transportation planning & engineering consultants

Manitoba Infrastructure and Transportation

Executive Summary

Manitoba

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iTRANS Consulting Inc.
160-601 West Cordova St.
Vancouver, BC V6B 1G1
Tel: (604) 682-8119
Fax: (604) 682-8170
Email: itrans@itransconsulting.com
www.itransconsulting.com

Project # 3764

EXECUTIVE SUMMARY

A. Background

Manitoba Infrastructure and Transportation (MIT) is currently considering implementing an increase of the posted speed limit on the Provincial Trunk Highways (PTH) 1, 75 and 100. The proposed 10 km/h increase would take the posted speed limit from 100 km/h on these highways to 110 km/h. The consultant team, led by iTRANS has been retained by MIT to investigate, understand and communicate the implications of the proposed speed limit change. In addition, the consultant team will establish the potential mitigation treatments, improvements, and measures needed to sustain an acceptable level of safety where speed limits are increased.

The resulting report is a culmination of work, including site surveys, an in-depth literature review, stakeholder consultation, safety analysis, and an estimate of the environmental and economic impacts resulting from a posted speed limit increase. The supporting documentation for these chapters is found in the four working papers that were prepared by the consultant team over the course of the project. These working papers include:

- Literature Review for the Proposal to Establish 110 km/h Speed Limits on Select Rural Divided Highways
- Stakeholders Consultations Report
- Sustainability Impacts of Implementing Higher Speed Limits on Selected Rural Highways in Manitoba
- Posted Speed Limit Criteria Report

The final report includes a Section containing the Introduction and the major Conclusions for the study.

B. Literature Review

This literature review is an essential part of the overall study. It contains a review of current studies, research, and practices concerning speed limit increases and their potential impacts. In addition, information about treatments, improvements, and measures that improve road safety in a rural environment were collected during the literature review. The impacts of speed limit increases on sustainability are also briefly discussed.

Posted speed limits of 110 km/h were also implemented in Saskatchewan in 2003. Due to the apparent similarities between the highway system structure in Manitoba and Saskatchewan, the results of this change were deemed to be especially applicable to the Manitoba case and were given special attention.

A variety of other studies were also incorporated into the literature review based their applicability to the speed limit change on PTH 1, 75, and 100. In total, 25 documents were incorporated from a wide range of sources. The documents allowed the research team to complete a broad review of the important relationships between speed limit changes and safety, economic effects and sustainability implications.

Findings

Overall the research showed a definitive linkage between an increase in mean speed and an increase in the severity of collisions. This increase can be explained by the power model, which relates the change in mean speed with the change in the number of collisions in categories based on severity. The relationship between the overall number of collisions and speed is less clear, as the number of collisions first decreases with an increase in speed, and then increases. For this case, it is plausible that the number of severe collisions will increase with an increase in mean speed.

The research also showed, however, that an increase in the speed limit does not necessarily result in an equivalent increase in mean speed. To the contrary, the consulted studies show that the roadway itself has greater influence over operating speed than the posted speed limit. Even for jurisdiction wide changes, the expected change in operating speed is about 25% of the change in the speed limit. This means that on Manitoba PTH 1, 75, and 100 the expected change in mean operating speed is anticipated to be around 2.5 km/h. This is by no means an exact estimate, but an order of magnitude expectation based on the literature. (An increase of about 4 km/h was seen in the Saskatchewan case, a result that the authors consider to be consistent with this estimate.)

There are societal, economic, and environmental impacts associated with a change in the posted speed limits. An increase in operating speed mathematically decreases the time required to travel, however, drivers perceive this reduction as being greater than it is. Increased operating speeds at the 100 km/h level also increase the release of air pollutants and greenhouse gases. As measures exist or are being discussed at the federal, provincial, and local levels to promote sustainability, measures should be taken to mitigate the possible negative impacts of the change in operating speed. Measures within the Province of Manitoba, including the Sustainable Development Act, will be key to this project and warrant more intense consideration.

Design, operating, and posted speed limits are connected in a circular relationship. All influence the safety of a section of roadway. Measures that provide for "forgiving roads" should be implemented along portions of the study area roadways that experience high levels of collisions. By implementing changes in the roadway, the potential increase in the number and severity of collisions can be mitigated, ensuring that roadways provide the best possible environment for high speed travel, if it is decided to implement the speed limit change.

Applications and Conclusion

The lessons learned in the literature review and in the experiences of Saskatchewan Highways and Transportation in their speed limit increase can be applied to Manitoba. A small increase in operating speeds can be expected. Without additional measures, this increase can be expected to cause an increase in the number and severity of collisions and release of air pollutants and greenhouse gases. Both of these effects can be mediated, however.

C. Stakeholder Consultation Report

It is always a prudent approach for a road authority, when assessing policies related to roadways, to gauge input from others who may be affected by the change. It is recognized that several agencies and departments, both internal and external to MIT, are likely to be affected by an increase in the posted speed limit along Provincial Trunk Highways.

It was decided to obtain stakeholder feedback through two separate meetings; one for internal and one for external stakeholders. In this way, the presentations and discussions could be structured to provide the technical details in a way that is appropriate for each audience.

The internal stakeholders contacted included:

Internal Stakeholder Branches and Divisions

- Traffic Engineering Branch
- Highway Planning and Design Branch
- Policy & Regulation Division
- Bridges and Structures Branch
- Materials Engineering Branch

A meeting was established and conducted on June 19, 2007. A total of five different branches and divisions were represented by seven individuals. The meeting consisted of a presentation by iTRANS followed by a round-table discussion and then a request to complete and submit the questionnaire.

The list of external stakeholders identified by the entire project team was used as a reference for identifying the various external organizations. The following list includes the organizations that were contacted.

External Stakeholder Organizations

- Association of Manitoba Municipalities
- Canadian Automobile Association
- Chamber of Commerce
- Department of Justice
- Manitoba Department of Conservation
- Manitoba Public Insurance
- Manitoba Safety Council
- Manitoba Safety Services
- Manitoba Trucking Association
- Minister of Culture, Heritage and Tourism
- Minister of Health
- Mothers Against Drunk Driving
- Royal Canadian Mounted Police

Application and Conclusion

It was clear that there is a mix of support amongst organizations and even within the Provincial branches and departments. Internal representatives would address the speed limit increase through a re-prioritization of their resources and budgets. Policies would be reviewed and modified where necessary (such as the implications associated with road design).

Generally, representatives from the external organizations tend to look to the Engineers at MIT to make the final decisions. The exception to this view came from representatives from the Health sector and the Trucking Association. The position of the Health sector is that a reduction in safety and an increase in emissions will have very negative affects on public health while the trucking association felt there will be negative implications associated with operating costs, the environment and truck safety.

The input obtained through written correspondence to the Government was clearly not in favour of a speed limit increase.

All stakeholders attending the meetings appreciated the opportunity to participate in the project and to share their views.

D. Sustainability Report

Sustainability can include a wide variety of concepts, and is generally understood as an ideal that provides for the needs of future generations without compromising the ability of the current generation to meet its needs. In practice, it involves balancing the environment, the economy and society, resulting in a triple bottom line that provides the greatest possible overall gains. In all discussions of sustainability, it is important to understand that every action has impacts in a variety of areas. For example, environmental damage or social issues often have quantifiable economic costs.

Applied to this project, the sustainability analysis considers two major factors. The first, emissions, addresses air quality and climate change concerns, while the second, economics, addresses the impact on Manitoba's economy.

Within the transportation sector, the burning of fossil fuels in internal combustion engines used by current vehicle technologies produces a wide variety of air emissions. Some, like volatile organic compounds and various oxides of nitrogen, combine with sunlight to form smog, which in combination with carbon monoxide and particulate matter contribute to poor air quality. Air quality (AQ) generally refers to the impacts of air contaminants that are considered to be harmful to human health, also known as Criteria Air Contaminants (CACs). Other emissions, like carbon dioxide and nitrous oxide, contribute to global warming, also referred to as climate change. The transportation sector is known to be a significant source of air contaminants and of greenhouse gases (GHGs).

The Posted Speed Limit Criteria Report describes how the project team determined which roadway segments are candidates to be included in the four tiers of implementation of a speed limit increase, should one be implemented. The first of these four tiers is referred to as Implementation Tier 1 and involves minor improvements to the roadway prior to implementing a posted speed of 110 km/h. The final tier (Tier 4) of implementation will see all sections of PTH 1, 75 and 100 posted at 110 km/h.

Application and Conclusion

Table 1 presents a summary of the approximate baselines values of GHG and CAC emissions on PTH 1, 75, and 100 as well as the percentage increase in emissions expected if the speed limit increases from 100 km/h to 110 km/h.

Table 1: Total Annual Emissions

	GHGs (tonnes)	Annual CO (tonnes)	Annual HC (tonnes)	Annual NO_x (tonnes)	Annual SO_x (tonnes)	Annual PM (tonnes)
Baseline	399,024	984.96	26.20	216.05	4.48	8.53
Tier 1 Increase	0.22%	1.66%	0.37%	3.46%	0.00%	0.00%
Full Implementation	0.93%	9.1%	1.18%	17.51%	0.00%	0.00%

The increase in emissions presented here also has economic applications. By applying the economic cost data for emissions from Section 4 to the results of this analysis, the project team found that the expected increase in emissions from the proposed speed limit change would cost the Manitoba economy approximately $137,000 per year for the Tier 1 implementation. Once the posted speed limit increase is fully implemented, the Province could expect to see an increase in emissions that would cost the economy approximately $530,000 annually.

In Tier 1, diesel consumption is expected to increase by 0.67% while gasoline consumption is expected to increase by 0.37%. Like the percentages for emissions, these percentages may seem quite small, but they represent an additional 357,000 litres of gasoline and 395,000 litres of diesel. By using the costing information given in Section 4, the project team estimates that this would result in an additional economic cost of approximately $551,000 annually.

In the full implementation scenario diesel consumption is expected to increase by 1.40%, resulting in an additional 825,000 litres of diesel while the gasoline consumption is expected to increase by 0.79%, resulting in an additional 763,000 litres of gasoline. Using the costing information in Section 4, this would create an additional economic cost of approximately $1,164,000 annually.

Although the time savings may be quite small for individual vehicles using the expected changes in average speed, there is more significance to the time savings when it is considered across all vehicles using the roadway. For Tier 1 implementation, the expected daily VHT savings for automobiles is 214 hours, while trucks are expected to save 60 hours. This is expected to result in economic savings of approximately $1.7 million annually. For full implementation, the expected economic savings will increase to approximately $5.4 million annually.

The expected increase in the severity of collisions can also be predicted. For example, we may predict that maintaining a 100 km/h posted speed limit along the candidate sections will result in approximately 135 injury or fatal collisions over a 3 year period. This prediction is based on the collision histories of these segments and accounts for the random nature of collisions. Using the same prediction procedures to assess a 110 km/h posted speed limit results in 140 injury or fatal collisions during the same 3 year period. This represents an increase of 5 injury or fatal collisions over 3 years for Tier 1 implementation of a 110 km/h speed limit and an increase of 19 injury or fatal collisions over three years for the full implementation.

An understanding of the economic, environmental and safety implications associated with a raised speed limit was necessary to the development of an implementation strategy by designing it to build in the mitigation of unwanted effects wherever possible.

In order to understand the actions required to mitigate emissions, the project team compiled a list of mitigation measures intended to reduce GHG emissions. From this list, 15 measures were chosen in four groups. These measures are the most applicable and are expected to have the most significant results. They are:

1. **Fuel and Efficiency Initiatives:**
   - Biofuel Initiatives
   - Bison Transport – Fuel Management Program
   - Biodiesel Preference Clause
   - E85 Demonstration Project
2. **Financial Rewards Initiatives:**
   - Hybrid Rebate Program
   - ecoAuto Rebate Program
   - Excise Tax Exemptions for Lower Carbon/Renewable Fuels
   - Pilot Emission Removals, Reductions and Learning
3. **Freight Initiatives:**
   - FleetSmart
   - ecoENERGY for Fleets
   - Freight Technology Demonstration Fund
   - Freight Technology Incentives Program
   - ecoFREIGHT Partnerships
4. **Planning Initiatives:**
   - Green Commute Program
   - City of Winnipeg Active Transportation Study

The environmental impacts of raising the speed limit can be mitigated through a combination of these measures. It is important to understand, however, that all of these measures are already existent in the policy and planning documents of industry and government in Canada, Manitoba, and in Winnipeg. Some are already in action, and all are expected to have positive impacts on emissions reductions. These measures will mitigate emissions independent of the proposed speed limit increase, and the overall environmental impact would be greater if the speed limit increase does not move forward.

E. Posted Speed Limit Criteria Report

This Posted Speed Limit Criteria Report documents the process developed by the project team to identify a plan to implement a 110 km/h posted speed limit on Provincial Trunk Highways 1, 75, and 100. The plan results in a stratified implementation where Tier 1 includes those highway segments that can potentially be increased to 110 km/h provided that the recommended short term mitigation measures are implemented. The remaining highway segments have been identified as candidates for Tiers 2, 3, or 4 of implementation, depending on their shortcomings (i.e. safety, design). In these tiers, mitigation and design requirements are identified to make the highway sections more suitable for the speed limit increase.

In developing a set of criteria with which to identify an implementation strategy for increasing the speed limit on candidate highway segments, the consultant team adopted the factors outlined by TRB Special Report 254 and expanded this list to include other considerations which stem from the findings from other documents examined in the literature review, stakeholder input and the expert opinion of senior members of the consultant team.

The final set of criteria used to assess candidate segments includes the following considerations. The Highway sections shall:

- Exhibit a predicted collision history that is less than the current average collision history for 100 km/h segments
- Provide for a transition length sufficient to address driver adaptation
- Avoid the mixed message: it is "safe to go 110" but there may be a need to stop at signals or at-grade crossings
- Avoid frequent (as defined in the report) at grade intersections and accesses to ensure stopping distances are maintained and to reduce turbulence in the traffic flow
- Exhibit appropriate existing 85th percentile speeds so as not to pressure drivers into an artificially high operating speeds
- Exhibit an appropriate design speed
- Not introduce unacceptable compromises for Stakeholders

These considerations only pertain to rural highways as described in the RFP and proposal; as such, all urban roadway segments, roadway segments with existing speed limits lower than 100 km/h and undivided segments of PTHs 1, 75 and 100 are omitted from further consideration. All of the criteria must be met before the candidate segment is included in the shortlist for the first tier of implementation. Those segments that do not meet all of the criteria are identified for other tiers of implementation once mitigation measures are implemented or deficiencies eliminated so that all of the criteria are met.

Just as the environmental programs have the potential to mitigate the unwanted GHG effects, safety measures should be introduced that have the ability to reduce the number and severity of collisions. It is for this reason that the following safety measures are strongly recommended for consideration by MIT if implementing an increased posted speed limit in the Tier 1 candidate sections. These measures are further suggested for consideration for all highways throughout the province:

- Paving the shoulders of all PTHs and implementing rumble strips wherever paved shoulders are present.
- Consider fencing where animal collisions are prominent.
- Review signs, pavements markings and entrance points.
- Remove obstacles or roadside objects from the area immediately adjacent to the roadside thereby providing a clear zone for vehicles to safely recover. These obstacles include boulders, large vegetation, and large open culverts.
- Remove pavement edge drop-offs in excess of 7.5 centimetres for future pavement rehabilitation or replacement projects.
- Adding exclusive left- and right-turn lanes at all intersections.
- Replacement of sign posts with break-away posts.
- Replacement of inappropriate bridge or guardrail ends.
- Relocation of hydro poles that are placed too close to the edge of roadway.
- The implementation of standardized slopes whenever possible (1:4 or flatter).

F. Study Conclusions

The following Exhibit illustrates the four implementation tiers:

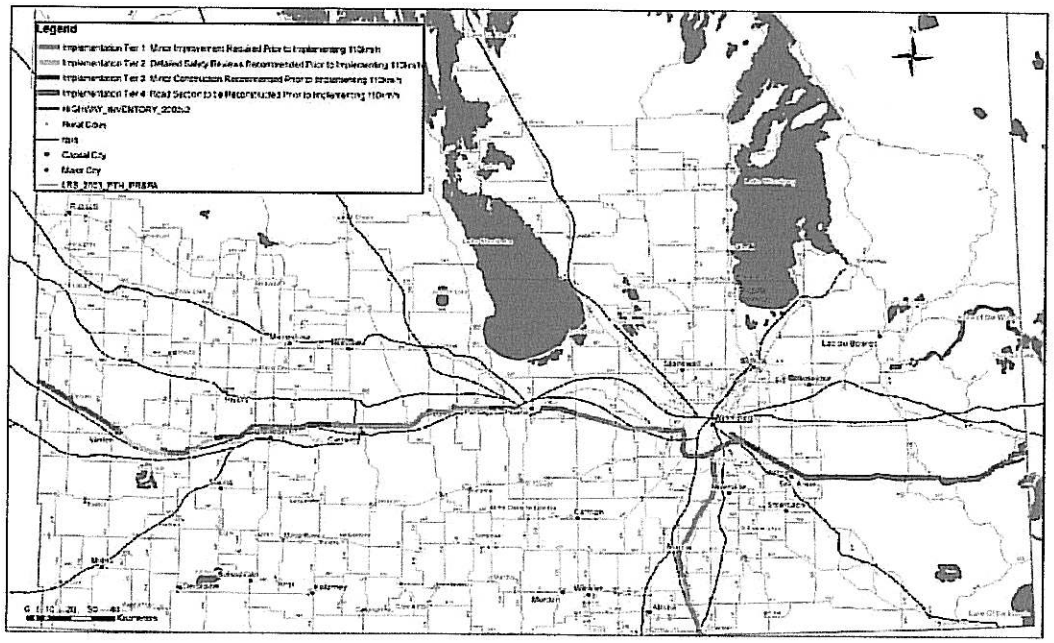

Exhibit 1: Implementation Strategy for 110 km/h Posted Speed Limits

In summary the implementation strategy is as follows:

1. The road sections identified for Implementation Tier 1 may be considered for a 110 km/h posted speed first (provided the modifications listed in the report are addressed).
2. Road sections that pass all criteria except for the predicted collision history test (i.e. implementation tier 2) may be considered for the 110 km/h speed limit provided a more detailed safety review is undertaken to identify mitigating measures for collision patterns. For example:
   a. High predicted occurrences of run-off-road collisions are mitigated through paved shoulders, shoulder line rumble strips and clear zones
   b. High predicted occurrences of collisions with animals are mitigated through animal control measures such as fences
   c. High predicted occurrences of collisions involving other vehicles are mitigated through closures of access points, driver educations programs, additional safety reviews
3. Road sections that require minor construction such as flattening grades or introducing guardrails may be implemented during Tier 3.
4. Road sections that exhibit design limitations (at grade crossings or intersections, frequent access points, inappropriate design speeds) should be re-constructed to eliminate these deficiencies prior to implementing the 110 km/h posted speed limit.
5. Road sections that have been reconstructed since the road assessment and data collection tasks were undertaken (such as Highway 1 west of Virden) should be assessed against the criteria presented in this report. It is further recommended that operating speeds for these new highway sections be measured at a posted speed of 100 km/h with the results assessed against the 85th percentile speed criteria. Further, after three years of operating at 110 km/h posted speed limit, the collision history should be reviewed.