

UNDERSTANDING AND PLANNING FOR RURAL IMPACTS OF HIGH SPEED RAIL PROJECTS

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Introduction

High speed rail (HSR) proponents are increasingly recognizing that support, or at least acceptance, from rural communities along planned HSR rights-of-way is key to the successful rollout of HSR projects. However, rural impacts from HSR projects have generally received limited attention in the early HSR planning process in North America. This has the potential to slow or otherwise frustrate the development of HSR initiatives. CPCS recently completed a study of the potential impacts of a Calgary-Edmonton HSR project on the rural population of Alberta within the corridor. This study is among the first to comprehensively define the range of potential rural impacts from HSR. Drawing on this study, this paper provides an overview of the key impacts of HSR projects on rural communities, a summary of measures for addressing impacts as well as the importance of clear communication between project proponents and rural stakeholders to minimize misunderstandings and head off problems before they lead to project delays and cost overruns.

Background

High speed rail (passenger trains operating at speeds in excess of 200 km/h) has recently enjoyed a resurgence of public interest in both Canada and the United States. While HSR is well established in Europe and Asia for a number of historical, geographic and market

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reasons, North America's experience with HSR has largely been limited to studies of potential HSR services.

In Canada, HSR has been considered on two key economic corridors: the Windsor-Quebec City corridor, and the Calgary-Edmonton corridor. In both cases, the potential for HSR has been studied extensively. The first studies of HSR on the Windsor-Quebec City corridor date back more than 25 years and there have been several new or "update" studies since then. HSR on the Calgary-Edmonton corridor has also been the subject of at least two feasibility studies. Yet the actual development of HSR in Canada remains a matter of political debate; there is no clear indication that HSR is imminent in this country, despite the rhetoric.

Most of the previous literature and analysis of HSR in Canada has focused on questions of ridership, as well as financial and economic feasibility: Will the service be competitive in attracting passengers in sufficient numbers (demand and ridership studies)? Are the significant capital costs justified by the expected economic and environmental benefits (cost-benefit analysis studies)? Can an HSR service operate without an operating subsidy (business case and financial viability studies)?

Noticeably absent from the previous literature are assessments of the potential impacts, both positive and negative, of HSR on rural communities along or near the HSR right-of-way. For instance, neither of two recent Alberta HSR studies explicitly mentions the impacts on rural Alberta nor the potential implications of HSR for rural communities.² Similarly, there is only limited research on potential rural impacts in previous Windsor-Quebec City corridor

² *Market Assessment of High Speed Rail in the Calgary-Edmonton Corridor*, prepared for Alberta Infrastructure and Transportation by TEMS Inc. / Oliver Wyman, February 2008. And, *Calgary/Edmonton High Speed Rail: An Integrated Economic Region*, prepared by the Van Horne Institute, October 2004

HSR studies (One study from 1995 notes only that impacts on corridor-communities will be limited)³.

This gap in previous analysis fails to address the interests and concerns of rural communities, which are perhaps a less visible stakeholder group but, nonetheless, a very important one in HSR initiatives in Canada. Certainly, the majority of the right-of-way in both potential HSR corridors in Canada would trace through largely rural settings.

Dangers of Overlooking Rural Considerations in the HSR Planning Process

The matter of potential rural impacts of HSR in Canada may not in of itself derail potential HSR projects. Certainly, broader socio-economic, financial and technical considerations remain paramount in determining HSR feasibility. But HSR planners and decision makers would be remiss to overlook or ignore their potential rural impacts for several reasons.

First, rural concerns, if not explicitly addressed in the planning process, could lead to opposition from rural communities, justified or unjustified. Such is currently the case in California, where rural residents in the city of Gilroy and elsewhere who oppose HSR plans are mounting pressure on local politicians to stop the project. Challenges from rural interests could also lead to lengthy legal campaigns and appeals to halt HSR development plans. This could lead to significant delays in moving forward with HSR implementation. Such opposition could also weaken political support for HSR projects, which is important to recognize as vital to moving from studies to construction.

Second, failure to consider HSR implications for rural communities could lead to costly redesign or realignments in HSR plans

³ *Quebec/Ontario High Speed Rail Project: Effects of the Urban System and Settlement Patterns*, prepared for Transport Canada by Hemson / Pluram, February 1995

retroactively to accommodate rural issues as these are identified (rather than address these issues upfront as part of the planning process). A simple example would be understanding and addressing bridge or underpass clearance requirements to allow the movement of large farm equipment such as combines. These technical requirements will also influence construction costs and so should be included in the early planning process.

Third, rural communities within potential HSR corridors could also find their own rural development and planning process frustrated by a lack of clarity on HSR plans. Such is currently the case in the Calgary-Edmonton corridor. No alignment has yet been announced, leaving rural communities between Calgary and Edmonton unsure where and how their long-term development plans will interact with HSR, and adding significant risk to their rural development process.

Fourth, and perhaps most significant, the dearth of rural consideration in most previous HSR research makes it very difficult for rural communities and HSR planners and decision makers to engage meaningfully about specific potential impacts of HSR and to work together to develop workable solutions to address these impacts. Without grounding in solid research and analysis, discussions of HSR can become beholden to debates based on anecdotes and emotion. Indeed, “not in my backyard” (NIMBY) opposition has been a feature of most HSR discussions and development plans. NIMBY-ism will not disappear, but with a better understanding of the true potential impacts of HSR on rural communities, and evidence that HSR planners and decision makers desire to address these issues, both rural stakeholders and HSR proponents can get on with identifying practical ways forward with HSR projects that will minimize impacts for rural communities and indeed promote the value of HSR for all.

Study of Potential Rural Impacts of High Speed Rail

It was in recognition of the above that the Alberta Association of Municipalities and Districts and Counties (AAMDC), the association of rural communities in the province, sought to understand the

potential rural impact of a future HSR project between Calgary and Edmonton.

Accordingly, AAMDC resolved at its Fall 2009 convention to clearly identify, with supporting analysis, the potential impacts of the Calgary-Edmonton HSR on rural areas along and adjacent to its corridor, such that AAMDC could be well informed of related implications for its members and municipal long-term planning and development, and advocate for their interests accordingly in the HSR planning process.

CPCS was retained by AAMDC to develop the study of potential impacts on Alberta's rural communities along the potential HSR corridor and to provide recommendations on how to address identified impacts. This paper summarizes the key findings from this study.

Methodology for Assessing Range of Rural Impacts of HSR

As a point of departure, the study sought to define the area of potential impact from HSR within the corridor. Broad zones of impact were defined, primarily using the catchment area of affected traffic as a proxy. Narrower impact zones, including areas impacted by noise and vibration, were defined as a subset of the broader impact zones.

The study drew on an international literature review, road and traffic pattern analysis and a review of environmental, land use and rural developments within the corridor using a geographic information system (GIS). Extensive consultations with rural planners and other stakeholders in the affected regions were also used to identify potential rural impacts that could result from the HSR.

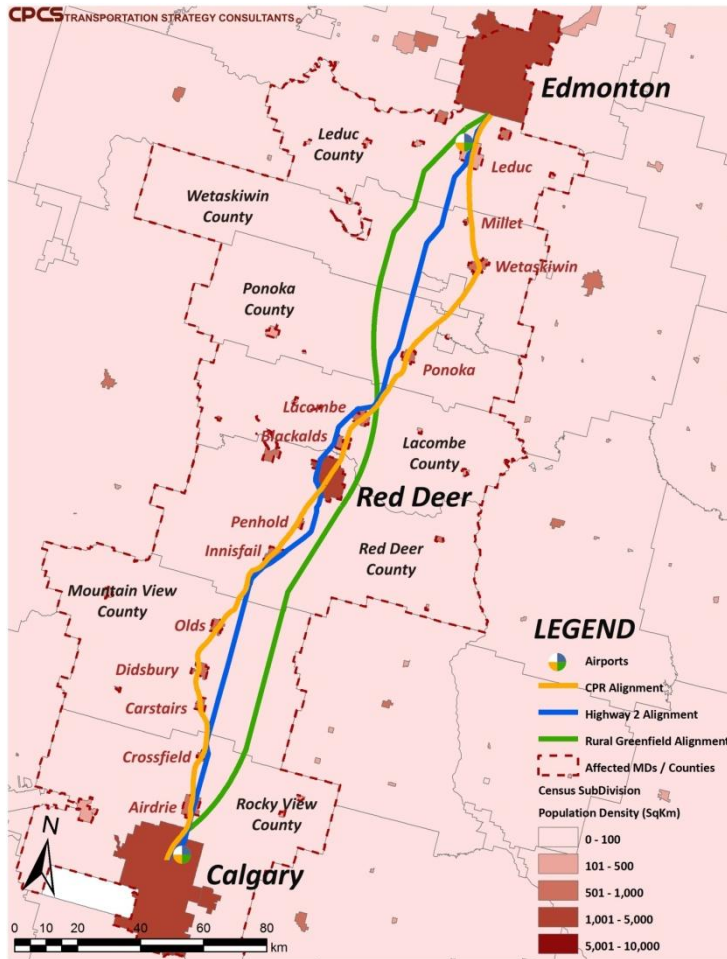
Each potential impact identified was then assessed in more detail by the study team, and quantified, where possible. A framework was developed to categorize the range of potential impacts of HSR on affected rural communities.

Once the most significant impacts were identified, the team consulted with rural planners and stakeholders to consider potential mitigation measures. High-level engineering assessments were used to estimate the implications and costs of potential HSR rural impact mitigation measures. Practical examples of rural impact mitigation measures of transportation infrastructure from around the world also informed the development of potential mitigation measures.

Methodological Challenges

The AAMDC study was characterized by two notable challenges.

The first challenge was that the alignment of the Calgary-Edmonton HSR has yet to be defined or announced by the Government of Alberta. Clearly, this precludes the possibility of undertaking an alignment-specific study of impacts on rural communities. The study team developed three alternative “conceptual alignments” for the purposes of assessing the range of impacts that might result from the development of HSR between Calgary and Edmonton. These were a) along the existing Canadian Pacific Railway (CPR) line, b) along the main road artery between the two cities, Highway 2, and c) a new greenfield alignment that minimized interaction with built-up areas. Both the CPR and Highway 2 alignments had been considered as part of previous studies. The new greenfield alignment concept was developed by CPCS as an indicative alignment that avoids existing areas of development.



The second challenge was that track characteristics (and HSR technology, for that matter) have also yet to be defined. At a minimum, HSR operations must be fully grade-separated (i.e. no at-grade road crossings) and the right-of-way fully protected. However, the range and degree of rural impacts of HSR could be very different depending on the track “vertical alignment”, whether constructed

entirely at grade (on the ground) with over or underpasses, below grade (in a trench) with overpasses, or on an elevated track, in which case all crossings would pass underneath the line.



Source: CPCS (left and right), <http://www.crbasic.info/Alameda-Corridor-Trench.html> (centre)

For the purposes of the AAMDC study, it was assumed that the right-of-way through rural areas would be at grade, given significant relative capital costs of elevated and below-grade alternatives.

Rural Impacts of HSR

The types of rural impacts from HSR projects can be organized into four broad categories:

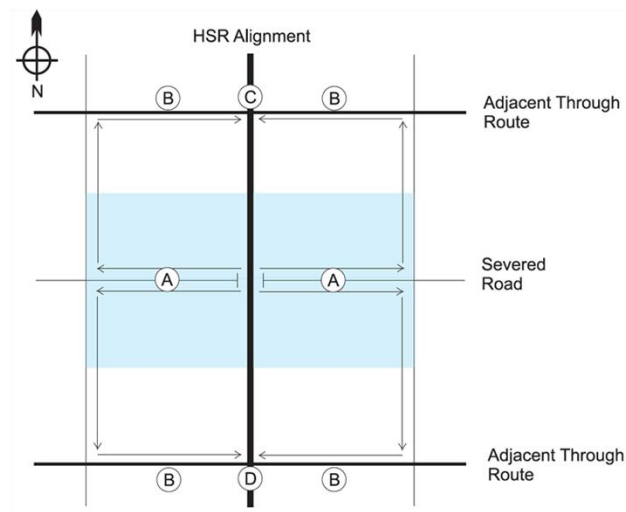
- Road-user impacts
- Commercial and economic impacts
- Social and environmental impacts
- Administrative and planning impacts

The related impacts and potential mitigation measures, discussed below, are not intended to be comprehensive, but represent the most significant impacts identified. For the full range of impacts, see the full study (available at <http://aamdc.com/content/view/1909/446/>).

Road User Impacts

The most obvious rural impact of HSR is on road users in rural communities. Because many rural roads are characterized by low volumes of traffic, it can be assumed that many roads would be severed and closed (rather than be grade separated), which would result in trip diversions by rural road users moving across the HSR alignment, leading to increased transportation time and cost.

The following diagram provides a conceptual representation of trip diversion impacts for east-west traffic across a Calgary-Edmonton HSR alignment.



The number of road crossings that the HSR would traverse depends on the selected alignment, but could be as high as 200 roads. Of these, more than a third are private farm crossings. Several public crossings and all private crossings would likely have to be closed to accommodate the HSR.

In most instances, the additional driving time for affected drivers would only be a few minutes per one-way trip, depending on affected origin/destination and location of crossings (greater for the rural Greenfield alignment given that there are fewer existing crossings). However, based on actual traffic patterns in the affected Calgary-Edmonton HSR corridor, the total annual driving time for affected rural drivers could be as high as 230,000 hours (rural greenfield alignment). The related economic costs could be significant indeed.

While a few additional minutes per trip may not be a major concern for most drivers and passengers, these delays are perhaps more significant for the delivery of emergency services, where even a delay of a few minutes for fire trucks, police and ambulances can make the difference between life and death.

To mitigate the most serious impacts of potential road closures on emergency service response time, HSR crossings should be planned as close as possible to existing emergency service facilities (fire stations, police stations, hospitals) to minimize diversion times for these time-critical services.

The impact of road closures on other road users, including passenger vehicles, school buses and commercial transportation operations, can be mitigated by planning grade-separated road/rail crossings where they will minimize impact on traffic patterns. Detailed traffic studies should be undertaken to inform the optimal crossings and road closures in rural areas.

Commercial and Economic Impacts

The commercial operations of farmers would likely be the most significantly impacted by HSR. Depending on the selected alignment, it is expected that a number of farmers' fields would have to be severed to accommodate the HSR right of way (particularly with a greenfield alignment).

The severance of farmland would have a number of implications for regional farmers. First, this would require additional time and cost for

affected farmers to access their severed fields on both sides of the HSR. Second, the emotional and psychological cost of land severance and expropriation also has the potential to be extremely difficult for farmers, particularly where land has been owned and farmed by the same family for several generations.

The HSR has the potential to frustrate the mobility of large farm equipment including combines, tractors and air seed drills. Where private farm crossings are severed and closed, equipment would be required to make significant detours to access fields on both sides of the HSR. The related costs could be significant given the capital cost of these machines and the time that this equipment would be “commuting” to fields rather than “working” in the fields. Similarly, ensuring adequate clearance for oversized farm equipment at grade-separated crossings is also crucial.

A parallel issue is the mobility of livestock. Where possible and practical, ranchers generally prefer to move cattle for short distances on foot along quiet country roads, thus allowing access to new pastures at little cost. These are the roads most likely to be severed by a HSR, given low traffic volumes. The potential impact would be greatest if a greenfield HSR alignment were built, given the greater possibilities for severing existing ranches, and the existence of fewer high-traffic road crossings.

Minimizing farm severance, where practical, and ensuring adequate and sufficient grade-separated crossings for affected farmers, farm equipment and livestock will be important measures to mitigate impacts of HSR. Avoiding land severance altogether is likely not an option. Key in the HSR planning process would be to engage with farmers and ranchers as part of the HSR planning process to address their concerns and mitigate their impact to the extent possible and practical. Expropriation of land is also expected to be inevitable, and so adequate and early communication with rural landowners on the expropriation process, compensation schemes and timing should be a priority to minimize negative impacts (emotional and otherwise) associated with concerns around land expropriation.

Social and Environmental Impacts

High speed rail in the Calgary-Edmonton corridor would likely have a number of social and environmental impacts. The most significant social impacts include potential for noise and vibration from HSR operations on rural residents in the affected corridor. It is expected, however, that the related impact zone would be fairly narrow, likely within a few hundred metres of the HSR alignment (depending on HSR technology and speeds, among other factors). Noise and vibration impacts in the Calgary-Edmonton corridor would be expected to be greater in the CPR alignment relative to the greenfield alignment, given greater population densities along the CPR alignment. In any case, to mitigate impacts of noise and vibration from HSR operations, the alignment should avoid residential areas where practical, and standard noise barriers should be used to limit the travel of noise.

Other, less significant social impacts from HSR include disruption to recreational activities in rural areas (e.g. nature trails or biking paths, etc.), which can be mitigated to some degree with appropriate over or underpasses.

From an environmental standpoint, the most significant rural impact from HSR is likely related to disruptions to the movement of wild animals and migration patterns. The related implications would be similar to that resulting from a new greenfield highway. These potential impacts on wildlife can be mitigated with adequate grade-separated animal crossings (preferably overpasses, as animal underpasses are reportedly convenient for lurking prey).

Potential impacts on lakes, rivers and other watercourses and drainage would also have to be addressed as part of the HSR planning process. It can be expected that this would be addressed as part of the Environmental Impact Assessment process.

Administrative and Planning Impacts

Several administrative and planning impacts were identified in the context of the rural impact of HSR study in Alberta.

The most significant is the uncertainty of future HSR plans, and the related risks this creates for the regional rural planning process. Seven counties between Calgary and Edmonton have designated economic growth areas along major highways (2 and 2A). Growth Management Strategies and Area Structure Plans have been or are being prepared to encourage and direct industrial, commercial, and business park development.

Uncertainty is a major disincentive to investment and land development, however. If and when HSR becomes fully operational, it is unlikely to cause uncertainty, but until that time there will continue to be uncertainty both in terms of whether or not it will be constructed and, if so, what route it will take.

The best measure to address these and other planning and administrative impacts is greater clarity on HSR plans. Between Calgary and Edmonton: will the project go ahead, what will be the final alignment (horizontal and vertical), where will crossings be located, what technology will be used, etc.?

Clearly, addressing and defining these issues will require significant future study and decision. Steps are already being taken to do this. Alberta Transportation Minister Luke Ouellette said in a May 28, 2010, interview that his department is looking for about \$9 million to fund a two-year study into the best route for HSR between Calgary and Edmonton.

There may also be opportunities to identify and plan for broader utility corridors (e.g. for relocation of existing freight lines, pipelines, transmission lines and highways, as well as HSR).

Summary of Relative Impact Magnitudes by Potential Alignment

The range and degree of rural impacts are very much tied to the future alignment. With respect to the three conceptual alignments considered for the purposes of this study – a) along the existing CPR line, b) along Highway 2, and c) a new greenfield alignment – each is expected to have different magnitudes of impacts on rural communities. The figure below provides a summary of impacts and their relative magnitudes for each conceptual alignment considered.

Impact	Relative Magnitude of Impacts by Conceptual Alignment		
	CPR	Highway 2	Rural Greenfield
Road User Impacts			
Traffic delays and forced travel time and routing changes	◆◆	◆	◆◆◆◆
Emergency vehicle access	◆	◆◆	◆◆◆◆
Commercial and Economic Impacts			
Farm equipment access	◆◆	◆	◆◆◆◆
Livestock access	◆◆	◆	◆◆◆◆
Farm severance psychological costs	◆◆	◆	◆◆◆◆
Foregone land-use opportunities	◆◆◆◆	◆◆◆◆	◆
Social and Environmental Impacts			
Wildlife mobility	◆◆	◆	◆◆◆◆
Recreation	◆◆	◆	◆◆◆◆
Noise and vibration	◆◆◆◆	◆◆	◆
Administrative and Planning Impacts			
Planning uncertainty	◆◆◆◆	◆◆◆◆	◆
Road maintenance costs	◆◆	◆	◆◆◆◆
School bussing	◆◆	◆	◆◆◆◆
Emergency services training	Equal across all three conceptual alignments		
Scale: ◆ low relative impact; ◆◆ medium relative impact; ◆◆◆ high relative impact			

Conclusions

Potential impacts of HSR on rural communities are but one of many considerations that should inform planning of an HSR alignment and system. It may very well be that the best alignment from an engineering, cost and HSR operations standpoint is one that will have the greatest impact on rural communities (e.g. rural greenfield alignment that avoids built-up areas). But much can be done to mitigate the potential impacts on rural communities with prior study to understand and adequately address rural issues and concerns. It is hoped that this paper and the study on which it is based go some way toward achieving this goal and in informing the HSR planning process in the Calgary-Edmonton corridor, and indeed others. However, an analysis of potential rural impacts from “conceptual” alignments is not adequate. Once the preferred alignment is selected, more detailed analysis of potential rural impacts will be critical to mitigating alignment-specific impacts and promoting the most value of HSR (or at least the least harm from HSR) for rural communities.