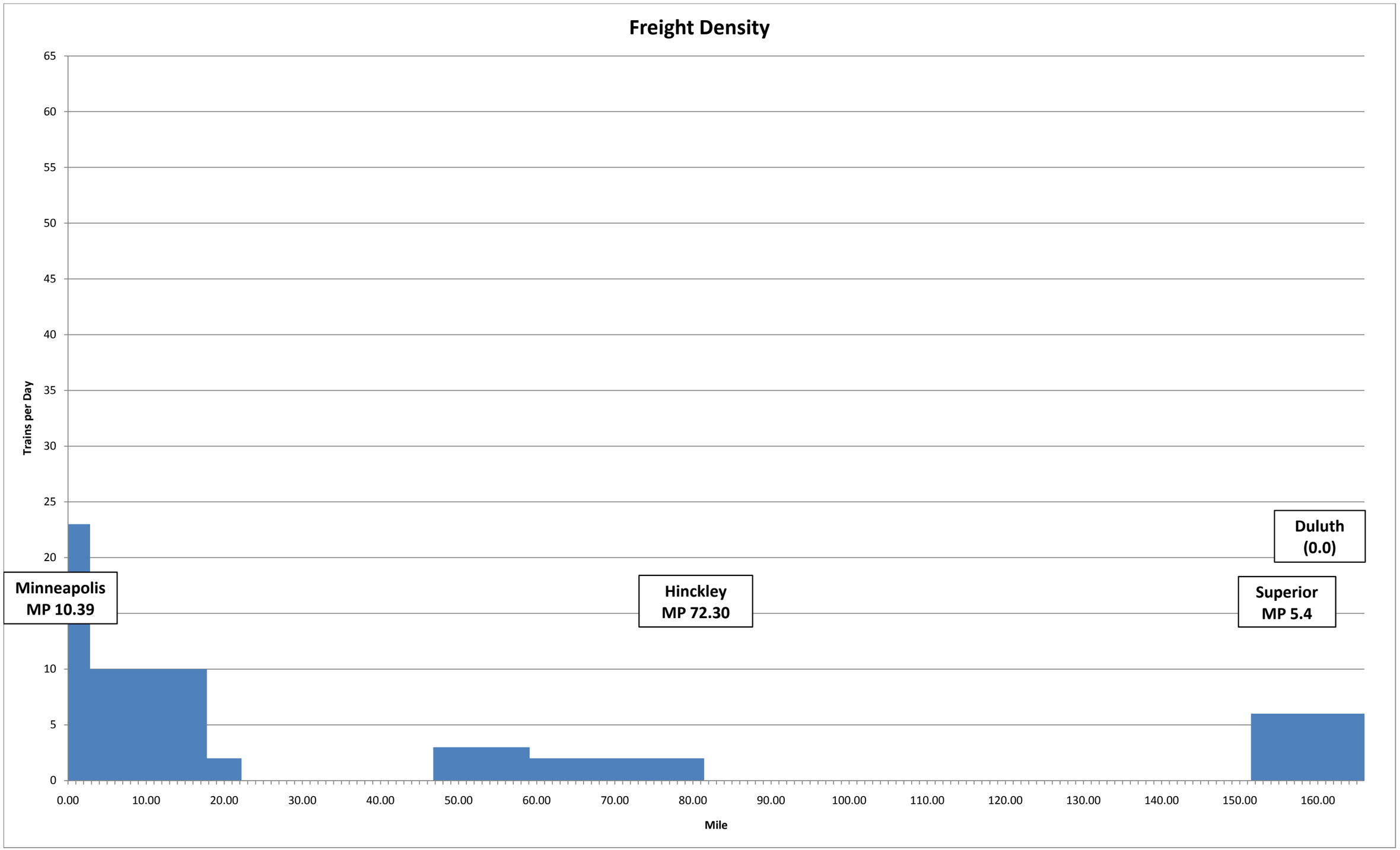
Route #10


Freight Density
Trains per Day
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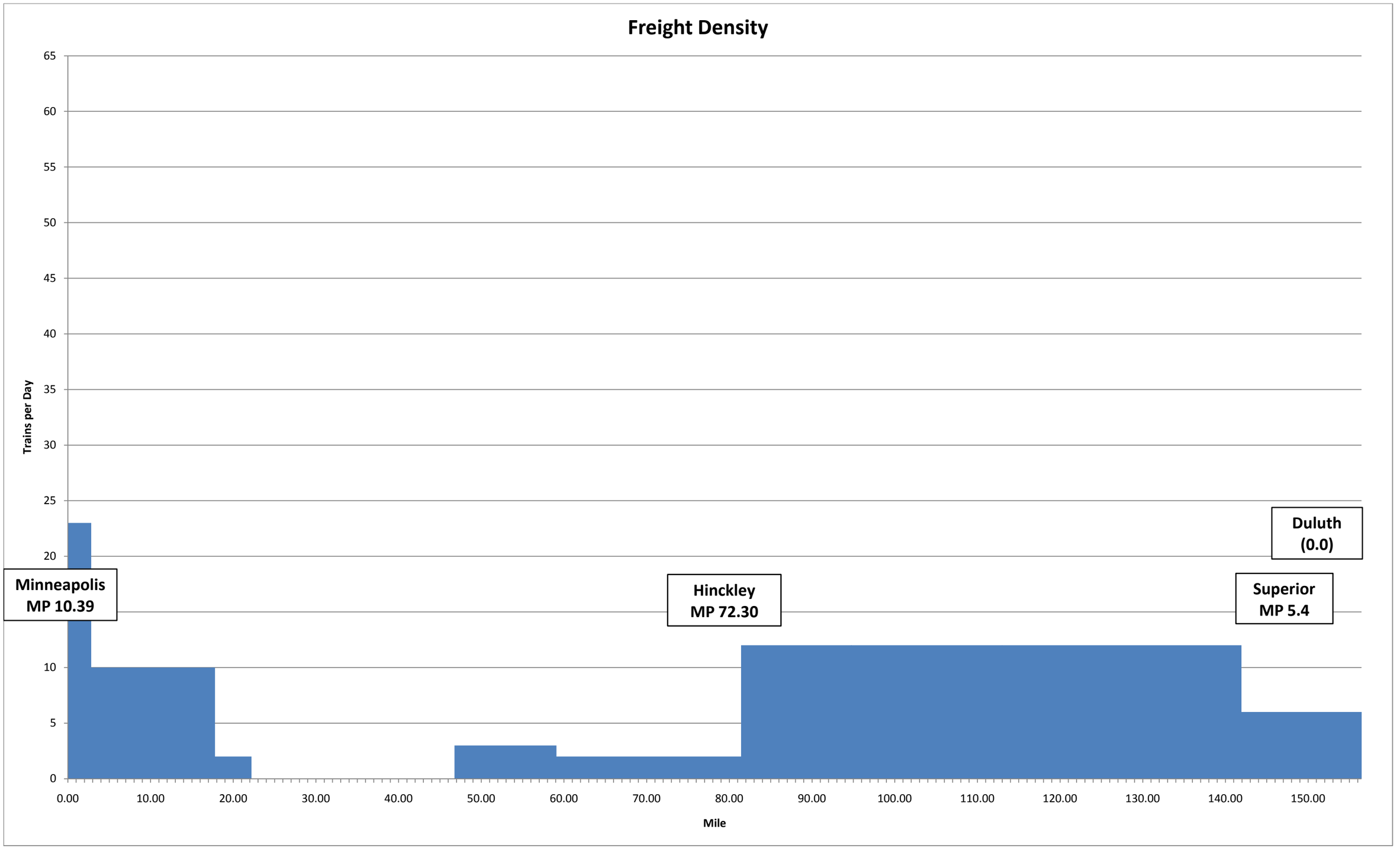
Mile
Minneapolis
MP 10.39
Hinckley
MP 72.30
Duluth
(0.0)
Superior
MP 5.4

Route #11


Freight Density
Trains per Day
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Mile
Minneapolis
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Hinckley
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Duluth
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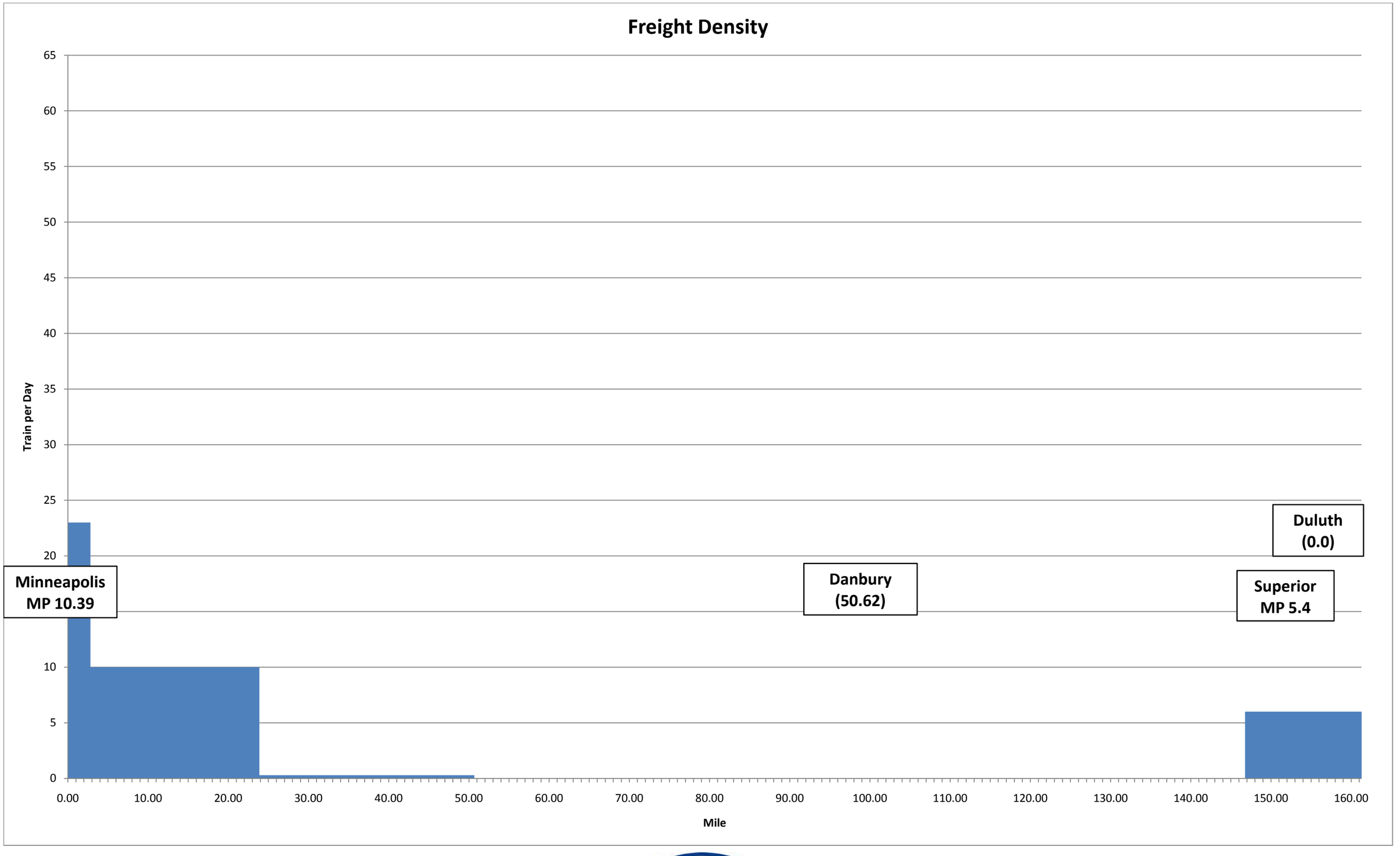
Superior
MP 5.4

Route #12


Freight Density
Train per Day
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70.00
80.00
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100.00
110.00
120.00
130.00
140.00
150.00
160.00
Mile
Minneapolis
MP 10.39
Danbury
(50.62)
Duluth
(0.0)
Superior
MP 5.4

Route #8

TRAIN PERFORMANCE

ACCELERATION:

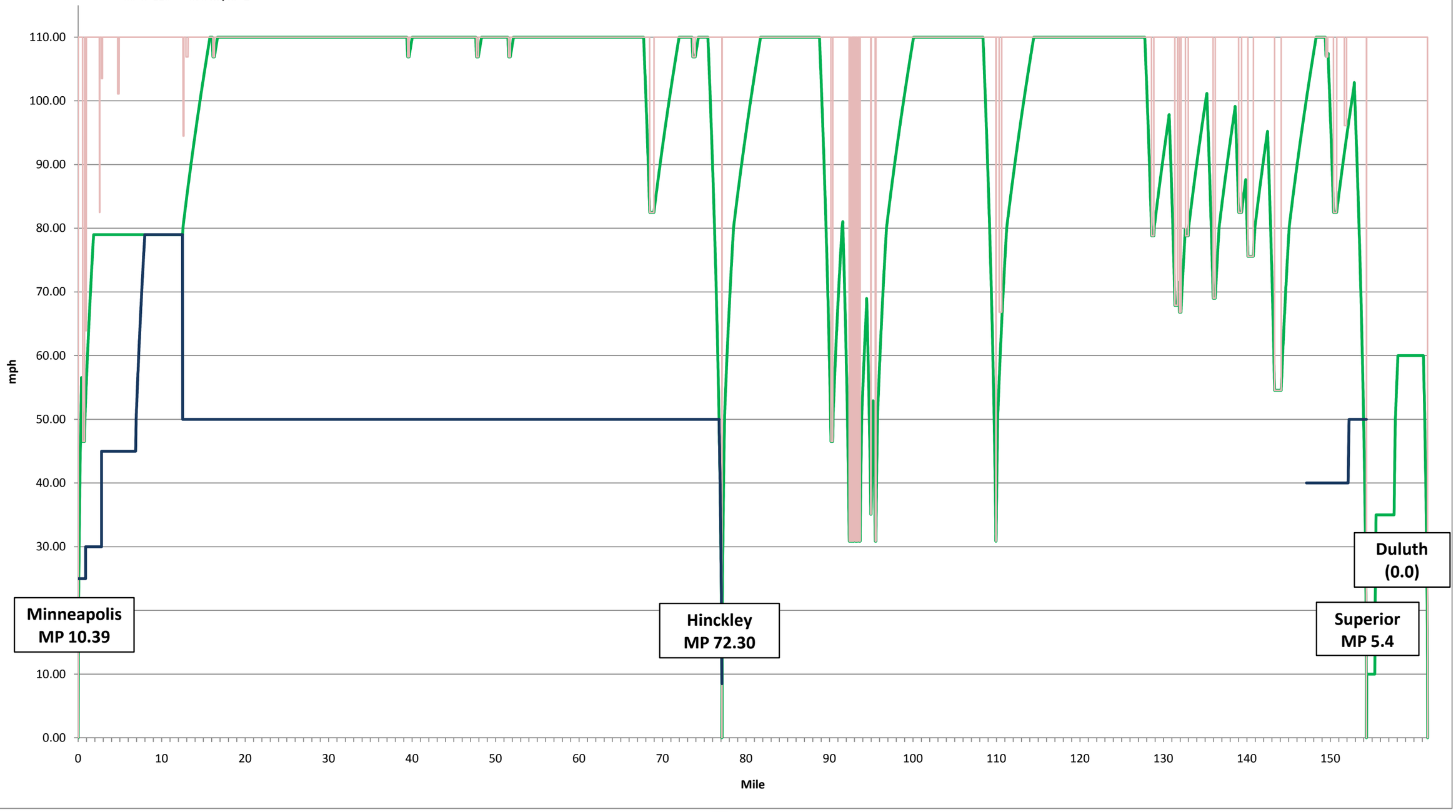
0<x<50	**4000 mi/hr^2**
50<x<80	**1800 mi/hr^2**
80<x<110	**878 mi/hr^2**

DECELERATION:
-3600 mi/hr^2

Passenger Speed Profile

TPC Speed — Max Speed through Curve — Existing Speed Limits

TPC TRAVEL TIME: 2 hrs 8 min
(Two minutes allotted per intermediate station stop)



QUANDEL

Route #9

TRAIN PERFORMANCE

ACCELERATION:

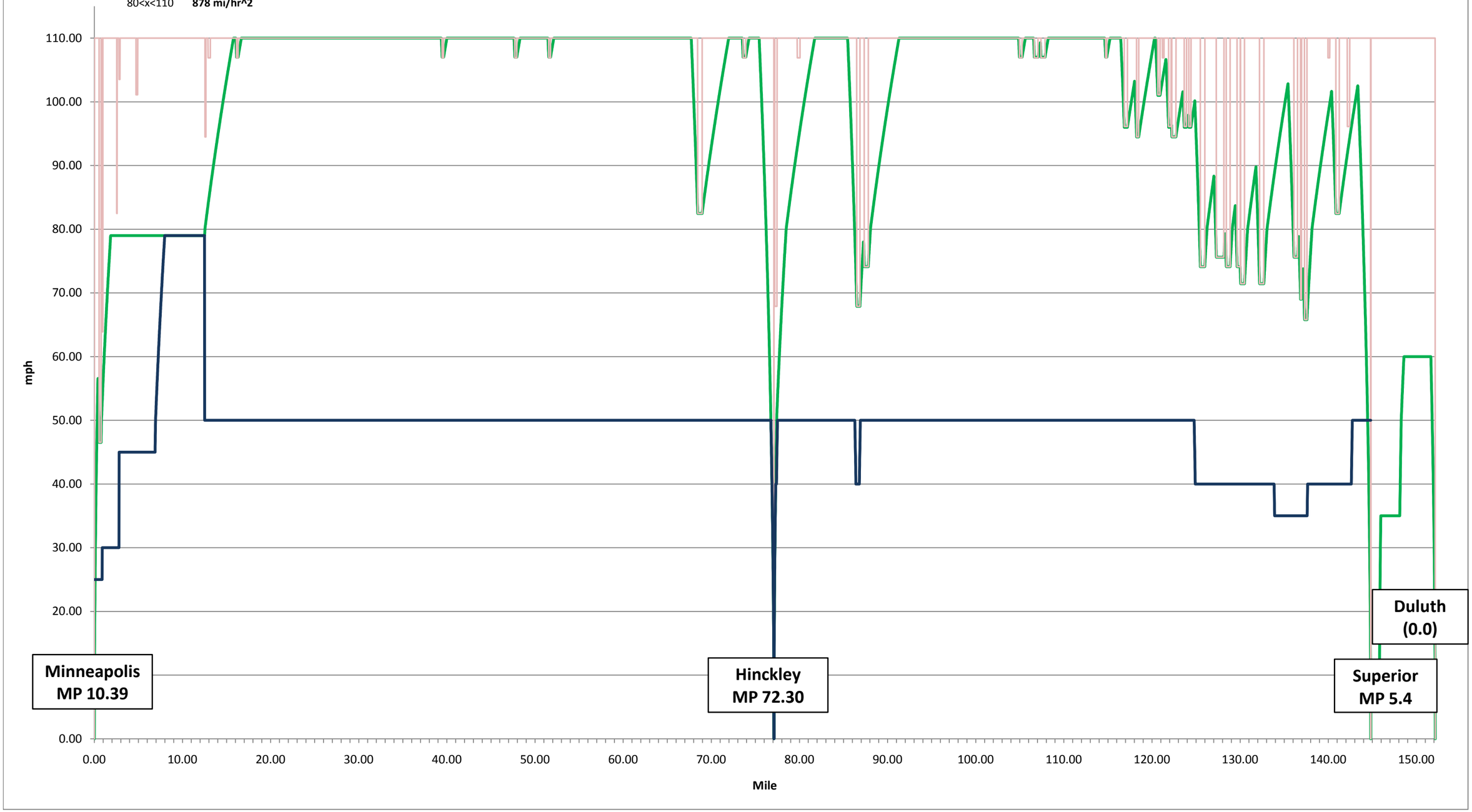
0<x<50	**4000 mi/hr^2**
50<x<80	**1800 mi/hr^2**
80<x<110	**878 mi/hr^2**

DECELERATION:
-3600 mi/hr^2

Passenger Speed Profile

TPC Speed — Max Speed through Curve — Existing Speed Limit

TPC TRAVEL TIME: 1 hrs 56 min
(Two minutes allotted per intermediate station stop)



QUANDEL

Route #10

TRAIN PERFORMANCE

ACCELERATION:

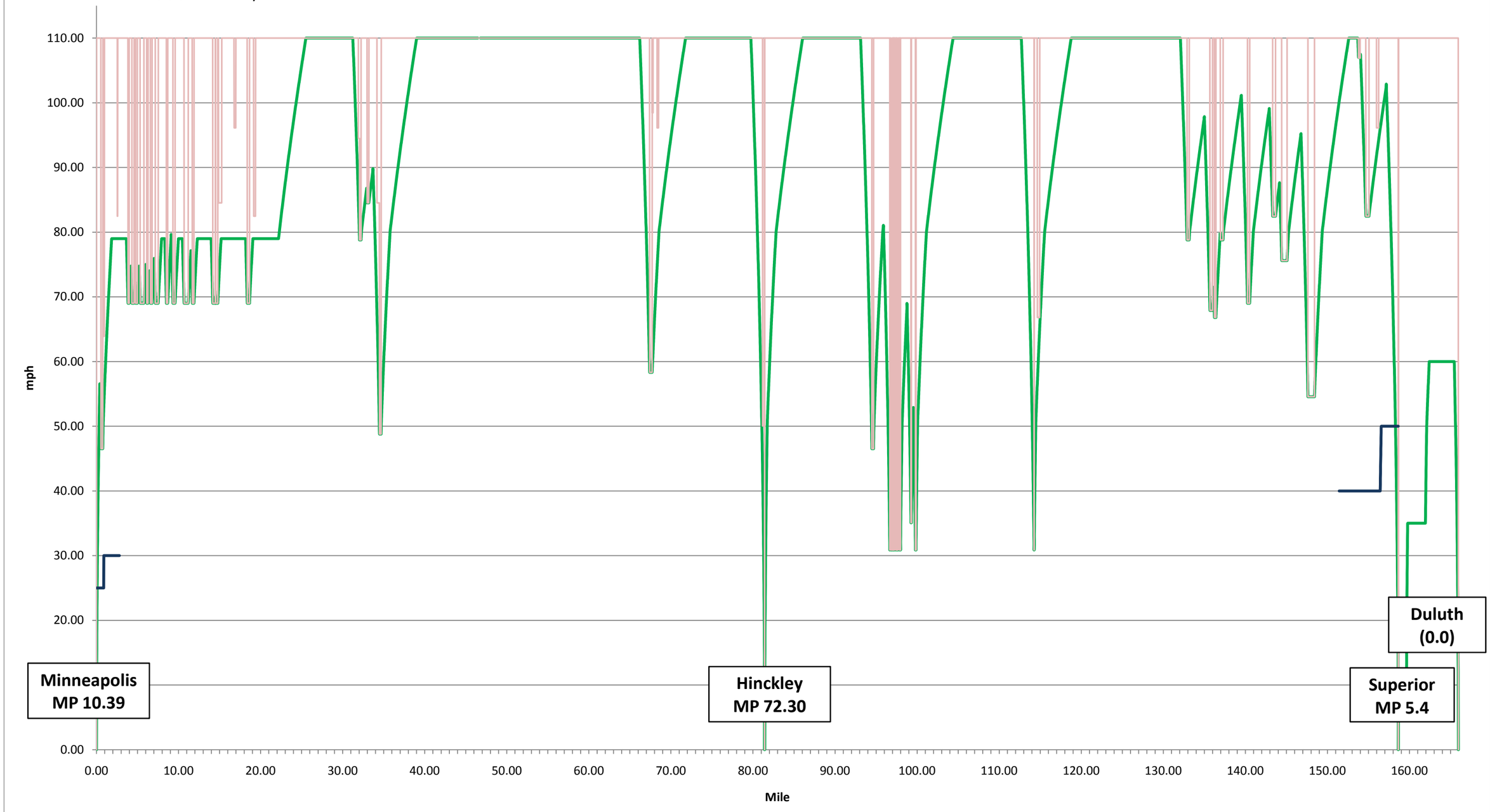
0<x<50	**4000 mi/hr^2**
50<x<80	**1800 mi/hr^2**
80<x<110	**878 mi/hr^2**

DECELERATION:
-3600 mi/hr^2

Passenger Speed Profile

TPC Speed — Max Speed through Curve — Existing Speed Limit

TPC TRAVEL TIME: 2 hrs 15 min
(Two minutes allotted per intermediate station stop)



Route #11

TRAIN PERFORMANCE

ACCELERATION:

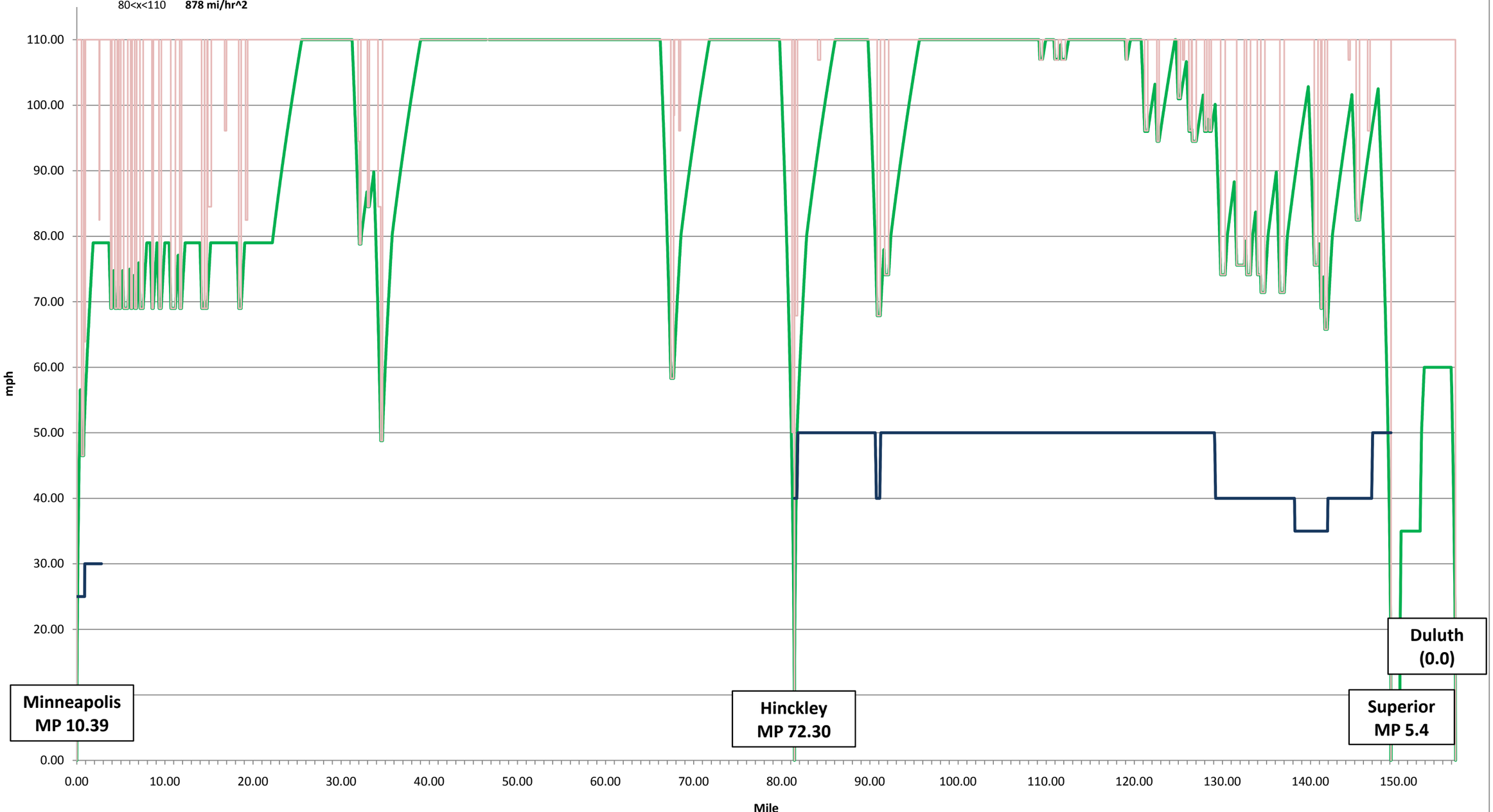
0<x<50	**4000 mi/hr^2**
50<x<80	**1800 mi/hr^2**
80<x<110	**878 mi/hr^2**

DECELERATION:
-3600 mi/hr^2

Passenger Speed Profile

TPC Speed — Max Speed through Curve — Existing Speed Limit

TPC TRAVEL TIME: 2 hrs 4 min
(Two minutes allotted per intermediate station stop)



QUANDEL

Route #12

TRAIN PERFORMANCE

ACCELERATION:

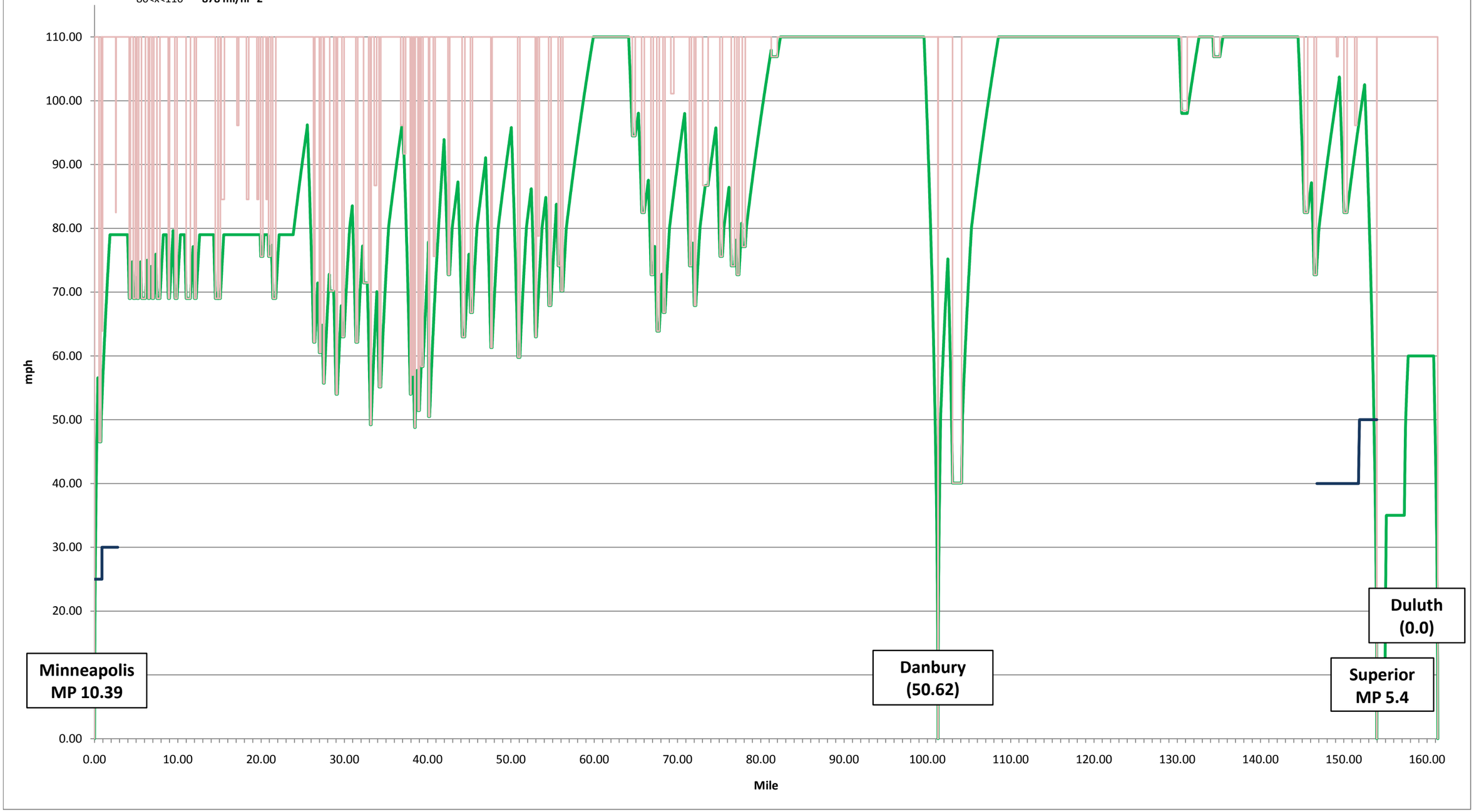
0<x<50	**4000 mi/hr^2**
50<x<80	**1800 mi/hr^2**
80<x<110	**878 mi/hr^2**

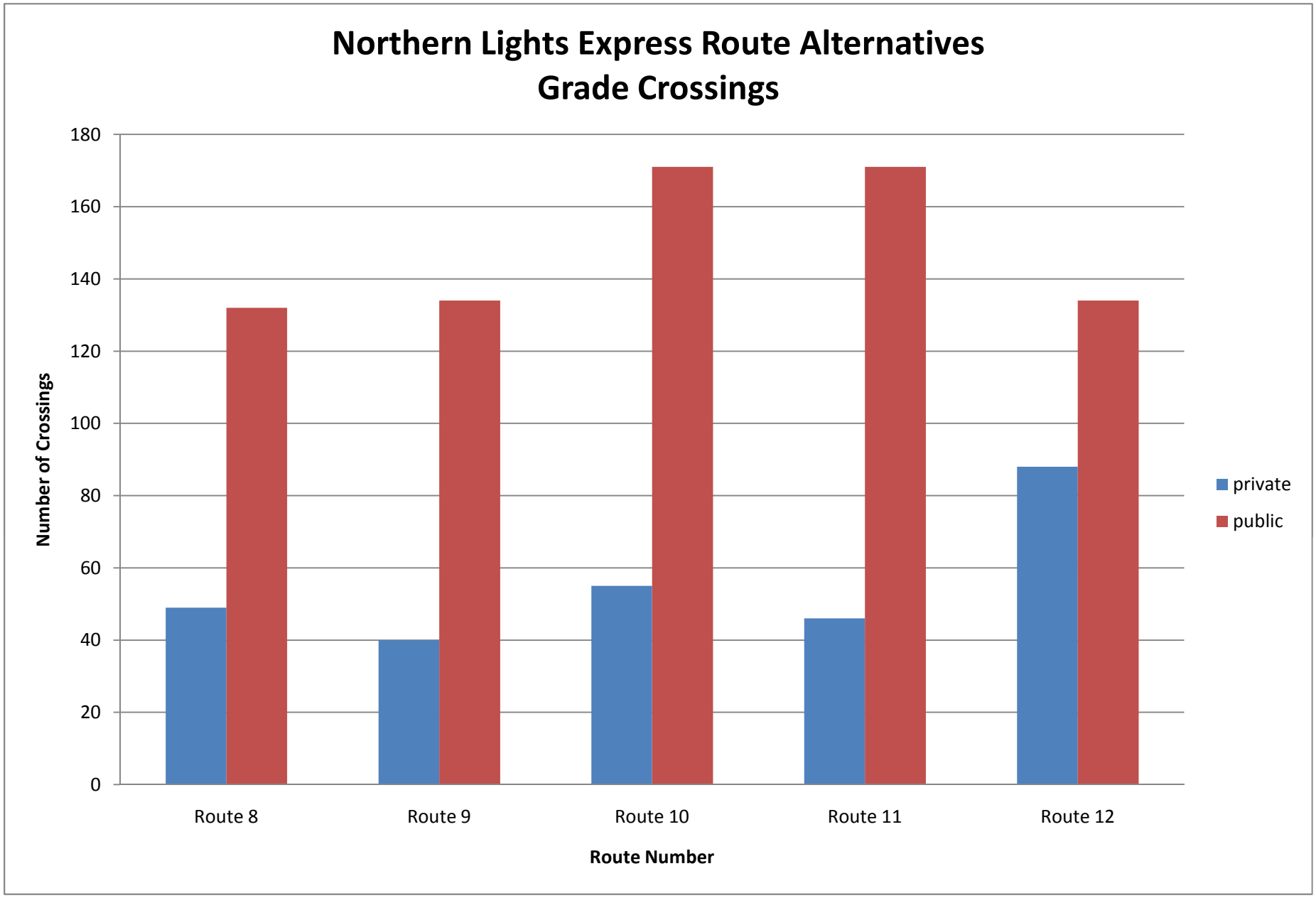
DECELERATION:
-3600 mi/hr^2

Passenger Speed Profile

TPC Speed — Max Speed through Curve — Existing Speed Limit

TPC TRAVEL TIME: 2 hrs 16 min
(Two minutes allotted per intermediate station stop)




Northern Lights Express Route Alternatives
Grade Crossings
Number of Crossings
180
160
140
120
100
80
60
40
20
0
Route 8
Route 9
Route 10
Route 11
Route 12
Route Number
private
public

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Fax: (312) 346-9603
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www.quandel.com

Technical Memorandum

Subject:	**Minnesota Northern Lights Express Project** **Alternatives Analysis – Level 1, Step 3 Screening** **Technical Memorandum 4 – Intermodal Stations**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**November 20, 2009**

Purpose

This technical memorandum provides information to the participants of the engineering planning charrette or interactive workshop on intermodal terminal/station opportunities for the five routes that remain in the Minneapolis-Duluth/Superior Northern Lights Express (NLX) Alternatives Analysis.

Intermodal Stations

1. *Minneapolis/St. Paul Region*

Two sites in the cities of Minneapolis and St. Paul region are identified as possible intermodal sites that could serve the NLX.

1.1 Minneapolis Downtown Intermodal Station

A new intermodal station is planned in downtown Minneapolis near the new Target Field. This future multimodal transit station will be located adjacent and just north of the new Twins Target Field ball park on 5th St. between 3rd Avenue and 5th Avenue and is planned to accommodate other modes of transportation, including taxi, pedestrian, bicycle, and integration of the nearby bus network. Currently this location is near the confluence of several transit lines operated by Twin Cities Metro Transit, including:

- *The Northstar Commuter Rail line* – the Northstar commuter rail line extends from its southern terminus in downtown Minneapolis forty miles north/northwest toward Big Lake, MN. The Northstar is scheduled to begin service in November 2009, and will make six weekday trips per day in each direction[1].
- *The Hiawatha Light Rail Line* - The Hiawatha line extends south from downtown Minneapolis, with seventeen stops between downtown and the Mall of America, including both the Lindbergh and the Humphrey terminals at Minneapolis St Paul International Airport. A recent northern extension moves the northern terminus of the Hiawatha to a new station near the Minneapolis Downtown Intermodal Station, adjacent to the Northstar commuter rail line station[2].
- *Twin Cities Metro Transit Bus Service* - The existing Ramp B/5th Street transit center is located less than two blocks from the Intermodal Station, and provides bus service as part of the overall Metro Transit Bus Service. Additional bus service is also planned as part of the future build-out of the station[2].

Each of the five remaining routes has direct access to this intermodal station via the double-track BNSF Wayzata Subdivision. The Wayzata Subdivision connects to the BNSF Midway subdivision via a wye track at Minneapolis Junction, approximately 1.5 miles west of the Intermodal Station. At Minneapolis Junction, all five routes proceed north on the Midway subdivision, sharing the same track right-of-way as the North Star.

The TEMS Feasibility Study and a 2008 downtown intermodal station study by Hennepin County discussed the use of the Minneapolis downtown Intermodal Station as the southern terminal of the NLX.

1.2 St. Paul's Union Depot

The Ramsey County Regional Rail Authority is planning to develop a multimodal transit hub at the existing St. Paul Union Depot in downtown St. Paul. As described on the county's website, Union Depot would serve as a stop on the future Rush Line and the Red Rock commuter rail lines, and on the future Central Corridor light rail line that will connect downtown Minneapolis and St. Paul. The Eastern end of the Central Corridor line will share stations with the Hiawatha line's five stations on its western end, which includes the Minneapolis downtown Intermodal Station.

Plans call for the use of Union Depot as an Amtrak stop on Amtrak's Empire Builder service that runs daily service between Chicago and Seattle. Union Depot is also used as the endpoint on the Chicago-Madison-St. Paul route as part of the Midwest Regional Rail System. Union Depot also proposes to service Greyhound and Jefferson Lines intercity buses, and Metro Transit regional buses.

[1] http://www.northstartrain.org/
[2] http://metrotransit.org/

The five remaining routes under consideration can connect to the St Paul Union Depot.

1.3 Metropolitan Airports

Minneapolis-St. Paul International Airport (MSP) is located approximately 12 miles south of downtown St. Paul. Intermodal connections to and from Minneapolis-St. Paul International Airport (MSP) are provided by private ground transportation. Light rail transit via the Hiawatha line provides service to downtown Minneapolis. No existing freight track or track right-of-way connects the airport with downtown Minneapolis or St. Paul.

The Metropolitan Airports Commission (MAC), a public corporation of the state of Minnesota, also operates six 'reliever' airports in the Minneapolis-St. Paul metro area to help relieve congestion at MSP. Of these, only the St. Paul Downtown Holman Field airport had more than 500 enplanements in 2008[3]. Holman Field is located east of downtown St. Paul on the south bank of the Mississippi River, and does not have any direct access to existing rail lines.

2. *Minneapolis/St. Paul – Duluth Corridor*

No major intermodal facilities currently exist in the corridor. Amtrak and Greyhound service several towns in the Minneapolis/St. Paul - Duluth corridor, including North Branch, Rush City, Pine City, Hinckley, Moose Lake, Sandstone, and Cloquet. All these cities and towns are located adjacent to Interstate 35 that connects Minneapolis/St. Paul with Duluth.

Amtrak provides shuttle service from the St. Paul Midway Station to Duluth as an extension of its Empire Builder service, with intermediate stops in Cloquet, MN and Sandstone, MN. Other than service between Minneapolis/St. Paul and Duluth within the I-35 corridor, no other transportation providers provide frequent transit service that connects transit riders to destinations outside of the corridor.

Routes 10 and 11 parallel I-35 to the west between St. Paul and Hinckley, adjacent to the west by approximately 1 mile. North of Hinckley into Duluth, Routes 9 and 11 parallel I-35 to the west, adjacent by approximately 2-3 miles. Cities and towns located along the I-35 corridor are the only likely candidates outside the Minneapolis/St. Paul and Duluth metropolitan areas that could serve new multimodal transit stations that would complement a passenger rail line.

3. *Duluth/Superior Region*

No major passenger intermodal stations existing in Duluth metropolitan area. Transit Service in the region is provided by the Duluth Transit Authority, which provides bus service within Duluth and the surrounding area, including Superior, WI. A majority of these bus routes run through the downtown

[3] http://www.faa.gov/

Duluth Central Business District, where the Duluth Union Depot is located. Greyhound and Amtrak shuttle bus service serve Duluth/Superior with one station stop 3.5 miles south of the downtown Duluth Central Business District.

All five of the Step 3 route alternatives enter the Duluth/Superior region from the south via BNSF tracks into Superior. For each of these routes, access into Duluth is via the BNSF and Canadian National lines that parallel St. Louis Bay to the north and proceed into downtown. The Duluth International Airport needs to be studied as a potential intermodal connection to the high speed rail system. The selection of the routing of high speed passenger rail service into the Duluth-Superior area will be undertaken in subsequent tasks.

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www.quandel.com

Technical Memorandum

Subject:	**Technical Memorandum 5 – Ridership Potential** **Minnesota Northern Lights Express Project** **Alternatives Analysis – Level 1, Step 3 Screening**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**November 20, 2009**

Purpose

This technical memorandum provides population information to the participants of the engineering planning charrette or interactive workshop for the five routes that remain in the Minneapolis-Duluth/Superior Northern Lights Express (NLX) Alternatives Analysis.

Population and Ridership Potential

A reasonable assumption for estimating ridership is that potential ridership in a passenger rail corridor is directly related to the population within the service area. Based on this assumption, route populations were calculated for each route alternative using GIS software and US census data from the year 2000. The route populations for each route include cities and towns within a 20-mile band of each route, and within a 20 mile radius of each of the terminal stations in Minneapolis and Duluth. As described in Technical Memorandum 2, the terminal stations used for this analysis are the Minneapolis downtown Intermodal Station, and the Duluth Union Depot. These terminal stations were identified in the 2007 TEMS Inc. report 'Minneapolis-Duluth/Superior Restoration of Intercity Passenger Rail Service' (the 'TEMS Feasibility Study'). Maps depicting these population bands for each of these route alternatives are shown in Appendix A.

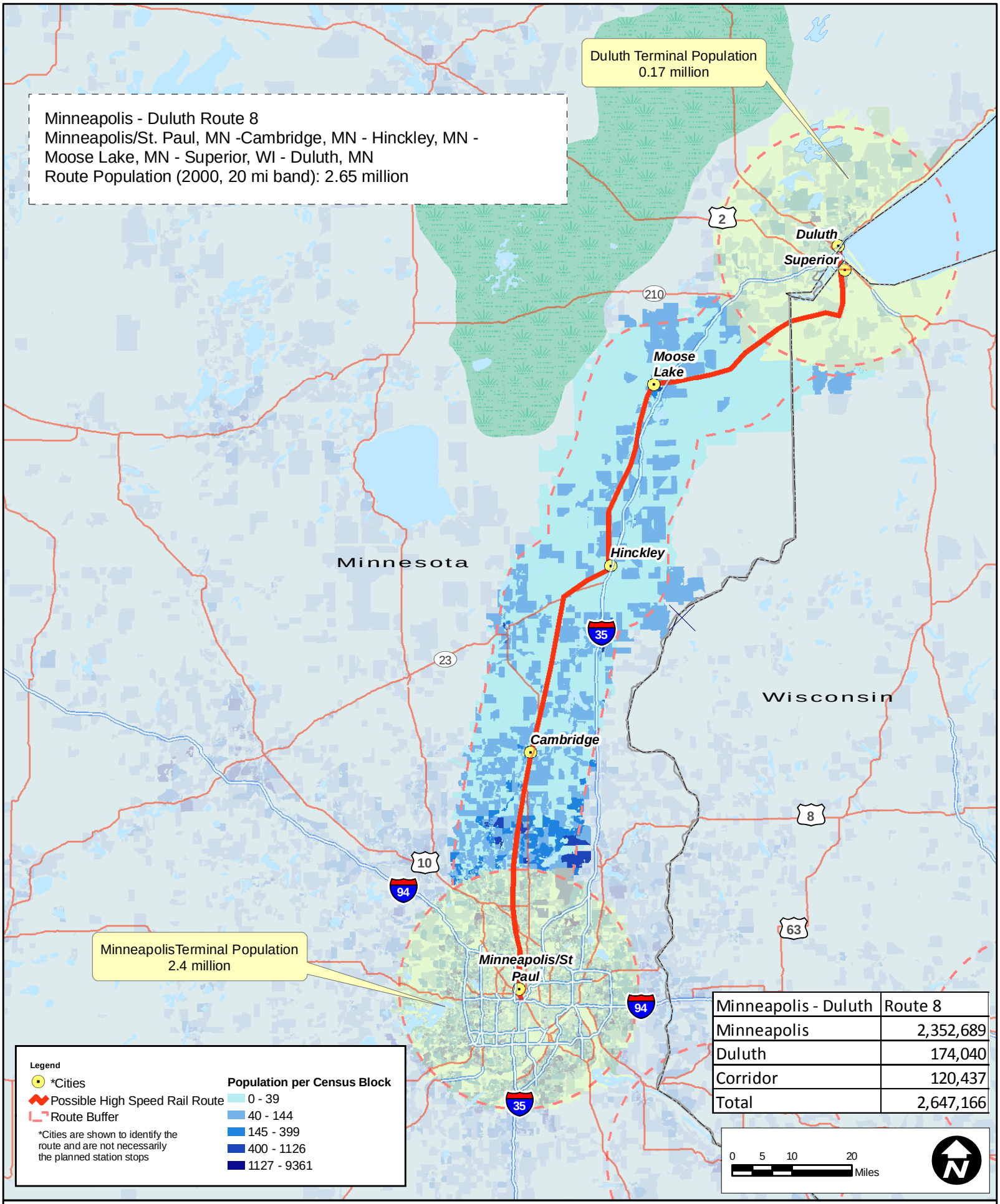
As shown in Table 1, the populations in the Greater Minneapolis/St. Paul and Duluth regions make up more the 95% of the corridor populations of each of the five remaining route alternatives. Population differences among each of the corridors are relatively small. The difference between the most and least populous routes is 12,273, which represents less than 1% of any route total.

Table 1 – Population Breakdown of Route Alternatives

	Route 8	Route 9	Route 10	Route 11	Route 12
Greater Minneapolis/St. Paul Population	2,352,689	2,352,689	2,352,689	2,352,689	2,352,689
Greater Duluth Population	174,040	174,040	174,040	174,040	174,040
Corridor Population	120,437	115,382	127,230	119,623	114,957
Corridor Population as Percentage of Route Total	4.55%	4.37%	4.79%	4.52%	4.35%
Minneapolis/St. Paul and Duluth Regions as Percentage of Route Total	95.45%	95.63%	95.21%	95.48%	95.65%

Appendix A

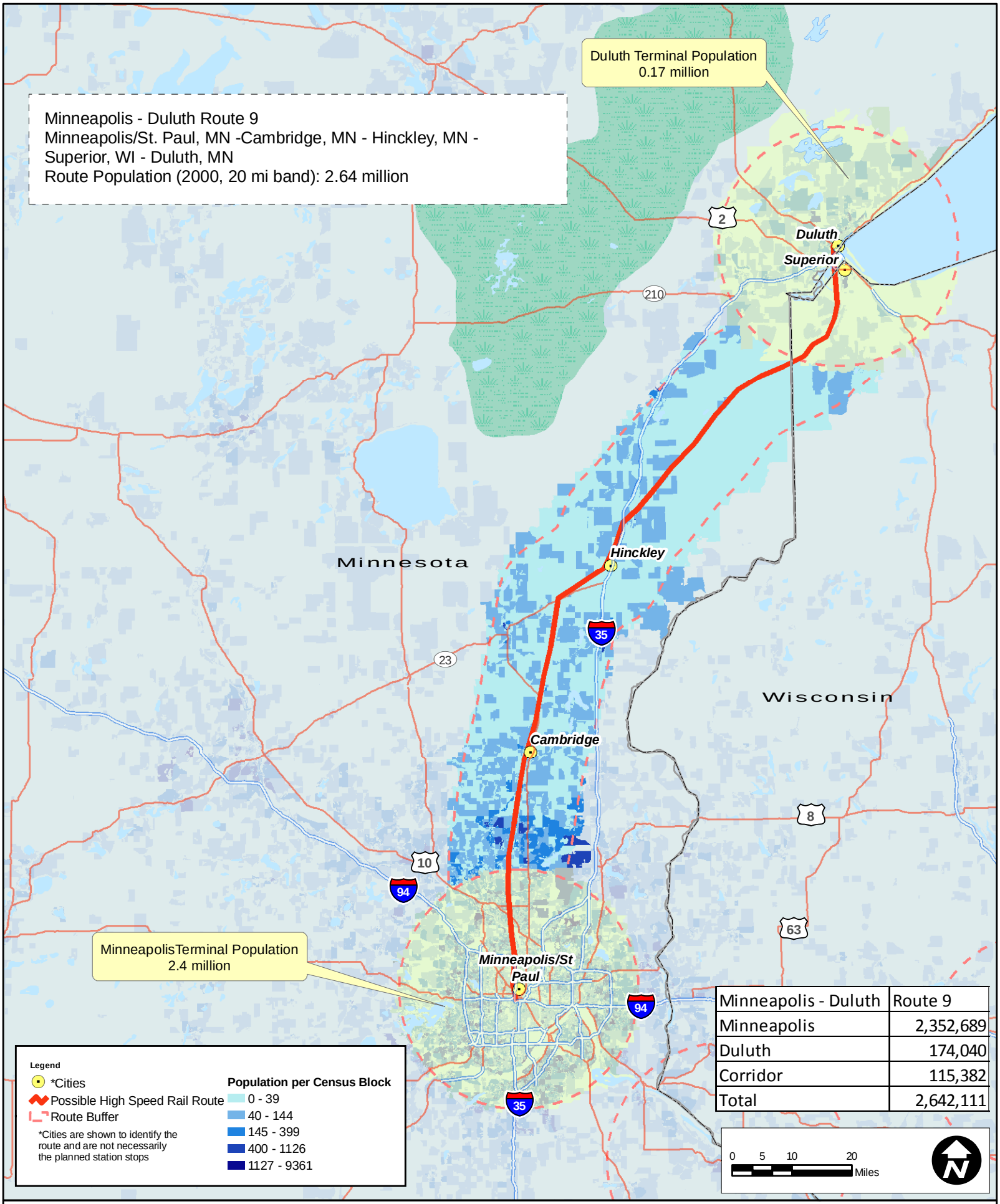
Corridor Populations of Route Alternatives



Minneapolis - Duluth	Route 8
Minneapolis	2,352,689
Duluth	174,040
Corridor	120,437
Total	2,647,166

Northern Light Express Alternatives Analysis

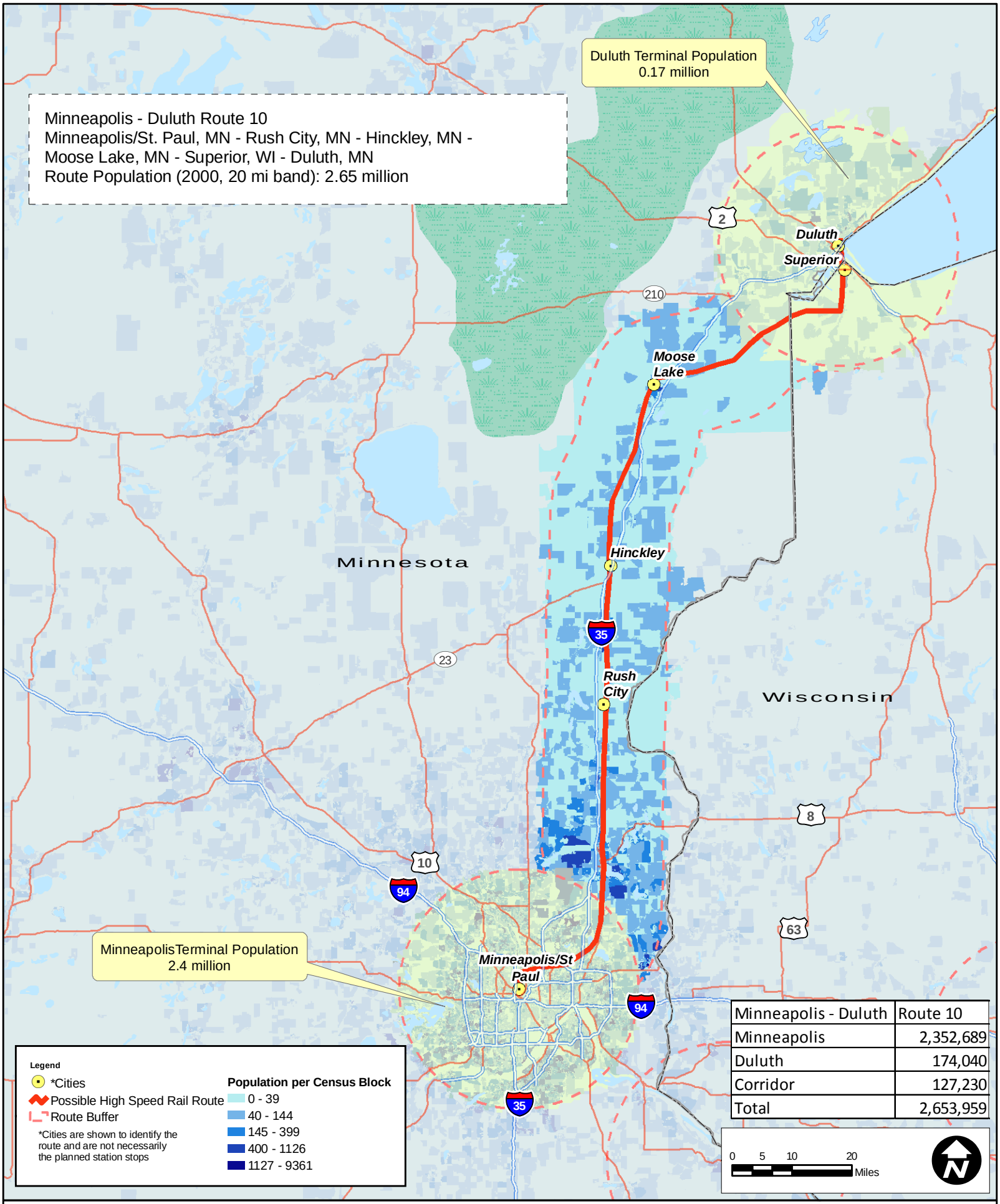
Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 9
Minneapolis	2,352,689
Duluth	174,040
Corridor	115,382
Total	2,642,111

Northern Light Express Alternatives Analysis

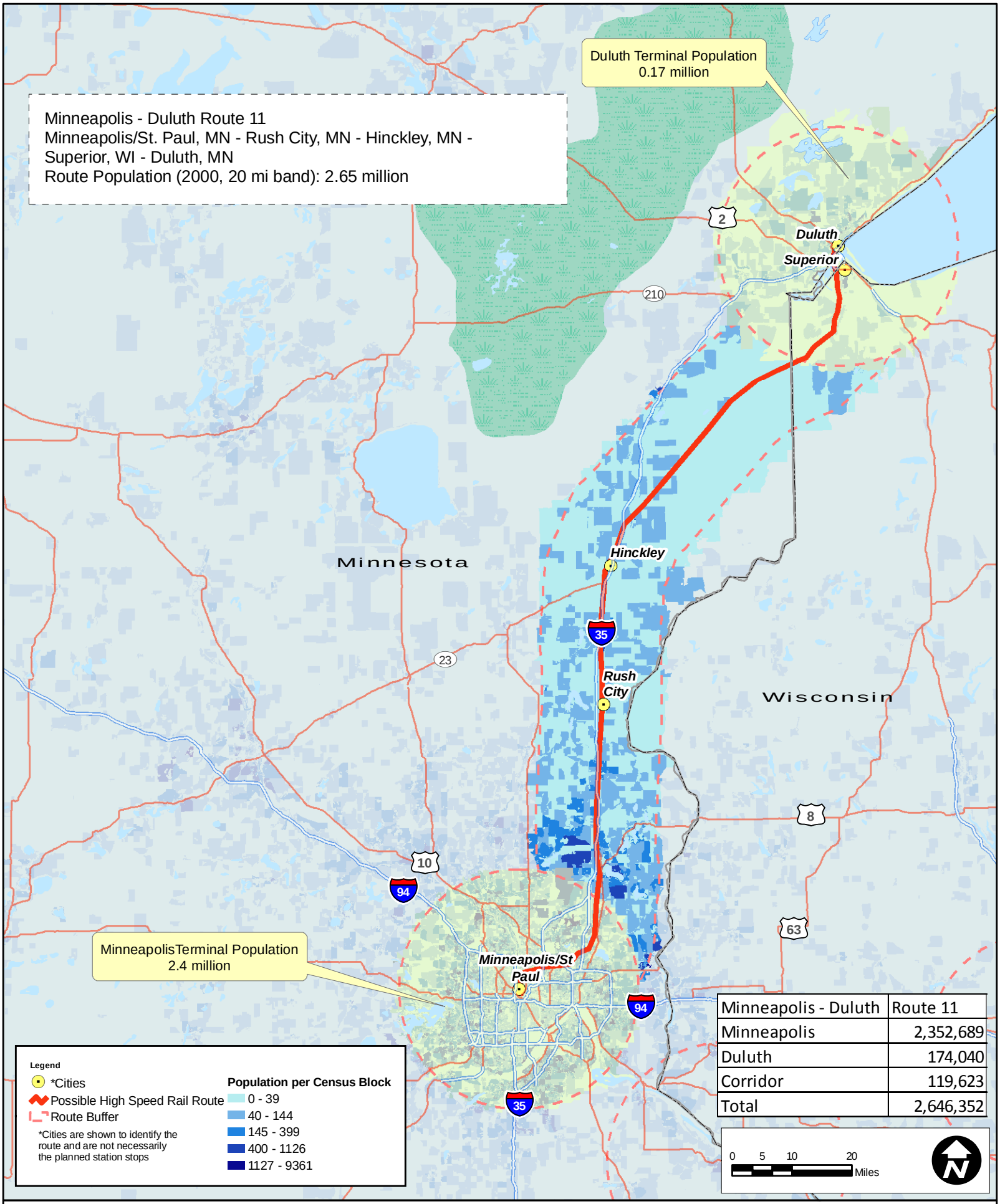
Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 10
Minneapolis	2,352,689
Duluth	174,040
Corridor	127,230
Total	2,653,959

Northern Light Express Alternatives Analysis

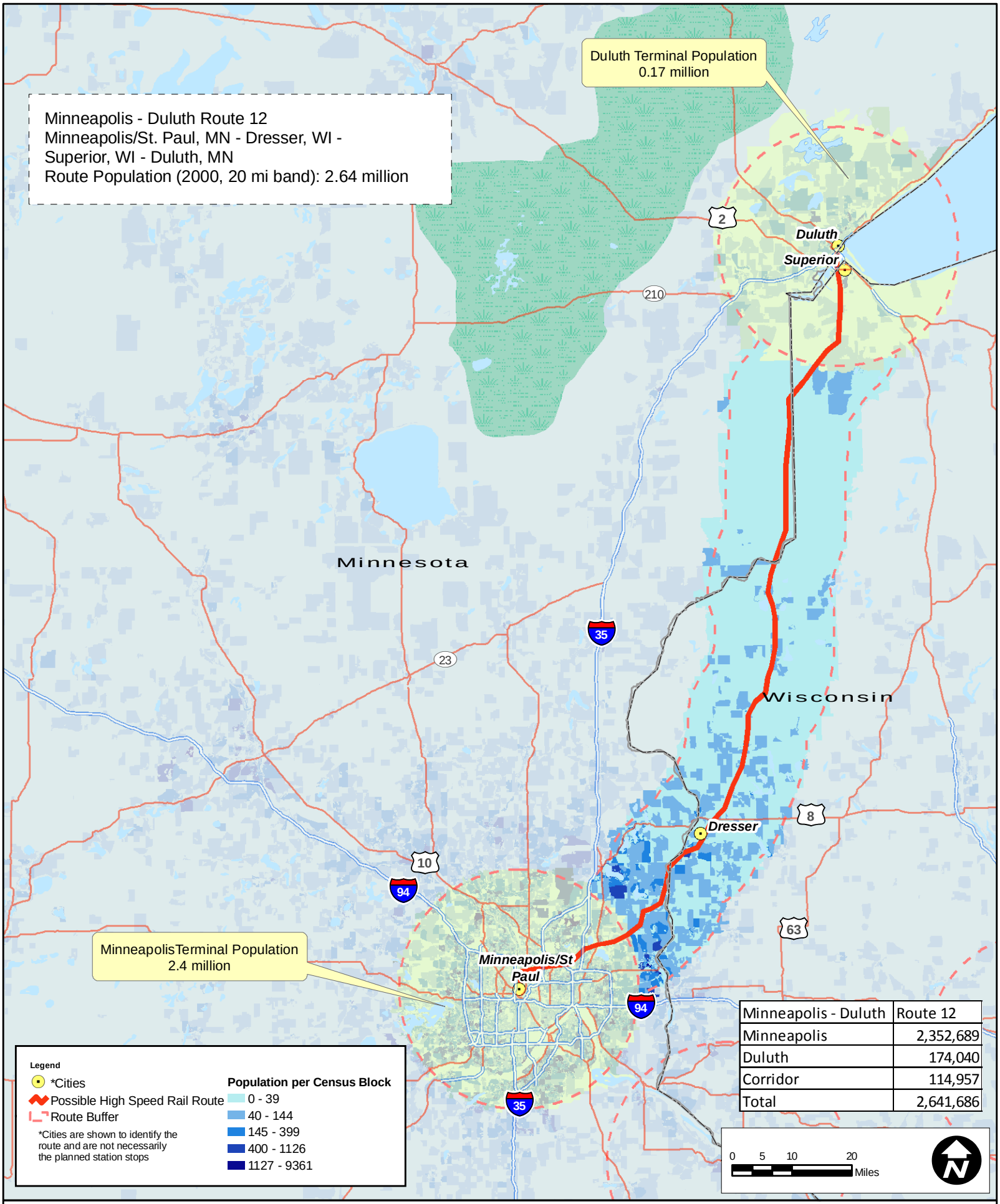
Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 11
Minneapolis	2,352,689
Duluth	174,040
Corridor	119,623
Total	2,646,352

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data



Minneapolis - Duluth	Route 12
Minneapolis	2,352,689
Duluth	174,040
Corridor	114,957
Total	2,641,686

Northern Light Express Alternatives Analysis

Data Sources
2000 US Census Data - census blocks
2000 ESRI Census Data (SF1) - population
2009 ESRI Data & Maps - base data

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Technical Memorandum

Subject:	**Technical Memorandum 6 – Cost of Improvements** **Minnesota Northern Lights Express Project** **Alternatives Analysis – Level 1, Step 3 Screening**
Prepared For:	**SRF Consulting Group, Inc.**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**November 20, 2009**

Purpose

This technical memorandum provides information to the participants of the engineering planning charrette or interactive workshop on improvement costs for the five routes that remain in the Minneapolis-Duluth/Superior Northern Lights Express (NLX) Alternatives Analysis.

Cost of Improvements

This technical memorandum presents the cost of improvements for the five remaining route alternatives identified in Technical Memorandum 2 as follows:

Route 8 – BNSF/Munger Trail

Route 9 – BNSF

Route 10 – St Croix valley/Munger trail

Route 11 – St. croix valley/BNSF

Route 12 – Gandy Dancer Trail

The cost estimates were based on the unit costs developed for the Midwest Regional Rail Initiative in 2002. These costs were updated to 2009 dollars using the inflation factors listed in the Producer Price Index PCUBHVY 'PPI Inputs for Other Heavy Construction', which increased unit costs from 2002 by a factor of 1.47. Quantities for each pay item were calculated specifically for each route using existing track conditions, track geometry, and bridge and crossing data.

The cost estimates are presented in table 1 below and display the difference in cost of each route from the baseline.

Table 1 – Route Alternatives Level 1, Step 3
Cost of Improvements Screening Summary

Route Number	Increase Vs. Baseline Cost
8	63%
9	-
10	108%
11	45%
12	106%