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District 1 Freight Plan

Working Paper 4: Investment Priorities

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Solutions for growing economies

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District 1 Freight Plan

The objective of the District 1 Freight Plan (Plan) is to provide a clear understanding of the multimodal freight system, how local industries use the system and their needs and issues, so MnDOT's policy and programming decisions can be better informed in the District.

Working Paper

This Working Paper is the fourth in a series of five that together inform the Plan. This Working Paper presents an approach to project scoring and ranking, to enable District 1 freight needs to advance to project development and eventual funding.

Acknowledgments

The CPCS Team acknowledges and is thankful for the input of those consulted in the development of this Working Paper, as well as the guidance and input of representatives from MnDOT and their study partners.

Opinions

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of MnDOT.

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Cover image source: CPCS

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Acronyms and Abbreviations

BNSF	Burlington Northern Santa Fe Railway
CN	Canadian National Railway
FAST	Fixing America's Surface Transportation
HCAADT	Heavy Commercial Annual Average Daily Traffic
MHFP	Minnesota Highway Freight Program
MnDOT	Minnesota Department of Transportation
MRSI	Minnesota Rail Service Improvement Program
NHFP	National Highway Freight Program
NHS	National Highway System
NLX	Northern Lights Express
NPMRDS	National Performance Management Research Data Set
OSOW	Oversize-Overweight
PDAP	Port Development Assistance Program
TEA-21	Transportation Equity Act for the 21st Century
TIGER	Transportation Investment Generating Economic Recovery
TPI	Twin Ports Interchange
TTR	Travel Time Reliability

Executive Summary

Producing a list of projects that could be considered for future freight-related investments is one of the key goals of the District 1 Freight Plan. Previous Working Papers have provided insight into overall freight system needs and issues, and identified "gaps" where these needs and issues may not be addressed by short-term investments (i.e., in the next 5 years). This Working Paper advances the process of listing priority freight-related investments in the District by presenting an approach to scoring and ranking identified "gaps."

Minnesota Highway Freight Program Project Selection Methods

The 2017 Minnesota Highway Freight Program (MHFP) provided a starting point for the creation of a District 1-specific scoring and ranking method. The MHFP is directly linked to the FAST Act-established National Highway Freight Program (NHFP), and as part of this Federal program, MnDOT is apportioned approximately $20 million a year and may determine its own process for selecting projects to receive this funding, as long as it is used for freight-related investments. Lessons learned from the statewide MHFP solicitation were used to help guide the development of the District 1 methodology. Two primary lessons from the MHFP process were (1) that it prioritized highest-traffic routes including Interstates and Trunk Highways compared to local routes, and (2) that it relied on the availability of data (e.g., truck counts) that may not be available the local level. These were considered in forming the District 1 prioritization process.

Funding Sources for Freight Improvements

The MHFP is not the only approach to funding freight-relevant projects in Minnesota. There are several other freight-relevant sources that have projects in District 1, including the Minnesota Rail Service Improvement Program (MRSI) and Port Development Assistance Program (PDAP). Additionally, there is precedent for funding projects that benefit freight with non-freight-specific sources, as in the case of the Twin Ports Interchange where a mix of funds from MHFP and MnDOT's major construction program were used.

Freight and passenger benefits are often complementary, as investments related to condition, safety, and mobility can improve the system for all users. Therefore, it is important for planners to remember that freight benefits can be gained through non-freight-specific program spending, for example, programs that fund routine roadway maintenance provide benefits to cars and trucks, alike. Leveraging these sources of funding that are not traditionally considered "freight funding sources" may require planners to make adjustments to their routine planning processes, so that freight needs and issues can be addressed as part of ongoing capital, operations and maintenance activities. Additionally, mixing and matching multiple funding sources can help finance incremental freight-relevant improvements, or fund projects that would be too large for any single funding stream.

The District 1 Prioritization Process

Based on the review of MnDOT's past process for evaluating and ranking freight system projects, District 1 stakeholder comments, and the overall intent of prioritizing unaddressed needs for the District 1 Freight Plan, an approach to conducting evaluation and ranking those unaddressed needs ("gaps") has been developed.

The evaluation approach is intended to 1) evaluate/screen "gaps" (potential project concepts), not concrete, defined projects, 2) focus on regional issues (i.e., known to be important to District 1) vs. those that may be more important to the Metro District or more urban areas, and 3) use as much data available at the local level, as possible.

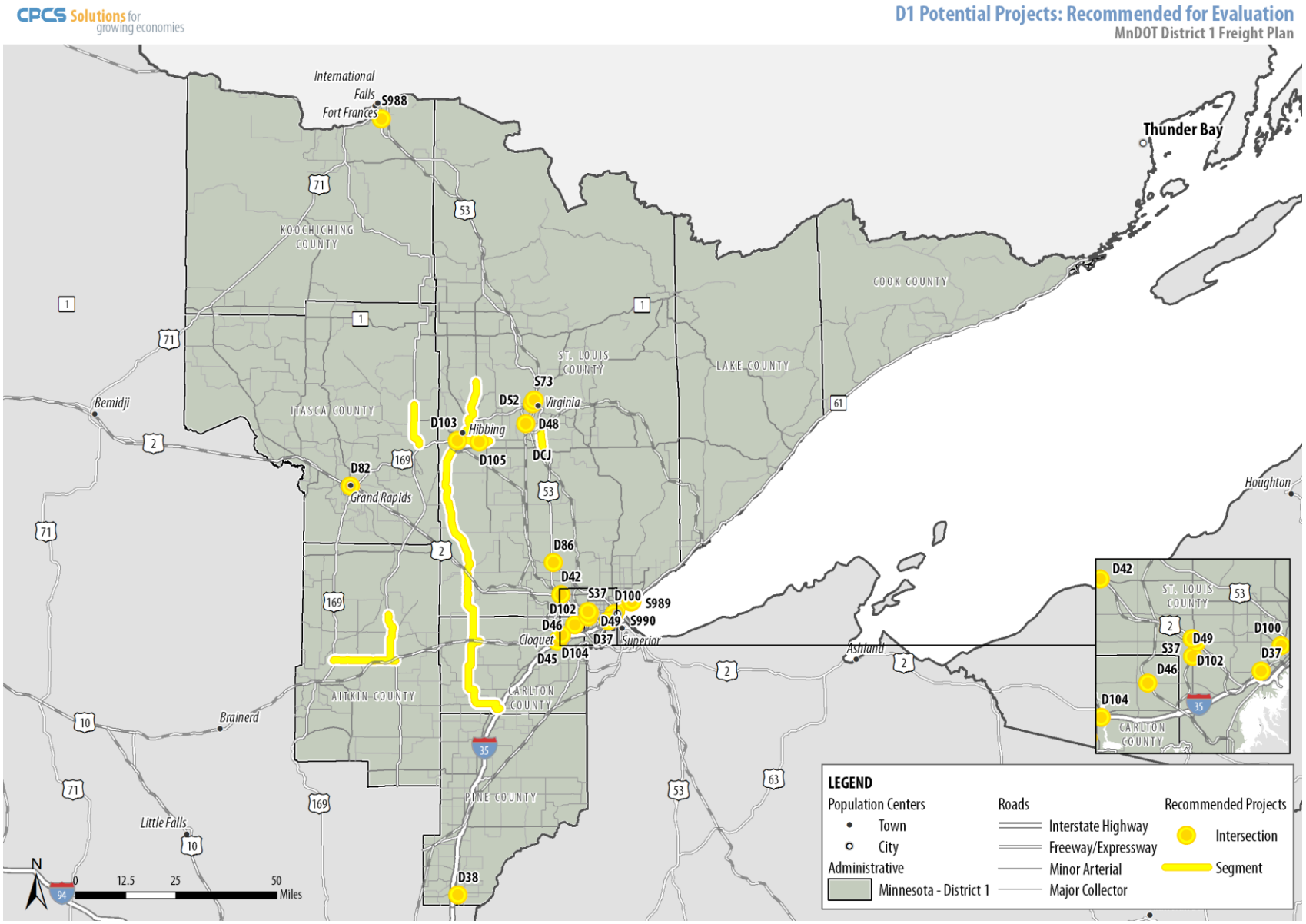
The evaluation resulted in a rank order of priority needs for the District to address, as well as sub-rankings of projects deemed to provide the greatest benefits to freight system safety, condition and mobility. While these projects are "ranked" it is ultimately left to MnDOT District 1 and key stakeholders to determine which projects may be in the best interest of the region to advance. This decision-making process may also include those key freight projects that were not highway infrastructure-related, and may not have been prioritized during evaluation (e.g., projects that are rail, port or related to other highway facilities – like truck parking).

Pre-Feasibility Assessment

One of the aims of the District 1 Freight Plan is to ensure that the critical needs in the region have the potential to be addressed by future rounds of funding. One way to do this is to take steps to prepare data and information to support the full slate of criteria used in evaluating/scoring projects in the MHFP process. This includes further developing unaddressed "gaps"/project concepts into clear projects/solutions, so that they can be scored and considered when future investment decisions are made.

A slate of 30 "gaps"/project concepts – out of a possible 124 – are being advanced to pre-feasibility assessment that will include 1) conceptual design of a slate of possible projects/solutions to address the "gap", and 2) order-of-magnitude construction cost estimating. This list represents a mix of "gaps" that when addressed are aimed at improving the safety, condition, and performance on the District 1 freight system. The locations that will be evaluated are shown in Figure ES-1.

Figure ES-1: Map of Project Concepts Recommended for Pre-Feasibility Evaluation



1 An Introduction to Freight Investment Decision-making in Minnesota

Key Findings

The 2017 Minnesota Highway Freight Program (MHFP) project selection process provided a starting point for the creation of a District 1-specific project concept scoring method. In particular, lessons learned from the statewide MHFP solicitation were used to help guide the development of the District 1 methodology. Two primary concerns with the MHFP process were that it prioritized highest-traffic routes including Interstates and Trunk Highways compared to local routes, and that it relied on the availability of data (such as truck counts) that may not be available the local level.

1.1 Introduction

One goal of this freight plan is to develop a process for identifying and ranking freight investment needs in District 1. To begin this process, the Minnesota Department of Transportation's (MnDOT) process for selecting project to receive Minnesota Highway Freight Program (MHFP) funding was used as the starting point for the development of a project concept evaluation and ranking methodology described in this Working Paper. The MHFP was used as a starting point because it was an established processed used by MnDOT to evaluate and fund freight-specific projects across the state, including projects in District 1.

The MHFP is directly linked to the FAST Act-established National Highway Freight Program (NHFP). As part of this Federal program, MnDOT is apportioned approximately $20 million a year and may determine its own process for selecting projects to receive this funding, as long as it is used for freight-related investments. The competitive MHFP evaluation process conducted in 2017 was aimed at advancing shovel-ready projects during the 2019-22 fiscal years. That process was developed to evaluate projects on a statewide basis and to quantify the types of freight benefits they may provide.

1.2 Minnesota Highway Freight Program Selection Criteria

In 2017 MnDOT elected to select MHFP projects through a competitive process and evaluate applicants on criteria that included truck volume, safety, mobility, facility access, and other factors as shown in Figure 1-1. These criteria were weighted differently, based on how a project was categorized. The + sign indicates extra points can be awarded for the category or measure, and

projects could not exceed 1,000 points or the maximum points for any category. The following briefly describes each of the criteria for context.

Figure 1-1: Minnesota State Freight Investment Plan Criteria and Maximum Points

Criteria	Measures	Category: Safety	Category: Freight Congestion / Freight Efficiency Improvement	Category: First/Last Mile
Truck Volume	HCAADT	250	250	250
Safety	• Crash rate reduction • Addresses a sustained crash location (Y/N) OR Not sustained crash location, but addresses a safety issue identified in a district or county safety plan (Y/N). If so, provide risk rating. • For truck parking projects: truck parking utilization at existing rest stops	350	100	100
Freight Mobility	• Truck Travel Time Reliability • Removes a geometric or temporary (e.g. flooding) barrier or avoids future load restriction on an OSOW route (Y/N) • Upgrades a roadway to 10-ton standards	100	350	150
Freight Facility Access	Daily truckload equivalents entering and exiting a freight facility or facilities	+50	+50	200
Cost-Effectiveness	Divide amount of points awarded above by amount of requested funds divided by 1000	150	150	150
Project Readiness	A variety of measures including: Environmental Documentation, Review of Sec 106 Historic Resources, Review of Sec 4f/6f Resources, Right-of-Way, Construction Plans/Documentation, Railroad Involvement, and Funding	150	150	150

Source: Adapted from Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027, November 2017

Truck Volume

Truck volume scores were assigned based on the Heavy Commercial Annual Average Daily Traffic (HCAADT) volume ranges shown in Figure 1-2 and Figure 1-3. A lower truck volume threshold was used for assigning scores to first/last mile projects.

Figure 1-2: Truck Volume Ranges for Safety and Freight Congestion/Freight Efficiency Improvement Projects

HCAADT	Percentage	Points
>4,000	100%	250
2,000 to 4,000	75%	190
1,000 to 2,000	50%	125
500 to 1,000	25%	60
<500	0%	0

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

Figure 1-3: Truck Volume Ranges for First/Last Mile Projects

HCAADT	Percentage	Points
> 750	100%	250
400 to 750	75%	190
250 to 400	50%	125
125 to 250	25%	60
< 125	0%	0

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

Safety

Safety scores were usually determined based on crash rate reductions, and the potential safety points for each project category are listed in Figure 1-4. The exception to this score assignment method was truck parking projects, which had a safety score determined by truck parking usage. The "+" sign indicates extra points can be awarded for the category or measure.

Figure 1-4: Safety Score Options

	Safety Points	Freight Congestion / Freight Efficiency Improvement Points	First/Last Mile Points
Crash rate reduction (scaled to top score)	350	100	100
Addresses a sustained crash location (Y/N) OR Not sustained crash location, but addresses a safety issue identified in a district or county safety plan (Y/N).	+50	+20	+20

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

Freight Mobility

Freight mobility scores were determined partially by truck travel time reliability (TTR) for safety and freight congestion/freight efficiency improvement projects. Figure 1-5 shows how TTR was used to assign points to safety, and congestion/efficiency projects. TTR was not used for first/last mile project scoring.

Figure 1-5: Truck Travel Time Reliability Score Options (Scaled to Top Score)

	Percentage	Safety Points	Freight Congestion / Freight Efficiency Improvement Points
Project substantially improves reliability at project location	100%	100	350
Project minimally improves reliability at project location	50%	50	175
Project does not address reliability at the project location	0%	0	0

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

In addition to TTR, other measures were used to assess a project's relevance to freight mobility, and provide additional points, as appropriate. These additional considerations are listed in Figure 1-6.

Figure 1-6: Other Mobility Score Measures

	Safety Points	Freight Congestion / Freight Efficiency Improvement Points	First/Last Mile Points
• Removes a geometric or temporary (e.g. flooding) barrier or avoids future load restriction on an OSOW route (Y/N) • Upgrades a roadway to 10-ton standards	+20	+50	150

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

Freight Facility Access

Projects were assigned a facility access score, which was determined by "daily truck load equivalents entering and exiting a freight facility or facilities." The highest daily load equivalents received the maximum points, with other projects scaled to the highest load equivalent. Figure 1-7 lists how these scores could be assigned to each project category.

Figure 1-7: Daily Truck Load Equivalent Scores

Safety Points	Freight Congestion / Freight Efficiency Improvement Points	First/Last Mile Points
+50	+50	200

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027

In addition to the measures listed above, the 2017 MHFP evaluation scored projects based criteria related to cost effectiveness and project readiness. Since the District 1 freight is evaluating project concepts, rather than shovel-ready projects, those additional MHFP criteria are not relevant for the discussion here.

1.3 Outcome and Lessons Learned

In total, the 2017 solicitation received 36 applications requesting $248 million. Using available funds, $98 million of those requests were programmed through 2022. In District 1, MnDOT and the City of Duluth submitted applications requesting $20,525,565, and the Twin Ports interchange was awarded $6 million. In addition, the MHFP solicitation specifically requested port and waterway intermodal project submissions, and the Duluth Port Intermodal Terminal Expansion was awarded $1.9 million.

After review of the MHFP selection process, discussion with District 1 stakeholders, and with the focus of ensuring the evaluation is relevant to the District 1 Freight Plan purposes, several lessons learned were considered in developing the revised approach and criteria applied to District 1, as further described in Chapter 3. A primary lesson was that the MHFP prioritized highest-traffic routes, compared to local routes, and relied on data that is not always available at the local level. Other lessons learned that should be applied in District 1 include:

- **Cost Effectiveness and Project Readiness.** The District 1 approach is being developed to screen freight system needs that could eventually become projects – or "project concepts." As such, sufficient detail is not available to quantify cost effectiveness or

project readiness. These categories are recommended to be dropped from the initial District 1 evaluation process, however future solicitations or statewide freight plans may incorporate cost effectiveness and project readiness as a means of comparison.

- **Truck Volume.** Greater Minnesota truck volumes are generally lower than truck volumes in the Metro District or other urban centers. While truck volumes may provide indication of roads that many trucks use, it may also inadvertently identify routes that are important for through-truck activity vs. the local activity that benefits the State of Minnesota. In District 1 it is recommended that the truck percent is given consideration to complement truck percent.
- **Safety.** MnDOT has re-evaluated its approach to safety, and has adopted a risk-based approach to determine where priority investments should be made. While aimed at improving safety, it is not explicitly focused on reducing crashes at spot locations. In District 1 it is recommended that this safety risk rating be used in scoring projects. Also, the presence of truck-related incidents within the past 5 years, or more, should also be considered.
- **Freight Mobility.** Freight mobility as measured by travel time reliability is important in areas where congestion is an issue and travel conditions may be unpredictable. While this measure (i.e., TTR) is federally-required, in an area such as District 1 that does not generally have mobility issues, TTR provides less insight here than in more urban areas such as the Metro District. In District 1 it will be important to continue to have a connection to the statewide National Performance Management Research Data Set (NPMRDS) analysis and use that process to identify bottlenecks that have "statewide significance." However, in District 1 there are significant physical barriers to mobility (e.g., vertical clearance, bridge weight limits, etc.) that should also be captured in the evaluation as "regionally significant."
- **Freight Facility Access.** This category was logical for inclusion in the past MHFP evaluation as MnDOT was interested in advancing projects to improve first-/last-mile connectivity. However, the District 1 analysis did not perform a comprehensive evaluation of all first-/last-mile connections – these types of projects were revealed partly through broad data analysis, but primarily through stakeholder input. Additionally, in most cases truck volumes on these first-/last-mile routes is generally not readily available due to these routes being off the National Highway System (NHS) and not part of regular MnDOT or other agency counting programs. It was recommended that freight facility access not be evaluated initially in the District 1 process, however, improving first-/last-mile connections will continue to be important and a priority investment area for the state.
- **Total Points and Bonus Points.** As shown, projects were awarded points up to a maximum of 1000, but also some projects received "bonus points" in certain categories if they were able to provide benefits beyond their project category (e.g., a safety project also providing benefits to freight facility access). To allow flexibility on scoring, a maximum score may not be needed. Also, evaluating all projects against the same criteria may be useful in determining the types of benefits projects may provide (e.g., a higher

score against safety criteria implies that it may be safety benefiting, and could be placed in the "safety bucket" in the post-process step).

- **Weighting Criteria.** The 2017 MHFP process "weights" criteria, in that custom criteria is developed for the three project categories and some criteria are weighted higher (given more points) than others in those categories. It is recommended that in District 1 project categories are used (e.g., initially categories of safety, mobility and condition), but as all categories are important, the categories themselves nor the individual criteria will be weighted.

This feedback was incorporated into the process for identifying and ranking freight investment needs in District 1, and Minnesota as a whole. A further discussion of the approach used in District 1 is provided in Chapter 3.

2 Freight Funding Case Studies

Key Findings

The MHFP is not the only approach to funding freight-relevant projects in Minnesota; there are multiple funding sources that can fund freight-relevant projects in District 1. This includes non-freight-specific programs designed to fund routine maintenance or improvements to the highway network as a whole. Leveraging these sources of freight-relevant funding requires planners to incorporate considerations of freight benefits and impacts into their routine planning processes, so that freight needs and issues can be addressed as part of ongoing maintenance and improvement work.

2.1 Introduction

The Minnesota Highway Freight Program is not Minnesota's only freight-relevant funding source, additional programs exist for road, rail and maritime projects, including:

- Railroad At-Grade Crossing Safety Program (Section 130)
- Minnesota Railroad Service Improvement Program (MRSI)
- Port Development Assistance Program (PDAP)
- Weigh Station and Commercial Vehicle Safety/Enforcement Program

In addition to the assistance provided by these freight-specific programs, freight improvements can be made through other non-freight specific funding streams such as the Minnesota State Highway Investment Program (MnSHIP). This chapter provides some examples of the various programs and approaches used to fund freight-relevant projects in District 1 in recent years.

A variety of general funding programs can be leveraged to provide freight benefits.

2.2 Road Projects

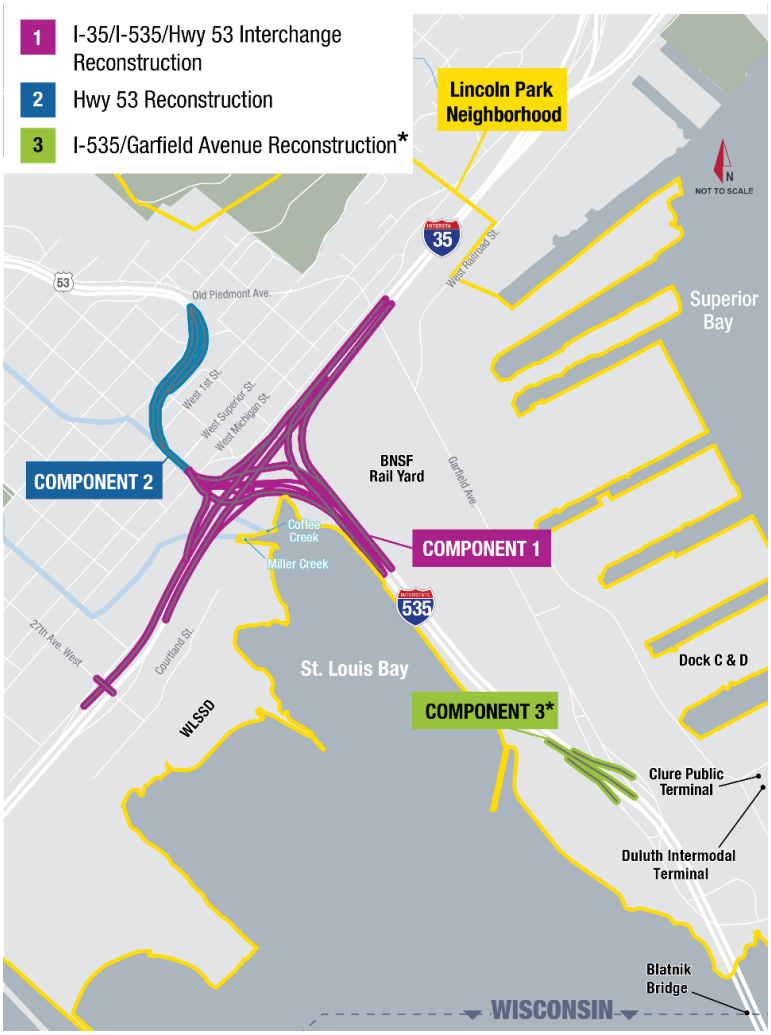
2.2.1 Twin Ports Interchange: A Large, Regionally-Relevant Project

The Twin Ports Interchange (TPI) is located in Duluth, and includes I-35, I-535, and US-53. The TPI is a critical piece of infrastructure for trucks moving between Minnesota and Wisconsin, as well as trucks traveling to and from the Port of Duluth.

The TPI project is large and addresses issues of safety, condition, and freight accessibility. Much of the bridge and ramp infrastructure that makes up the TPI has reached the end of its design life, and is insufficient to accommodate heavy or oversized trucks. As a result, some of the truck traffic that would pass through the interchange must travel on local surface streets instead. Additionally, the current layout of the interchange includes multiple blind merges and left-hand ramps, which create safety hazards. A redesigned interchange will provide safety improvements relevant for all users, and improve freight mobility by providing new routes for trucks to access the Port of Duluth without having to travel on local streets.

The TPI project is made up of three separate components, shown in Figure 2-1. Currently, only components 1 and 2 are funded, and these two components have an estimated total project cost of $299 million. $6.0 million of the funding for the TPI is provided from the Minnesota Highway Freight Program (MHFP). Interestingly, the TPI scored relatively low among all projects submitted for MHFP funding, with a score of 463. 20 other projects out of the 35 submitted had higher scores than the TPI. However, the TPI was selected for MHFP funds because it scored higher when compared to projects outside of the Metro district, and a minimum of 20 percent of MHFP funds needed to be spent outside of the Metro District. Selection of the TPI ensured that MHFP funding was more geographically spread across Minnesota.

Figure 2-1: TPI Components



Source: Minnesota Department of Transportation. 2018.

The selection of the TPI for MHFP funds demonstrates how previous MHFP criteria related to truck volumes meant that projects in the Metro District could out-compete projects in Greater Minnesota, by virtue of higher overall traffic volumes. This experience also demonstrates the importance of crafting a prioritization scheme that accounts for local freight needs in each District. The TPI also illustrates the value of combining multiple funding streams for a project, which can help fund any incremental cost necessary to add freight-relevant elements to existing projects.

Freight system investments can be made using a combination of multiple funding sources, which allow for freight elements to be incorporated on existing projects.

2.2.2 US-53/MN-37 Overpass: Solving Vertical Clearance Issues

The interchange of US-53 and TH-37 is located about four miles south of Eveleth, where TH-37 passes over US-53. The original TH-37 overpass was a low-clearance bridge that previously experienced multiple over-height truck hits. Therefore, this bridge was an impediment to the movement of oversized trucks between Duluth and the Range Cities. In fact, the TH-37 overpass is part of a larger effort that will remove impediments to oversize trucks on US-53. North of the overpass, an abandoned railroad bridge is being removed, and the clearance beneath a second, active railroad bridge is being increased. Together, these three projects will remove the last low-clearance restrictions on US-53 between Duluth and the Range.

In addition to these safety and mobility concerns, the bridge had reached the end of its service life, and was in need of replacement. Figure 2-2 provides a map of the project location, with the overpass marked in orange, and US-53 detour marked in blue. The overpass was replaced in 2018 at a cost of $1.9 million. The replacement of this bridge was programmed using MnSHIP funds, which are not freight-specific.

Figure 2-2: MN-37 Overpass Project Location

Source: Minnesota Department of Transportation. 2018.

This case shows that non-freight-specific investments to replace or rehabilitate aging transportation assets can provide freight benefits for the District as a whole. This also demonstrates the importance of incorporating freight considerations into existing planning processes, so that freight-relevant infrastructure improvements can be identified and executed as part of ongoing infrastructure maintenance and replacement work. Finally, this project also illustrates the importance of "network thinking," or considering how different investments across the network can

provide complimentary benefits. In this case, the true freight value of the improved TH-37 overpass for oversize truck loads will be unlocked when removal and improvement work on two nearby railroad bridges is complete.

Incorporating freight considerations into existing planning processes can help the District improve freight mobility using existing funding streams.

2.2.3 Carleton Weigh Station: Expanding Commercial Vehicle Enforcement

The Carleton Weigh Station is located on both sides of I-35, northeast of the MN-210 exit. The facility includes a fixed building on the southbound side of I-35, and an open concrete pad for enforcement on the northbound side. Most recently, the station was used by the University of Minnesota as a research site for the Northland Advanced Transportation Systems Research Laboratory, and has since been deeded back to MnDOT. Figure 2-3 provides a birds-eye view of the station, with southbound lanes at top.

Figure 2-3: Carleton Weigh Station

Source: Google Earth. 2019.

MnDOT's 10-year strategic plan for commercial vehicle enforcement identified a need for weight enforcement facilities on I-35, because there is no weigh station coverage on I-35 from the Twin Cities to Duluth. Additionally, weight enforcement for vehicles headed towards the Blatnik and Bong Bridges was identified as a need. Because of these identified needs, the Carleton station was selected for funding to re-activate the site. This includes funding to provide a full range of needed weigh station signage, and single platform scale on southbound lanes. Improved signage was noted as particularly important for safety, as the weigh station is located close to the Black Bear Casino, a major tourist attraction, and confused drivers have accidentally exited into the weigh station at high speed, making previous enforcement work at the station unsafe. Funding for this project will come from annual weight enforcement operating funds, and this project is a good example of how system-wide improvements can provide freight-related safety and condition benefits for District 1.

2.2.4 Saginaw Weigh Station: Improving Commercial Vehicle Enforcement

The Saginaw Weigh station is located on US-2 adjacent to the interchange of US-2 and MN-33. It serves as a 4-direction weigh station, and trucks traveling north or south on MN-33 are required to

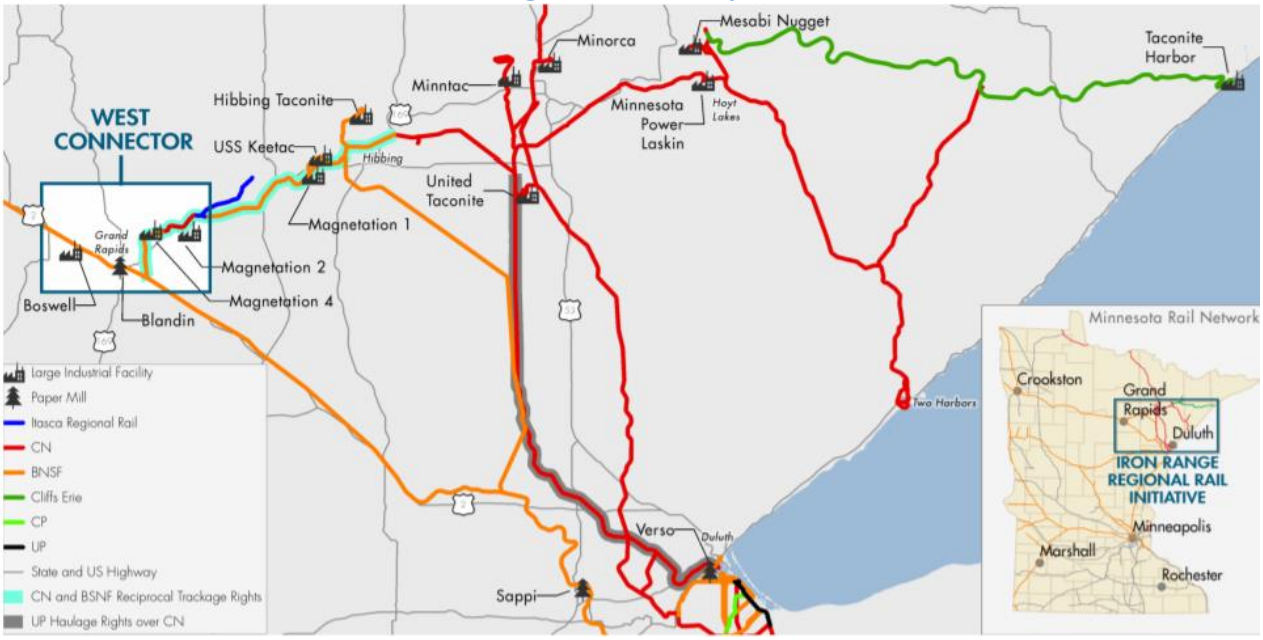
exit onto US-2 to access the station. The station was originally constructed in the late 1990s, and recent improvements include $700,000 for new weigh platforms from State Road Construction funds, and $75,000 for improved electronics and cameras from Resource Investment Committee funds. This project illustrates how smaller funds from various statewide sources can be used to improve the effectiveness of existing freight-relevant assets.

2.3 Rail Projects

2.3.1 Northeast Minnesota Rail Study: Short Line Studies

The Northeast Minnesota Rail Study was funded by the state legislature, using money from Minnesota's General Fund. The goal of this project (due to be complete in June 2019) is to identify efficiency improvements or better connections that could potentially reduce the cost of rail service in Northeastern Minnesota. Currently, communities in this area are served by one of two railroads, either the CN or BNSF, and each railroad's respective monopoly on service means that rail shipping rates for businesses in the area are relatively high. Figure 2-4 illustrates some of the rail lines under review. The area marked "West Connector" is considered the first phase of the project.

Figure 2-4: Rail Study Area



Source: Iron Range Regional Rail Initiative.

It is likely that some of the improvements identified by the Study will be eligible for funding through the Minnesota Rail Service Improvement (MRSI) program. This program provides grants and loans for the rehabilitation and construction of rail service facilities in Minnesota. Eligible projects include capital improvements such as expanded spurs or additional storage capacity, rail line rehabilitation, and rail line purchase assistance.

The soon-to-be completed Northeast Minnesota Rail Study will identify some opportunities for rail investment.

2.3.2 Northern Lights Express Grade Crossing Improvements

The Northern Lights Express (NLX) is a proposed higher-speed rail service between Duluth and the Twin Cities, and would operate on existing BNSF track. The creation of this service would require the improvement of safety equipment at 99 public and private grade crossings. 62 crossings on the route already have automatic gates and flashing lights. If the NLX is advanced, improvement of grade crossings throughout District 1 would provide additional benefits for the safe movement of freight. Potential funding sources for these grade crossing improvements include the MRSI program, as well as the Federal Highway Administration's Rail-Highway Crossings (Section 130) program, which provides funds for the elimination of hazards at railway-highway crossings.

2.3.3 Duluth Intermodal Terminal Expansion

The Duluth Intermodal Terminal opened in 2017 and provides road-rail intermodal container service for businesses in Minnesota, Wisconsin, and Ontario. Since its creation, the volume of containers handled at the terminal has grown significantly, and additional handling space is needed. The intermodal terminal is currently undergoing an expansion that will add 2,400 feet of railroad track, and pave or grade additional laydown space for intermodal activity. The project budget is $3,000,000, $1.8 million of which is coming from the Highway Freight Program's intermodal fund, and work is scheduled to be complete in summer 2019.

The terminal expansion is a good example of how intermodal projects can benefit from highway-related investment programs. In this case, the Duluth terminal was eligible for MHFP funding, thanks to the FAST Act's allowance for a percentage of a state highway freight program's funds to be spent on intermodal projects. This demonstrates the importance of thinking about the freight system as a whole: while an intermodal project is not strictly a highway project, it can provide benefits for highway freight movement by enabling modal shift of some loads from trucks to rail.

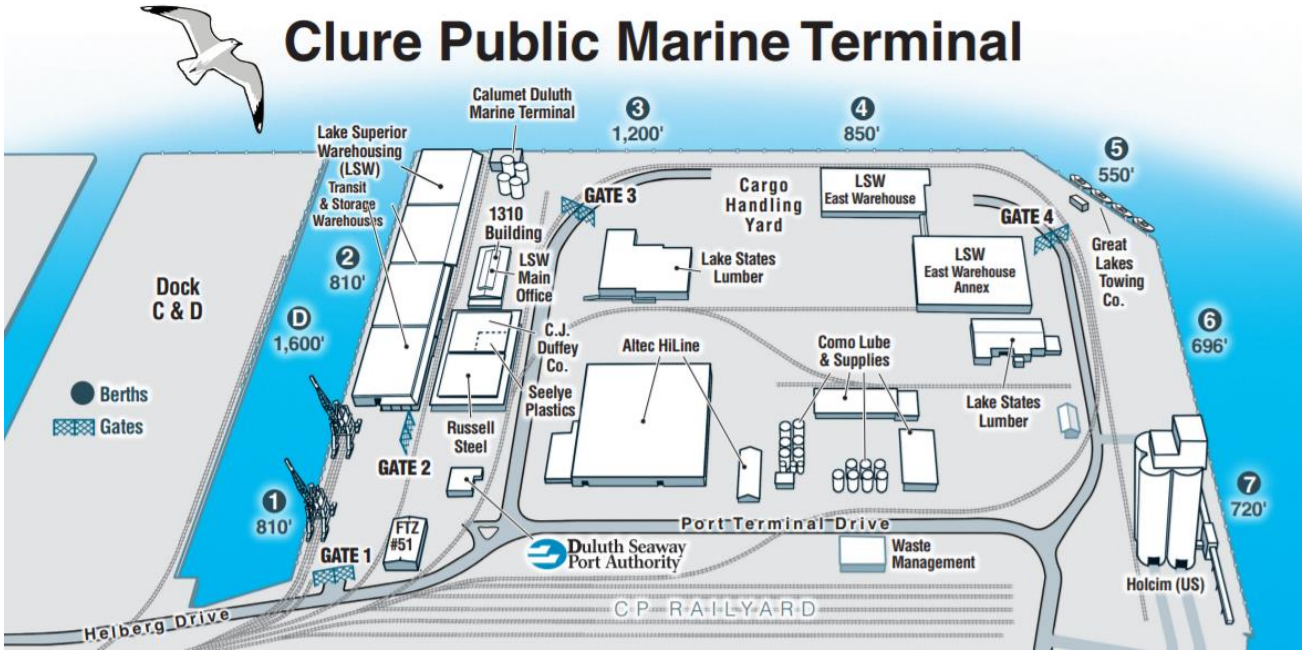
Rail and port projects can also benefit from highway-related funding sources, which can be used to improve multimodal connections.

2.4 Port Projects

2.4.1 Dock C & D Rehabilitation: On-Water and Land Improvements

The C&D Dock is located north of the Clure Public Terminal. The dock was originally home to rail-serviced grain elevators, which were purchased by the Duluth-Seaway Port Authority in 1989. In the early 2000s, these elevators were demolished to create space for future port terminal expansions. In 2016, the port completed an $18 million project to rehabilitate the property and convert it into an outdoor laydown space for cargo. This rehabilitation work included sheet pile reconstruction, dredging berths, and brownfield pollution remediation. Figure 2-5 provides an example of the C&D Dock's size and location relative to the developed marine terminal.

Figure 2-5: C & D Dock Location



Source: Duluth Seaway Port Authority.

Funding sources for the C&D Dock rehabilitation project included a $10 million TIGER grant, a $2.75 million PDAP grant, and $900,000 pollution control grant for remediation. This project further illustrates the wide variety of funding sources that can be combined to support large port projects, as well as some of the funding sources available to support maritime investments on the water.

2.4.2 Helberg Drive: Improving First- and Last-Mile Connections

Helberg Drive was constructed in 2007, and provides paved road access to the Garfield Avenue waterfront, including the C & D Docks. Port Development Assistance and TEA-21 federal grant funds were used to pay for the $3 million construction of Helberg Drive. This investment is an example of how funding from multiple sources and multiple levels of government is often needed to support port-related projects.

2.5 Common Themes and Lessons Learned

The case studies demonstrate that there are multiple funding sources that can provide freight-relevant benefits for District 1, and the MHFP is not the only approach to funding freight-relevant projects. Some common themes and lessons from the case studies include:

- **Passenger projects can benefit freight, and vice-versa.** It is important to keep in mind that freight and passenger investments do not stand alone, and are likely to yield complementary benefits by improving overall traffic mobility or safety, or infrastructure condition. Viewing freight and passenger benefits as complementary creates an opportunity to use a variety of non-freight-specific funding sources to address freight-related issues.
- **Incorporating freight into existing planning processes**. Some freight issues like bridge clearances, or geometric improvements may be able to be resolved by ongoing

maintenance and upgrade work, with little to no additional investment required. Conversely, some improvements such as improperly-designed roundabouts can have a negative impact on freight mobility. Therefore, it is important that plans ensure that freight benefits and impacts are considered for all projects.

- **Leveraging "general" investment programs to provide freight benefits.** Once freight considerations are incorporated into existing planning and investment processes, projects funded by non- freight-specific programs can yield freight benefits.
- **Mixing and match funding sources.** Incorporating freight-relevant elements into some existing projects may require "mixing and matching" multiple funding sources, which can be used to pay for the incremental cost of freight-relevant investments, or simply fund a freight-related improvement without freight-specific dollars.

3 Prioritizing District 1 Freight Needs and Issues

Key Findings

Based on the review of MnDOT's past process for evaluating and ranking freight system projects, District 1 stakeholder comments, and the overall intent of a "gap" evaluation for the District 1 Freight Plan, a revised approach to conducting evaluation and ranking has been developed. This approach is intended to 1) evaluate/screen "gaps" (potential project concepts), not concrete, defined projects, 2) focus on regional issues (i.e., known to be important to District 1) vs. those that may be more important to the Metro District or more urban areas, and 3) use as much data available at the local level, as possible.

The evaluation process resulted in a rank order of priority needs for the District to address, as well as sub-rankings of projects deemed to provide the greatest benefits to freight system safety, condition and mobility. While these projects are "ranked" it is ultimately left to MnDOT District 1 and key stakeholders to determined which projects may be in the best interest of the region to advance. This decision-making process may also include those key freight projects that were not highway infrastructure-related, and may not have been prioritized during evaluation (e.g., projects that are rail, port or related to other highway facilities – like truck parking).

3.1 Introduction

District 1's freight system has a variety of needs and issues, most of which are centered on the road network. In particular, both stakeholder and data analysis reveal the dominant issues in the District are related to roadway safety, including issues specific to trucks due to their slower movement relative to passenger traffic. As a result, safety-related improvement such as passing lanes and harder or wider shoulders were often mentioned as solutions by stakeholders consulted.

By comparison, there were relatively fewer needs and issues related to the topics of mobility or condition. Congestion is not a problem in the District, and relatively common mobility concerns related to weight limits and bridge clearances for large trucks were identified. In terms of system condition, pavements do have issues but analysis found that all will be addressed as part of future capital plans. District 1 does have a large number of structurally-deficient bridges, but these are concentrated on local roads, and do not appear to be an impediment to freight movement.

The wide range of needs and issues in District 1 were documented in Working Paper 3: Needs, Issues, and Opportunities, as well as if there were any known plans to address them. Those needs and issues unaddressed by short-term investments (i.e., in the next 5 years) are referred to as "gaps" that could be addressed in the future by projects. The next steps in the developing this Freight Plan are to determine:

- the type of benefits that could be provided if "gaps" addressed (i.e., if projects are advanced at these locations), and
- which of these could provide more freight benefits than others (rank order).

3.2 Process

Based on the review of MnDOT's past process for evaluating and ranking freight system projects (described in Chapter 1), District 1 stakeholder comments received, and the overall intent of "gap" evaluation for the District 1 Freight Plan, a revised approach to conducting evaluation and ranking has been developed. This approach is intended to:

- Evaluate/screen "gaps" (potential project concepts), not concrete, defined projects.
- Focus on regional issues (i.e., known to be important to District 1) vs. those that may be more important to the Metro District or more urban areas.
- Use as much data available at the local level, as possible.

This process is fully documented in **Appendix A – Identifying Investment Priorities**, and the resultant ranking is documented in **Appendix B – Findings**.

3.2.1 Stakeholder Engagement

Engagement with MnDOT and District 1 stakeholders was integral to prioritizing District 1 freight needs and issues. Stakeholders were consulted and feedback incorporated at three key points in the prioritization process:

- **Evaluation Process.** The proposed process for evaluating freight "gaps" (potential project concepts) documented in **Appendix A – Identifying Investment Priorities** was developed for MnDOT and stakeholder comment prior to conducting the evaluation.
- **Initial Findings.** The initial findings of the evaluation were prepared for MnDOT and stakeholder comment prior to finalizing.
- **Revised Process and Findings.** The revised findings documented in **Appendix B – Findings** were presented to the Area Transportation Partnership (ATP) for comment.

The process and findings in this Working Paper reflect comments received during this multi-stage review.

3.2.2 Categories and Measures for Evaluation

Figure 3-1 highlights the categories and measures used for the District 1 freight "gap" evaluation. A few notes on this figure and the evaluation process:

- All measures are weighted equally.
- A high overall score is intended to identify what "gaps" (potential project concepts) have the greatest potential to provide freight benefits (referred to in this Working Paper as "pure ranking").

- As sub-set evaluation can be conducted that indicates those "gaps" (potential project concepts) that score well in safety, mobility or condition.

Figure 3-1: Categories and Measures for Evaluation

Category	Measures	Safety	Condition	Performance
Truck Activity	HCAADT	X	X	X
	Truck percent (%) of total vehicles	X	X	X
Safety	Addresses a sustained crash location	X		
	A safety issue identified in a district or county safety plan	X		
	Addresses at-grade crossing safety risk	X		
Freight Mobility	Truck Travel Time Reliability			X
	Addresses a vertical clearance restriction			X
	Addresses a weight limited bridge		X	X
Condition	Bridge condition rating		X	
Stakeholder Need	Y/N if this issue overlaps with a stakeholder identified need	X	X	X

Additional information on the criteria for each category and measure is provided in **Appendix A**.

3.3 Evaluation

The following sub-sections present the results of the evaluation. This information was used to inform "gaps"/project concepts advanced to pre-feasibility assessment, described in Chapter 4.

3.3.1 Pure Ranking Evaluation

MnDOT requires that all "gaps"/project concepts be evaluated and placed in rank order (i.e., 1, 2, 3...), therefore, this is the ultimate goal of the "pure ranking" evaluation.

This pure ranking is simply the total of all scores, for each measure, for each "gap"/project concept. Not all project concepts have scores for each of the measures, for example a weight limited bridge may not have safety issues (nor safety data available) and will not receive a score in the safety category. However, there are cases where project concepts receive scores in multiple categories, and as a result will receive a higher score and ultimately will be ranked higher in the evaluation.

In **Appendix B – Findings**, a list of the 124 "gaps"/project concepts in pure rank order is shown in Figure B-30 and a map is shown in Figure B-31. For the District 1 Freight Plan, these rankings provide indication of what project concepts have the highest score, considering all measures and establish a general understanding of how project concepts may compare against each other.

3.3.2 Evaluation by Project Type or Expected Benefit

Ranking by project type builds on the concept shown in Figure 3-1; essentially that certain category measures provide indication of the types expected benefits addressing a "gap" may provide. For example, "gaps"/project concepts that score highly in safety category measures may be linked to a safety project as a solution (note: at this point the actual solutions have not been determined). Three types of projects and expected benefits have been identified:

- Safety
- Condition (including first-/last-mile connectivity)
- Performance/Mobility

These three project types are directly related to goals of the Minnesota Statewide Freight System Plan, were the focus of the quantitative analysis conducted in the District 1 Freight Plan, and are also tied to existing MnDOT funding programs.

When scored within these categories, top safety, condition, and performance "gaps"/project concepts are more clearly identified, and are not diluted by being combined with all project types in the "pure ranking." The ranking by project type or expected benefit will enable District 1 to advance projects aligned with their interests/goals, as appropriate. For example, District 1 may elect to advance all safety projects before any others, and they will be able to easily do this based on the dedicated safety ranked list.

Safety-Related Project Concept Evaluation

Safety represented the highest number of unaddressed "gaps"/project concepts. The results of the safety evaluation are listed in Figure 3-2 and mapped in Figure 3-5. These figures show the ranking of the top 30 of 77 total gaps identified. The table includes several columns that provide context to the ranking:

- **Pure Rank** reflects the competitiveness of a project across all categories. Since pure rank is based on a percentage value assigned to projects, there are ties for pure ranks.
- **Safety Rank** reflects the ranked competitiveness of safety projects. Since many projects have the same safety scores there are ties in the safety rank category.
- **Safety Rank (w/HCAADT)** shows the rank of safety projects after HCAADT-related tiebreaker rules were applied (where data was available).

Additional detail on the evaluation is provided in **Appendix B – Findings**.

Figure 3-2: List of Top Safety "Gaps"/Project Concepts

Project ID	Highway	Location	Pure Rank	Safety Rank	Safety Rank (w/ HCAADT)
SAM	State Highway 194	Duluth	2	2	1
DCH	Miller Trunk Hwy	Eveleth (Heading South)	1	1	2
DBY	Central Ave	Nashwauk	3	3	3
D105	MNTH 37	Saint Louis County	9	4	4
DCR	MNTH 37	Hibbing (Heading East)	10	5	5
D100	USTH 53	Saint Louis County	12	4	6
SAP	State Highway 37	Hibbing	16	6	7
SS	State Highway 73	Entire Highway	15	4	7
D102	US 2	Saint Louis County	5	7	8
D103	USTH 169	Saint Louis County	18	4	8
D86	USTH 53	Saint Louis County	14	8	9
D104	USTH 35	Carlton County	11	8	10
D82	4TH ST NW	Grand Rapids	21	9	11

Project ID	Highway	Location	Pure Rank	Safety Rank	Safety Rank (w/ HCAADT)
SAN	US Highway 53	Duluth	17	11	12
ST	State Highway 210	Aitkin to Cloquet	25	8	13
D101	USTH 169	Itasca County	32	10	14
SAO	State Highway 38	Grand Rapids	28	11	15
DCW	USTH 169	Swan Lake to Hibbing	35	11	16
S37	Highway 2.	Going downhill into	8	12	17
DCJ	Miller Trunk Hwy	Eveleth (Heading South)	20	13	18
SAH	State Highway 65	Calumet to McGregor	24	13	19
D61	3RD ST N	Brook Park	26	14	20
D50	MNTH 37	Saint Louis County	31	15	21
D45	OLD CARLTON RD	Cloquet	22	17	22
D46	N CLOQUET RD E	Carlton County	22	17	22
D48	CSAH 7	Mountain Iron	22	17	22
D49	MIDWAY RD	Saint Louis County	22	17	22
D51	FAYAL RD	Mountain Iron	37	17	22
D52	MINERAL AVE	Mountain Iron	22	17	22

Condition-Related Project Concept Evaluation

Condition represented the fewest number of unaddressed "gaps"/project concepts. The results of the condition evaluation are listed in Figure 3-3 and mapped in Figure 3-6. The table includes two columns that provide context to the ranking

- **Pure Rank** reflects the competitiveness of a project across all categories. Since pure rank is based on a percentage value assigned to projects, there are ties for pure ranks.
- **Condition Rank** reflects the ranked competitiveness of condition projects. Since many projects have the same condition scores there are ties in the condition rank category.

A truck-specific tiebreaker was not conducted for these condition projects because HCAADT data was not available. Additional detail on the evaluation is provided in **Appendix B – Findings**.

Figure 3-3: List of Top Condition "Gaps"/Project Concepts

Project ID	Highway / Railway	Location	Pure Rank	Condition Rank
D14	UTWN 446	Trout Lake Township	7	1
D19	MUN 85	Duluth	23	1
D1	CSAH 1	Cloquet	33	1
D7	CNTY 70	Little Fork	36	1
D18	UT 8146	Ash Lake	50	1
D24	TWNS 883	West Swan River	50	1
D23	MUN 10	Cook	23	2
S997	BNSF Bridges on Hinckley Subdivision	Hinckley	65	3
S998	BNSF Bridges on Hinckley Subdivision	Hinckley	65	3
S999	Grassy Point Bridge	Duluth	65	3

Performance-Related Concept Evaluation

The results of the performance evaluation are listed in Figure 3-4 and mapped in Figure 3-7. The table includes several columns that provide context to the ranking:

- **Pure Rank** reflects the competitiveness of a project across all categories. Since pure rank is based on a percentage value assigned to projects, there are ties for pure ranks.
- **Performance Rank** reflects the ranked competitiveness of performance projects. Since many projects have the same scores there are ties in the performance rank category.
- **Performance Rank (w/HCAADT)** shows the rank of performance projects after HCAADT-related tiebreaker rules were applied (where data was available).

Additional detail on the evaluation is provided in **Appendix B – Findings**.

Figure 3-4: List of Top Performance "Gaps"/Project Concepts

Project ID	Highway	Location	Pure Rank	Performance Rank	Performance Rank (w/ HCAADT)
S989	36th Avenue East.	Duluth	23	1	1
S990	32nd Avenue East	Duluth	23	1	1
S996	International Bridge	International Falls	37	2	2
D26	MUN 361	Duluth	4	3	3
D28	CR 931	Sturgeon River	7	3	3
D27	STURGEON ISLAND RD	Sturgeon Lake	7	4	4
D31	MSAS 101	Duluth	50	5	5
D32	32 AVE E	Duluth	50	5	5
D33	36TH AVENUE E	Duluth	50	5	5
D34	CSAH 80	Marble	39	5	5
D35	GARY ST	Marble	50	5	5
D37	CSAH 89	Duluth	23	5	5
S77	HWY 2	Saginaw	38	7	6
SCB	Mesaba Avenue	Duluth	27	6	7
S991	Superior Street and 21st Avenue East	Duluth	62	6	8
S993	Tight turn at S. 40th Avenue W and Oneota Street	Duluth	62	6	8
S994	40th Ave East and London Road	Duluth	62	6	8
D38	MN 70	Rock Creek	30	8	9
D42	US 2	Duluth	34	8	10
S78	HWY 169	Buhl	51	8	11
D44	IDAHO ST	Duluth	39	8	12
D39	SUPERIOR ST	Duluth	55	8	13
D40	MORRIS THOMAS RD	Duluth	63	8	13
D43	CSAH 61	Rock Creek	63	8	13
S57	TH 23	Duluth	64	9	14
S992	Woodland Ave and W. Arrowhead Road	Duluth	65	9	15

Figure 3-5: Map of Top Safety "Gaps"/Project Concepts

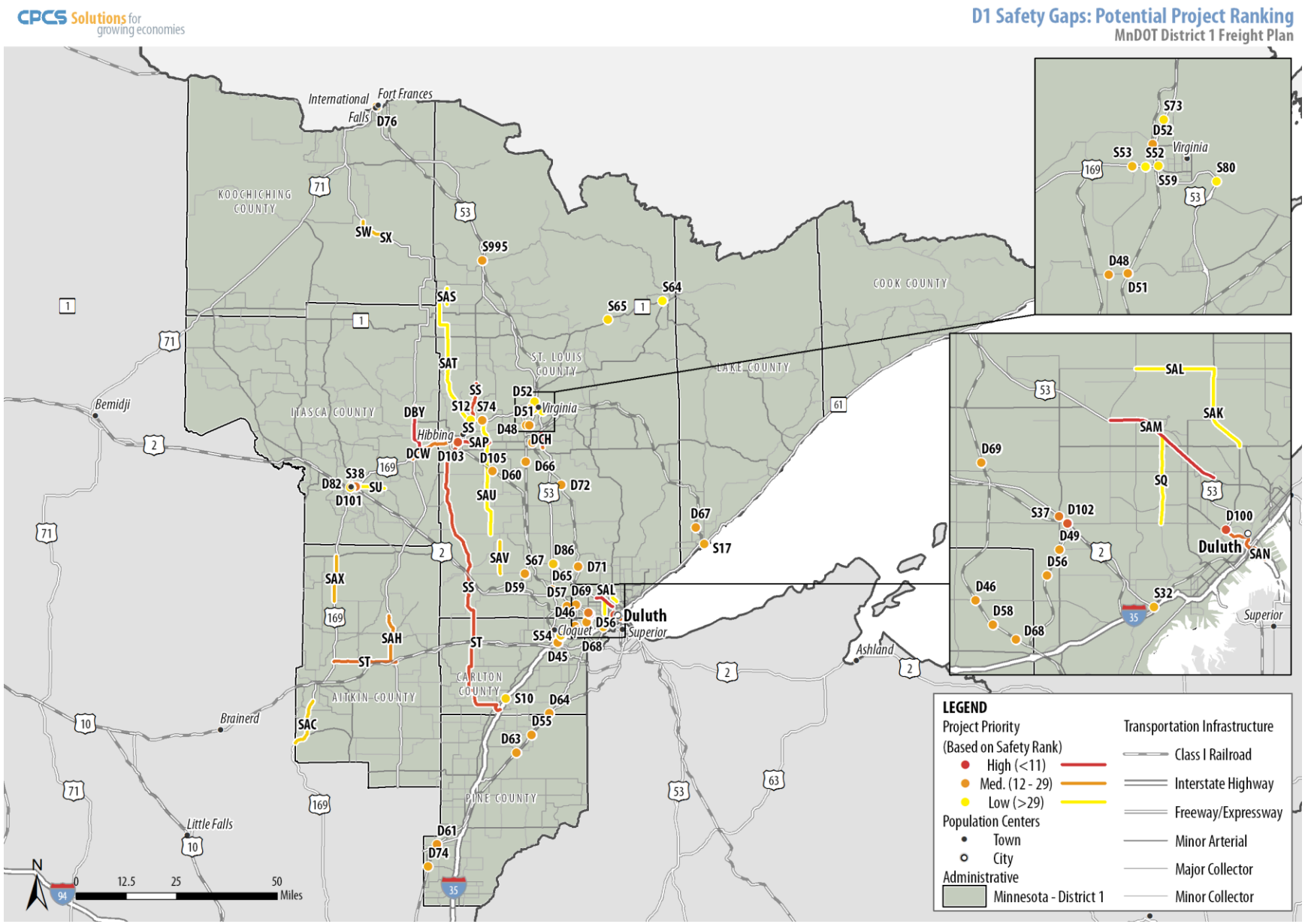


Figure 3-6: Map of Top Condition "Gaps"/Project Concepts

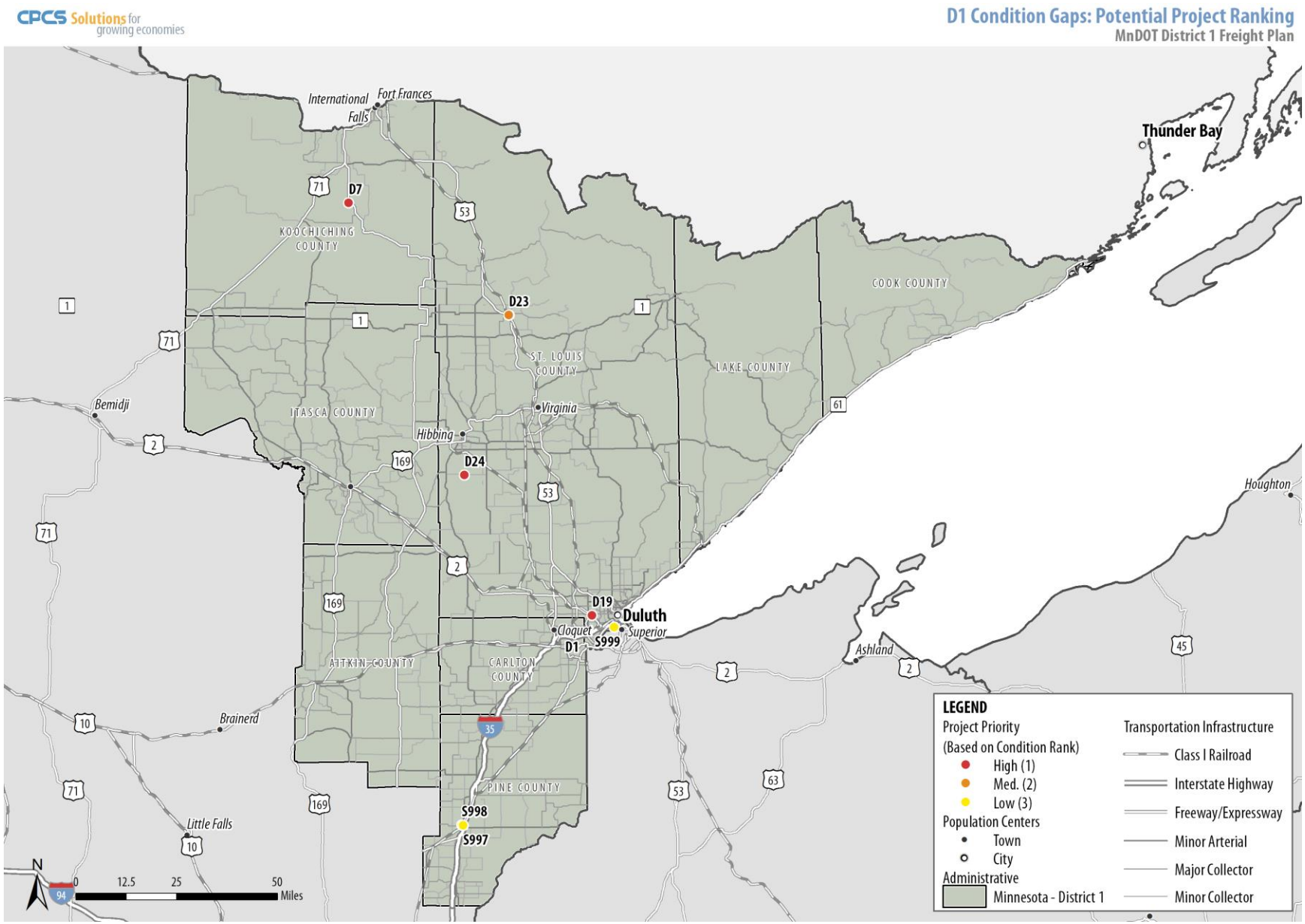
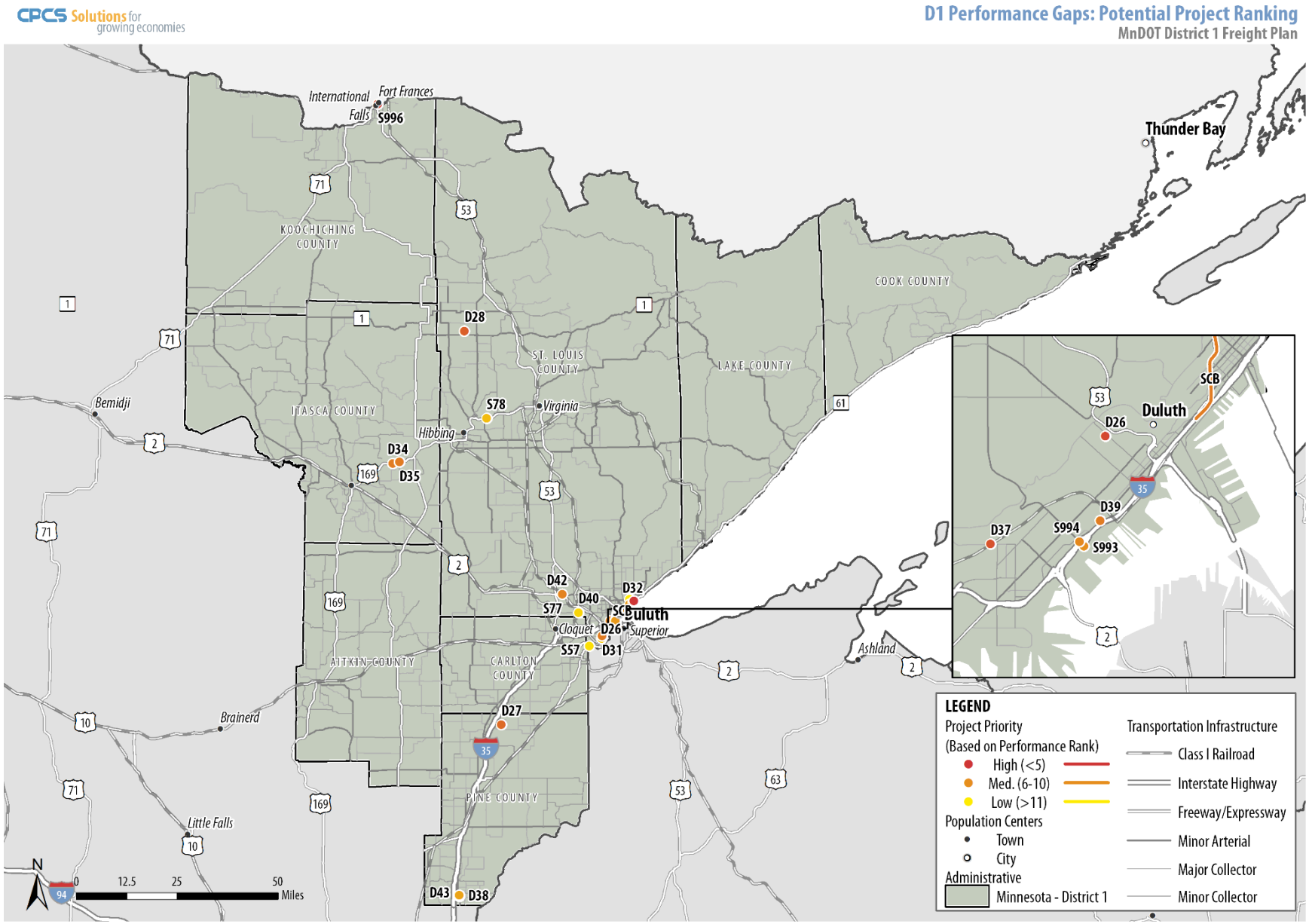


Figure 3-7: Map of Top Performance "Gaps"/Project Concepts



3.4 Other Freight Benefitting Projects

The evaluation and ranking process described in the preceding sections is nearly solely focused on those "gaps" on the highway system that can be addressed through infrastructure investment. In a few cases "gaps" were identified with a rail component – specifically at road/rail grade crossings or where vertical clearance is limited due to an overhead rail bridge.

However, Working Paper 3: Needs, Issues, and Opportunities identified several other key freight system needs and issues that have not been evaluated in this document, but will nevertheless be important to address in the future. This primarily includes issues such as first-/last-mile connections for large freight generators in the District. MnDOT has two key studies underway that will identify a slate of facility-related needs in District 1 that this Freight Plan will also need to consider:

- Minnesota Weight Enforcement Investment Plan (2018 – draft)
- Statewide Truck Parking Study (2019 – in development)

While the prioritization process described in this Working Paper provides a good basis for comparing potential highway infrastructure investments against each other, the process should not be a replacement for stakeholder engagement on the broad slate of issues in the District (including rail, port, facilities, etc.). It is not assumed that projects will advance in "rank order," nor that other non-prioritized projects will not be considered for advancement.

It is expected that, as funding is available, MnDOT will continue to advance projects using the criteria established in the Minnesota State Freight Investment Plan (shown previously in Figure 1-1). As such, projects that improve/support first-/last-mile connectivity, intermodality, and expand truck parking in the state will continue to be a critical type of projects MnDOT aims to advance.

4 Selection of Projects to Advance to Pre-Feasibility

Key Findings

One of the aims of the District 1 Freight Plan is to ensure that the critical needs in the region have the potential to be addressed by future rounds of funding. One way to do this is to take steps to prepare data and information to support the full slate of criteria used in evaluating/scoring projects in the MHFP process. This includes further developing unaddressed "gaps"/project concepts into clear projects/solutions, so that they can be scored and considered when future investment decisions are made.

A slate of 30 "gaps"/project concepts – out of a possible 124 – are being advanced to pre-feasibility assessment that will include 1) conceptual design of a slate of possible projects/solutions to address the "gap", and 2) order-of-magnitude construction cost estimating. This list represents a mix of "gaps" that when addressed are aimed at improving the safety, condition, and performance on the District 1 freight system.

4.1 Introduction

After review of the Minnesota Highway Freight Program (MHFP) selection process (Chapter 1), one of the key lessons learned was that if project concepts were not fully developed, portions of the score could not be calculated, specifically 1) cost effectiveness and 2) project readiness. As a result, there is the potential for newly identified projects/project concepts to be placed at a disadvantage in investment scoring and funding decision-making.

One of the aims of the District 1 Freight Plan is to ensure that the critical needs in the region have the potential to be addressed by future rounds of funding. One way to do this is to take steps to prepare data and information to support the full slate of criteria used in evaluating/scoring projects in the MHFP process. This includes further developing unaddressed "gaps"/project concepts into clear projects/solutions, so that they can be scored and considered when future investment decisions are made.

For the "gaps"/project concepts that scored highly in the District 1 evaluation, the following sub-section describes the process to advance a sub-set of well scoring concepts to pre-feasibility evaluation. The project feasibility work will include two key components – 1) conceptual design of a slate of possible projects/solutions to address the "gap", and 2) order-of-magnitude construction cost estimating. The design will identify:

- Overall land impacts and any right-of-way needs
- Safety concerns or desired improvements such as lighting
- Private access concerns

- Private utility relocations that may be required

All designs will meet current MnDOT standards and follow the guidelines for a Level 1 Geometric Layout. The results of the evaluation will be presented in Working Paper 5 – Project Feasibility.

4.2 Selecting Project Concepts to Advance to Pre-Feasibility

A list of 124 "gaps"/project concepts across the District had been identified as listed in Figure B-30 and mapped in Figure B-31. This project listing was used as the basis for determining which projects would be carried forward into Task 6 – Project Feasibility for evaluation. The process for selecting the priority projects to evaluate involved the following steps:

- "Gaps"/project concepts were rank ordered according to the "Pure Rank" scoring.
- The individual condition, safety, and performance categories were considered for each project concept to ensure that the items advanced reflected a mix of potential issues and solutions.
- Understanding that not all project concepts on the "pure rank" listing could be evaluated, it was decided to initially review those in the Top 30 of the pure ranking. Given there were several instances with multiple projects ranked at the same level, a total of 58 "gaps" were considered. For each "gap" the review included:
  - Use of GoogleEarth to consider the situation on on-the-ground and the context surrounding each issue.
  - Review of project history – that is, several of the "gaps" are well known and have already been studied extensively, and have identified solutions. It was determined that these projects would not warrant further evaluation as part of the District 1 Freight Plan.
  - Consideration of areas with relatively higher AADT'S (1,000 or more) and HCAADT's (where available) – this was done to ensure advancement of "gaps" that when addressed could provide travel benefits (as compared to those areas with fewer overall vehicles and trucks).

After consulting with MnDOT and key District 1 stakeholders, a slate of 30 "gaps"/project concepts were identified for pre-feasibility evaluation. Figure 4-1 provides a list of the gaps identified, and Figure 4-2 highlights these gaps in map form (this includes Item S988 – US 53/State Highway 332, which was added based on stakeholder feedback).

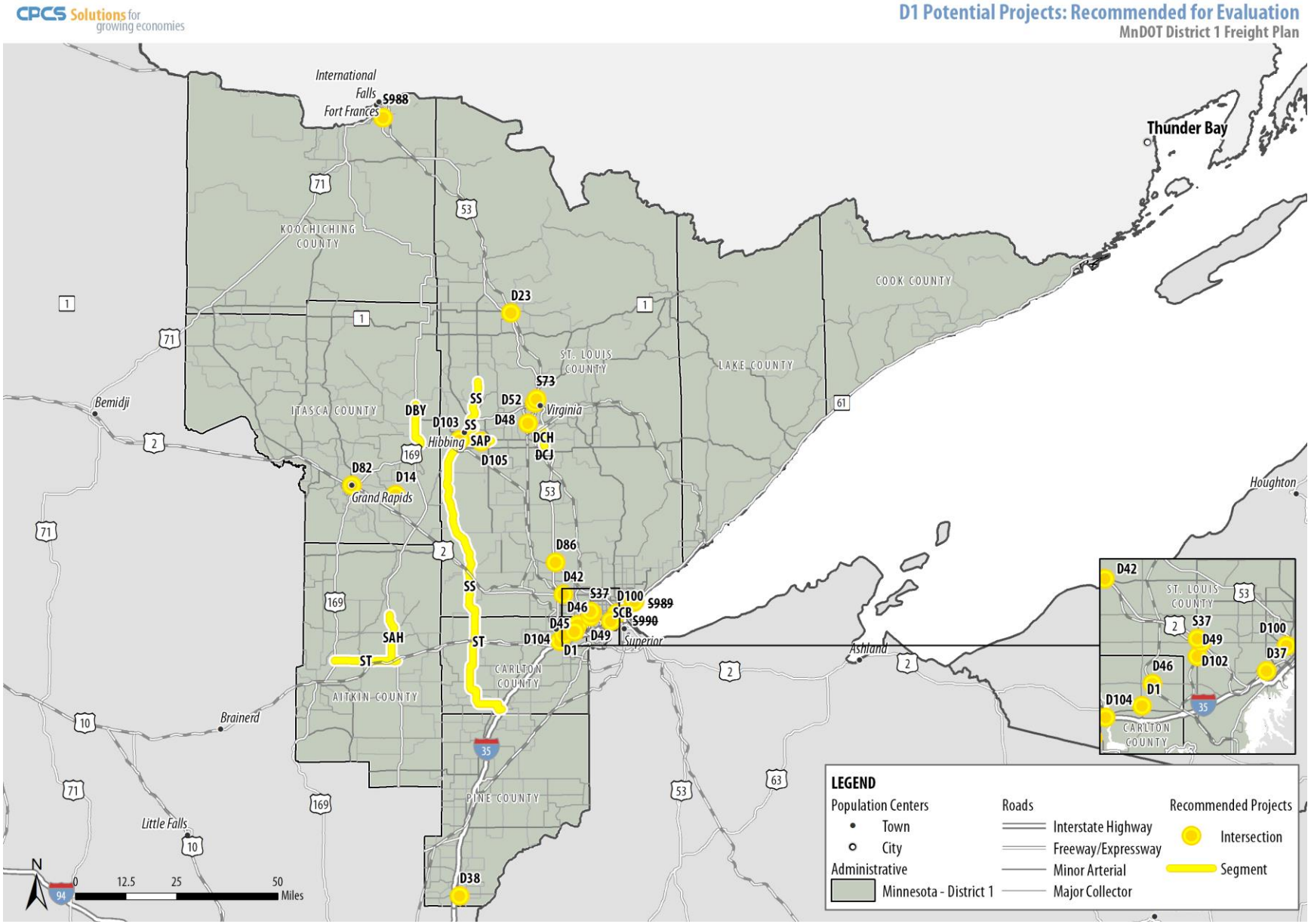
As shown, the list touches on the variety of safety, condition and mobility issues identified in the District, are geographically dispersed, as well as are on parts of the state, county and local transportation systems. The Figure 4-1 listing also provides indication of the level of expected complexity of the project/solution – and the level of effort that may be required to produce pre-feasibility assessment information for the location.

It is expected that between 20 and 30 projects we be evaluated as part of Task 6. The final number will be determined after MnDOT and District 1 stakeholders review initial pre-feasibility assessment information and provide further direction on the level of evaluation detail required for each location.

Figure 4-1: List of Project Concepts Recommended for Pre-Feasibility Evaluation

ID	Hwy	Location	Pure Rank	Safety Rank	Perf. Rank	Condition Rank	Complexity/ Scope
DCH	Miller Trunk Hwy	Eveleth (Heading South)	1	2		--	High
DBY	Central Ave	Nashwauk	3	3	--	--	Medium
D102	US 2	Saint Louis County	5	8		--	Medium
D14	UTWN 446	Trout Lake Township	7			1	Medium
S37	Highway 2	Going downhill into	8	17		--	Low
D105	MNTH 37	Saint Louis County	9	4		--	Medium
DCR/SAP	MNTH 37	Hibbing (Heading East)	10	5		--	Medium
D104	USTH 35	Carlton County	11	10		--	High
D100	USTH 53	Saint Louis County	12	6		--	Medium
SS	State Highway 73	Entire Highway	15	7		--	Medium
D86	USTH 53	Saint Louis County	17	9		--	High
D103	USTH 169	Saint Louis County	18	8		--	Medium
DCJ	Miller Trunk Hwy	Eveleth (Heading South)	20	18		--	High
D45	OLD CARLTON RD	Cloquet	22	22	--	--	Medium
D46	N CLOQUET RD E	Carlton County	22	22	--	--	Medium
D48	CSAH 7	Mountain Iron	22	22	--	--	Medium
D49	MIDWAY RD	Saint Louis County	22	22	--	--	Medium
D52	MINERAL AVE	Mountain Iron	22	22	--	--	Medium
D23	MUN 10	Cook	23			2	Medium
S989	S 36th Ave E: Need low clearance warning systems	Duluth	23		1	--	Low
S990	S 32nd Ave E: Need low clearance warning systems	Duluth	23		1	--	Low
D37	CSAH 89	Duluth	23		5		Medium
SAH	State Highway 65	Calumet to McGregor	24	19		--	Medium
D82	4TH ST NW	Grand Rapids	25	11		--	High
ST	State Highway 210	Aitkin to Cloquet	25	13		--	Medium
SCB	Mesaba Avenue: need swing-away traffic signals for oversize trucks	Duluth	27		7	--	Low
D38	MN 70	Rock Creek	30		9		Medium
D1	CSAH 1	Cloquet	33			1	Medium
D42	US 2	Duluth	34		10		Medium
S73	US 53/P&H Road	Virginia	57	37			Medium
S988	US 53/State Highway 332	International Falls	--	--	--	--	Medium

Figure 4-2: Map of Project Concepts Recommended for Pre-Feasibility Evaluation



5 Conclusions and Next Steps

5.1 Conclusions

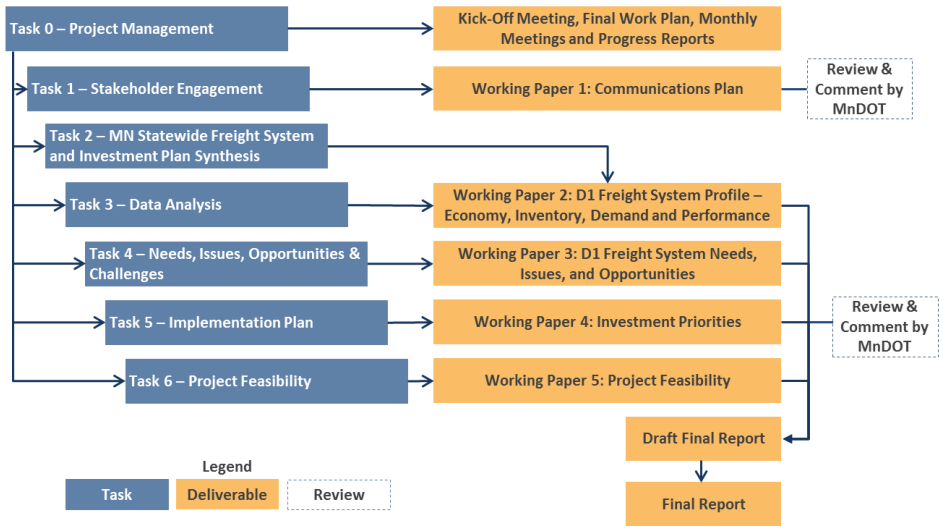
A key aim of the District 1 Freight Plan is to ensure that the critical needs in the region have the potential to be addressed by future rounds of funding. One way to do this is to take steps to prepare data and information to support the full slate of criteria used in evaluating/scoring projects in the MHFP process. This includes further developing unaddressed "gaps"/project concepts into clear projects/solutions so that they can be scored and considered when future investment decisions are made.

A slate of 30 "gaps"/project concepts – out of a possible 124 – are being advanced to pre-feasibility assessment that will include 1) conceptual design of a slate of possible projects/solutions to address the "gap", and 2) order-of-magnitude construction cost estimating. This information will be essential to addressing project gaps in the future.

5.2 Next Steps

As shown in the following figure, this Working Paper represents the output of Task 5 – identification of the unaddressed needs and issues in District 1 that could become investment priorities. The slate of projects that have been identified for Task 6 pre-feasibility assessment will be documented in the final Freight Plan Working Paper – Project Feasibility. All Working Papers will then be consolidated to present a concise, informative and implementable District 1 Freight Plan.

Figure 5-1: Project Approach



A – Identifying Investment Priorities

About the Draft Approach

The aim of Task 5 – Implementation Plan activities is to further evaluate District 1 freight system needs/project concepts and make recommendations to aid the District in 1) understanding what types of freight needs exist, 2) ranking needs to articulate which may be more important to address, and 3) preparing for future funding (MnDOT, grant or other) opportunities.

The starting point for the approach to evaluation and ranking described here is the prior process used by MnDOT to select projects for Minnesota Highway Freight Program (MHFP) funding. This competitive evaluation process conducted in 2017 was aimed at advancing shovel-ready projects during the 2019-22 fiscal years. That process was developed to evaluate projects on a statewide basis and to quantify the types of freight benefits they may provide.

As part of developing the District 1 Freight Plan, two primary concerns with the past process were identified through stakeholder feedback, including:

- Prioritizes highest traffic routes including Interstates and Trunk Highways compared to local routes, and,
- Relies on the availability of data that may not be available at the local level (e.g., truck counts).

As a result of these comments the District 1 Freight Plan is exploring a revised approach to evaluating and ranking freight system needs. To be clear, the intent of the approach described here is slightly different than the process used to select projects for MHFP funding:

- First, there is currently no additional freight-specific funding that the approach will select projects for.
- Second, the approach is being developed to screen freight system needs that could eventually become projects. As such, the needs are often referred to as “project concepts” as the scope and details to address the freight system needs have not yet been identified.
- Third, while the evaluation is intended to establish a conceptual project ranking, it is expected that MnDOT District Staff and local stakeholders will have the opportunity to advance projects based on factors that could include availability of funding, construction timing, integration with other projects and regional decision making by the Area Transportation Partnership. For example, a safety project may be ranked #1, but safety funds may be unavailable to advance. In this case a lower ranked (e.g., condition) project may be advanced if it aligns with available resources.

The remainder of this document presents the recommended approach for identifying freight system investment priorities for the District 1 Freight Plan.

Proposed Categories and Measures

Overview

Based on the review of MnDOT's past process for evaluating and ranking freight system projects, District 1 stakeholder comments received, and the overall intent of project concept evaluation for the District 1 Freight Plan, a revised approach to conducting evaluation and ranking has been developed. This approach is intended to:

- Evaluate/screen needs or "project concepts" instead of concrete, defined projects.
- Focus on regional issues (i.e., known to be important to District 1) vs. those that may be more important to the Metro District or more urban areas.
- Use as much data available at the local level, as possible.

Figure A-2 highlights the freight categories and measures proposed for the District 1 evaluation. Each of these items is further presented for MnDOT and stakeholder comment following the figure. A few notes on what is presented:

- There are not different categories or measures for different project types (whereas the prior process had measures for three different project types).
- The high score is intended to identify more important needs to address/project concepts to advance.
- For this "first cut" evaluation each item is weighted the same. The weighting can be revisited after initial results are derived.

Figure A-2: Proposed Freight Categories and Measures

Category	Measures
Truck Activity	HCAADT
	Truck percent (%) of total vehicles
Safety	Addresses a sustained crash location (Y/N)
	A safety issue identified in a district or county safety plan provide risk rating)
	Addresses at-grade crossing safety risk
Freight Mobility	Truck Travel Time Reliability
	Addresses a vertical clearance restriction
	Addresses a weight limited bridge
Condition	Bridge condition rating (one element less than 5)
Stakeholder Need	Y/N if this issue overlaps with a stakeholder identified need

Proposed Categories, Measures and Scores

Truck Activity

The Truck Activity score has two components – 1) truck volume and 2) truck percent.

The Truck Volume score is determined by the Heavy Commercial Annual Average Daily Traffic (HCAADT). Proposed scores for HCAADT ranges in District 1 are shown in the figure below. The measure and score ranges for truck volume have been developed based on thresholds relevant to District 1. These thresholds may be re-evaluated for other Districts or for statewide analysis. The scores, as applied, are shown in Figure A-5.

Figure A-3: Truck Volume Measures and Scores

HCAADT	Score
High Volume (>1,801)	5
1,000 – 1,800	4
600 – 1,000	3
350 – 600	2
151 – 350	1
Low Volume (<150)	0

The Truck Percent score is determined by the percent of HCAADT compared to total vehicle traffic. Proposed scores for truck percent ranges in District 1 are shown in the figure below. The measure and score ranges for truck percent have been developed based on thresholds relevant to District 1. These thresholds may be re-evaluated for other Districts or for statewide analysis. The scores, as applied, are shown in Figure A-6.

Figure A-4: Truck Percent Measures and Scores

HCAADT Percent	Score
High Truck % (>25.1%)	5
12.51 – 25.0%	4
7.51 – 12.5%	3
5.1 – 7.5%	2
2.51 – 5.0%	1
Low Truck % (<2.5%)	0

Note, for both measures in the truck activity category, there are still a substantial number of county and local roads that do not have information associated with them for evaluation.

Figure A-5: Truck Volume Score, As Applied

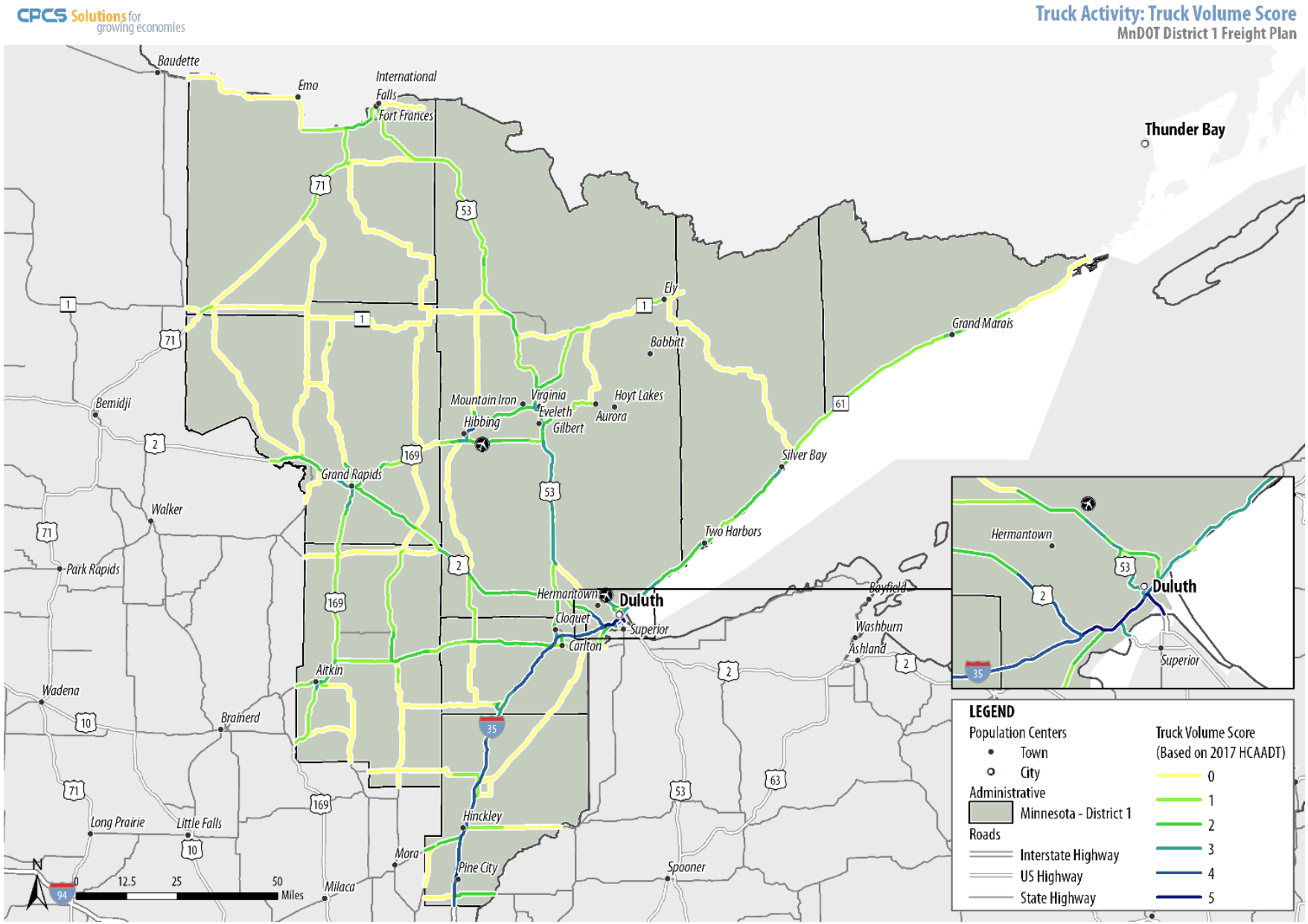
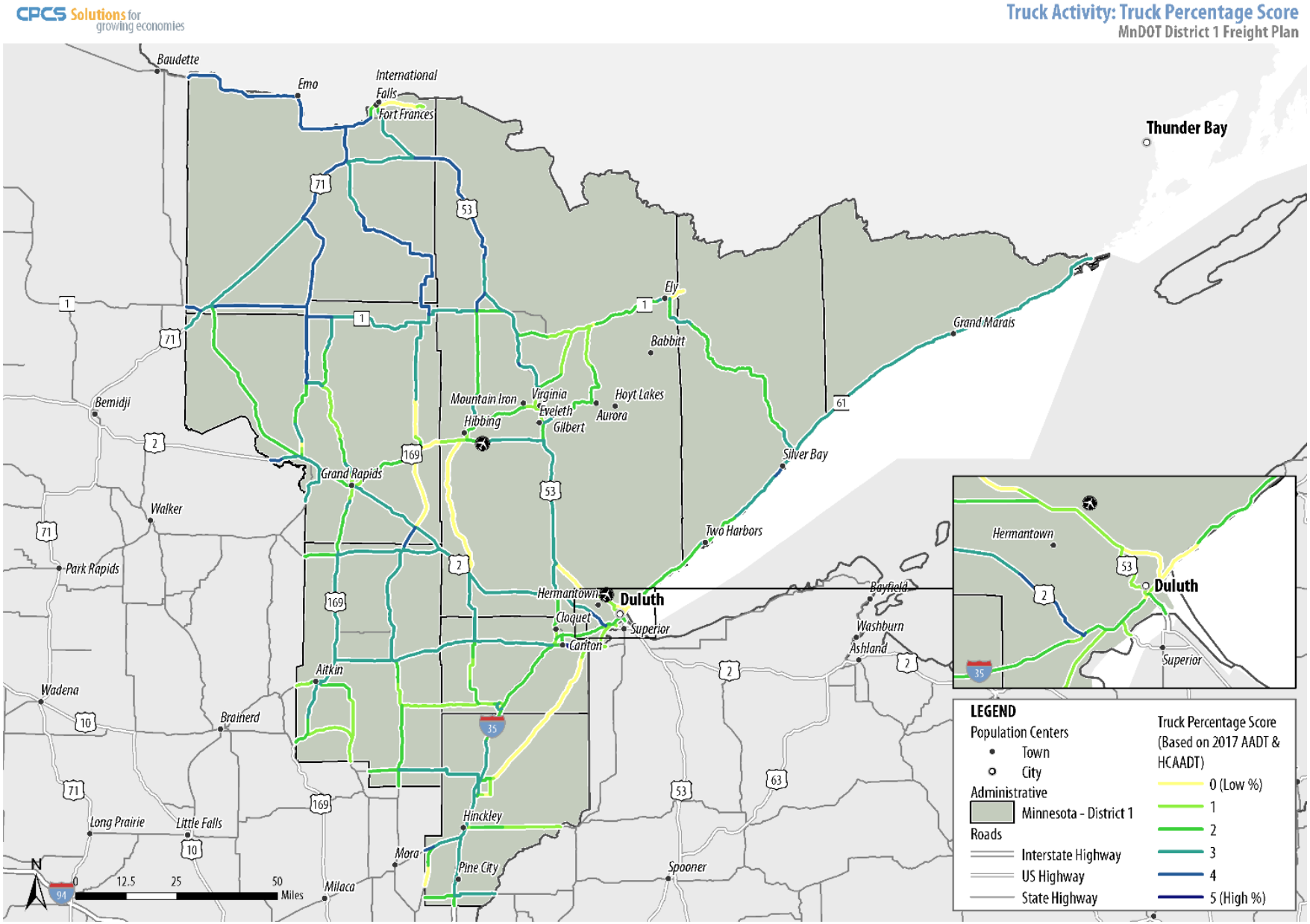


Figure A-6: Truck Percent Score, As Applied



Safety

The Safety score has three components – 1) freight-related crash location, 2) safety issue identified in county safety plan, and 3) at-grade crossing risk.

The first item acknowledges freight-related crash locations, either a single occurrence or a sustained location. A freight-related crash location is a location that has had a crash(es) recorded for recent analysis years (2012-2018). This item can be scored on all parts of the system (i.e., state, county, local). *This item has been adjusted from the initial draft approach to scoring (i.e., simply a score of 5 for any location with 2 or more crashes during the analysis period) to better account for multiple crashes that may occur along a segment, and individual crashes that are coincident with other identified gaps.*

Figure A-7: Sustained Freight-Related Crash Location

Freight-Related Crash Location	Score
If two or more crashes at a point or along a segment	5
If one crash overlaps an identified gap (point or segment)	1
If no crashes within proximity of an identified gap (point or segment)	0

The second component relates to if the location has been identified as an issue in the District or a county safety plan. If it has been identified in these documents, then it is scored in according to the risk rating calculated in the safety plan. Proposed safety risk scores are shown in Figure A-8. This score can only be applied to parts of the system where a safety plan has been conducted.

MnDOT's safety risk assessment does not fully consider freight vehicles. Therefore, the intent of scoring both 1) sustained crash location and 2) safety issue identified in county safety plan, is to ensure that those locations that are relevant to freight movement (i.e., at a sustained crash location for freight-related crashes) gets a higher score than those that are not.

Figure A-8: Safety Risk Measures and Scores

Risk Rating	Score
High Risk Rating (>5)	5
4	4
3	3
2	2
1	1
Low Risk Rating (=0)	0

MnDOT has an established, centralized process for evaluating at-grade crossing safety risk throughout the state. Most recently at-grade crossing safety risk for all Minnesota crossings was determined by MnDOT's Office of Freight and Commercial Vehicle Operations (OFCVO), Railroad Safety and Coordination Unit as part of a 2016 grade crossing study. These at-grade crossing risk scores will be brought forward and used to determine the evaluation score of each crossing, as shown in Figure A-9, and as applied in Figure A-13. This item can scored on all parts of the system (i.e., state, county, local), as MnDOT has evaluated all crossings in the state, and can also be used as

a point of awareness for MnDOT Districts and local governments as the work with OFCVO to address these locations.

Figure A-9: At-Grade Crossing Risk Measures and Scores

At-Grade Crossing Risk	Score
High At-Grade Crossing Risk (>9)	5
7 – 8	4
5 – 6	3
3 – 4	2
1 – 2	1
Low At-Grade Crossing Risk (=0)	0

Freight Mobility

The Freight Mobility score has three components – 1) truck travel time reliability, 2) vertical clearance, and 3) bridge weight limit.

As truck TTR is a federally-required measure, it is recommended that it continue to be used to gauge freight system mobility, and given priority in the overall evaluation. Unlike the prior MnDOT evaluation process [that awarded points on a projects ability to substantially improve reliability (all points), minimally improve reliability (half of the points), or not address reliability (no points)], the District 1 approach simply scores roadway segment TTR based on each segments' TTR relative to all other segment TTRs in the District. This is shown in Figure A-10. The measure and score ranges for truck TTR have been developed based on thresholds relevant to District 1. These thresholds may be re-evaluated for other Districts or for statewide analysis. The scores, as applied, are shown in Figure A-14. Not all county or local routes have scores in this measure. This is intended to identify bottlenecks of regional/District significance, the NPMRDS data will continue to be used with the process established by MnDOT to determine bottlenecks of statewide significance.

Figure A-10: Truck TTR Measures and Scores

TTR	Score
High Truck TTR (>15.1%)	5
9.1 – 15.0%	4
6.1 – 9.0%	3
3.51 – 6.0%	2
2.1 – 3.5%	1
Low Truck TTR (<2%)	0

Note: for this project average truck TTR was calculated based on the ratio of 50 – 95% travel time.

More important to freight mobility in District 1 is the presence of bottlenecks/chokepoints that are caused by things other than congestion – for example vertical clearance restrictions and bridge weight limit restrictions. Both of these impede mobility primarily for OSOW trucks which are critical to some of the heavy industries in the District (e.g., forestry) and for goods to/from the Port of Duluth. In District 1, information will be available to score both vertical clearance and bridge weight limits on all parts of the system (i.e., state, county, local). Figure A-11 highlights vertical clearance measures and scores, and Figure A-15 applies them to the system.

Figure A-11: Vertical Clearance Measures and Scores

Vertical Clearance	Score
Low Clearance – 13'6", or less	3
13'6" – 14'6" (under FHWA recommend)	2
14'6" – 16'6" (under the – minimum height for MnDOT OSOW super load corridors)	1
Higher Clearance – 16'6"+	0

Figure A-12 presents an approach to score bridges based on their operating rating (metric tons). This criteria could be adjusted if there is desire to score if a bridge suitable to handle up to 10-tons, up to 40-tons, or other ranges for overweight loads. The scores, as applied, are shown in Figure A-16.

Figure A-12: Bridge Operating Rating (Metric Tons) Measures and Scores

Bridge Weight Limit	Score
Low Weight Limit (<15.00)	5
15.01 – 40.00	4
40.01 – 50.00	3
50.01 – 65.00	2
65.01 – 85.00	1
Higher Weight Limit (>85.01)	0

Figure A-13: At-Grade Crossing Scores, As Applied

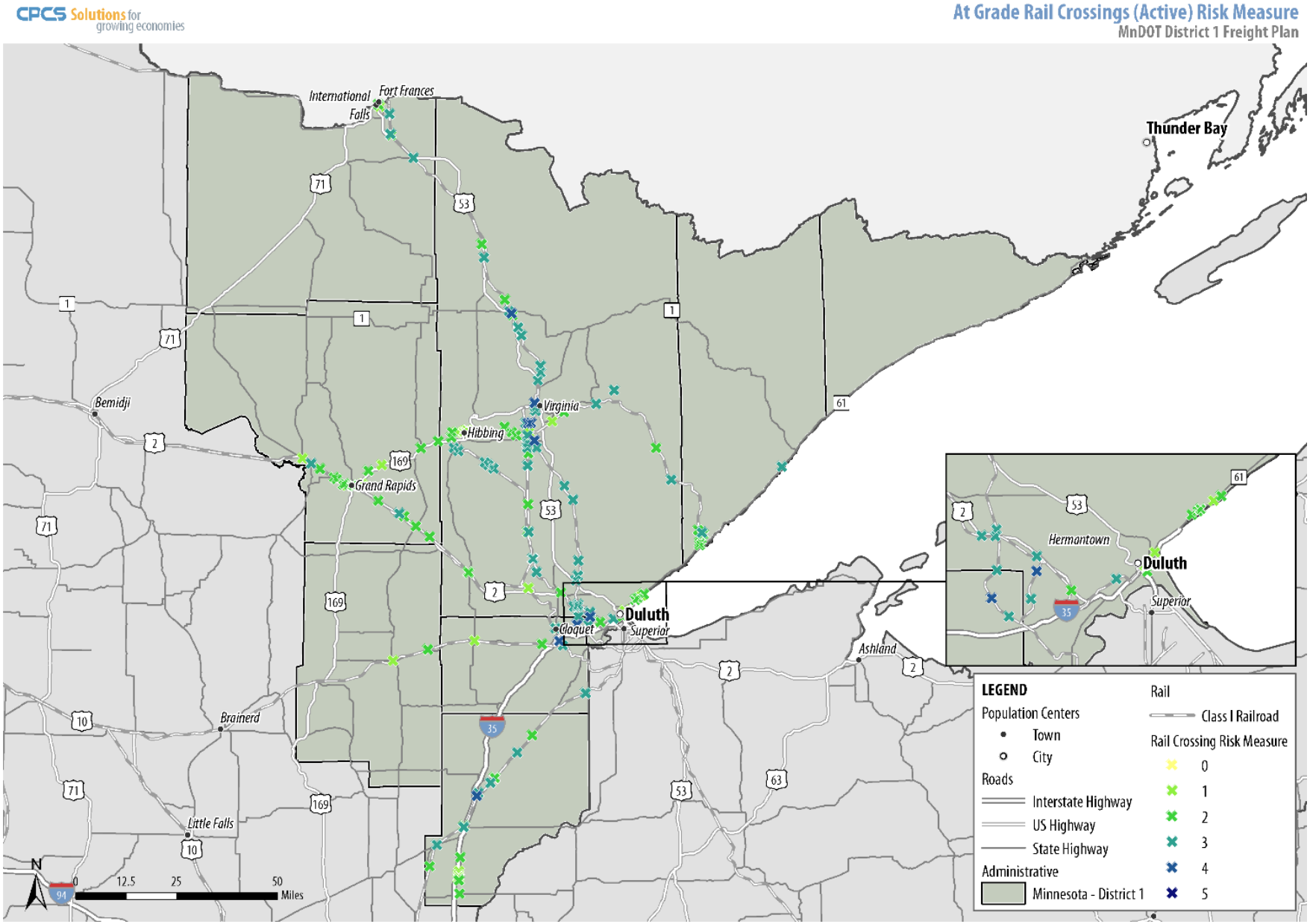


Figure A-14: Truck TTR Scores, As Applied

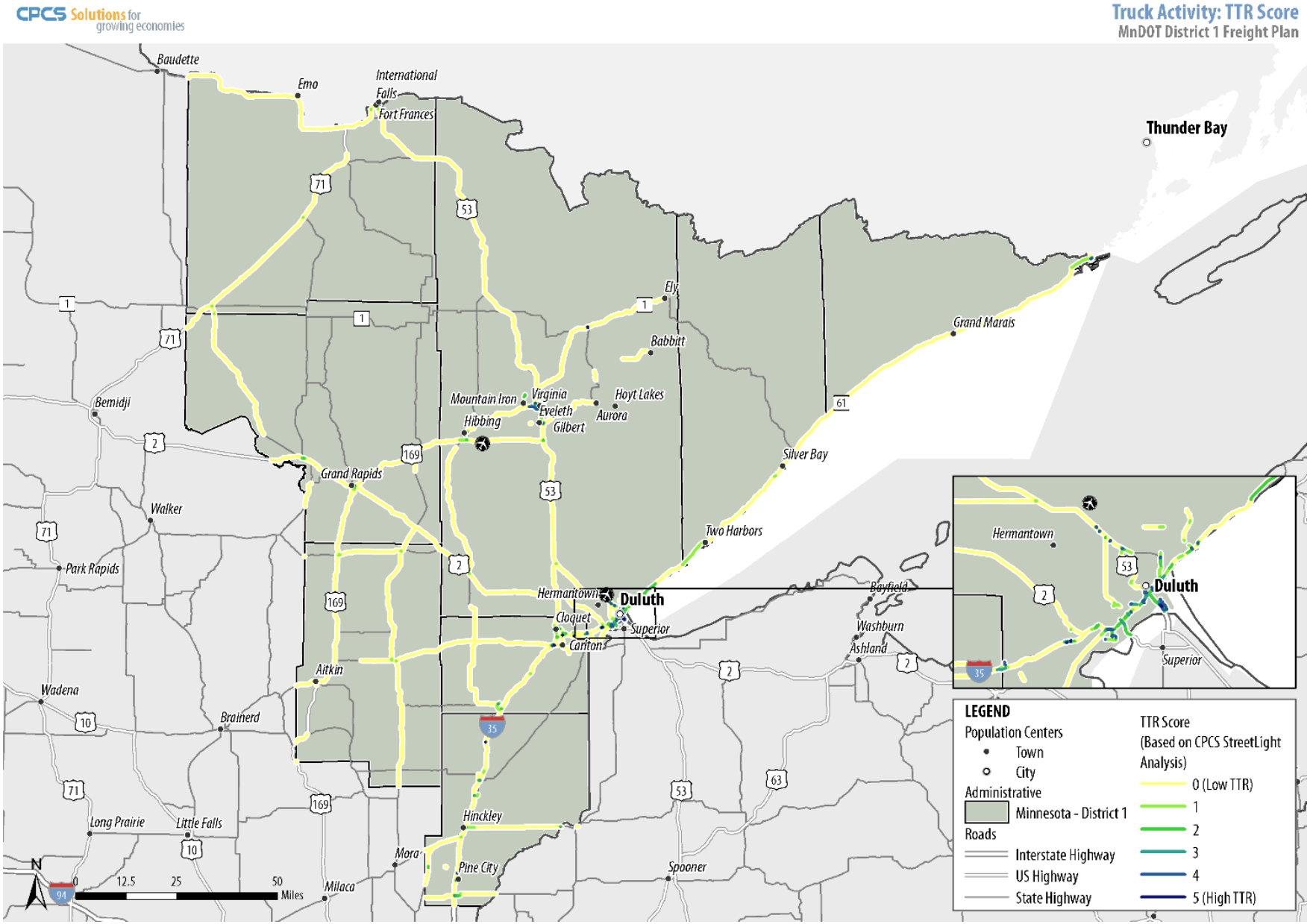


Figure A-15: Vertical Clearance Scores, As Applied

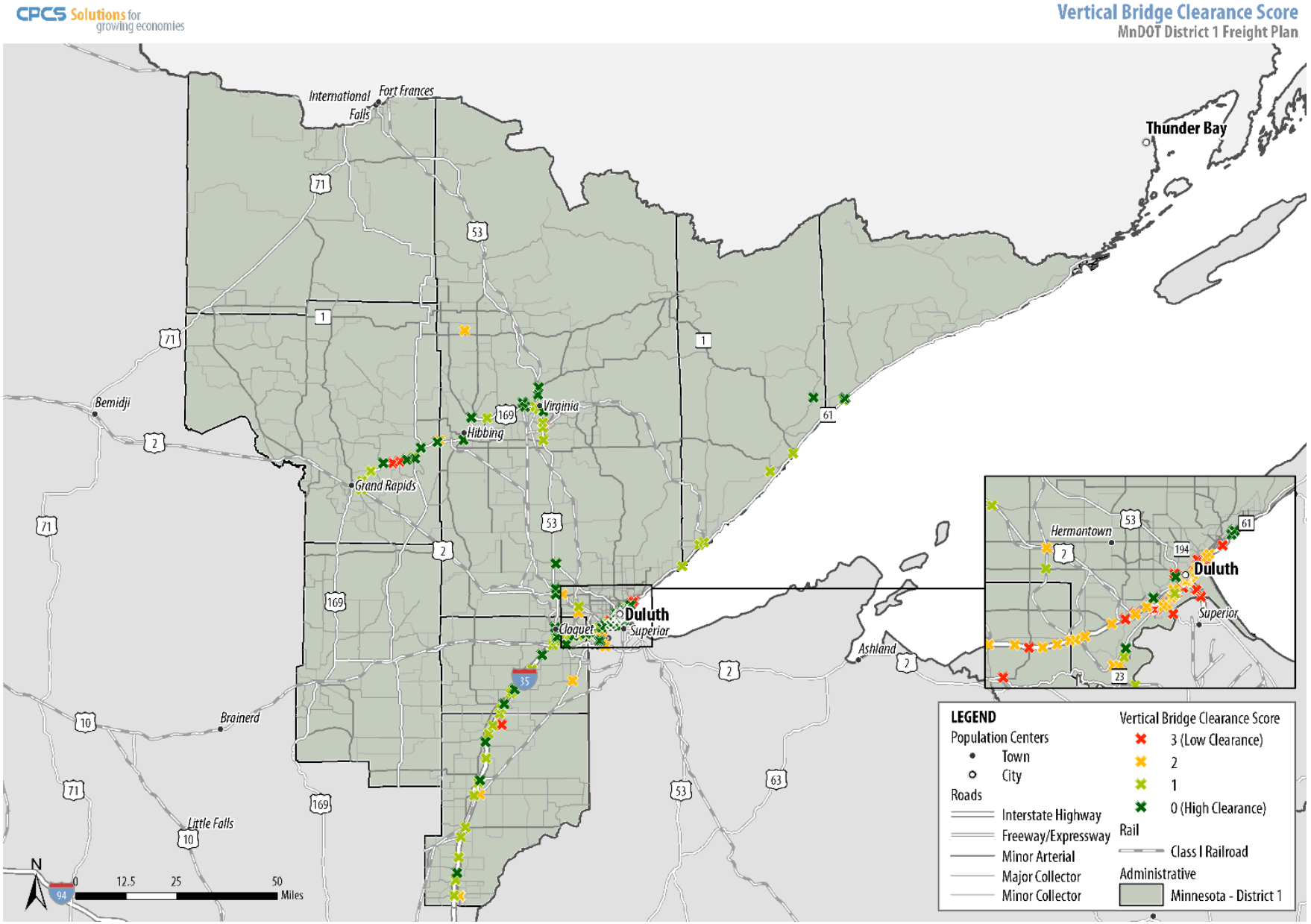
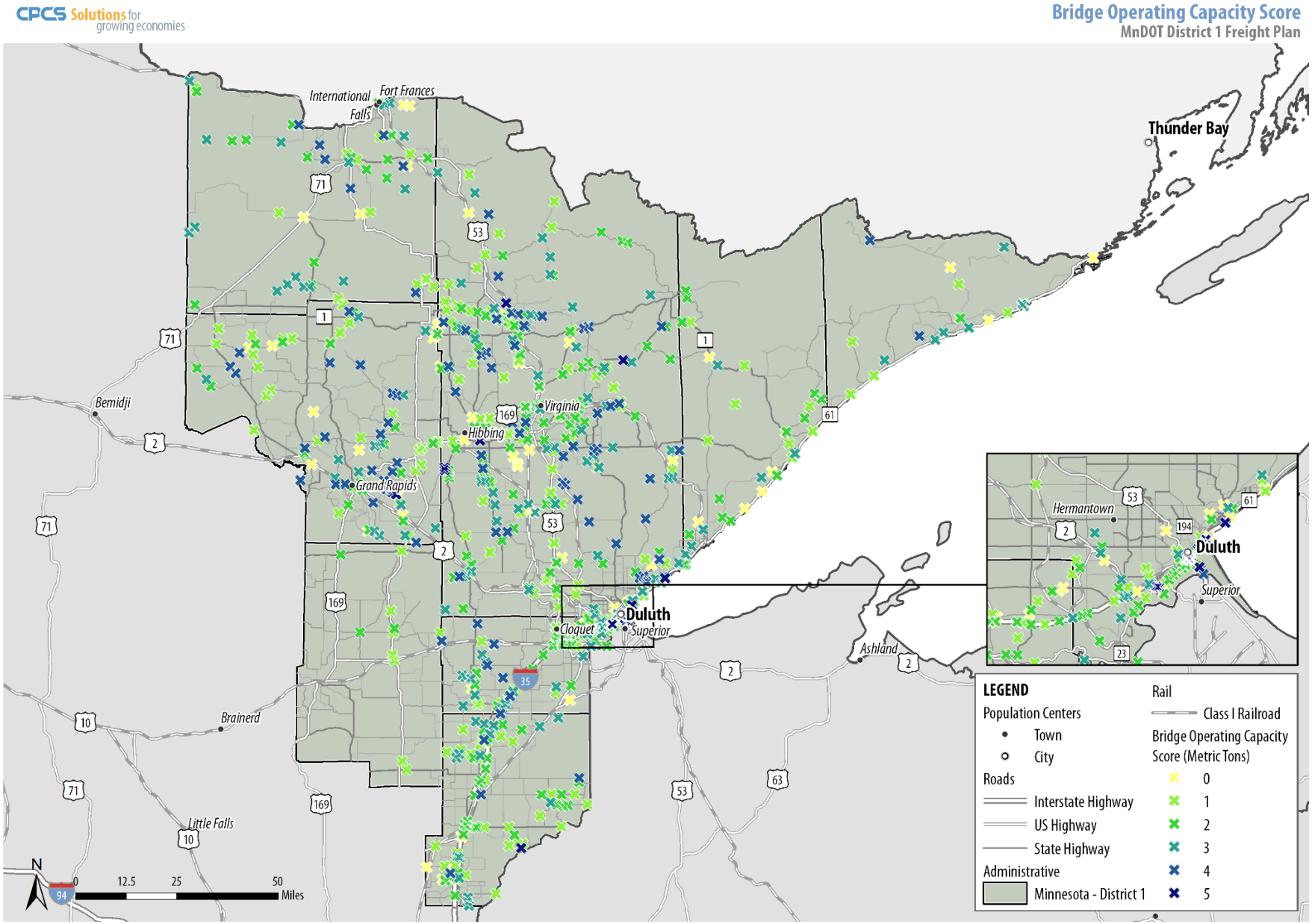


Figure A-16: Bridge Operating Capacity, As Applied



Condition

Bridge condition was identified as a concern for the region's roadway system. MnDOT's bridge condition evaluation process flags bridges with at least one element scoring "less than 5" on MnDOT's rating system as requiring attention. The District 1 evaluation process focuses on three categories of bridge condition to evaluate – 1) superstructure, 2) substructure, and 3) deck.

Figure A-17: Bridge Condition Measures and Scores

Bridge Condition	Score
Scores 5, or less, in 3 or more condition categories	3
Scores 5, or less, in 2 condition categories	2
Scores 5, or less, in 1 condition category	1
No scores of 5 or less in any condition category	0

Stakeholder Need

The process to identify needs in District 1 was both quantitative and qualitative, with the input from stakeholders contributing significantly to identifying freight system needs. This stakeholder input came one-on-one consultations, output from the District 1 Manufacturers' Perspective Study, and Advisory Committee and Technical Team feedback. As such, any project concept that overlaps with a stakeholder identified need is given 5 points.

Project Grouping

The resultant scores will provide indication of the type of project that may be advanced to address the identified needs. Figure A-18 highlights which categories and measures may be used to inform projects that provide safety, condition, or performance benefits.

Figure A-18: High Scores and Indication of Type of Project or Benefit

Category	Measures	Safety	Condition	Performance
Truck Activity	HCAADT	X	X	X
	Truck percent (%) of total vehicles	X	X	X
Safety	Addresses a sustained crash location	X		
	A safety issue identified in a district or county safety plan	X		
	Addresses at-grade crossing safety risk	X		
Freight Mobility	Truck Travel Time Reliability			X
	Addresses a vertical clearance restriction			X
	Addresses a weight limited bridge		X	X
Condition	Bridge condition rating		X	
Stakeholder Need	Y/N if this issue overlaps with a stakeholder identified need	X	X	X

Linking Evaluation to Project Concept Rankings

MnDOT requires that all project concepts be evaluated and placed in rank order (i.e., 1, 2, 3...). Therefore, the ultimate goal of this evaluation is to determine this ranking. For the District 1 Freight Plan, rankings will be used for two general purposes:

- to establish a general understanding of how project concepts compare against each other, and
- to aid in selecting a number of project concepts to advance to pre-feasibility.

The calculation of scores for each project concept will be straightforward, however, the interpretation of the scores will be approached in a few different ways.

Pure Ranking (Individual Project Concepts)

The "pure ranking" is simply the total of all scores, for each measure, for each project concept. As noted previously, not all project concepts will have scores for each of the measure categories, e.g., a weight limited bridge may not have a safety issues and will not receive a score in the safety category. However, there may be cases where project concepts do receive scores in multiple categories, and as a result will receive a higher score and ultimately will be ranked higher in the evaluation.

The pure ranking will provide indication of what project concepts have the highest score, considering all measures. **This ranking will form the rank order list that MnDOT requires.**

Ranking by Type of Project or Expected Benefit (Individual Project Concepts)

The ranking by project type will build on the information in Figure A-18; essentially that certain category measures provide indication of different types of solutions of expected benefits. For example, project concepts that score highly in safety category measures may be linked to a safety project as a solution (note: at this point the actual solutions have not been determined).

Three types of projects and expected benefits have been identified:

- Safety
- Condition
- Performance/Mobility

These three project types are directly related to goals of the Minnesota Statewide Freight System Plan, were the focus of the quantitative analysis conducted in the District 1 Freight Plan, and are also tied to existing MnDOT funding programs. From prior analysis there is much good data that can be used to inform these scores. Other categories could also be identified, as desired. As example, select criteria could provide indication of a project that would provide OSOW benefits (i.e., vertical clearance and posted bridge weight limits).

When scored within these categories it is expected that "top" safety, condition, performance, or OSOW projects will be more clearly identified, and not get diluted by being combined with all project types in the "pure ranking." This ranking will enable District 1 to advance projects aligned

with their interests/goals, as appropriate. For example, District 1 may elect to advance all OSOW projects before any others, and they will be able to easily do this based on the decided OSOW ranked list.

Other Ranking Methods (Individual Project Concepts)

There are also other methods of ranking project concepts, including ranking them in ways that provide important insights to District 1 stakeholders (e.g., potential funding source). As example project concepts may be ranked by:

- NHS vs. non-NHS routes
- Highest truck volume or percent
- District 1 County
- Intersection vs. corridor
- …and other ranking methods as determined by stakeholders.

Note, these other ranking methods would be best determined as a sub-set of the "pure ranking."

Clustered Ranking (Multiple Project Concepts)

As all the data used will be GIS-based, there will be an opportunity to review the scores as groups of clustered project concepts, primarily to determine if identified needs and issues are related to each other and if project concepts should be developed to address multiple issues at once. This "clustering" step is not intended to artificially inflate the rankings, but rather to reflect that adjacent projects benefit from each other and that there may be cost savings and additional economic and social benefits received through packaging investments together. Clustering could provide the greatest benefits along corridors that have multiple issues identified within a certain distance/proximity to each other (distance TBD).

Summary of Revised Approach

The recommended approach to identifying investment priorities for District 1 is as follows:

Step 1 – Identify needs and issues not being addressed

Step 1 includes:

- Quantitative (data analysis) and qualitative (stakeholder feedback and review of past studies) means to determine freight system needs and issues.
- Compare identified freight system needs and issues against planned/funded projects listings (e.g., MN STIP, MPO TIP, County road improvement programs, etc.).
- Identify the needs and issues that are not being addressed (gaps).

This step is complete, including identification of unaddressed needs and issues organized 1) by data and stakeholders, and 2) by gap type – safety, condition, and performance. The gap type provides insight into the type of "project concept" that could be advanced to address the gap.

Step 2 – Apply measures to calculate scores

Step 2 includes:

- Using the measures proposed in Section 3, determine the score for each gap/project concept for each category area.
- Identify where data is unavailable to determine scores for individual measures for any gaps/project concepts.
- Calculate total scores for each gap/project concept by summing scores for all measures together.

In this step each gap/project concept will have the same measures applied, each being weighted equally. At this point a full determination has not been made related to priorities or project solutions.

Step 3 – Evaluate results and establish rankings

Step 3 includes:

- Establishing the "pure ranking" of individual projects based on the sum of all scores.
- Establishing any required sub-rankings, as desired, based on the sum of scores in select categories, or based on other means.

B – Findings

This Appendix presents the preliminary findings from the application of the Approach to Identifying Investment Priorities described in Appendix A. This document is broken into four sections:

1. Findings from applying the "pure ranking" approach to all identified project concepts/gaps.
2. Findings from applying safety-related measures to a safety relevant projects.
3. Findings from applying condition-related measures to a condition relevant projects.
4. Findings from applying performance-related measures to a performance relevant projects.

1. Findings – Pure Ranking

Truck Volume Score

Truck volume scores were assigned to all identified gaps (points and segments) where HCAADT data was available. Where data was not available, a value of N/A was assigned to the gap. If a score was assigned to the gap (0-5, as outlined in Figure B-19), a total of five points was carried over to the *Possible Score* column. The *Total Score* column is a sum that includes all scores assigned to the gap in question. This score will be used to calculate additional rankings within the truck activity category, in addition to being used as a tiebreaker score for safety and condition projects.

Figure B-19: Truck Volume Measures and Scores

HCAADT	Score	Projects
High Volume (>1,801)	5	0
1,000 – 1,800	4	5
600 – 1,000	3	11
350 – 600	2	20
151 – 350	1	11
Low Volume (<150)	0	5
No Data	N/A	72

Truck Percent Score

Truck percent scores were assigned to all identified gaps (points and segments) where truck percent data was available. Where data was not available, a value of N/A was assigned to the gap. If a score was assigned to the gap (0-5, as outlined in Figure B-20), a total of five points was carried over to the *Possible Score* column. This score will be used to calculate additional rankings within the truck activity category, in addition to being used as a tiebreaker score for safety and condition projects.

Figure B-20: Truck Percent Measures and Scores

HCAADT Percent	Score	Projects
High Truck % (>25.1%)	5	0
12.51 – 25.0%	4	4
7.51 – 12.5%	3	13
5.1 – 7.5%	2	13
2.51 – 5.0%	1	21
Low Truck % (<2.5%)	0	1
No Data	N/A	72

The high count of potential projects with no truck volume or percent data reflects a common comment in regard to a lack of truck data on local roads, and the fact that many of District 1's identified needs were on local roads.

Crash Location Score

Crash location scores were assigned based on the degree of "overlap" between truck-involved crashes and identified project gaps. Intersections or segments that had 2 or more crashes received a high score of five, while sites with a single crash received a score of 1. This scoring difference was chosen in order to elevate areas with repeated truck-related accidents, which may be in immediate need of remediation.

Figure B-21: Freight Crash Location Measures and Scores

Freight Related Crash Location	Score	Projects
If 2+ crashes overlap an identified gap	5	23
If 1 crash overlaps an identified gap	1	6
If no crashes overlap identified gap	0	95

Safety Risk Score

Safety scores were assigned to all identified gaps (points and sections) only if they had been previously identified in the District 1 Safety Plan (May 2016). Gaps that did not overlap with identified problems in the D1 Safety Plan received a value of N/A, and this category was not considered as part of the total possible score for these gaps. Scores were based on 2-lane segment prioritization, 4-lane segment prioritization, freeway prioritization, 2-lane intersection prioritization, and expressway intersection prioritization. Where scores were assigned, the safety risk score is equivalent to the "total stars" found within the District 1 Safety Plan. Rail bridges and the majority of rural rail crossings were not scored in this category, as rail was not considered in the D1 Safety Plan.

Figure B-22: Safety Risk Measures and Scores

Risk Rating	Score	Projects
High Risk Rating (>5)	5	4
4	4	2
3	3	10
2	2	4
1	1	0
Low Risk Rating (=0)	0	54

Risk Rating	Score	Projects
No Data	N/A	50

At-Grade Crossing Score

At-grade crossing scores were only assigned to the rail-related gaps within the study. Scores were based on the assigned crossing risk categories shown in Figure B-23. This score will be carried over to *Total Possible Score* only for those gaps as identified as rail-related.

Figure B-23: At-Grade Crossing Risk Measures and Scores

At-Grade Crossing Risk	Score	Projects
High At-Grade Crossing Risk (>9)	5	0
7 – 8	4	23
5 – 6	3	1
3 – 4	2	1
1 – 2	1	0
Low At-Grade Crossing Risk (=0)	0	0
No Data / Not Relevant	N/A	99

Truck Travel Time Reliability (TTR)

TTR is generally not considered to be a problem in the District, and this is reflected in the distribution of scores, with most potential projects receiving no points, and an even greater number of potential projects lacked TTR data, due to limited StreetLight data coverage in rural areas.

Figure B-24: Truck TTR Scores

TTR	Score	Projects
Low Truck TTR (>15.1)	5	0
9.1 – 15.0	4	2
6.1 – 9.0	3	0
3.51 – 6.0	2	1
2.1 – 3.5	1	11
High Truck TTR (<2)	0	42
No Data	N/A	68

Vertical Clearance Score

Vertical clearance scores were assigned only to gaps identified from two sources: 1) D1 Bridge Clearance and Condition Data; or 2) bridges as identified as problematic by stakeholders. Where the gap was *not* identified as a bridge, a value of N/A was assigned so as to not skew the *Possible Score*.

Figure B-25: Vertical Clearance Measures and Scores

Vertical Clearance	Score	Projects
Low Clearance – 13’6”, or less	3	10
13’6” – 14’6” (under FHWA recommend)	2	2
14’6” – 16’6” (under the minimum height for MnDOT OSOW super load corridors)	1	7
Higher Clearance – 16’6”+	0	7
No Data / Not Relevant	N/A	98

Bridge Operating Score

Bridge operating scores were assigned only to gaps found identified from either 1) D1 Bridge Clearance and Condition Data; or 2) bridges as identified as challenging by stakeholders. Where the gap was not identified as a bridge, a value of N/A was assigned so as to not skew the Possible Score.

Figure B-26: Bridge Operating Rating (Tons) Measures and Scores

Bridge Weight Limit	Score	Projects
Low Weight Limit (<15.00)	5	1
15.01 – 40.00	4	2
40.01 – 50.00	3	2
50.01 – 65.00	2	2
65.01 – 85.00	1	0
Higher Weight Limit (>85.01)	0	14
No Data / Not Relevant	N/A	103

Bridge Condition Score

Bridge condition scores were assigned only to gaps found within both the D1 Bridge Clearance and Condition Data, where scores were available. Where the gap was not identified as a bridge, a value of N/A was assigned so as to not skew the *Possible Score*.

Figure B-27: Bridge Condition Rating Measures and Scores

Bridge Condition	Score	Projects
Scores 5, or less, in 3 or more condition categories	3	10
Scores 5, or less, in 2 condition categories	2	3
Scores 5, or less, in 1 condition category	1	0
No scores of 5 or less in any condition category	0	12
No Data / Not Relevant	N/A	99

Pure Ranking Results

Possible Scores

Possible score reflects the maximum potential points that a project concept *could* receive. These scores primarily reflect the availability of safety, condition, performance, and truck activity data for a project concept, because a lack of data for a specific project will lower its potential total score. The distribution of scores below shows that the majority of project concepts have a moderate amount of data available.

Figure B-28: Distribution of Possible Scores

Score	Projects
28	2
26	2
25	42
20	8
16	18
15	12
11	2

Score	Projects
10	33
8	5

Total Scores

Total score reflects the actual number of points awarded to each project concept. The distribution of total scores below shows that a select number of projects would rise to the top of the rankings. However, it is important to keep in mind that this total score is also influenced by the total number of categories in which a project concept was ranked.

Figure B-29: Distribution of Total Scores

Score	Projects
14	2
13	3
12	6
11	7
10	2
9	5
8	6
7	4
6	7
5	7
4	28
3	16
2	5
1	7
0	19

Figure B-30: Pure Ranking Listing

Project ID	Highway	Location	Pure Rank	Pure Rank (w HCAADT)
DBY	Central Ave	Nashwauk	1	3
D26	MUN 361	Duluth	2	4
D14	UTWN 446	Trout Lake Township	3	7
D27	STURGEON ISLAND RD	Sturgeon Lake	3	7
D28	CR 931	Sturgeon River	3	7
DCH	Miller Trunk Hwy	Eveleth (Heading South)	4	1
SAM	State Highway 194	Duluth	5	2
D76	2ND AVE W	International Falls	6	29
D102	US 2	Saint Louis County	7	5
D104	USTH 35	Carlton County	8	11
S15	Hwy 2/Cty Road 63	Corner of Hwy 2 and Cty Road 63	9	6
SBM	US Highway 53	Orr to International Falls	9	6
S37	Highway 2.	Going downhill into	10	8

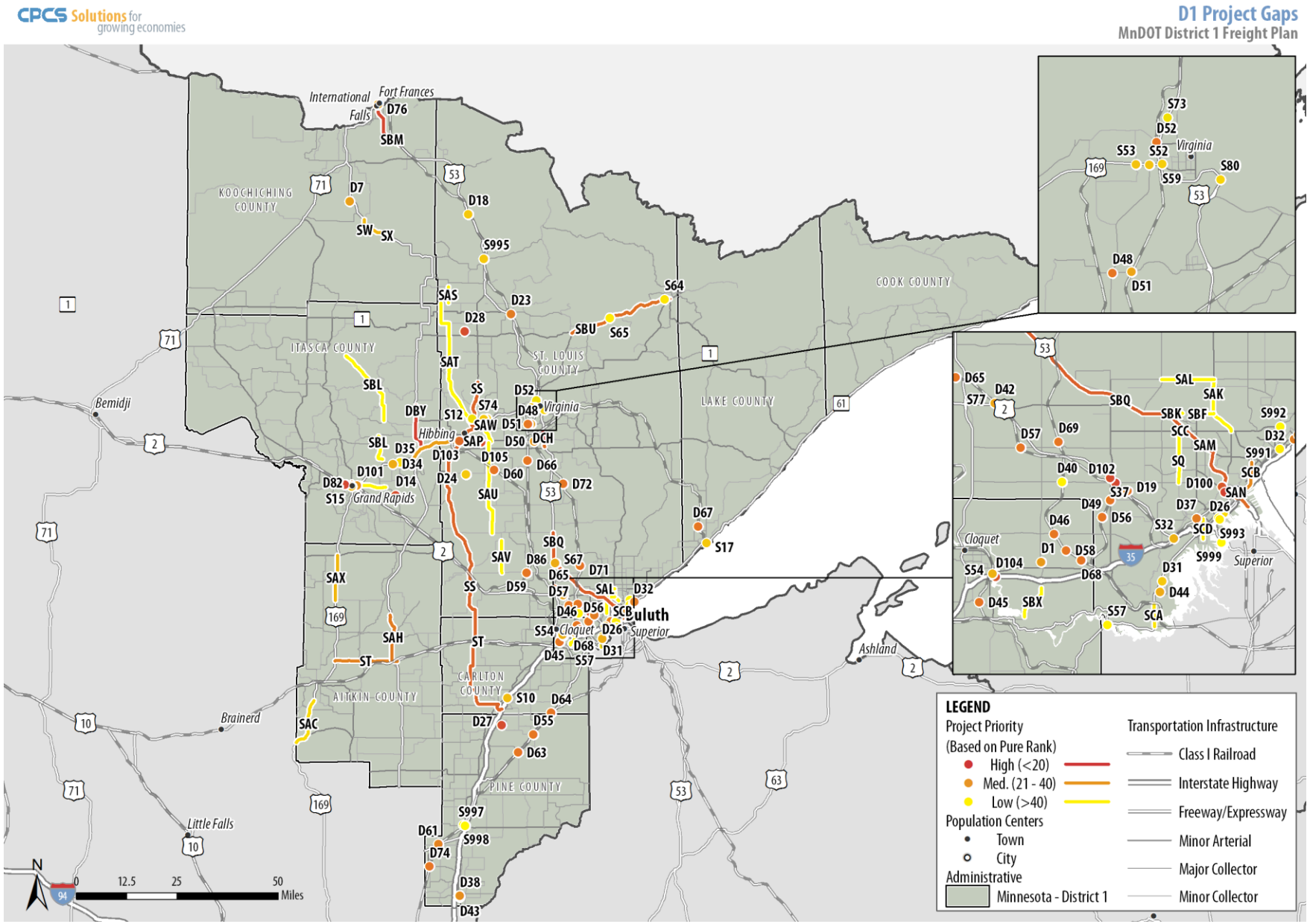
Project ID	Highway	Location	Pure Rank	Pure Rank (w HCAADT)
D105	MNTH 37	Saint Louis County	11	9
DCR/SAP	MNTH 37	Hibbing (Heading East)	12	10
SAN	US Highway 53	Duluth	13	17
D100	USTH 53	Saint Louis County	14	12
D45	OLD CARLTON RD	Cloquet	15	22
D46	N CLOQUET RD E	Carlton County	15	22
D48	CSAH 7	Mountain Iron	15	22
D49	MIDWAY RD	Saint Louis County	15	22
D52	MINERAL AVE	Mountain Iron	15	22
D55	KLEIN RD	Kerrick	15	22
D56	STARK RD	Saint Louis County	15	22
D57	MAPLE GROVE RD	Saint Louis County	15	22
D58	E HARNEY RD	Carlton County	15	22
D59	DULUTH SAINT VINCENT RD	Saint Louis County	15	22
D60	MAKI RD	Saint Louis County	15	22
D63	PINE ST	Bruno	15	22
D64	CR145	Carlton County	15	22
D65	INDEPENDENCE RD	Saint Louis County	15	22
D66	NORWAY RIDGE RD	Saint Louis County	15	22
D67	BIG ROCK RD	Lake County	15	22
D68	RATIKA RD	Carlton County	15	22
D69	MUNGER SHAW RD	Saint Louis County	15	22
D71	BATCHELOR RD	Saint Louis County	15	22
D72	MELRUDE RD	Saint Louis County	15	22
S996	International bridge at International Falls	INTERNATIONAL FALLS	15	37
SBQ	US Highway 53	DULUTH	15	13
D23	MUN 10	Cook	16	23
D37	CSAH 89	Duluth	16	23
S989	36th Avenue East.	Duluth	16	23
S990	32nd Avenue East	Duluth	16	23
D19	MUN 85	Duluth	16	23
D86	USTH 53	Saint Louis County	17	14
SS	State Highway 73	Entire Highway	18	15
SAP	State Highway 37	Hibbing	19	16
D103	USTH 169	Saint Louis County	20	18
SBU	State Highway 1	Tower to Ely	21	19
SAO	State Highway 38	Grand Rapids	22	28
D38	MN 70	Rock Creek	23	30

Project ID	Highway	Location	Pure Rank	Pure Rank (w HCAADT)
DCJ	Miller Trunk Hwy	Eveleth (Heading South)	24	20
D82	4TH ST NW	Grand Rapids	25	21
SCB	Mesaba Avenue	Duluth	26	27
D1	CSAH 1	Cloquet	27	33
D42	US 2	Duluth	28	34
SAH	State Highway 65	Calumet to McGregor	29	24
ST	State Highway 210	Aitkin to Cloquet	30	25
D61	3RD ST N	Brook Park	31	26
D7	CNTY 70	Little Fork	32	36
D50	MNTH 37	Saint Louis County	33	31
S54	45	Kwik Trip in Cloquet	34	41
D101	USTH 169	Itasca County	35	32
D34	CSAH 80	Marble	36	39
DCW	USTH 169	Swan Lake to Hibbing	37	35
S77	HWY 2	Saginaw	38	38
SW	State Highway 65	Bois Forte Reservation to Little Fork	39	43
SX	State Highway 65	Bois Forte Reservation	39	43
S67	Swan Lake Road Bridge	Independence	40	40
S32	I35/Proctor exit	Duluth	41	42
S53	7 and 53	Intersections near Walmart (Hwy 169 and Mud Lake Road)	42	47
S52	7 and 53	Intersections near Walmart (Hwy 7 and 53)	43	48
S80	HWY 53/LANDFILL ROAD	VIRGINIA	44	53
D51	FAYAL RD	Mountain Iron	45	37
S17	2	Cty 2	45	49
D18	UT 8146	Ash Lake	46	50
D24	TWNS 883	West Swan River	46	50
D31	MSAS 101	Duluth	46	50
D32	32 AVE E	Duluth	46	50
D33	36TH AVENUE E	Duluth	46	50
D35	GARY ST	Marble	46	50
SAX	US Highway 169	Hill City	47	44
S10	1-35	Bridge 09823 1-35 over Moose Horn River at Milepost 219.556	48	45
S38	TH 2/2nd Ave NW	Grand Rapids	49	46
S59	53 Southbound	North of 169, Virginia	50	52
D44	IDAHO ST	Duluth	51	39
S78	HWY 169	BUHL	52	51
S74	HWY 5/HWY 169	Hibbing	53	49

Project ID	Highway	Location	Pure Rank	Pure Rank (w HCAADT)
S995	Orr RR Crossing	ORR	53	49
D74	POKEGAMA AVE	Henriette	54	54
D39	SUPERIOR ST	Duluth	55	55
SAC	US Highway 169	Aitkin (Heading South)	56	56
S73	HWY 53	Virginia	57	57
S12	Iron World Road and 169	Chisholm	58	58
SV	US Highway 169	Hibbing to Virginia	58	58
S64	Hwy 21	Sheridon St and Central	59	59
S991	Superior Street and 21st Avenue East	Duluth	60	62
S993	S. 40th Avenue W and Oneota Street	Duluth	60	62
S994	40th Ave East and London Road	Duluth	60	62
SCA	Grand Avenue	Duluth	60	60
SCD	Central Avenue	Duluth	60	62
S65	Hwy 169	Six Mile Road	61	61
D40	MORRIS THOMAS RD	Duluth	62	63
D43	CSAH 61	Rock Creek	62	63
S57	TH 23	Munger Trail Bridge	63	64
DCC	CSAH 5	Chisolm (Heading South)	64	65
S992	Woodland Ave and W. Arrowhead Road	Duluth	64	65
S997	BNSF Bridges on Hinckley Subdivision	Hinckley	64	65
S998	BNSF Bridges on Hinckley Subdivision	Hinckley	64	65
S999	Grassy Point Bridge	Duluth	64	65
SAK	Rice Lake Rd	Duluth	64	65
SAL	Caribou Lake Rd	Duluth	64	65
SAS	County Highway 5	Meadow Brook	64	65
SAT	County Highway 5	Hibbing (Heading North)	64	65
SAU	County Highway 5	Hibbing (Heading South)	64	65
SAV	County Highway 5	Meadowlands	64	65
SAW	County Highway 5	Hibbing	64	65
SBF	Airport RD	Duluth	64	65
SBK	Airport Rd	Duluth	64	65
SBL	County Highway 7	Taconite to Big Fork	64	65
SBX	Thompson Rd	Cloquet	64	65
SCC	Arrowhead Road	Duluth	64	65
SQ	Stebner Rd	Duluth	64	65

Project ID	Highway	Location	Pure Rank	Pure Rank (w HCAADT)
SU	County Highway 21	Grand Rapids	64	65

Figure B-31: Map of Pure Rankings



2. Findings – Safety Sub-Ranking

An evaluation of a subset of projects – those with a "Need/Issue Type" marked as "safety" – was conducted using the process described in the previous section for safety-related measures. Figure B-38 highlights safety sub-ranking findings.

Crash Location Score

Figure B-32: Freight Crash Location Measures and Scores

Freight Related Crash Location	Score	Projects
If 2+ crashes overlap an identified gap	5	18
If 1 crash overlaps an identified gap	1	4
If no crashes overlap identified gap	0	55

Safety Risk Score

Figure B-33: Safety Risk Measures and Scores

Risk Rating	Score	Projects
High Risk Rating (>5)	5	3
4	4	2
3	3	8
2	2	2
1	1	0
Low Risk Rating (=0)	0	39
No Data	N/A	23

At-Grade Crossing Score

At-grade crossing scores were only assigned to the rail-related gaps within the study area. Scores were based on the assigned crossing risk and reassigned as shown in Figure 5. This score will be carried over to *Total Possible Score* only for those gaps as identified as rail-related.

Figure B-34: At-Grade Crossing Risk Measures and Scores

At-Grade Crossing Risk	Score	Projects
High At-Grade Crossing Risk (>9)	5	0
7 – 8	4	23
5 – 6	3	1
3 – 4	2	1
1 – 2	1	0
Low At-Grade Crossing Risk (=0)	0	0
No Data / Not Relevant	N/A	52

Safety Sub-Ranking Results

Possible Safety Scores

Figure B-35: Distribution of Possible Safety Scores

Score	Projects
15	2
10	75

Total Safety Scores

Figure B-36: Distribution of Total Safety Scores

Score	Projects
10	3
8	5
7	1
5	9
4	26
3	3
2	2
1	3
0	25

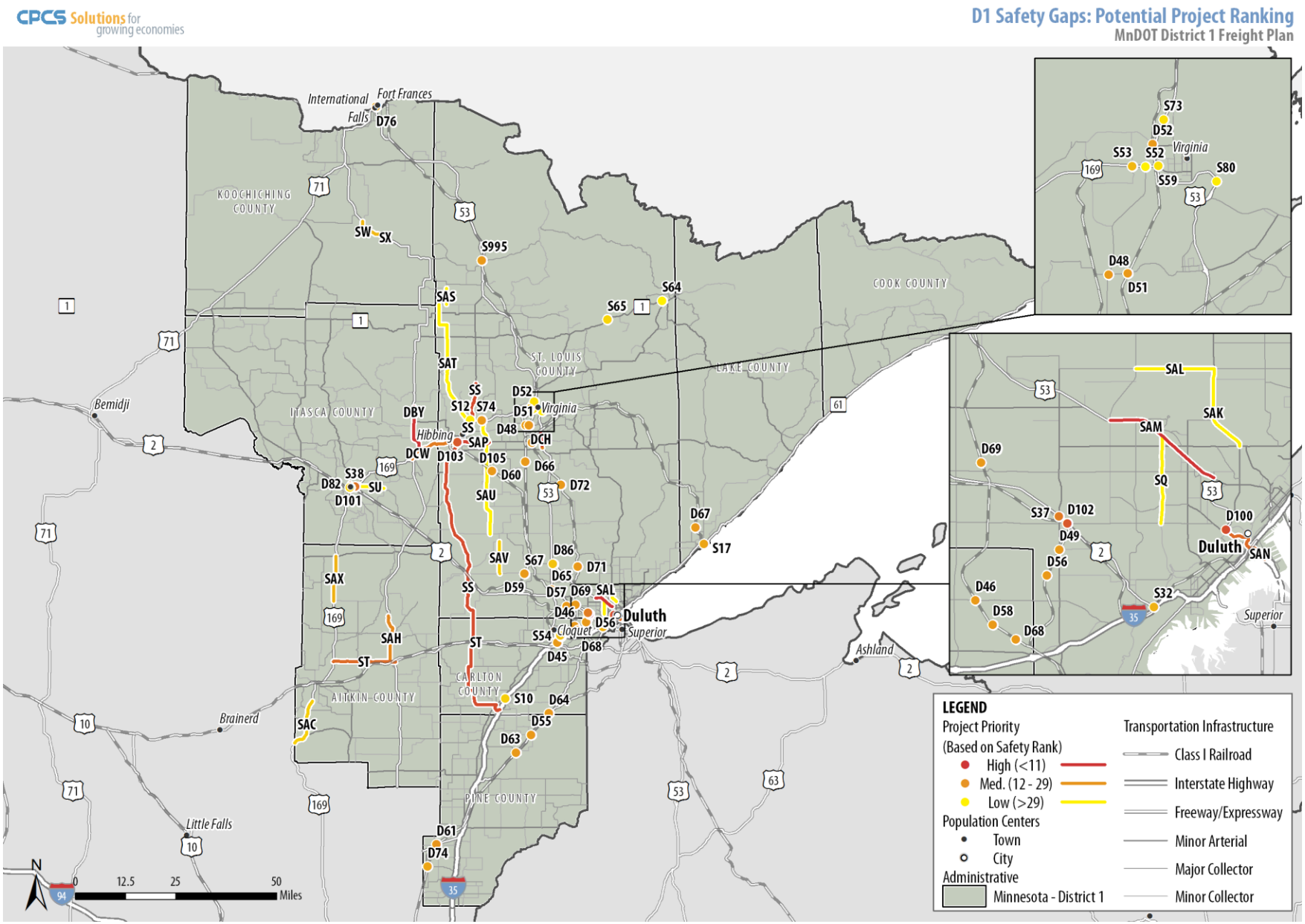
Safety Score Percentages

Using safety score percentages alone, three projects rise to the top of the rankings. While safety score percentages are used to inform safety score rank, tie-breaker rules were enforced for the final ranking. For example, the three projects that score 100% all have different truck volumes associated with them. The project with the highest truck volume would be ranked 1st, the project with the next highest truck volume would be 2nd, and so on.

Figure B-37: Distribution of Total Safety Scores

Percentage	Projects
100%	3
80%	5
70%	1
50%	9
40%	26
30%	2
20%	2
13%	1
10%	3
0%	25

Figure B-38: Map of Safety Project Sub-Rankings



3. Findings – Condition Sub-Ranking

An evaluation of a subset of projects – those with a "Need/Issue Type" marked as "condition" – was conducted using the process described in the previous section for safety-related measures. Figure B-43 highlights condition sub-ranking findings.

Bridge Condition Score

Bridge condition scores were assigned only to gaps found within both the D1 Bridge Clearance and Condition Data, where scores were available. Where the gap was not identified as a bridge, a value of N/A was assigned so as to not skew the *Possible Score*.

Figure B-39: Bridge Condition Rating Measures and Scores

Bridge Condition	Score	Projects
Scores 5, or less, in 3 or more condition categories	3	6
Scores 5, or less, in 2 condition categories	2	1
Scores 5, or less, in 1 condition category	1	0
No scores of 5 or less in any condition category	0	3
No Data / Not Relevant	N/A	10

Condition Sub-Ranking Results

Possible Condition Scores

Figure B-40: Distribution of Possible Condition Scores

Score	Projects
3	10
0	10

Total Condition Scores

Figure B-41: Distribution of Total Condition Scores

Score	Projects
3	6
2	1
0	3
N/A	10

Condition Score Percentages

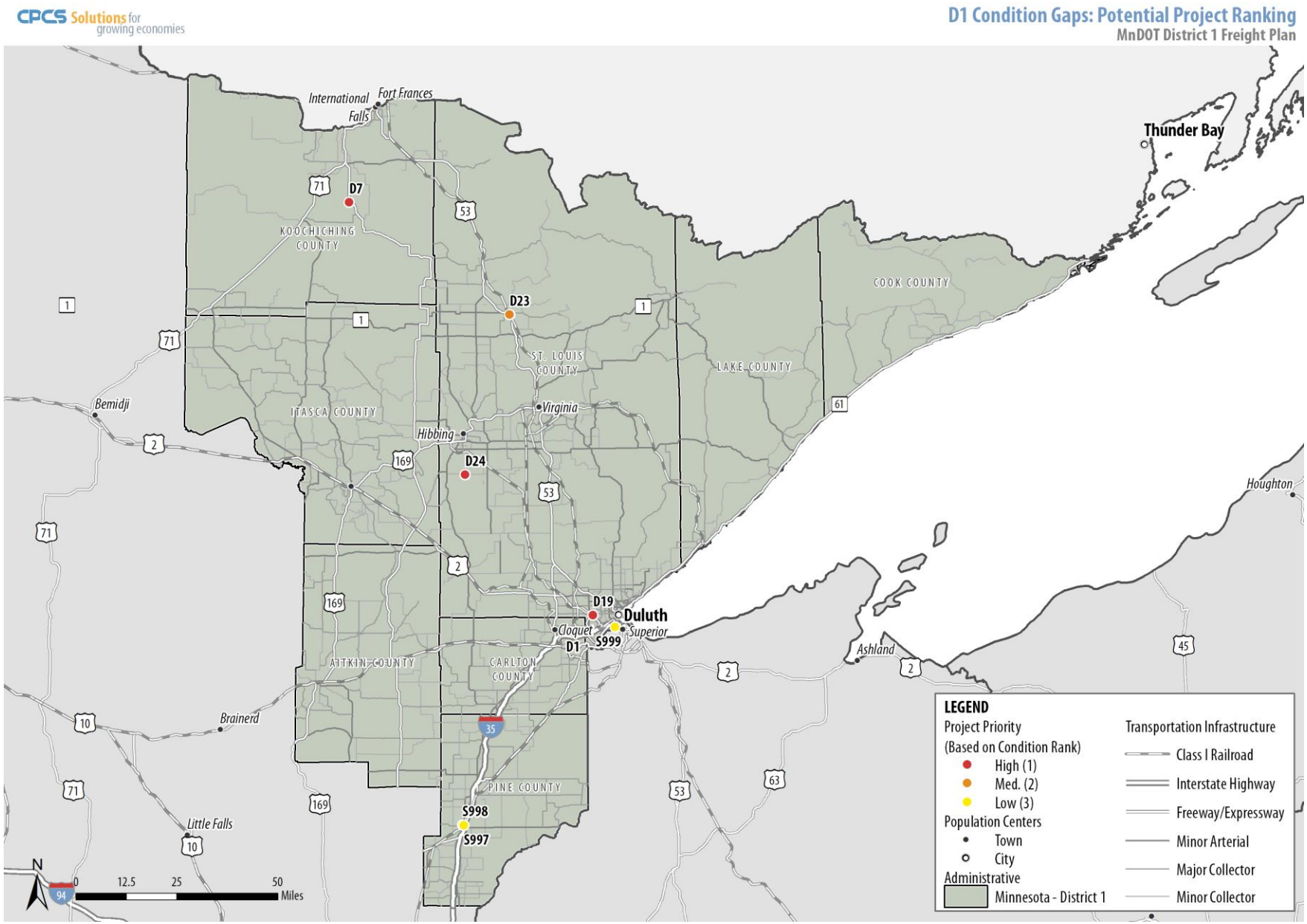
Unlike safety projects, where truck HCAADT was available to serve as a tie-breaker where projects had the same rank, no HCAADT data was available for the identified condition-related projects. The ties remain.

Figure B-42: Distribution of Total Condition Scores

Percentage	Projects
100%	6
67%	1
0%	3

N/A	10

Figure B-43: Map of Condition Project Sub-Rankings



4. Findings – Performance Sub-Ranking

An evaluation of a subset of projects – those with a "Need/Issue Type" marked as "performance" – was conducted using the process described in the previous section for performance-related measures. Figure B-50 highlights performance sub-ranking findings.

Truck Travel Time Reliability (TTR)

TTR is generally not considered to be a problem in the District, and this is reflected in the distribution of scores, with most potential projects receiving no points, and an even greater number of potential projects lacked TTR data, due to limited StreetLight coverage in rural areas.

Figure B-51 highlights the segments in District 1 identified as statewide bottlenecks in MnDOT's NPMRDS analysis. Due to the nature of the data source and the methodology used, the two locations NPMRDS data identified were not flagged in the District 1 TTR analysis, however they were flagged as having either safety or condition issues. The segment in Grand Rapids is on NE 4th Street and there were two gaps flagged on this road – S38 & D82 (both safety issues). The other location in Hermantown it overlaps with SBQ (condition issue).

Figure B-44: Truck TTR scores

TTR	Score	Projects
9.1 – 15.0	4	1
2.1 – 3.5	1	4
High Truck TTR (<2)	0	4
No Data	N/A	18

Vertical Clearance Score

Vertical clearance scores were assigned only to gaps found within either a) D1 Bridge Clearance and Condition Data; or b) bridges as identified as problematic by stakeholders. Where the gap was not identified as a bridge, a value of N/A was assigned so as to not skew the *Possible Score*.

Figure B-45: Vertical Clearance Measures and Scores

Vertical Clearance	Score	Projects
Low Clearance – 13'6", or less	3	10
13'6" – 14'6" (under FHWA recommend)	2	2
14'6" – 16'6" (under the minimum height for MnDOT OSOW super load corridors)	1	7
No Data / Not Relevant	N/A	8

Bridge Operating Score

Bridge operating scores were assigned only to gaps found within either a) D1 Bridge Clearance and Condition Data; or b) Bridges as identified as challenging by stakeholders. Where the gap was not identified as a bridge, a value of N/A was assigned so as to not skew the Possible Score.

Figure B-46: Bridge Operating Rating (MTons) Measures and Scores

Bridge Weight Limit	Score	Projects
Low Weight Limit (<15.00)	5	0
15.01 – 40.00	4	1

40.01 – 50.00	3	1
50.01 – 65.00	2	1
Higher Weight Limit (>85.01)	0	12
No Data / Not Relevant	N/A	12

Performance Sub-Ranking Results

Possible Performance Scores

Figure B-47: Distribution of Possible Performance Scores

Score	Projects
8	17
5	7
3	2
0	1

Total Performance Scores

Figure B-48: Distribution of Total Performance Scores

Score	Projects
6	2
5	1
4	1
3	8
2	1
1	11
0	2
N/A	1

Performance Score Percentages

Unlike safety projects, where truck HCAADT was available to serve as a tie-breaker where projects had the same rank, only a few projects had HCAADT data available to aid in breaking any performance-related project ties. In several case, ranking ties remain.

Figure B-49: Distribution of Total Performance Scores

Percentage	Projects
100%	2
80%	1
75%	2
63%	1
38%	6
20%	4
13%	7
0%	2
N/A	1

Figure B-50: Map of Performance Project Sub-Rankings

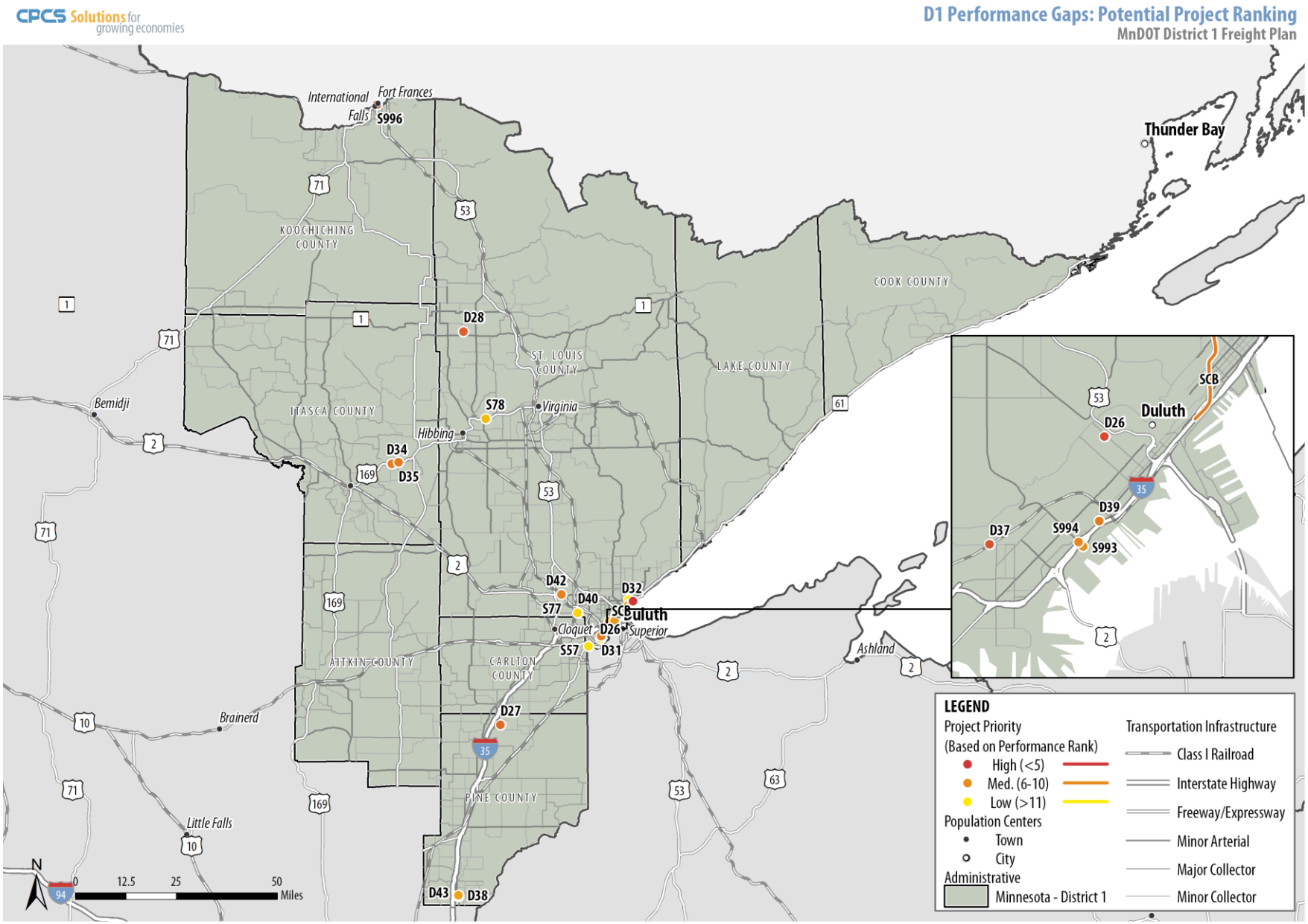


Figure B-51: Project Identified through MnDOT NPMRDS Evaluation