OSOW Permit Efficiency Study

Final Report

prepared for

Minnesota Department of Transportation

prepared by

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CAMBRIDGE SYSTEMATICS

Consultant's Report

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Executive Summary

The Minnesota Department of Transportation (MnDOT) continues to make advances in the area of effectively and efficiently routing extremely oversize and/or overweight (OSOW) vehicles. As part of this ongoing effort, Cambridge Systematics was engaged by MnDOT's Office of Freight and Commercial Vehicle Operations (OFCVO) to provide expertise in the process of organizing data, process workflows, and performance measures to support the OSOW function within Minnesota. The effort focused on developing a draft sub-network suitable for a *collaborative* tier of complex vehicles. The permits in this tier comprise approximately fifty percent of the agency's labor effort for permit review on a typical day, but only ten percent of the permit volume.

Vehicles in this tier pose challenges to a state's basic truck route network and often require interaction between multiple agency areas to ensure an efficient operation. A typical vehicle in the collaborative tier could be 15′ 6″ in height, or it could be 150 feet in length, or 17 feet in width, or have a gross vehicle weight of a quarter of a million pounds… or it could even have *all* of the above. For this collaborative tier of permits, the MnDOT review process contains additional steps. Permit applications for loads with excessive weight need to be analyzed by the engineering group to verify that the bridges along the route can safely support the weight. Requests for permits in excess of 15′6″ in height are required to be accompanied by a route survey. A route survey certifies to MnDOT that the proposed route was pre-driven by the carrier using a height pole, and that the trip cleared all obstructions such as but not limited to wires, signals, and signs. As dimensions and/or weight increase, the number of available routes diminishes rapidly. A cross-state route suitable for a vehicle with a 16 foot high load is often extremely difficult to identify.

The project team reviewed a data set containing nearly twenty thousand collaborative tier permits from a 21.5 month period in 2012 and 2013. Key industries identified include construction, manufactured housing, prefabricated concrete, and energy-related products. Approximately four dozen of the most frequently-taken trips were identified state-wide.

A three-phase methodology was utilized to define and then refine an initial draft network specification suitable for providing guidance in routing collaborative tier vehicles. The methodology included:

- Identifying the sources of supply (network infrastructure) and demand (goods movement represented by permit requests);
- Building the "perfect case" for the most frequent demands, comparing it against the limitations of the infrastructure, and identifying conflicts, and
- Iteratively identifying potential resolutions to known conflicts, and expanding the network accordingly.

The process was tested in collaboration with MnDOT Permit Section staff. The initial network identified key conflicts for certain load configurations, and alternative segments were added to the network to alleviate these conflicts. The current draft network is suitable for internal discussion to refine the process of identifying and mitigating conflicts. Ongoing internal discussions should include a deeper review of potential conflicts in the Metro district as well as dialogue with other districts on potential network improvements.

An initial information-sharing session was held with invited staff from District 8. The subsequent discussion yielded several examples of potential process improvements to aid the effectiveness of the Permit Section. Cross-cutting processes where the Permit Section may benefit include needs identification, project prioritization, facility design, construction and implementation, and ongoing operations. Articulated examples included management of high-volume customers, district-related outreach, managing information related to bridge hits by carriers, and integration of concepts from this project into broader MnDOT freight planning activities.

1.0 Overview

The Minnesota Department of Transportation (MnDOT) continues to make advances in the area of effectively and efficiently routing extremely oversize and/or overweight (OSOW) vehicles. As part of this ongoing effort, Cambridge Systematics (CS) was engaged to provide expertise in the process of organizing data, process workflows, and performance measures to support the OSOW function within Minnesota. CS was requested by MnDOT's Office of Freight and Commercial Vehicle Operations (OFCVO) to review the current MnDOT approach to reviewing applications for extremely overdimensional and/or overweight vehicles, recommend approaches to streamline both the review process and the management of necessary data, and determine the best methods for MnDOT's OSOW function to continue to be integrated into the broader agency functions such as asset management, work zone operations, and coordination with enforcement.

Our methodology is based in the experience that the complexity of goods movement routing increases rapidly with incremental increases in either one or more of the movement's dimensions or the overall gross vehicle weight. This fact is operationalized in most states, including Minnesota, by the issuance of multi-trip permits for extra-legal vehicles below a defined enveloped size. We assert that the style of management needed for efficiently providing customer service while maintaining a safe operating environment differs as the complexity increases. Our methodology divides the OSOW permitting world into three categories of operations:

- A transactional tier of routine permitted vehicles, many of which qualify for blanket multi-trip permits with durations varying by state;
- A collaborative tier of complex vehicles posing challenges to a state's basic truck route network and requiring interaction between multiple agency areas for smooth operation; and
- A consultative tier of "Megaload" vehicles, often traveling only once to a particular destination, for which advanced planning is of limited use due to the sheer size of the items being transported.

In this project, we focused on the collaborative tier, and the potential use of a designated highway sub-network to foster collaboration and improve the overall efficiency of the OSOW permit review and approval function within MnDOT.

This document is the final report for this project. It is organized into the following sections:

- Section 1 provides an overview of the project objectives and a description of the report organization;

- Section 2 provides a summary of our review of existing MnDOT workflows and procedures with relevance to the collaborative tier of permit applications;
- Section 3 presents the methodology utilized to identify our initial draft network, and how the network was modified based on conflicts in Minnesota infrastructure such as bridge load ratings and difficult interchanges for large vehicles; and
- Section 4 outlines concepts for increasing efficiency through leveraging a draft network to improve collaboration with stakeholders in various parts of MnDOT, in local government, and in industry.

Sections 2 and 3 of this report represent the formal documentation deliverables for Tasks 1 and 2 of the project, respectively. The complete report is the formal deliverable for Task 3 of the project.

2.0 Review of Existing Workflows and Procedures

CS team members reviewed the current workflow procedures of the Permit Section, including the typical interactions of Permit Section staff with other parts of MnDOT, other Minnesota statewide agencies, and local authorities. While most of our evaluation was on the collaborative tier of permit requests, we considered how those requests are managed compared to other types of requests.

Across the nation, there are typically a number of industries typically falling into a size and weight envelope where a defined specialized network could be of maximum value:

- Construction and mining machinery, and industrial loaders and stackers;
- Large-scale wind energy components, such as blades and nacelles;
- Generators, motors, rotors, and turbines;
- Construction cranes and their components;
- Bridge beams and girders (both steel and concrete); and
- Tanks, vessels, drums, and containers.

The majority of the OSOW hauling industry orders permits that are small enough to be transactional in nature and the primary concern for a permit group is issuing these as quickly as possible. The review process for permits in this *transactional* tier is typically straightforward and simple in nature. The approval process is either performed entirely within the permit office or performed automatically by the agency's permit application system, and the average time spent approving a permit that falls within this tier is minimal. There is, however, a subset of the OSOW industry that focuses on the movement of larger loads that require interagency collaboration and more extensive analysis prior to their approval. The time and effort required to process this *collaborative* tier of permits can be much higher than the transactional tier. Finally, there are a much smaller volume of permit requests for extremely large loads. These "megaloads" are generally "one of a kind" types of moves, and a more *consultative* process is needed to custom craft solutions.

2.1 Summary of Review Activities

The project team reviewed current workflows and procedures surrounding the issuance of permits by the permit section, as Task 1 of this project. The objectives of the review were to:

- Establish a baseline of operations surrounding the issuance of size and weight permits in the State of Minnesota;
- Identify and characterize the demand for permits requiring a more collaborative approach;
- Define the limits of the collaborative tier of permits, both in terms of a lower limit (vs. transactional) and an upper limit (vs. consultative/megaload);
- Quantify the impact of thecollaborative permits on everyday operations;
- Outline appropriate guidelines for the development of an OSOW-centric highway sub-network; and
- Identify any additional areas where process improvements could enhance the overall effectiveness of permit section operations.

The project team utilized a combination of legislative and procedural review, staff interviews, and data collection to meet the objectives of the review. A thorough review of Minnesota State Statutes, specifically sections 169.80 through 169.88, was conducted to gain an intimate understanding of the regulations surrounding the movement of oversize and overweight loads in Minnesota. In person interviews were conducted with MnDOT permit staff to establish a basic understanding of office operations and workflow. A number of follow-up discussions with staff, through a combination of phone calls and e-mail correspondence, were used to address any informational gaps. Table 2.1 lists the staff interviewed as part of this task.

Table 2.1 MnDOT Staff Interviewed in the Review Process

Staff Member Name	Job Title
Ted Coulianos	Permit Section Supervisor
Michael Carli	Permit Section Team Leader
Debbie Starr	Senior Permit Tech
Rob Holschbach	Senior Permit Tech

2.2 Relevant Permit Section Operations

The Minnesota size and weight permit section operates between the hours of 6 AM and 4:30 PM with telephone service available between the hours of 8:30 AM and 3 PM. Customers can submit applications using an online permit system, , or in person at the customer service window located at MnDOT[1]. The operating hours for the walk-in window are 8 AM to 4 PM.

The permit section currently consists of ten staff and one supervisor. The supervisor's primary responsibilities include the day to day management of permit section staff and assisting in establishing size and weight policy and legislation. The supervisor also acts as the interagency liaison between the permit section and the engineering and planning department, as well as the industry advocate for size and weight permit related matters. Of the ten staff members, four focus primarily on the applications representing what the project methodology defines as the collaborative and consultative tier of permits. The remaining six staff members work solely on processing the transactional permits. Training of new staff is performed by the most senior of the permit staff and is done through an informal process that varies by trainee.

Permit applications are either entered into the online system by external users, carriers and permit service companies. In cases where the application was submitted by fax or the walk-in window, application data is entered into the system by a member of the permit section staff. Once a permit is entered into the system, it enters a queue from which a staff member will select it for review. Applications are generally processed in the order they are received but exceptions are made when appropriate.

Upon being selected for review the application is checked for accuracy and the requested route is screened by the permit system. The permit system utilizes MnDOT's bridge data and transportation information systems database to check the roadway characteristics along each route (such as road width, number of lanes, etc) and identify height related obstructions, weight limitations and such. These datasets are maintained by the department and updated within the permit system from time to time. If the route is approved then the appropriate permit restrictions are assigned to the application and it is issued automatically to the customer. If the requested route fails route screening then permit staff will either contact the customer or utilize the system to determine and appropriate route for the permit.

For a transactional permit which cannot be automatically approved and issued by the permit system, this is the end of the review process, as it is handled entirely within the permit section by staff utilizing the permit system. The average turnaround time, the time a permit is entered into the system until the time it is approved and issued, for this type of permit is between two and four hours. The average time required to review a transactional permit is five minutes.

For the collaborative tier of permits the review process contains additional steps. Permit applications for loads with excessive weight need to be analyzed by the engineering group to

[1] During the period for which a sample of permits was obtained, applications were also accepted via fax.

verify that the bridges along the route can safely support the weight. Requests for permits of height exceeding 15'6" are required to be accompanied by a route survey. A route survey is a document outlining the requested routes and certifies they have been driven with a height pole to verify that the load can safely traverse the route. A route survey certifies to MnDOT that the proposed route was pre-driven by the carrier using a height pole, and that the trip cleared all obstructions such as but not limited to wires, signals, and signs.

Once a permit has passed the initial review by permit section staff they generate a list of bridges, using the permit system, and send engineering group an e-mail containing the information needed to conduct their analysis. As with the permit queue, permits in the engineering queue are generally reviewed in the order they come in with exceptions made when appropriate. Once a member of the engineering staff (located organizationally outside of OFCVO) has finished their review, the results of their review are sent via e-mail to the permit staff member who conducted the initial review. The e-mail will state whether the application can be approved or must be rejected. It will also contain any special restrictions or procedure that must be followed while in transit to preserve the safety of Minnesota's infrastructure. For example, the engineering department may approve a route but determine that it can only safely cross a bridge if the carrier drives down the centerline. Permit staff will review the information in the e-mail, add any necessary restrictions to the permit, verify any applicable route surveys, and reach out to the regions through which the permit is traveling to solicit feedback on the application. If the regions do not alert the permit staff to any issues the permit is issued to the customer.

In certain instances carriers, or permit services, will contact the permit section ahead of time to alert them of upcoming projects that they expect to result a large number of permit applications. This is typically done when a significant number of collaborative tier moves will need to be moved along a set of routes over a small time period. This advance notification allows the permit section to perform pre-clearance checks as necessary to ensure that the review process is as smooth as possible when the influx of permits occurs.

The average turnaround time for collaborative permits varies greatly depending on the overall size and weight of the load and can range from four hours up to five days. The total labor time spent reviewing a permit in the collaborative tier is typically substantially greater than for smaller permits which required manual review.

Megaload permits requiring a more consultative approach utilize all of the workflows of the collaborative permits,as well as additional workflows. These permits are characterized by the substantial challenges in route selection and the amount of coordination needed between the agency and the carrier. Agency time spent on megaloads can be characterized in person-days and weeks, and in rare cases, months.

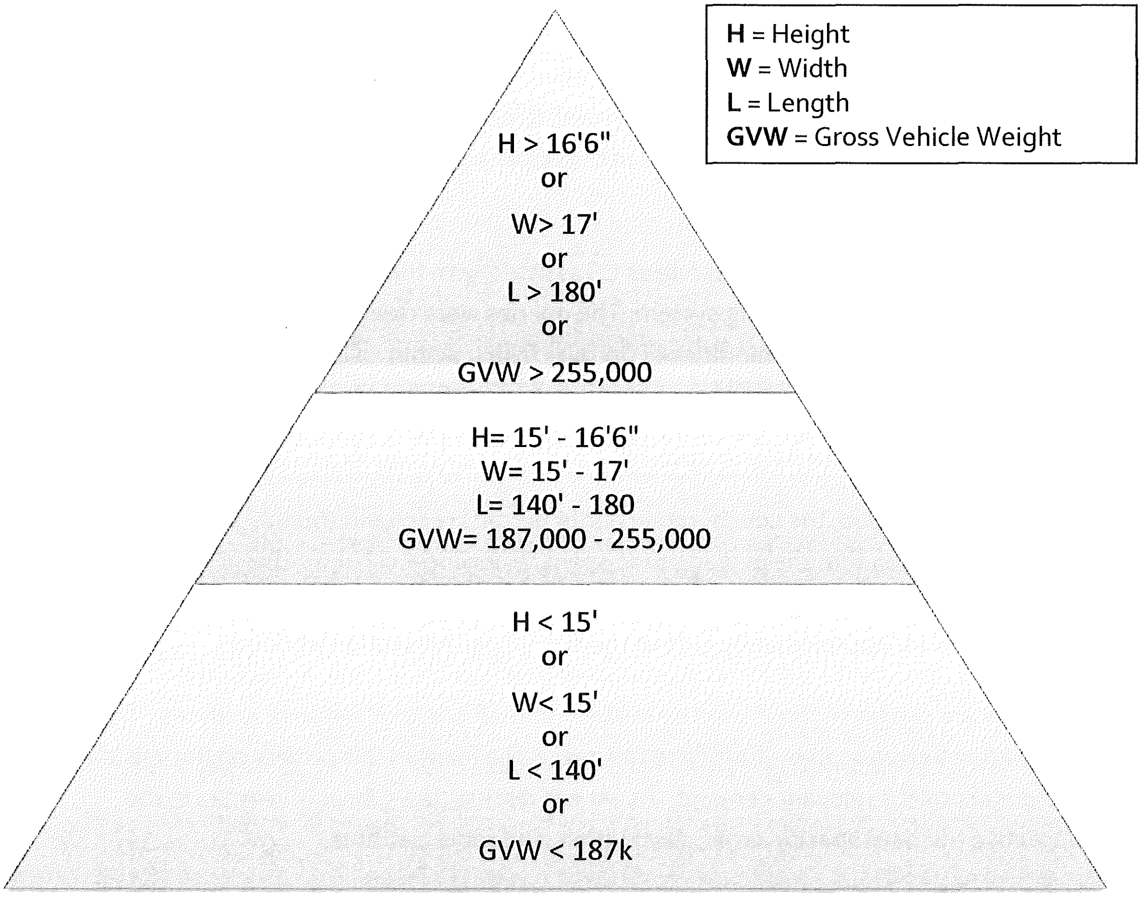
2.3 Establishing Collaborative Tier Limits

Based on discussions with MnDOT permit staff we defined the collaborative tier as having the parameters outlined in Figure 1. The permits falling within the middle zone of the figure are considered to be in the collaborative tier. Permits falling within the bottom portion of the figure are considered transactional. The permits in the upper section are considered "megaloads" and are handled on an individual basis.

After conducting the initial staff interviews CS assisted with the development of queries to be run against the data in MnDOT permit system. The queries were designed to determine the volume, origins, destinations, and commodities of permits falling within collaborative tier limitations between January 1, 2012 and October 15, 2013. Based on the queries MnDOT processed nearly twenty thousand permits that are considered to be within the collaborative tier between January 1, 2012 and October 15, 2013. Given the average number of permits issued annually by the permit section is around 90,000, the collaborative tier of permits represent roughly 15% of the overall permit volume. Given that the average time spent reviewing a collaborative permit, at 50 minutes, is up to ten times greater than the time it takes to review a transactional permits, these permits account for approximately 50% of the overall permit section workload.

These limits are similar to those used by MnDOT in their previous network analyses. The key differentiation between prior efforts and this one is the focus in this project on the specific characteristics of the relevant demand. As we will discuss, the subset of permits in the collaborative tier have specific orgin, destination, and route patterns.

Figure 2.1 Collaborative Permit Criteria



2.4 Operational Observations

OSOW Highway Network

Roughly one half of the time MnDOT staff spends reviewing OSOW permits is spent on the 10% of overall permit volume that comprises the collaborative tier. Interviewees confirmed that development of an OSOW highway subnetwork could help streamline the review processes of these types of permits by reducing staff effort levels when collaborating internally, and by providing better information to carriers when making route selections. MnDOT could also utilize the network to promote better asset management practices by prioritizing construction projects based on their impact to the OSOW carrier community.

Formal Staff Training Procedure

Currently all staff training and mentoring is handled by the most senior member of the permit section staff. This one individual teaches new staff how to review permits through an informal process without any specific performance measures. While this is currently sufficient for the training of new hires, it might not be an effective long term solution. Should this staff member retire, or leave the Department for any reason, much of the knowledge of training practices and procedures would be lost.

It would be beneficial for the permit section to develop a formal set of training procedures and document them. Doing so would allow for all staff to be trained in a consistent manner, with defined performance measures, and allow more than one person to be capable of training staff should the need arise. Developing and documenting a set of procedures would also preserve the institutional knowledge that would otherwise be lost in the case of staff attrition. Given that the collaborative tier of permit applications represent a much higher time investment for review and internal collaboration, additional standardization of procedures would appear to be beneficial.

Industry Interaction Mechanism

Through our discussions with permit section staff it became apparent that it was very helpful when industry representatives provide advanced notice of projects expected to require a large number of permits to be issued. Advance notice allows permit section staff to work with both industry and local stakeholders to ensure that permits can be issued safely and in a timely manner.

The permit section may wish to explore the development of a formal mechanism for interacting with the OSOW industry and local municipalities specifically around this tier. Other states have taken this approach through the development of advisory groups. Having formal and regular interaction with local and industry stakeholders will allow for smoother operations surrounding the issuance of collaborative permits. At a minimum, industry representatives should have an opportunity to provide feedback on later iterations of a draft network specification before it is operationalized.

3.0 Development of a Draft Network Specification for Extremely Overdimensional and/or Overweight Loads

Staff in the freight section of OFCVO has been previously analyzing its network to develop a specification for the network sections most suitable for transport of extremely overdimensional loads. In Task 2 of this project, the CS team was asked to review the previous MnDOT efforts, then design and test a methodology to build a specialized network specification which considers both the network supply (infrastructure plus limitations) and demand (permit requests as a proxy for goods movement) in a balanced manner. This section reports on the methodology and results of this process, including selected intermediate results.

3.1 Methodology

3.1.1 Methodological Philosophy

For defining an appropriate network for the collaborative tier of permits, we wish to start by isolating the largest sources of demand, which are typically repetitive movements of non-divisible goods. The collaborative network should be responsive to these repetitive movements, as they can be anticipated and included in broader freight planning contexts. Individual ad hoc movements, such as the occasional single piece of equipment being delivered to a remote location, are more difficult for an agency to anticipate and provide the same level of proactive customer service. Previously (in Section 2.3) we outlined the results of our discussions with MnDOT permit section leadership regarding establishing the appropriate breakpoints for delineating the tiers based on current application review procedures.

In a "perfect case" scenario, the goods being moved would never have any obstacles to using the most expedient available truck route. Therefore, we wish to estimate that "perfect case" travel pattern against the realities of the agency's supply: highway segments and related assets such as bridges, interchanges, signals, signs, and the like. By comparing demand and supply, we can identify areas of potential conflict in advance of the goods movement activities, and identify compromises to benefit both the motor carrier and the State.

The result is a network with the following components:

- Estimates of repetitive goods movement flows;
- Highway segments and infrastructure from the "perfect case" which support the goods movement;

- Highway segments and infrastructure from the "perfect case" which conflict with the goods movement, and whose conflict resolution are thus potential future projects for the agency; and

- Additional highway segments and infrastructure which provide resolution to the identified "perfect case" conflicts.

The step of the methodology generally outside the scope of this project is the iterative definition of goods movement, potential conflicts, and negotiated resolutions with a broader set of both agency and industry stakeholders. Limited discussions with agency stakeholders along these lines were convened in Task 3 and summarized in Section 4 of this report.

3.1.2 Methodological Steps

The tactics of the methodology are represented in three phases:

- First, identifying the sources of supply (network infrastructure) and demand (goods movement represented by permit requests);

- Second, building the "perfect case" for the most frequent demands, comparing it against the limitations of the infrastructure, and identifying conflicts, and

- Third, iteratively identifying potential resolutions to known conflicts, and expanding the network accordingly.

It was mutually agreed upon by CS and MnDOT that in the area of conflicts, the Metro district had substantial conflicts outside of the basic infrastructure clearance and load rating, and that identification and resolution of Metro district conflicts would be beyond the resources available for the project. Therefore, while the networks presented later in this section include the Metro district, the relevant constraints have not been applied to the network within the district.

Table 3.1 summarizes the steps of the methodology as applied in the project.

Table 3.1 Steps Undertaken to Development the Draft Network

Methodological Step	Data Used	Analysis Technique	Resulting Information
1) Identifying Supply and Demand			
Identify Permit Sample	Query from MnDOT Permit System Live Data	Discussion with MnDOT Staff	Approximately 21,000 issued permits
Identify Key Overdimensional Flows	Permit Sample	Statistical Analysis and Categorization	Set of most common overdimensional flows
Identify Key Overweight Flows	Permit Sample	Statistical Analysis and Categorization	Set of most common overdimensional flows
Identify Network Infrastructure	• State Highway Network • Previously developed OSOW SuperLoad Corridor Map	Discussion with MnDOT Staff	• Bridge Inventory • Roundabout Information
2) Building the "Perfect Case" Network			
Defining fastest unconstrained travel path for key flows	• Data sets of common flows • Network travel time data (using Google Maps)	• Identifying individual shortest paths • Compiling results into GIS tool	Draft subnetworks for overdimensional and overweight flows
Identifying relevant bridge-related constraints	Bridge inventory vertical clearances and load ratings	Filtering and mathematical analysis	GIS layers for vertical clearance and load rating constraints
Identifying intersection and interchange constraints	• Roundabout information • Satellite imagery from Google	Discussions with MnDOT staff and review of interchange images	GIS layer for potential intersection and/or interchange constraints
Constraints from neighboring states	• Information from neighboring states about routing initiatives	Discussions with MnDOT staff	Additional points of demand to be connected and points of potential constraint
3) Iteratively Identify Conflicts and Explore Potential Resolutions			
Identification of conflicts	GIS Layers for flows, bridge inventory, and intersections/interchanges	Visual review	Data set of conflicts to prioritize
Define prioritization of conflicts	Known conflicts	Discussion with MnDOT staff	Conflicts to resolve in first iteration
Identification of alternate routes	• Network data • Set of potential conflicts • Queries to MnDOT Permit System	• Identify segments to resolve • Query live permit system for options • Discuss with MnDOT staff	Additional network segments to be added
Discuss with Stakeholders and iterate	All information to date	Discussion	Reprioritization of known conflicts

3.2 Identifying Supply and Demand

3.2.1 Identifying the Permit Sample

We began by defining a sample of issued permits likely to be found in the collaborative tier. The initial threshold for the tier used in defining the sample was slightly different from the tier breakpoints used to define the eventual draft network, so that we would have some flexibility in setting the appropriate thresholds. A time sample of 21.5 months was established, covering all permits issued by MnDOT between January 1, 2012 and October 15, 2013.

The sample was divided into two components. One sample was a group of 14,312 permits which qualified for the collaborative tier due to being overdimensional, regardless of the gross vehicle weight. The other sample was a group of 5,586 permits which qualified for the collaborative tier due to being overweight, as long as the dimensions of the load were not so great as to cause the load to enter the consultative tier. Note that some approved permits fell into both samples.

3.2.2 Characteristics of the Permit Sample

Size and Weight Distributions

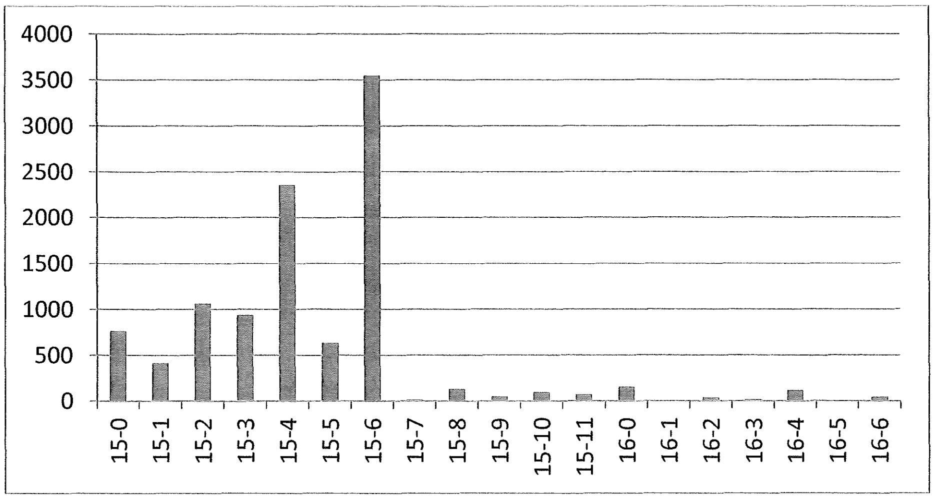
The permits in our samples are not completely heterogeneous in size and shape, although some basic patterns can be identified. Table 3.2 describes how overdimensional permits in the collaborative tier compare for height, width, and length.

Table 3.2 Distribution of Overdimensional Collaborative Permits by Dimension

Inclusion For			Permits from the Overdimensional Sample	
Height	Width	Length	Number	Percentage
YES			6219	43.5%
	YES		3342	23.4%
		YES	1201	8.3%
YES	YES		3235	22.7%
YES		YES	250	1.7%
	YES	YES	17	0.1%
YES	YES	YES	48	0.3%

Height issues are the most common, representing a total of 68% of the overdimensional sample. Length issues are the least common, representing just 9%. But even within height issues, there is a distinct stratification, as very few loads exceeded 15 feet 6 inches high. Figure 3.1 presents a distribution of permit volume based on stated height for those permits with a height greater than or equal to 15 feet. Of the 10,520 permits in this range, 9,742 were between 15 feet 0 inches and 15 feet 6 inches. A similar finding is seen for width, where the majority of permits included for width were at 16 feet wide. Length, conversely, does not have this type of distribution.

Figure 3.1: Distribution of Permits by Height (15 feet to 16.5 feet) in the Dimensional Sample



9,856 of the permits in the dimension sample had a gross vehicle weight of 80,000 pounds or less. Conversely, only 1,808 permits in the dimension sample had a gross weight of 187,000 pounds or greater.

The severe drop off at 186 inches (15′ 6″) is intriguing, but it would be inappropriate to make a definitive assertion as to why this phenomenon occurs. Several factors could plausibly be advanced for such an observation, including:

- The specific industries generating the most amount of traffic have practical height limits in their applications;
- The additional costs of transporting a load due to additional processes and approvals make travel over 15 feet 6 inches less practical;
- The requirement that a route survey be provided for loads greater than 15 feet 6 inches;
- The infrastructure within Minnesota has difficulties handling loads above 15 feet 6 inches; or
- Alternate routes exist outside of the state which are more efficient for transporting such high loads on cross-border moves.

Additional study will be required by MnDOT to determine the factors truly involved in Minnesota, including benchmarking the distribution of permit applications between 15 and 16 feet high against the distributions of neighboring states.

For the overweight sample, Table 3.3 describes the distribution of permits by gross vehicle weight. When we evaluated the bridge data, it became apparent that 255,000 pounds was a more appropriate cutoff point for the collaborative tier. This decision was due to the fact that 255,000 was a natural breakpoint in MnDOT's process for estimating bridge load ratings and associated travel restrictions. As 5,464 of the 5586 permits in the sample were at a gross vehicle weight of 255,000 pounds or less, it was decided after consultation with the MnDOT permit section that the tier weight cutoff would be reset to 255,000 pounds.

Table 3.3 Distribution of Overweight Collaborative Permits by Gross Vehicle Weight

GVW Range	Number of Permits	Percentage
187,000-209,000	2890	51.7%
209,001-231,000	1841	33.0%
231,001-253,000	647	11.6%
253,001-275,000	260	4.7%

Industry Distribution

The transport of loads in the collaborative tier is relatively uncommon compared to total permit traffic, much less total truck traffic. Therefore, it is reasonable to assume that particular industries are commonly found when inspecting the permits for larger vehicles. This is indeed the case in Minnesota, and Table 3.4 highlights the most common industries in the overdimensional. The numbers in the table are inexact, as several assumptions had to be made when categorizing permits based on the Load Description field in the agency's online permit system. The relative numbers, however, are sufficiently descriptive.

Table 3.4: Most Common Industries in the Overdimensional Sample

Industry	Approximate Number of Permits
Modular/Mobile Home	6514
Construction Equipment	2874
Concrete Culverts or Beams	726
Farm/Tractor	309
Steel or Fiberglass Tanks	235

Wind Industry Components	163
Industrial Buildings	69
Generators	60

Manufactured buildings (either housing or commercial) is by far the most common industry. The industries in Table 3.3 are consistent with what we have observed in other states, with variations subject to the particular manufacturing emphasized in each state or region.

In the overweight sample, the disproportionate amount of loads involved variations in construction equipment. Over 3400 of the 5586 permits were directly identified as construction equipment, and at least another 1000 were indirectly related to construction. Industries with much smaller but still substantial numbers of permits included energy (wind and steam), steel tanks, and prefabricated concrete.

The emphasis on particular industries in the demand sample Is illustrative of the need to consider demand and not focus simply on the agency's infrastructure supply. As we will see in later figures, the resulting iterations of maps are substantially less dense in certain regions of the state than those from previous MnDOT efforts, because there is no demand for collaborative tier travel in those areas.

3.2.3 Identifying Key Travel Flows

The available permit data does not include latitude and longitude coordinates for origin and destination. Therefore, our analysis is based on the "From" and "To" text fields in the data from the agency's online permit system. Fortunately, MnDOT imposes a general structure for specifying geographic locations within the system, and filtering based on phrases such as " AT ", "IN LIMITS OF ", "VICINITY OF ", and "MILE" (as in "0.5 MILE W OF MONTEVIDEO") allowed us to get reasonable approximations of volumes. There are likely to still be some permits which did not get issued with these specifications, especially around the Minneapolis-St. Paul metropolitan region. We assert, however, that this analysis is reasonably comprehensive without resorting to inspection of each permit individually for nearly 20,000 permits.

After some experimentation, the approach for identifying trip patterns utilized a series of filtered pivot tables within Microsoft Excel. The first pass looked at raw data from the permit system. The next pass searched the raw data for particular origin border crossings as well as origin town names found with a specific point having at least 25 permits in the dimensional sample or 10 permits in the weight sample. The third and fourth passes repeated this process for destinations. The fifth and final pass searched for key phrases for commonly found origins and commonly found destinations and identified key trips.

We will use the name of the relevant municipality when we mean a cluster of origins or destinations around a particular location, such as the eleven variations of Detroit Lakes as an origin in the overdimensional sample.

Common Origins

1838 distinct origins (as per system data entry standards) were found in the overdimensional sample, and 1538 distinct origins were found in the overweight sample. But over 95% of the distinct origins in the overdimensional sample and 98% of the distinct origins in the destination sample had averaged less than one trip per month. Table 3.5 presents common origins found in the samples.

Table 3.5 Common Origins in Permit Samples

Overdimensional Sample		Overweight Sample	
Origin Place	**Number of Permits**	**Origin Place**	**Number of Permits**
Redwood Falls	1204	I94 - I94 AT WI	224
Montevideo	988	US75 - US75 AT IA	222
Detroit Lakes	850	I35 - I35 AT IA	221
I94 - I94 AT WI	601	US2 - US2 AT WI	160
Worthington	553	I90 - I90 AT SD	156
I90 - I90 AT SD	497	I90 - I90 AT WI	140
I90 - I90 AT WI	448	I94 - I94 AT ND	132
I35 - I35 AT IA	385	Alexandria	85
Elk River	300	Duluth	72
US2 - US2 AT WI	283	New Brighton	69
I94 - I94 AT ND	279	St. Cloud	53
MN70 - MN70 AT WI	249	MN210 - MN210 AT ND	47
US75 - US75 AT IA	240	Shakopee	44
Danube	230	Mountain Iron	43
US2 - US2 AT ND	214	MN15 - MN15 AT IA	42
Red Lake Falls	196	MN48 - MN48 AT WI	37
US61 - US61 AT WI	113	US65 - US65 AT IA	37
Duluth	83	Bloomington	35
US63 - US63 AT IA	76	US14 - US14 AT SD	34
US14 - US14 AT SD	74	Cambridge	34

Common Destinations

25 destinations account for 47.1% of the trips in the overdimensional sample. The overweight sample has a more diverse set of destinations, as could be expected with predominantly construction equipment. 17 unique destinations account for 24.8% of the overweight trips, but it takes 112 unique destinations to account for 50% of the trips. Table 3.6 presents common destinations found in the samples.

Table 3.6 Common Destinations in Permit Samples

Overdimensional Sample		Overweight Sample	
Destination Place	**Number of Permits**	**Destination Place**	**Number of Permits**
I94 - I94 AT ND	1015	Hardwick	262
US212 - US212 AT SD	913	Bloomington	136
I90 - I90 AT SD	910	I35 - I35 AT IA	109
US14 - US14 AT SD	571	I94 - I94 AT WI	93
Hardwick	521	I90 - I90 AT WI	90
MN40 - MN40 AT SD	337	US2 - US2 AT WI	90
Barnesville	285	I90 - I90 AT SD	73
I94 - I94 AT WI	215	New Brighton	72
US2 - US2 AT ND	205	Alexandria	57
I35 - I35 AT IA	201	Maple Grove	55
US53 - US53 AT CA	156	St. Cloud	51
US71 - US71 AT IA	153	MN210 - MN210 AT ND	49
I90 - I90 AT WI	152	MN34 - JCT MN32 MN34	47
Fergus Falls	142	Rushmore	46
Rushmore	117	US14 - US14 AT SD	45
Minneapolis	105	Blue Earth	45
MN171 - MN171 AT ND	100	Savage	43
Duluth	95	Minneapolis	39
MN210 - MN210 AT ND	94	Duluth	33
Thief River Falls	92	MN48 - MN48 AT WI	31

Very Frequent Trips

Our final pass through the pivot tables generated origin-destination pairs using these locations. Table 3.7 summarizes the 30 most frequent origin-destination pairs from each of the two samples.

Table 3.7: Very Frequent Trips for Collaborative Permits

Overdimensional Sample			Overweight Sample		
Origin	Destination	Number of Permits	Origin	Destination	Number of Permits
MONTEVIDEO	US212 - US212 AT SD	611	US75 - US75 AT IA	HARDWICK	214
WORTHINGTON	I90 - I90 AT SD	416	NEW BRIGHTON/I35W	NEW BRIGHTON/I35W	56
REDWOOD FALLS	US14 - US14 AT SD	389	I35 - I35 AT IA	BLOOMINGTON	49
REDWOOD FALLS	HARDWICK	328	I94 - I94 AT WI	I94 - I94 AT ND	43
DETROIT LAKES	I94 - I94 AT ND	288	MN15 - MN15 AT IA	MN32 MN34	38
US75 - US75 AT IA	HARDWICK	211	I90 - I90 AT WI	BLUE EARTH	34
MADISON	MN40 - MN40 AT SD	176	I90 - I90 AT WI	I90 - I90 AT SD	33
I94 - I94 AT WI	I94 - I94 AT ND	175	I35 - I35 AT IA	MN32 MN34	31
REDWOOD FALLS	BARNESVILLE	126	I90 - I90 AT SD	HARDWICK	27
PIPESTONE	HARDWICK	120	MN23/ATS Specialized	MN23/ATS Specialized	26
DANUBE	US212 - US212 AT SD	119	I94 - I94 AT WI	I94 US61	23
US2 - US2 AT ND	DULUTH	107	I90 - I90 AT SD	RUSHMORE	21
REDWOOD FALLS	US212 - US212 AT SD	103	I90 - I90 AT WI	I94 - I94 AT ND	21
DETROIT LAKES	BARNESVILLE	96	I90 - I90 AT SD	BLUE EARTH	18
I90 - I90 AT SD	RUSHMORE	92	I94 - I94 AT WI	SAVAGE	17
I90 - I90 AT WI	I90 - I90 AT SD	89	I94 - I94 AT WI	US52 PLATO, ST PAUL	17
I90 - I90 AT SD	HARDWICK	80	I90 - I90 AT SD	I90 - I90 AT WI	17
REDWOOD FALLS	FERGUS FALLS	80	I94 - I94 AT ND	I94 - I94 AT WI	17
I35 - I35 AT IA	MN32 MN34	77	DULUTH (/I535)	RUSHMORE	17
REDWOOD FALLS	I94 - I94 AT ND	76	MAPLE GROVE	ELK RIVER	17
DULUTH	US2 - US2 AT ND	75	I35 - I35 AT IA	ROSEMOUNT	13
DANUBE	MN68 - MN68 AT SD	66	US2 - US2 AT WI	BUHL	13
DODGE CENTER	I90 - I90 AT SD	66	DULUTH (/I535)	MN15 - MN15 AT IA	13
ELK RIVER	CANNON FALLS	66	CAMBRIDGE	MN70 - MN70 AT WI	13
US2 - US2 AT ND	US53 - US53 AT CA	63	US2 - US2 AT WI	MN61 - MN61 AT CA	12
MONTEVIDEO	MN40 - MN40 AT	62	I94 - I94 AT ND	I90 - I90 AT WI	12

	SD				
DETROIT LAKES	US2 - US2 AT ND	60	ELK RIVER	MAPLE GROVE	12
I90 - I90 AT WI	HARDWICK	58	I94 - I94 AT WI	I35E MN5	11
DETROIT LAKES	MN28 - MN28 AT SD	52	I94 - I94 AT WI	MN51 - JCT I694 MN51	11
REDWOOD FALLS	US71 - US71 AT IA	52	BLOOMINGTON	I35 - I35 AT IA	11

3.2.4 Identifying Network Infrastructure

After discussion with MnDOT staff, it was determined that the infrastructure on the state highway network with both the greatest likelihood of impacting route selection as well as availability of inventory data were bridges and roundabouts. Bridges could impact route selection in two ways, either vertical clearance for overdimensional vehicles passing under the bridge, or load rating for overweight vehicles passing under the bridge. Roundabouts would have potential impacts for overdimensional loads, although the specific impact might need to be identified on a case-by-case basis.

MnDOT provided the project team with data on both bridges and roundabouts. For bridges, a set of 6,824 bridge span records were available. Bridges with a vertical clearance of under 16 feet 4 inches[2] and with a state highway traveling under the bridge were identified, and NBI data was used to generate a GIS layer of locations. For bridge load rating, the MnDOT three category classification system was used for each span. All bridges with state highways traveling on the bridge were identified if they had a restriction for the type A or type B loads, as well as if they had a restriction more severe than a centerline restriction for type C (255,000 pound rating) loads. These bridges were mapped into a GIS layer using a similar technique.

3.3 Building the Initial "Perfect Case" Network

With the cornerstone data in place, the next set of steps are to define an initial "perfect case" network and then start to overlay any areas of potential conflict from the cornerstone data. While the original project scope did not anticipate using GIS techniques for resource reasons, they proved invaluable in building a framework for ongoing evaluation.

Defining Fastest Unconstrained Travel Paths

The first step was to start loading individual route segments corresponding to the most frequent trips found in the data set. The original goal was to plot the 45 most frequent trips from the

[2] To include a standard factor of safety when traveling

sample of nearly 20,000 permits. Given that there was overlap between frequent trips in the two samples, and that some trips were actually subsets of other trips, a larger number was in fact plotted. Table 3.7 (as well as some of the trips with volumes just falling short of inclusion) was used as a starting point, with additional frequent trips added to build breadth in the network.

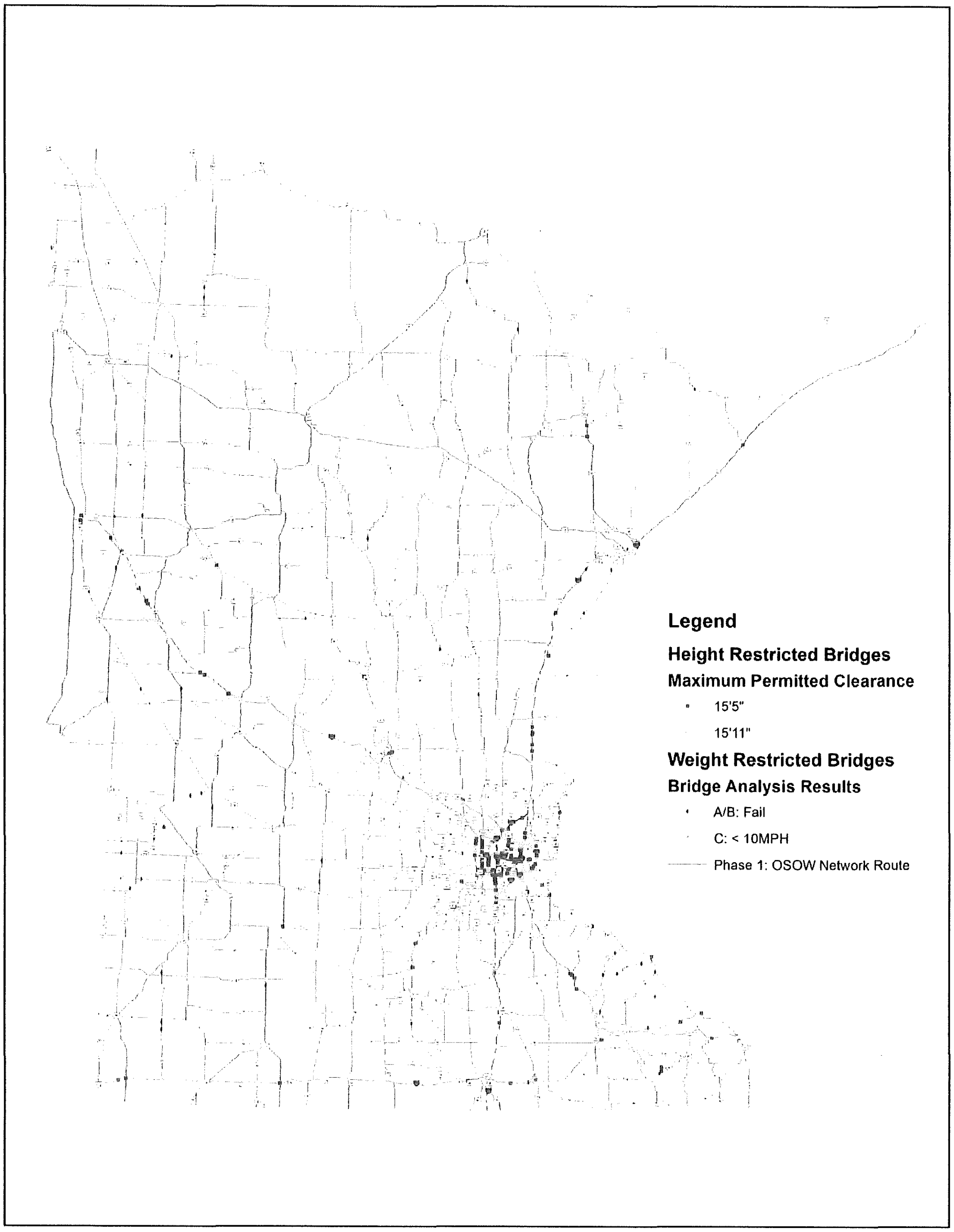
Routes were obtained using the Google Maps online product. Municipal centers were used as a point of approximation for common municipalities. For some origin-destination pairs where two very different routes were available with similar travel times, both routes were incorporated. Figure 3.2 illustrates the results of the initial assignment.

Loading Bridge and Interchange Data

At this point, the bridge and roundabout data discussed in Section 3.2.4 was loaded to the network. Co-location of a bridge or roundabout with a network section does not necessarily mean that there is a conflict, as in several places there were two state highways crossing each other. In addition, a conflict may only be present for a subset of the permits in the collaborative tier; for example a bridge clearance might not be able to support permitted loads between 15′ 9″ and 16′ 0″ high, but support all other loads in the tier.

At this point, the current iteration of the network was checked for potential turning movement issues, generally turns with an angle of sharper than ninety degrees. In general, there were very few issues with turning movements, and in most cases obvious workarounds were evident. As a result, it was decided not to pursue this issue at this point, but to identify it as a future area of interaction between the permit section and the district engineers.

Figure 3.2 Initial Mapping from Trip Route Assignments



Adding Constraints from Neighboring States

One item which arose when reviewing the initial common trips was that the border crossings between Minnesota and Wisconsin often did not correspond to the border crossings identified by the Wisconsin Department of Transportation in its "OSOW Freight Network" (for which

Cambridge Systematics also provided assistance with methodology and technical analysis). Part of the issue has to do with the topography on either side of the Mississippi River. The border crossings from the Wisconsin network were identified and highlighted for analysis later in the project.

3.4 Refining the Network via Conflict Identification and Resolution

Conflict Identification

At this juncture, a review session was held with MnDOT permit section staff. A number of constraints were identified when considering the draft network in its interim state. Most pressing, there was not a contiguous route through the state in several sequences of important trips. This was intentional, as we did not consider the actual permitted route taken by the carrier for the trips in question. The rationale for this decision is that the actual route was highly subjective to short-term issues, such as ongoing road construction or carrier-specific preferences. Identifying the fastest routes highlighted areas of potential conflict commonly considered by carriers and by MnDOT staff.

With that context, the conflicts could be easily reviewed and clustered, so that actions could later be defined for each cluster. The two largest categories of clusters were:

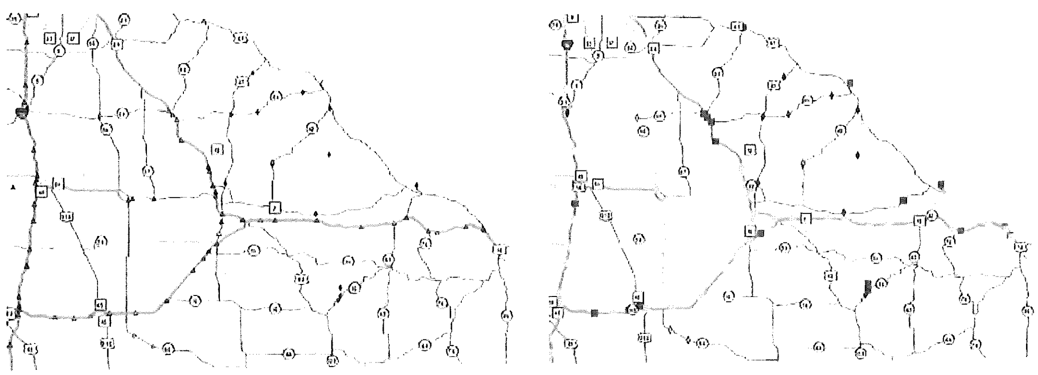
- The large number of low bridges on I-35 could be organized into three categories: those unable to accommodate a permitted load of 15′ 6″ high, those with ramp-off/ramp-on capabilities, and the remainder.
- For load rating issues, route segments were reviewed to determine if the trips on that segment were primarily overweight (more of an issue) or primarily overdimensional (less of an issue).

Interim Resolutions

At this point, the project team coordinated with MnDOT staff to determine a reasonable interim course of action for each cluster of issue. For the most pressing clusters, and for the easiest clusters to resolve, alternate routes were identified. In most cases, alternate routes were defined by providing MnDOT staff with specific origins, destinations, dimensions, and weights. The test version of the agency's permit system (using accurate live data) was utilized to return potential routes, if available.

Figure 3.3 shows an example of some of the results of this process. The left image shows the network before beginning to resolve conflicts. The right figure shows the network after a series of resolutions of height clearances[3]. Notice that several additional route segments have been added in yellow. These segments were added to resolve conflicts faced by some load configurations on Interstate 35, Interstate 90, and US Highway 52.

Figure 3.3 An Example of Conflict Resolution Results in Southeast Minnesota



Note that the original conflicted routes were <u>not</u> removed from the network. This is because many of the load size and weight configurations identified in our nearly 20,000 permit sample could still traverse the originally identified routes. The purpose of the process is to keep the network relatively sparse to funnel loads onto collaboratively maintained routes, but to give carriers information about potential options when conflicts with a specific load configuration do arise.

Network Height and Contiguous Cross-State Segments

One ongoing conflict is the inability to obtain a sufficient number of routes for long trips at a permitted height of 16 feet. The design standards used to build much of Minnesota's Interstate network are insufficient to allow 16 feet on many of those highways, and alternate routes do not always exist for such a height. Our understanding from talking to both MnDOT and Iowa Department of Transportation staff is that many loads traversing the southern part of Minnesota at 16 feet high end up utilizing Iowa highways for parts of the trip where Interstate 90 is infeasible.

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[3] The map symbols for the various types of issues were changed in the intervening two months to provide additional clarity during the resolution process.

We did obtain from our overdimensional sample a handful of permits for between 15′ 7″ and 16′ in height, traveling from one state border to another. Only fifteen permits out of over fourteen thousand, however, met this criterion. The routes utilized in those permits were reviewed and in several cases segments were added to the draft network specification.

The number of permits issued by MnDOT, however, drops sharply for heights greater than 15′ 6″, as illustrated previously in Figure 3.1. As a result, the current working decision is to ensure cross-state trips at 15′ 6″, while enabling loads up to 16 feet high for shorter sections of the state.

3.5 Recommendations for Ongoing Iterative Review

Figure 3.4 presents the current iteration of the draft network specification developed by the project team in consultation with MnDOT permit section staff. We must caution that it is not a finished product because additional steps of collaboration and iterative review need to be undertaken by MnDOT's permit section in conjunction with other agency, governmental, and industry stakeholders. In addition, as previously discussed, the conflicts in the Metro were not identified or resolved at this point. The Metro district faces additional challenges due to congestion, density of potential origins and destinations, and the interaction with county and municipal agencies.

In its current form, the draft network specification is a useful tool to improve the efficiency of collaboration for this class of permit applications. To reach the next level of effectiveness, however, additional collaboration between the MnDOT permit section and stakeholders should be undertaken.

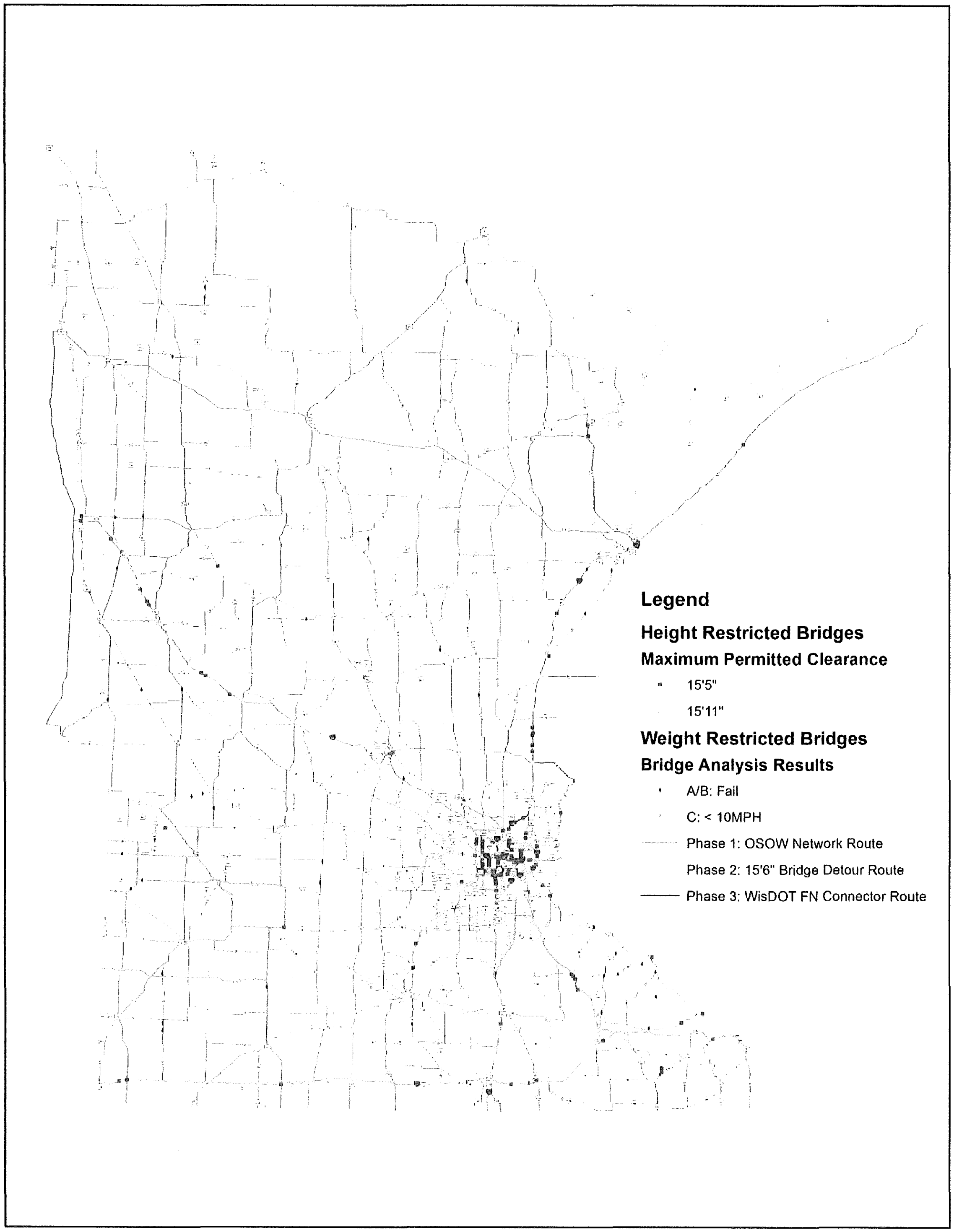
Inclusion of Congestion Conflicts

One of the underlying issues in considering the Metro district is the balance of infrastructure usage with congestion management. In our review of the initial (unconstrained) draft network with MnDOT OFCVO staff, the future task of identifying congestion bypasses around the Twin Cities was identified. We recommend that a broader look at congestion be considered, and that sections with problematic congestion levels be identified for discussion of routing bypasses.

Joint Safety Reviews with Districts

We considered the network infrastructure issues with the most deterministic sets of data – bridge interactions and roundabouts. We recommend that district engineers be consulted to identify other safety-related issues with the identified network segments. Examples include excessive grades, highway segments with sharp curves, and areas with high volumes of accidents.

Figure 3.4 Current Iteration of the Draft Network



Coordination with Key Municipalities

Twenty-four municipalities were identified in Tables 3.5 and/or 3.6 as having a substantial amount of originating or terminating traffic. It would be appropriate to begin a dialogue with these municipalities, either directly from the permit section or in coordination with the appropriate District leadership.

Identification of Specific Carriers, Manufacturers, and Construction Companies

After a sufficient amount of iterations with internal stakeholders, it is appropriate to begin including key carriers, manufacturers, and construction companies into the collaborative review and iteration process. At this point, MnDOT has *historical* data about permit-related goods movement. Going forward, it would be beneficial to have *forward-looking* information about the relevant industries, such as manufactured housing, construction, energy, and agricultural services.

Coordination with Permit Agencies in Neighboring States and Provinces

As the collaborative process is refined, an additional area of interaction is with the permit sections in neighboring states. The example of coordinating with Wisconsin was identified earlier in the report, where Wisconsin's infrastructure east of the Mississippi River and Minnesota's infrastructure west of the Mississippi River do not always match when it comes to accommodating loads of this size and weight profile. Similar issues are likely to arise when exploring multi-state trip patterns with other neighboring states and provinces. Funneling carriers to a particular border crossing to an infeasible route on the other side is not beneficial to any stakeholder.

3.6 Summary

The draft network specification developed through the processes described in this section differs substantially from the network specification previously considered by OFCVO. In general, the project team's specification is driven primarily by consistent demand and secondarily by network constraints. The approaches taken to date have fostered discussion within the permit section about efficiency and effectiveness when interacting with customers with larger loads. Applications for these loads often take greater amounts of time to review and process, and a known set of routes is expected help reduce the review cycle.

In our final section, we will explore how a collaboratively-maintained network for larger permitted loads can influence a broader set of goods movement-related issues across the agency.

4.0 A Collaborative Tier Network as a Driver for Broader Effectiveness in Related Processes

One of the interesting benefits of a collaborative tier for managing OSOW permits is that it provides opportunities to focus discussion of a wider array of topics which affect goods movement in general, and OSOW movements in particular. These discussions can lead to broader effectiveness benefits in improved process efficiency, information distribution, and conflict mitigation.

As part of the final task of this project, the CS project manager participated in a day-long set of meetings with the MnDOT permit section, including an information exchange session with representatives from other MnDOT central office departments as well as District 8. In this section, we will review some of the interesting themes raised during these meetings and frame them in terms of opportunities for achieving broader process effectiveness.

4.1 Areas of Permit Section Interdependence with Other Agency Functions

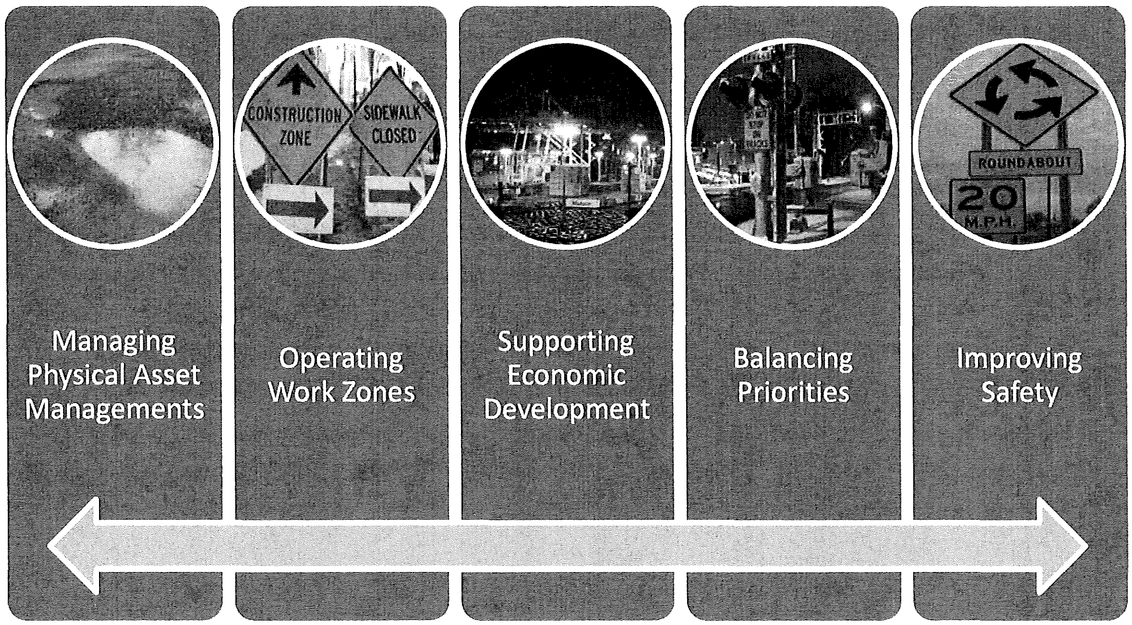
Depending on seasonal variations, there can be between 40 and 150 new permit application requests per day which are in the collaborative tier. With a single trip permit duration of five days, there can easily be several hundred active of these permits on the highway at any point in time. Staffing for these peaks can be problematic. For the transactional tier, many permitting agencies in other states have cross-trained staff to be able to by shifted to process OSOW permits during peak periods. Depending on agency organization, these staff may perform other regulatory compliance functions the rest of the year. Meanwhile, advances in permit automation and "self-issuance" have slowly reduced the nature of the problem.

For the collaborative tier, however, the problem remains. One of the challenges many states have in managing the collaborative tier is to identify staff with sufficient experience to be able to work effectively with carriers and permit services. This challenge is magnified if the agency management is not actively differentiating business process across tiers, and actively or passively asserts that all permits are similar.

Meanwhile, there are a surprisingly wide amount of agency functions which impact these carriers either directly or indirectly. Many of these functions impact broader goods movement, but the unique characteristics of the loads being transported in the collaborative tier magnify the issues because these carriers often do not have as many (if any) options.

Figure 4.1 identifies five broad classes of agency activities which impact collaborative tier carriers, and thus also impact the efficiency and effectiveness of the permit section. In transportation agencies nationwide, decisions in these broader areas often do not take the collaborative tier carrier or the corresponding permit section into account.

Figure 4.1 Agency Activities Affecting the Collaborative Tier



- **Asset management** is probably the area most obvious to an outside observer. In Section 3, we discussed how assets such as bridges can affect the viability of a route. Posted bridges are becoming more widespread nationwide, and the Federal analysis of potential changes to the legal limits directly affect the lower end of transactional permits. But at a more granular level, advances such as raising a problematic bridge can reduce detours and thus alleviate potential damage to other areas of infrastructure.

- **Work zones** can be a constant source of irritation to carriers in the collaborative tier, as well as a safety issue. Inaccurate work zone information can allow permitted loads to attempt to operate where they should not be traveling. Issues can include the notification that a zone exists as well as the design of the zone to accommodate goods movement in general and overdimensional loads in particular. Failure to consider OSOW load demands when designing work zones can cause unreasonable restrictions for OSOW traffic, which could have been avoided with simple steps. An agency that understands that a particular work zone is more likely to have some of those two hundred vehicles travel through it is an agency likely to think carefully about operational issues.

- The **economic development** mission of state government often has a transportation component when considering where to try and attract high-value jobs into the state. The collaborative tier supports several high-value or export-proof industries, and a well-defined network can help influence development choices.

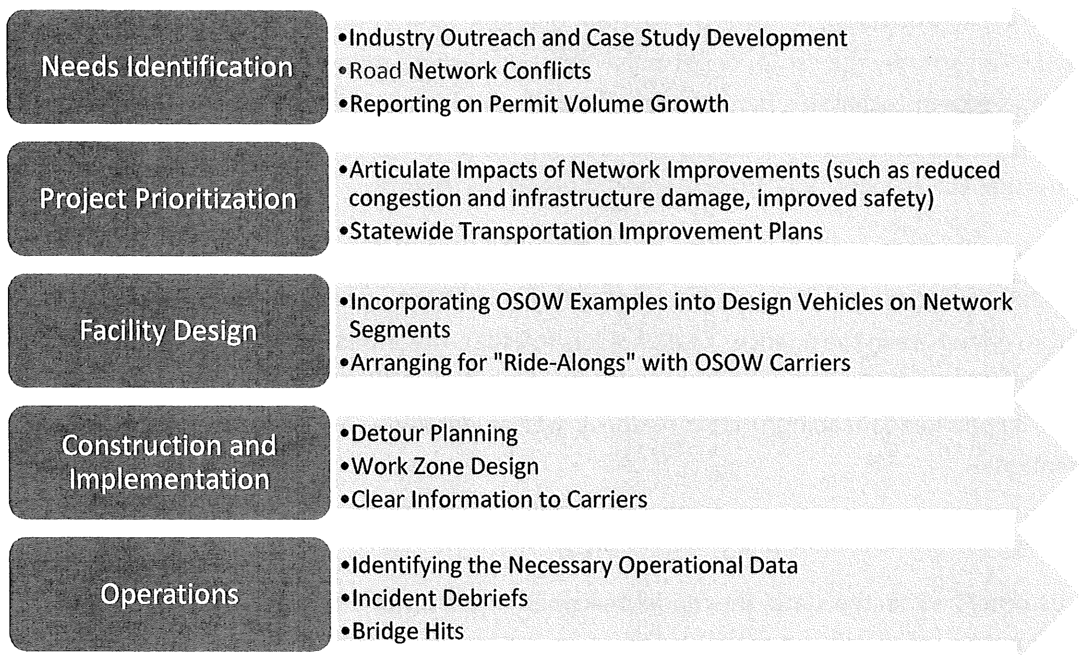
- Agencies have to **balance priorities** and manage overall performance, sometimes to the detriment of the industries in the collaborative tier. Being able to "tell the stories" of its constituents helps a permit section have its priorities considered in a broader agency structure?.

- Along with balanced priorities are the impacts of **limited resources**. For example, there are a substantial number of bridges on Minnesota's interstate system with height clearances under 16 feet. There is no practical way in which resources could be allocated to raise *all* of those bridges. Thus alternate routes have to be crafted and relevant priorities must be balanced.

- Finally, **improving safety** is a critical function at all transportation agencies. Many of the innovations in safety mitigation are aimed at motorists, not at goods movement. Given the unique nature of the collaborative tier of goods and related services, it can be challenging to argue that safety should be "compromised" for the benefits of a small but important volume of goods movement.

Given these challenges, how can a permit section improve efficiency by making some of its industry's more problematic moves more collaborative? One approach is illustrated in Figure 4.2. No agency permit section can affect all of the examples identified simultaneously, but targeted communication in areas with a receptive audience can yield substantial benefits. The permit section should have a template for establishing dialogue with stakeholders in other agency functions regarding how OSOW movement in general, and the collaborative tier specifically, is affected by the decisions made elsewhere in the agency.

Figure 4.2 Where the Permit Section Can Impact Agency Functions to Improve Effectiveness



4.2 Examples of Potential Process Improvements through the Collaborative Tier

We will conclude by illustrating five examples of potential process improvements that were raised by meeting participants over the course of our on-site day. Focus on each of these areas can yield both immediate and long-term benefits for the carriers and industries participating in the collaborative tier, as well as benefits to the efficiency of MnDOT's permit section.

District-Level Communication and Coordination

District 8 shared information on its recent initiative, in which staff from the freight planning section participated, to develop case studies and collateral materials about examples of key industries in the District. OSOW-related industries were included in these case studies.

District 8 and permit section staff shared ideas about future joint outreach activities. The permit section representatives explained the collaborative tier network project, and a number of the activities shown in Figure 4.1 were discussed. All parties agreed that collaboration between the permit section and District 8 staff in reviewing and maintaining elements of both the network specification and the known conflicts, as well as jointly reaching out to key district-based stakeholders when appropriate, would be mutually beneficial.

Coordinating Information on Bridge Hits

National permit-related organizations, such as the AASHTO Subcommittee on Highway Transport, have increased its focus on the topic of bridge hits. In some cases, a bridge hit is caused by an error by the carrier or permit service purchasing a permit. But in many cases the carrier has never purchased a permit. Unfortunately, sometimes the issue is a lack of information sharing between the parts of the agency which respond to bridge hits, the parts of the agency which issues the permits, and the carriers purchasing the permits.

But it is rare for there to be a comprehensive process for agency tracking and debriefing on bridge hits. In many agencies, a permit section finds out about a bridge hit from another carrier, not from elsewhere in the agency. Stakeholders felt that establishing a dialogue and developing a small pilot project using one or more segments of the draft collaborative tier network would aid carriers by providing meaningful information as well as identifying future measures for incident prevention.

Customer Relationship Management

For customers within the state, the model described with District 8 appears to provide a great start. But many of the permit section's customers are located outside the state, and some utilize third party companies to manage the logistics of purchasing permits or arranging escort vehicles. Meanwhile, out of state customers are less likely to attend industry events held within the state. One area of potential focus is to implement some initial customer relationship management techniques for high-volume, collaborative tier, out-of-state customers. Another potential area is to redefine the current work queues for inbound permit requests to have a smaller number of team members working proactively with each of the most frequent permit purchasers in the collaborative tier.

Interaction with Broader Freight Planning Activities

Many of the agency processes which impact collaborative tier carriers also impact a broader set of goods movement activities. Therefore, it would be irresponsible to assume that the permit section can operate in a vacuum on these topics. As OFCVO embarks on new activities to improve its freight planning techniques and documentation, the permit section should embrace the opportunity to collaborate on those broader topics and identify areas where the concepts developed through this project can be utilized to enhance a broader set of goods movement issues.

In addition to this study, the MnDOT permit section has been working with MnDOT's Business Planning unit this past year to document variouswork flow processes and determine where efficiencies can be maximized.

4.3 Evolution of the Collaborative Tier Network over Time

The work presented in this report represents an *iteration* of analyzing the collaborative tier. Specificially, it is the second *formal* iteration, subsequent to work conducted internally within OFCVO in recent years. It certainly will not be the last iteration. The network should be considered a living concept, and the characteristics of the network will certainly change over time. One of the challenges is to manage the various impacts which will cause the relevant network to change. These challenges can be traced back to the core concepts of agency supply and industry demand.

The demand for permits in both the consultative tier (i.e. megaloads) as well as the collaborative tier (the primary focus segment of this study) is generally expected by industry observers to grow in the next decade. Business processes at permitting agencies in most states were updated to reflect the impacts of system automation on the transactional tier as opposed to the fax and phone approaches of the late 1990s. Demand for larger loads keeps growing, and new patterns of travel can be expected to emerge as Minnesota's industries (and those of neighboring states) evolve.

Meanwhile, agency supply in terms of an effective highway network will evolve as well. Transportation improvement projects, even those conducted for reasons other than permitted loads, can be expected to open up new route options for carriers. Similarly, the inevitable deteroration of assets such as bridges, and the need for improvements in passenger vehicle safety countermeasures have the potential to slowly shut off certain sections of the network.

Finally, as OFCVO interacts with other parts of MnDOT, other Minnesota statewide agencies, local governments, and industry representatives, the needs for the collaborative tier are certain to change in directions such as those illustrated in Figure 4.2. Many changes are likely to be implemented as process improvements, but the network design can be expected to change as well. An ongoing iterative process of MnDOT-led review that balances supply, demand, and coordination is critical to keeping the collaborative tier network concept relevant, both for carriers and OFCVO staff.