

Report



City of Medicine Hat

Assessment of Alberta Transportation Highway 1 and 3 Proposed Improvements

April 2013



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1 Introduction

1.1 BACKGROUND

Alberta Transportation (AT) is planning to upgrade Highways 1 and 3 to improve traffic flow and safety on these key routes within the City of Medicine Hat (CMH). Highways 1 and 3 have been identified as Core Routes within the transportation infrastructure of the CMH, which means they are key interprovincial and international routes and provide an important function to the CMH and beyond.

In 2010, AT retained Stantec to undertake a functional planning study and develop highway improvement plans for Highway 1 and 3 corridors titled “Highways 1 & 3 Network Functional Planning Study Existing Route Improvements City of Medicine Hat” (AT Functional Planning Report). This functional planning study produced the proposed improvement plans for Highways 1 and 3 within the CMH.

In 2010, the CMH retained Associated Engineering (AE) to update the 2005 Roadway Systems Master Plan (RSMP) resulting in the development of a 2010 RSMP. The purpose of the updated RSMP is to provide a future road network within the CMH that addresses future population to 95,000 (95K). As part of this study AE was asked to evaluate Highway 1 from the perspective of its role and function within Medicine Hat.

1.2 PURPOSE OF THE STUDY

The purpose of this study is to undertake a review of the proposed AT highway improvements that were identified in the AT Functional Planning Report. This included a general review of the safety and operational aspects of Highways 1 and 3. It is to identify the short and medium term road upgrades that should be considered within the study corridor, and to identify a phasing and/or priority listing for the implementation of these upgrades.

1.3 STUDY CORRIDOR

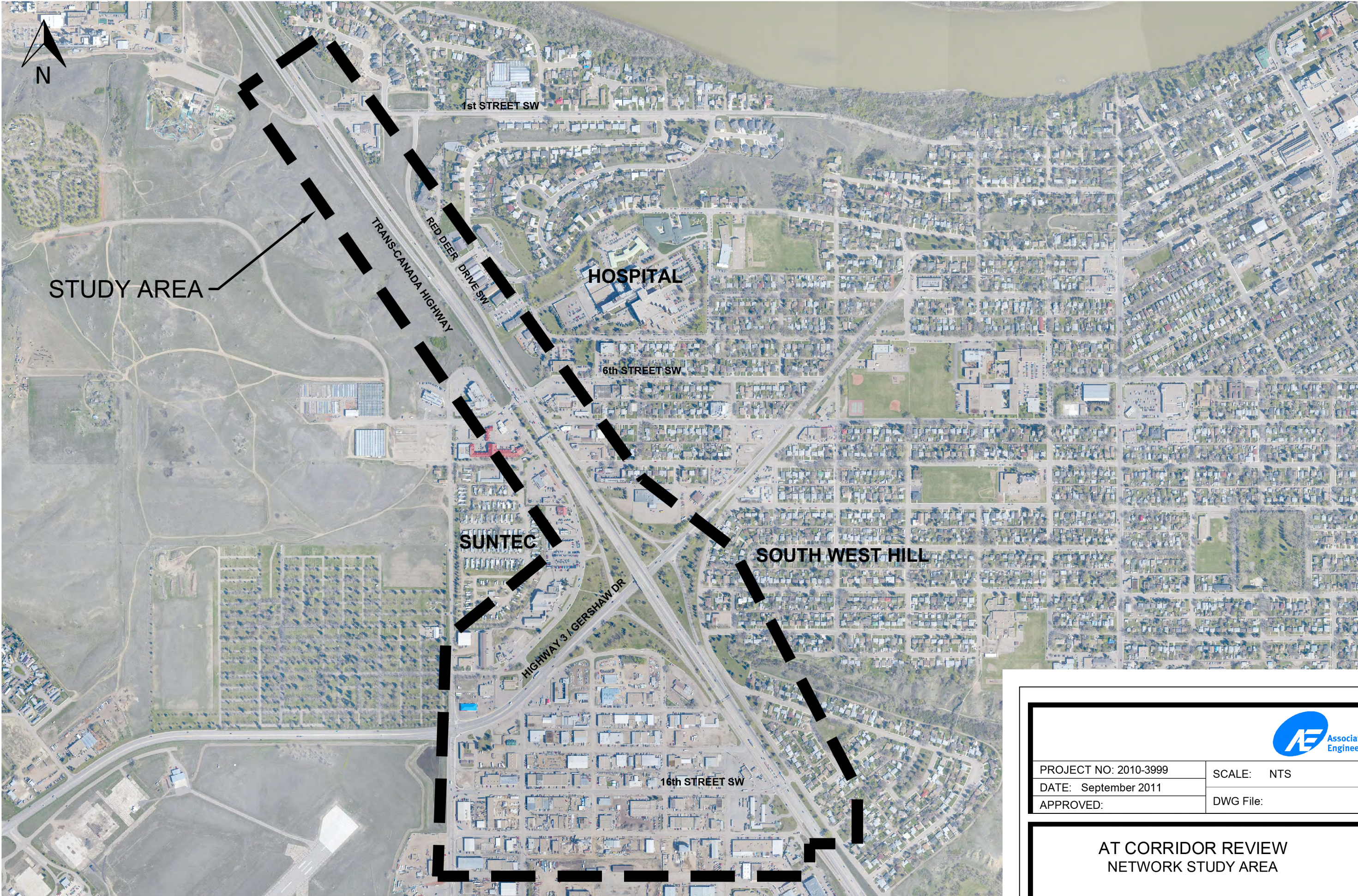
Highway 1, where it passes through the CMH is a key corridor that facilitates City of Medicine Hat traffic as well as the movement of national and provincial vehicular trips through the City.

The study corridor for this report (detailed in **Figure 1.1**) is located along Highway 1 to the southeast of the South Saskatchewan River and incorporates the following intersections and interchange:

- Highway 1 and 1st Street SW (unsignalized at-grade intersection)
- Highway 1 and 6th / 7th Street SW (signalized at-grade intersection)
- Highway 1 and 3 (Free flow grade separated interchange)
- Highway 1 and 16th Street SW (signalized at-grade intersection)
- Highway 3 from 10th Avenue SW to Highway 1.

This Drawing Is For The Use Of The Client/And Project Indicated
No Representations Of Any Kind Are Made To Other Parties

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STUDY AREA

1st STREET SW

HOSPITAL

6th STREET SW

SUNTEC

SOUTH WEST HILL

16th STREET SW

TRANS-CANADA HIGHWAY

RED DEER DRIVE SW

HIGHWAY 3 / GERSHAW DR



PROJECT NO: 2010-3999

SCALE: NTS

DATE: September 2011

APPROVED:

DWG File:

AT CORRIDOR REVIEW
NETWORK STUDY AREA

1.4 METHODOLOGY

The following methodology was used to assess the sequencing of the proposed AT Highway 1 and 3 corridor improvements:

Stage 1 - Review current operating conditions.

Stage 2 - Assess the benefits of a speed reduction on Highway 1 within the study limits.

Stage 3 - Assess converting 1st Street SW to a right in/right out at Highway 1.

Stage 4 - Evaluate the benefits of implementing individual components of the AT Highway 1 and 3 proposed upgrades.

Stage 5 - Based on an assessment of existing conditions and an evaluation of the proposed AT upgrades, outline a Phasing Strategy for the study area that provides maximum benefit to the CMH.

1.5 STUDY INFORMATION AND ASSUMPTIONS

The following information was provided for the completion of the study:

- Collision data for the study corridor between the period 2003-2010
- AT Functional Planning Report.

It was assumed that:

- Forecast 75K population horizon traffic volumes would be used for the analyses
- Manual traffic projections would be used for the analysis of Highway 3 and 8th Avenue SW
- No stakeholder meetings would be required.

1.6 EXISTING INTERCHANGE / INTERSECTION OPERATIONS

Table 1-1 provides a summary of the overall operation of the existing interchange and intersections within the study corridor. Of all the intersections in the study, the 16th Street SW intersection is worst performing from a capacity, collision, and travel time/delay perspective. This is due in part to the close proximity of the service roads to the Highway, resulting in lengthy delays at the intersection.

Table 1-1
Summary of Intersection and Interchange Operations within the Study Corridor

Location	Intersection LOS	Total Delay (seconds)	Collisions Per Year
Highway 1 and 1 st Street SW	D	10.1	9.1
Highway 1 and 6 th / 7 th Street SW	E	66.1	13.3
Highway 1 and 3 Interchange	N/A	N/A	5.9
Highway 3 South Interchange	A	2.0	N/A
Highway 3 North Interchange	A	16.7	N/A
Highway 1 and 16 th Street SW	F	114.4	15.6

2 Review of Study Corridor

2.1 INTRODUCTION

As part of the RSMP study, AE staff spent time in Medicine Hat observing traffic movement and traffic flow within the City. Based on AE's knowledge of the study area, our traffic engineering experience and the AT Functional Planning Report, we undertook a review of the current traffic conditions within the study area. The detailed review is provided in Appendix A.

One key indicator in the performance of the intersections within the study corridor is Level of Service (LOS), which is a qualitative measure describing operational conditions within a traffic stream and is based on service measures such as delay and congestion. Typically, AT strives for no worse than LOS C on highways, but will accept LOS D at congested urban intersections. The LOS reflects the level of acceptable delay to motorists from levels A to F. The level of service criteria for both signalized and unsignalized intersections is described in Appendix A of this report. LOS A indicates very good operation and an average delay of 10 seconds or less. LOS C indicates acceptable operation and an average delay of 35 seconds or less for signalized intersections. LOS F indicates unacceptable operation and an average delay of more than 80 seconds for a signalized intersection.

2.2 HIGHWAY 1 CORRIDOR

Within the CMH, Highway 1 is 13.4 km long and is orientated in a southeast to northwest direction from Boundary Road to 54th Street SE. The highway is a four lane divided highway, with various cross-sections throughout and a number of intersections and interchanges which provide access and egress to minor roads. The posted speed limit is 80 km/h. At the City Limits this speed limit increases to 100 km/h.

In the segment of Highway 1 from approximately 6th Street SW to 16th Street SW, the right-of-way is narrower and urban development exists adjacent to the highway. There is highway commercial property along the south-west side of this road segment, while along the north-east side there is a mix of highway commercial property and single family residential property. West of 6th Street SW, the roadside environment tends to be low density suburban/rural in appearance. In the segment from 1st Street SW to 6th Street SW, there is urban development along the north east side of the highway, albeit setback from the highway due to the service road (Red Deer Drive). However, there is no development on the southwest side due to the river valley escarpment. To the southeast and northeast of 16th Street SW, the development is setback more from the highway and sometimes hidden behind berms. Hence, the more urbanized segment of the highway is between 6th Street SW and 16th Street SW.

The AT Functional Planning Report listed traffic volumes on Highway 1 in Medicine Hat as 15,000 vehicles per day (VPD) west of Box Springs Road, and peak at 33,190 VPD south east of 16th Street SW before decreasing to 12,010 VPD at Dunmore Rd. This would indicate considerable usage of Highway 1 for local trips within the City Limits.

2.3 HIGHWAY 1 AND 1ST STREET SW INTERSECTION

1st Street SW is a two lane roadway that connects Highway 1 to a number of residential properties, to the downtown and the hospital. Currently, the Highway 1 and 1st Street SW intersection is an at-grade unsignalized intersection with designated left and right turn bays on Highway 1 with stop control on 1st Street SW. To the west of Highway 1, 1st Street SW is a two lane roadway that provides access to the Power Plant.

The major movements at the Highway 1 and 1st Street SW intersection are the northwest and southeast movements along Highway 1. Traffic wishing to enter and exit 1st Street SW, both to and from Highway 1, experience difficulty at peak times due to the high through traffic volumes on Highway 1. The traffic volumes attempting these movements is low and turning delays at this intersection isn't much of a concern; however, the safety of the motorist attempting these movements is a concern.

2.3.1 Highway 1 and 1st Street SW Capacity Assessment

The AT Functional Planning Report provides a capacity assessment of the Highway 1 and 1st Street SW intersection. This analysis identified Highway 1 as operating well within acceptable limits at the intersection with 1st Street SW. However, the 1st Street SW left turn to Highway 1 experiences long delays and in terms of LOS, is not a preferred condition. The delays experienced on 1st Street SW can be attributed to the high traffic volumes on Highway 1.

The following traffic lanes are operating at a low level of service:

- 1st Street SW right turn to northwest bound Highway 1 (LOS F)
- 1st Street SW through movements to Power House Road (LOS F)
- 1st Street SW left turn to southeast bound Highway 1 (LOS F)
- Power House Road right turn to southeast bound Highway 1 (LOS F)
- Power House Road through to 1st Street SW (LOS F)
- Power House Road left turn to northwest bound Highway 1 (LOS F).

The average intersection delay at the 1st Street SW intersection with Highway 1 is 10.1 seconds, which overall is an acceptable level of service. We do not have capacity concerns with this intersection; however, the thru movement from 1st Street SW to the power plant access road and the left turning movements onto the Highway 1 raise safety concerns. This is primarily related to site lines, traffic speeds on Highway 1 and the fact that this intersection is un-signalized.

2.3.2 Highway 1 and 1st Street SW Collision Data

Based on collision data provided by AT and the CMH (refer to [Table 2-1](#)) there have been 73 collisions at this intersection over the period 2003-2010. The most common types of collision at the intersection are right angle (23%), struck object (22%) and rear end (15%) with the average

collision rate of 9.1 per year over an eight year period. It should be noted that right angle collisions are common for high volume intersections that are unsignalized.

Table 2-1
Highway 1 and 1st Street SW Intersection Collision by Year

Collision Type	2003	2004	2005	2006	2007	2008	2009	2010	Total
Backing							1		1
Left Turn - Across Path				1		1	2	2	6
Off Road Left			1	1					2
Off Road Right								1	1
Other		1		1					2
Rear End	3		3	1			2	2	11
Right Angle	5	4	1	3		3		1	17
Sideswipe - Same Direction			4			1	2		7
Struck Object	1		4	1		3	3	4	16
Not Available					10				10
Total	9	5	13	8	10	8	10	10	73

2.4 HIGHWAY 1 AND 6TH / 7TH STREET SW INTERSECTION

Highway 1 and 6th / 7th Street SW intersection is an at-grade signalized intersection with designated left-turn lanes off Highway 1. Service roads are located adjacent to Highway 1 which in turn increase the number of traffic movements at the intersection. This configuration results in the traffic signals being multi-phased to accommodate the additional traffic lanes caused by the service road. The outside hard shoulder north of the intersection operates as a makeshift right turning lane in the southeast bound direction on Highway 1.

The majority of the traffic exiting Highway 1 at 6th / 7th Street SW intersection is accessing the residential areas, hospital and downtown Medicine Hat east of Highway 1 and the commercial area southeast of Highway 1. The major movements at this intersection are on Highway 1 southeast and northwest bound left and right turning movements from 6th Street SW and left turn from 7th Street SW to Highway 1. These movements reflect the major trip attractors and generators in the area.

2.4.1 Highway 1 and 6th / 7th Street SW Capacity Assessment

The AT Functional Planning Report provides a capacity assessment for the Highway 1 and 6th / 7th

Street SW intersection. Due to the close proximity of the service roads to the intersection and the resulting increase in signal timings to accommodate the extra traffic movements, the intersection is operating with congestion. The movement from 7th Street SW to 6th Street SW eastbound has an unacceptable LOS. The average intersection delay at this intersection is 46 seconds.

The Red Deer Drive and 6th Street SW intersection is also over capacity during the p.m. peak period with an unacceptable LOS at the intersection. In the p.m. peak, the southeast and northwest bound movements along Highway 1 experience the longest delays which is consistent with the traffic count data and observations at the intersection.

The following Highway 1 and 6th / 7th Street SW intersection traffic movements are operating over capacity:

- Highway 1 southeast bound through (LOS E)
- Highway 1 southeast bound right turn to 7th Street SW (LOS D)
- Highway 1 southeast bound left turn to 6th Street SW (LOS E)
- Highway 1 northwest bound through (LOS E)
- Highway 1 northwest bound right turn to 6th Street SW (LOS D)
- Highway 1 northwest bound left turn to 7th Street SW (LOS E)
- 7th Street SW through to 6th Street SW (LOS F)
- 7th Street SW left to northwest bound Highway 1 (LOS F).

The following 6th Street SW and Red Deer Drive intersection traffic movements are operating over capacity:

- 6th Street SW westbound through (LOS E)
- Red Deer Drive southeast bound through (LOS E)
- Red Deer Drive northwest bound through (LOS F).

2.4.2 Highway 1 and 6th / 7th Street SW Intersection Collision Data

Over the period 2003-2010 there have been 106 collisions, as shown in **Table 2-2**. This equates to 13.3 collisions per year at the intersection. The predominant collision (49%) at the junction is rear end which is associated with traffic backed up in through lanes; a behaviour that has been observed at this location.

Table 2-2
Highway 1 and 6th / 7th Street SW Intersection Collision by Year

Collision Type	2003	2004	2005	2006	2007	2008	2009	2010	Total
Backing	1	1		1			1		4
Left Turn - Across Path		1	1				2		4
Off Road Right				1					1
Other								1	1
Passing Right Turn						1	1		2
Rear End	5	8	10	6		10	7	6	52
Right Angle	2	2	2	1					7
Sideswipe	1								1
Sideswipe - Same Direction	2	2	2	1			2	2	11
Struck Object		4	3				2	1	10
Not Available					13				13
Total	11	18	18	10	13	11	15	10	106

2.5 HIGHWAY 1 AND 3 INTERCHANGE

Currently the Highway 1 and 3 interchange operates as a diamond style interchange. The southwest and northeast entrance ramps to Highway 1 do not tie directly onto Highway 1. The northeast entrance ramp ties into Red Deer Drive, which is a two way service road. This service road then connects to Highway 1 through the signalized intersection at 6th Street SW. A similar configuration exists for the southwest entrance ramp, where the ramp off Highway 3 connects to Bomford Crescent before it connects back to Highway 1 southeast of 16th Street SW. There are also southeast and northwest bound slip lanes off Highway 1 that tie directly onto Red Deer Drive in the northeast and Bomford Crescent in the southwest.

The southeast and northwest through movements on Highway 1 and east and west bound through movements on Highway 3 are the major movements at this interchange.

2.5.1 Highway 1 and 3 Interchange Capacity Assessment

The Highway 1 and 3 interchange is free flow on Highways 1 and 3. The ramps are stop controlled at Highway 3. The AT Functional Planning Report indicates that the ramp intersection southeast of Highway 1 & 3 is operating within capacity, but the northeast bound to west bound left turning

movement off Highway 1 is operating over capacity. The average delays experienced at the Highway 3 southeast and northwest ramp intersections are 16.7 and 2 seconds respectively. The analysis of the southeast ramp intersection at Highway 3 indicates the installation of traffic signals is required to improve the operation of the west bound left turning movement.

The following traffic movement is operating over capacity today:

- West bound left turn at Highway 3 on the southeast ramp terminal of the Highway 1/3 interchange.

2.5.2 Highway 1 and 3 Interchange Collision Data

Over the period 2003-2010 there have been 47 recorded collisions at the Highway 1 and 3 interchange, as shown in **Table 2-3**. This equates to 5.9 collisions per year at this intersection. The most common collision is a right angle collision which accounted for 36% of collisions at this interchange which is typical of a high volume stop controlled intersections (unsignalized intersections).

Table 2-3
Highway 1 and 3 Interchange Collision by Year

Collision Type	2003	2004	2005	2006	2007	2008	2009	2010	Total
Left Turn - Across Path	1		1	1					3
Off Road Left	1								1
Off Road Right		3							3
Other		1				2			3
Rear End	2		1	2		2		1	8
Right Angle	3	3	2	5		2	1	1	17
Sideswipe - Same Direction		1							1
Struck Object	1	2	1	1		2	1		8
Not Available					3				3
Total	8	10	5	9	3	8	2	2	47

2.6 HIGHWAY 1 AND 16TH STREET SW INTERSECTION

The Highway 1 and 16th Street SW Intersection currently operates as an at-grade signalized intersection with designated left-turn bays off Highway 1, and the service roads are in close proximity to the highway

intersection. Similar to the 6th / 7th Street SW intersection, the signal phasing is multi phased and experiences long intersection delays during the peak periods, owing to the length of the signal timings required to facilitate all movements at the intersection. This is particularly evident on the left turn movement from Highway 1 onto 16th Street SW, which experiences significant delays and queuing along Highway 1 during peak periods.

The east leg of the Highway 1 / 16th Street SW intersection services the Kensington residential area. The west leg of the Highway 1 / 16th Street SW intersection accesses the SW Light Industrial Area.

The average intersection delay experienced at this intersection is 52.1 seconds. The major traffic movements at this intersection includes the southeast and northwest through movements along Highway 1, the northwest bound to west bound left turn off Highway 1 to 16th Street SW and east bound 16th Street SW to northwest bound left turn onto Highway 1.

2.6.1 Highway 1 and 16th Street SW Capacity Assessment

Service road intersections at 16th Street SW are (Bullivant Crescent and Bomford Crescent) in close proximity to the 16th Street SW intersection with Highway 1. This results in these intersections essentially acting as one complex signalized intersection. Overall the intersection is experiencing significant delays and operates with significant congestion. The southeast bound through, east bound through, west bound through and Highway 1 left turn to west bound experience the longest delays and longest queue. This is consistent with what was observed during our site visits.

The following Highway 1 and 16th Street SW traffic lanes are operating over capacity:

- 16th Street SW westbound through (LOS E)
- Highway 1 southeast bound through (LOS F)
- Southeast bound Highway 1 to east bound Bullivant Crescent left turn (LOS D)
- Northwest bound Highway 1 to west bound 16th Street SW left turn (LOS E).

The following 16th Street SW and Bomford Crescent traffic lanes are operating over capacity:

- 16th Street SW eastbound through (LOS E)
- Bomford Crescent southeast bound left to Highway 1 (LOS F)
- Bomford Crescent northwest bound through to Highway 1 (LOS E).

2.7 HIGHWAY 1 AND 16TH STREET SW INTERSECTION REVIEW OF COLLISION DATA

Over the period 2003-2010 there was 125 collisions recorded at the Highway 1 intersection, as shown in **Table 2-4**. This equates to 15.6 collisions per year at this intersection. The most common collisions included rear end (40%), right angle (10%) and sideswipe same direction (8%). The rear end collisions are symptomatic of traffic queuing in through lanes.

Table 2-4
16th Street SW and Highway 1 Intersection Collisions by Year

Collision Type	2003	2004	2005	2006	2007	2008	2009	2010	Total
Backing	2	1		3		1	1		8
Left Turn - Across Path	1	2					1	2	6
Other		2							2
Passing - Left Turn	1								1
Passing - Right Turn		1	3			1		1	6
Rear End	2	4	6	13		7	12	6	50
Right Angle	2	1	6	1			1	1	12
Sideswipe						1			1
Sideswipe - Same Direction	2	1	2	1		2	2		10
Struck Object	2			2		2	1	2	9
Not Available				3	17				20
Grand Total	12	12	17	23	17	14	18	12	125

3

Assessment of Highway 1 Improvements

3.1 INTRODUCTION

AT currently has plans for the upgrading of the Highway 1 corridor within CMH to improve traffic flow and safety on the Highway. The AT Functional Planning Report indicates the Highway 1 corridor is operating with poor levels of service and with significant traffic delays. In order to achieve the desired free flow conditions along Highway 1, AT has identified a number of upgrades to the highway. These upgrades include:

- Closure of the 6th Street SW Intersection
- Upgrade 1st Street SW from an at grade intersection to a grade separated interchange
- Closure of the 16th Street SW Intersection
- Upgrades to the ramps at the Highway 1 and 3 interchange, including installation of traffic signals
- Upgrades to Highway 3; at 8th Avenue SW, 10th Avenue SW and 13th Street SW
- Removal of the Highway 1 to Bomford Crescent and Highway 1 to Red Deer Drive slip ramps
- Relocation of Red Deer Drive and 1st Street SW intersection
- Possibly converting Bomford Crescent to a one way. This will require further investigation to assess the limits and benefits of implementing this change.

In addition to the AT plans for the upgrading Highway 1, the CMH has requested AE to look at other potential short term solutions to improve traffic conditions along the study corridor. These other potential short term solutions include:

- Speed reduction to 60 km/h from 80 km/h along Highway 1
- Right in/right out only at the 1st Street SW intersection with Highway 1
- Close the access to Highway 1 from 1st Street SW.

The purpose of these additional short term solutions was to assess if implementing them would improve traffic flow and safety within the study corridor prior to the implementation of the full AT recommended solution.

To assess the effects of these impacts on the adjacent road network, and to identify an appropriate phasing strategy for the implementation of these upgrades, each component was analysed individually. This allowed us to identify which ones offer the greatest benefit as stand-alone projects. These were looked at from a high level functional and safety perspective as well as a quantitative perspective using the City's EMMÉ travel demand model (Traffic Model) for a population threshold of 75,000. This population is expected to be reached by 2022 and is a good representation of how traffic conditions will be as the City grows and as the phases of the Highway 1 upgrade plans are implemented.

The 75K Recommended scenario is the road scenario that includes all city wide recommended roadway upgrades but not the Highway 1 upgrades, so that it could be used as the basis for comparison of the

alternative scenarios assessed. The modelling tools used to assess the impacts on the adjacent road network included:

- A comparison in traffic volumes to see how the traffic pattern within the study corridor changes as a result of the changes to the road network (Volume Plot Comparison);
- Assess the impacts of each scenario on capacity (Volume/Capacity Ratio); and
- Identify travel time savings and gains within the CMH resulting from the introduction of each scenario (Travel Time).

3.2 SPEED REDUCTION TO 60 KM/H ALONG HIGHWAY 1

One short term consideration for improvements along the Highway 1 corridor was the introduction of a speed reduction from 80 km/h to 60 km/h along Highway 1. The initial thought behind this was that it would assist in reducing collisions within the study corridor, and may make it more comfortable for drivers turning left off of and onto Highway 1. AE commissioned Swanson Transportation to undertake a review of the speed limit within the study corridor. Swanson Transportations technical memo on this subject is provided in [Appendix B](#) and summarized below.

Several factors should be considered when setting a speed limit on a street or highway:

- Roadway conditions
- Existing vehicle speeds in the road segment
- Roadside environment
- Reported collision experience.

Data on existing vehicle speeds was not available; however other known factors regarding this segment of Highway 1 were used for the speed limit review.

One of the key issues when considering speed limit changes is whether the motorists will see the need for a change in their driving speed based on the road conditions, roadside environment and access management. This tends to be a human factor consideration where experience and past research plays an important role in a subjective judgment, and not easily put into a mathematical equation. Reducing the speed limit to 60 km/h in the subject road segment is too low and may create speed enforcement issues. The enforcement issues include local residents/motorists feeling that the low speed limit and regular police enforcement actions creating a speed trap, and a means to increase the revenue generated by fines. Similarly, this “unenforceable” speed limit creates a level of frustration among police officers as they are unable to achieve a reasonable level of compliance from motorists without spending extensive efforts and repetitive police enforcement actions. However, a 70 km/h speed limit may be reasonable considering the difference in the roadside environment in this area. The following is a summary of the advantages and disadvantages of introducing the speed limit reduction within the study area as outlined in the Swanson Transportation Memorandum.

Positive features that support lower speed:

- Lower speeds reflect the roadside environment in the area between 6th and 16th Street.
- The uphill slope on the southeast bound approach to 6th Street is conducive to a reduced speed limit. Similarly the northwest bound approach to 16th Street SW from Kin Coulee would have the same conditions.
- Will reduce the severity of collisions.

Negative features that do not support a lower speed limit:

- Likely increase in congestion/queuing at the intersections.
- Increased congestion at the intersections may also increase the collision frequency.
- The speed limit reduction may cause enforcement challenges.
- The speed limit reduction may cause traffic to choose alternate routes on neighbourhood streets, impacting the safety on those streets.
- There is no roadside friction or significant pedestrian crossings that would substantiate the need for a speed reduction.

Should a speed reduction be considered, we would recommend performing a more detailed speed study to confirm the impacts on the corridor capacity and the capacity at the various impacted intersections. The potential increase in intersection congestion is essentially because the lower speed decreases the number of vehicles that can proceed through a signalized intersection for a given amount of green time. A speed limit reduction introduces a mixed bag of benefits and negative aspects.

Although a speed reduction could be implemented along this segment of Highway 1, Associated Engineering would not recommend it as there are other more beneficial, cost effective and viable solutions that could be implemented to improve present day traffic conditions.

3.3 1ST STREET SW RIGHT IN / RIGHT OUT

Another short term consideration for improvements along Highway 1 in the study corridor was the introduction of a right in/right out configuration at the 1st Street SW/Highway 1 intersection. The purpose for the introduction of this geometric design is to reduce the collision risk, reduce traffic on 1st Street SW and avoid the need to install traffic signals at the intersection.

With the right in/right out arrangement in place, traffic volumes on 1st Street SW would decrease as it reduces access for residential and through traffic wishing to access 1st Street SW from the northwest. Traffic that usually turns left at 1st Street SW would turn left at the Highway 1 and 6th / 7th Street SW intersection. As this route provides access to the hospital, the reduced traffic movements at the intersection can effect travel times for emergency services originating from the northwest and wishing to access the hospital. The closure of the left turn from Highway 1 to 1st Street SW also results in longer travel times for residents travelling in a southeast direction, who now have to use the 6th / 7th Street SW intersection.

An alternative geometric configuration would be to make access to and from Highway 1 as a “right turns in and out” and to allow southeast bound traffic to make a left turn from Highway 1 to 1st Street SW. The left turn lane geometrics would need to be designed such that only the southeast bound left turn would be allowed and the median design would prohibit crossing movements from 1st Street SW. The turning movements that would be restricted are the left turn from 1st Street SW to southeast bound Highway 1, the through movement from 1st Street SW across Highway 1 to the Power Plant access roadway and the left turn off the Power Plant access roadway onto northwest bound Highway 1. This configuration could be adopted as an interim solution until the need arises for the full interchange proposed by AT. Our initial investigations indicate this access configuration can be designed to conform to AT design standards and guidelines.

With the implementation of a right in/right out at 1st Street SW a service road will be required from Power House Road SW to the Suntec Area to the south to maintain access to the Power Plant. The details of this service road will be addressed at a later date in advance of making improvements at the 1st Street SW/Highway 1 intersection. It will be important that the ultimate alignment for this service road address commercial, industrial and residential access in this area in consideration of present and future development. Based on public feedback, it will be important to go back to the public for input on the service road alignment and signage as these were critical issues raised by businesses adjacent to Highway 1.

Positive features that support turn restrictions from 1st Street SW onto Highway 1:

- Reduce collision risk for traffic entering or crossing Highway 1.

Negative Features that do not support turn restrictions on 1st Street SW at Highway 1:

- Increased travel distance for local residents and those wishing to access the hospital looking to access 1st Street SW from the northwest
- Increased left turning vehicles at 6th Street SW/Highway 1 intersection
- Traffic pattern changes can result in “Wayfinding” challenges for the public, particularly when the changes are newly implemented.

3.4 CLOSE ACCESS TO HIGHWAY 1 FROM 1ST STREET SW

Consideration was given as to what would happen if there was no access to Highway 1 from 1st Street SW. We found the following impacts related to the proposed closure of access to Highway 1 from 1st Street SW:

- **With and Without AT Improvements**

1st Street SW and Red Deer Drive had significant reductions in traffic. This was because these roadways only have to handle local traffic in a small developed area of the City.

- **Without AT Improvements**

The Highway 1 and 6th Street SW intersection would see a significant increase in southeast bound to east bound left turning traffic. This would cause further congestion to an already heavily congested intersection. This would also add more traffic on 6th Avenue SW and likely throughout the adjacent neighborhood.

- **With AT Improvements**

Gershaw Drive and 3rd Street NW had traffic volume increases. Closing 1st Street SW will result in the need to make intersection improvements along these corridors in the future. Example intersections on Gershaw Drive and 3rd Street NW would be:

- Gershaw Drive SW intersections at the ramps on and off of Highway 1
- Gershaw Drive SW and 7th Street SW
- Gershaw Drive SW and 5th Street SW
- 3rd Street SW and Division Avenue
- 3rd Street SE and 4th Avenue SE
- 3rd Street NW and Brier Park Road NW.
- Some small traffic volume increases were identified at intersections at both ends of the Maple Avenue and Finlay bridges at the 75,000 population horizon.

The closing of 1st Street SW access to Highway 1 will have a benefit to local residents in proximity to 1st Street SW, but will likely increase traffic in neighborhoods along 6th Street SW and Gershaw Drive.

Before the AT Highway 1 Improvements are completed, this closing will have a detrimental impact on the Highway 1 / 6th Street SW intersection as the southeast bound to east bound left turning traffic volume will increase causing further congestion and delay at this intersection. Post AT improvements to Highway 1, traffic will increase on other City streets particularly at intersections along Gershaw Drive and 3rd Street NW.

In short, the closure is simply moving a similar problem from one neighborhood to another and causing more delay at intersections on Highway 1, 6th Street SW and Gershaw Drive.

3.5 AT IMPROVEMENTS PHASING STRATEGY

Of all of the various upgrades examined, the closure of 16th Street SW and 6th / 7th Street SW intersections coupled with the proposed upgrades to the Gershaw/Highway 1 interchange allowing for free flow along Highway 1 and the proposed upgrades to Gershaw Drive, provides for the greatest improvement to how the various corridors and adjacent roadways function.

However, it was recognized that there may be funding and time constraints surrounding the implementation of all the Highway improvements, and on that basis there are interim phasing solutions that can be undertaken to ultimately complete the full upgrades proposed by AT.

The proposed approach to the upgrades involves the following five phased process:

- **Phase 1** - Construct an all turns intersection on Highway 3 at 8th Avenue SW, upgrade Highway 3 by adding signals at the SE exit ramp off Highway 1, and make other changes within the SW Industrial area that are needed to support this added access. These other items need to be determined through a future traffic study of the SW Industrial Area. Two examples of the type of improvements that could be beneficial are:
 - Converting a segment or segments of Bomford Crescent to one way
 - Reorient traffic control signage with SW Industrial Area.
- **Phase 2** - Provide either a full or partial closure (right-in only) of Bullivant Crescent at Highway 1. Before closing Bullivant Crescent at Highway 1, AE is recommending a study be completed to address access to the Kensington Area. It is important to look at emergency access and how travel in and out of the Kensington area could be improved when access to Highway 1 is closed.
- **Phase 3** - Upgrade the SE exit ramp from Highway 1 to Highway 3 to a dual left turn ramp at Highway 3, upgrade Highway 3 from 10th Avenue SW to just east of Highway 1, including adding a signal at the NW exit ramp off Highway 1 at Highway 3 and close 16th Street SW access to Highway 1.
- **Phase 4** - Upgrade the NE and SW ramps at the Highway 1 / 3 interchange including the removal of the slip ramps, upgrade the NW exit ramp from Highway 1 to Highway 3, construct a service road from 1st Street SW to the Suntec area SW of Highway 1 and close 6th Street SW / 7th Street SW accesses to Highway 1. Investigate the possibility of adding a RI / RO off the eastbound Highway 3 to northwest bound Highway 1 on ramp to provide better access to businesses on the east side of Highway 1 south of 6th Street SW.
- **Phase 5** - Relocate Red Deer Drive and 1st Street SW Intersection farther east and construct the 1st Street SW/Highway 1 interchange.

Phase 1:

The upgrades associated with this phase are as follows:

- Signalize the existing SE exit ramp off Highway 1 at Highway #3
- Open the median and add a west bound turn lane at 8th Avenue SW on Highway 3 to allow for an unsignalized all turns access at this location
- Changes that may be required as a result of a traffic study completed for the SW Light Industrial Area.

The benefits gained, based on the current modelling, indicates that approximately 200 left bound west turning vehicles at the 16th Street SW intersection will move to the Highway 1 / 3 exit ramp. This will

reduce the volume from 640 to 440 vehicles in the AM peak hour (~30% reduction). It will improve the level of service, but it will still be operating in a congested (over capacity) state.

Phase 2:

As noted, this phase incorporates all of the suggested changes as outlined in Phase 1 and adds closing the access and egress from Bullivant on to Highway 1.

The closure provides additional time to the remaining signal phases at the Highway 1 and 16th Street SW intersection and would substantively improve the level of service. However, it is recognized that this will cause for longer travel time and distance to and from the Kensington area and may require upgrades to improve the local traffic flow into the area. It was clear during the public process that the Kensington community will have concerns with this proposal. This will require an investigation into how access in and out of the Kensington area can be improved once Bullivant Crescent access to Highway 1 is closed.

A right-in/right-out (RI / RO) alternative on the Bullivant Crescent leg of the Highway 1 and 16th Street SW intersection was also considered. Some of the challenges with a right in/right out at this location are:

- There is not sufficient distance between Bullivant Crescent and the Highway 1 northbound exit ramp to Highway 3 to construct a proper entrance ramp out of Bullivant Crescent
- Even if we had room for a proper entrance ramp at Bullivant the traffic exiting northbound out of Bullivant would conflict with traffic exiting Highway 1 to Highway 3 causing a weaving conflict
- We would also have challenges associated with two U-turn traffic movements from Bullivant Crescent to Highway 1 and from Highway 1 to Bullivant Crescent because of how close Bullivant Crescent is to Highway 1.

Although a full RI / RO would be very challenging to get approval on, there may be an opportunity to close off the Bullivant Crescent access, but still allow for a “right-in (RI only)” traffic flow.

Any “RI / RO” or “RI only” would require AT approval and would need to meet current day design standards and guidelines.

Phase 3:

This phase would be the first phase of the ultimate AT proposed improvements and would involve the following upgrades:

- Upgrade the SE exit ramp from Highway 1 to Highway 3 by improving ramp geometric design and adding a northbound to westbound dual left turn movement. This dual left turn will be required to handle the added traffic once 16th Street SW is closed at Highway 1.
- Upgrade Highway 3 from 10th Avenue SW to just east of Highway 1. This improvement is required to add capacity to the roadway in order to handle the added traffic from closing the 16th Street SW / Highway 1 intersection.

- Add a traffic signal at the NW exit ramp off Highway 1 at Highway 3. This makes sense to add during this phase as all of Highway 3 is being upgraded at this time. The signal is not totally needed until the 6th Street SW / 7th Street SW intersection at Highway 1 is closed.
- Close 16th Street SW intersection at Highway 1. This closure is required to move the province towards a free flow traffic condition along Highway 1.

All the improvements in Phase 3 are part of AT's ultimate upgrade plans for Highway 1.

Phase 4:

The primary objective of Phase 4 is to close the 6th Street SW / 7th Street SW intersection at Highway 1 and eliminate the signalled intersection. To meet this objective, the following roadway/highway improvements are required:

- Upgrade the NE ramp at the Highway 1 / 3 interchange. This ramp handles eastbound to northwest bound traffic from Highway 3 to Highway 1. Upgrading this ramp includes removal of the existing slip ramp that exits Highway 1 to the service road on the east side of the highway. This ramp upgrade allows for direct enter from Highway 3 to Highway 1 and eliminates the need to use the service road and signal at the 6th Street SW / Highway 1 intersection. During the public process, businesses on the east side of Highway 1 asked if a RI / RO could be provided off the NE ramp at the Highway 1 / 3 interchange to provide better access on the East side of Highway 1 south of 6th Street SW.
- Upgrade the NW ramp at the Highway 1 / 3 interchange. This ramp handles the southeast bound Highway 1 to westbound Highway 3 traffic and also traffic destined for areas within the City east of Highway 1. The AT proposed changes include closing the RI / RO access that exists on this ramp today. Upgrades to this ramp are required to handle the added traffic once the 6th Street SW / 7th Street SW intersection at Highway 1 is closed.
- Upgrade the SW ramp at the Highway 1 / 3 interchange. The upgrade to this ramp includes removal of the existing southbound slip ramp from Highway 1 to the service road on the SW side of the highway. This ramp upgrade includes construction of RI / RO accesses along the ramp at a number of streets within the SW Light Industrial area.
- Construct a new service road from 1st Street SW to the Suntec area on the SW side of Highway 1. This service road is required to provide better access to businesses in the Suntec area and to provide access to the Power Plant until the full interchange is constructed at 1st Street SW and Highway 1. During the public process, businesses in the Suntec Area asked that they be consulted in the development of this service road with respect to alignment and guide signage.
- Close the 6th Street SW / 7th Street SW intersection at Highway 1. Closure of this intersection moves AT closer to their objective of a free flow condition along Highway 1 in the City of Medicine Hat.

All the Phase 4 improvements are part of AT's originally proposed improvements other than the SW service road from Power House Road to the Suntec area which was an add on request from the City of Medicine Hat.

Phase 5:

This is the final phase of the original AT proposed improvements and it incorporates all the remaining improvements to complete Highway 1 within the study corridor. The upgrades proposed for this phase area as follows:

- Move the Red Deer Drive / 1st Street SW intersection further east to make room for the 1st Street SW / Highway 1 interchange upgrade.
- Construct the 1st Street SW interchange incorporating any tie-in requirements for the proposed SW service road from 1st Street SW to the Suntec Area.

AT Upgrade Summary:

As noted, the Highway upgrade strategy that provides for the greatest improvement to traffic flow and travel time involves the proposed AT upgrades to Highway 3, proposed upgrades to the Highway 1/3 Interchange and the closure of the intersections at 6th / 7th Street and 16th Street SW.

In the short term, the Phase 1 interim upgrade could be implemented immediately with AT approval which entails opening the Gershaw Drive / 8th Avenue SW intersection to an all turns 'T' intersection and signalization of the ramps onto and off of Highways 1 / 3. We expect this will divert some northwest bound left turn traffic from the Highway 1 / 16th Street SW intersection on to Highway 3.

It is recommended that Phase 1 be undertaken first, and that monitoring be carried out to assess and establish the need for the full or partial closure of the Bullivant Crescent access to Highway 1. It would allow time to assess how well it is working and allows time to further evaluate the impact Phase 2 would have on the Kensington community.

As noted, the speed reduction to 70 km/h is not being recommended as other options are seen to have more benefit to the study corridor.

The interchange at 1st Street SW and Highway 1 is seen as the last phase of the proposed AT Highway 1 upgrades. This wouldn't occur until after the completion of the Highway 1 / 3 interchange and closures of 6th / 7th and 16th Street intersections.

3.6 TRAVEL TIMES

A travel time analysis was undertaken to identify how travel time varies for travel to and from two locations

at either end of the study corridor. One location was north of Highway 1 in Box Springs Business Park and the other was immediately north of Highway 1 and west of 13th Avenue SE. The results of the travel time savings are outlined in **Table 3-1** below. This information is for comparative purposes only and not literal, especially when it comes to how travel time is measured. The travel time is calculated on the amount of congestion on a roadway. The scenarios with the greatest improvement in travel time are the ones that involve removal of the signals at the 6th / 7th Street SW and 16th Street SW intersections, with up to 1.3 minutes less travel time than the base scenario. This change would be noticed by motorists and seen as a significant improvement in level of service along the corridor. The introduction of speed restrictions within the study corridor increases travel times and would be seen by motorists as a decrease in level of service along the corridor.

Table 3-1
Summary of Average Travel Times (Minutes) for all Scenarios

Scenario	Box Spring Road to 13 th Ave. SE North of Highway 1	Difference in Travel Times from Box Springs Road to 13 th Avenue SE (when compared with the 75K Recommended)	From 13 th Ave. SE North of Highway 1 to Box Spring Road	(Difference in Travel Time from 13 th Avenue SE to Box Spring Road (when compared with 75K Recommended))
2010 Existing	11.6	N/A	10.4	N/A
75K Base Recommended	12.2	N/A	11.2	N/A
75K Base with Speed Reduction	12.6	0.4	11.6	0.4
75K Base with Prohibited 1 st Street SW Movement	12.7	0.5	11.1	0.1
75K with 1 st Street SW Partial Interchange	12.4	0.2	11.1	0.1
75K with 6 th / 7 th Street SW Closure	11.7	(0.5)	11.0	(0.2)
75K with 16 th Street SW Closure	11.8	(0.4)	10.2	(1.0)
75K with 16 th Street SW and 6 th / 7 th Street SW Closure	11.2	(1.0)	9.8	(1.3)
75K Recommended with all AT Improvements	11.2	(1.0)	9.9	(1.3)

3.7 PUBLIC CONSULTATION

This section describes the public consultation process used on the 2010 RSMP, the Assessment of the Alberta Transportation Highway 1 and 3 Proposed Improvements and the Southwest Connector.

The information presented to the public was separated into the following three sections:

1. The Roadway System Master Plan
2. The proposed sequencing strategy for implementing the Alberta Transportation proposed Highway 1 and 3 improvements between Seven Persons Creek and the South Saskatchewan River
3. Alignment options for a South West Medicine Hat Connector between South Boundary Road and Highway 3 or some other location in the SW quadrant of the City.

To ensure all interested parties had an opportunity to comment on the plan, the public consultation process was performed as follows:

- The City received assistance from the Chamber of Commerce to draw land owners and businesses from within the SW Industrial Area of the city to a public meeting. This meeting was held on January 15, 2013 at the Best Western Inn on Redcliff Drive. Details on the 2010 RSMP were shared with this key segment of the community.
- The City of Medicine Hat contacted individual land owners that would be impacted by the proposed options for the SW Connector. Contact was made through meetings and/or phone calls and results of these discussions were documented.
- The City held an open house specifically for residents who fronted on or resided adjacent to 1st Street SW. This open house was held on January 16, 2013 from 3 pm to 8 pm at the Studio Theater in the Esplanade.
- A public open house was also held on January 23, 2013 at Higdon Hall on the exhibition grounds from 3pm - 8pm. This was a citywide open house that was well advertised on the radio, TV stations, newspapers and on street sign boards.

In general terms, the public appeared to be supportive of the direction the City is taking on the RSMP. There were a number of positive comments and the general theme was for the City to get moving on improvements as soon as possible especially those along Highway 1. An example of some of the concerns raised by the public are presented as follows:

- 1st Street SW residents were concerned about traffic conditions that exist closer to the downtown between Division Avenue and 4th Avenue SE. Speeding and perceived high traffic volumes were their big concerns.
- The SW Light Industrial group seemed to be concerned about access to and from this area off Highway 1 and Highway 3 when 16th Avenue SW closes at Highway 1. They were also concerned about it being more difficult to get to the area so the general public may not decide to go to their businesses if it's made more difficult. Those businesses located directly on 16th Avenue SW were concerned about a reduction in drive-by customers that stop at their business and who likely wouldn't stop with the 16th Avenue connection to Highway 1 closed.
- Residents in the Kensington Area were concerned about a single road access in and out of their neighborhood and the challenging route they would have to use to get out of the neighborhood to travel south and north.
- There was concern raised regarding business access on the NE side of Highway 1 between Highway 3 and 6th Street SW. One suggestion was to provide a RI / RO access off the NE ramp of the Highway 1 / 3 Interchange to provide access to businesses along this side of Highway 1.
- Businesses on the SW side of Highway 1 were very concerned about access off Highway 1 once 6th / 7th Street SW is closed. They were interested in having the proposed west service road in place before 6th / 7th Street SW are closed at Highway 1 and that good guide signage be provided. They wanted to have input on the alignment of the service road as to where it connects to the Suntec Area and Power House Road.

We received many valuable comments through the public process and many of them can be incorporated into future planning for changes to the roadway network.

A binder containing a summary of the comments received from the three events together with sign in sheets, all the actual comment forms, email responses and responses fed through the Chamber of Commerce is available for viewing at the City of Medicine Hat Municipal Works Department.

A copy of the Open House Presentation boards are enclosed in [Appendix C](#).

A summary of their results of Public Process can be found in [Appendix D](#).

4

Conclusion and Recommendation

4.1 CONCLUSIONS / RECOMMENDATIONS

Our assessment of the various aspects of this study can be summarized as follows:

Speed Reduction

The introduction of a reduced speed limit along Highway 1 will have both positive and negative impacts on the corridor. While it may decrease the severity of collisions, it may be difficult to enforce or there may be negative connotations with enforcing the speed limit. It may also decrease the capacity and increase how long it takes to travel along Highway 1.

Although we see a speed reduction to 70 km/h as possible, we are not recommending it as we believe there are other more effective means of improving safety and traffic congestion in the study corridor.

Close 1st Street SW at Highway 1 or Change to Right In / Right Out

Closing 1st Street SW at Highway 1 or changing 1st Street SW to a RI/RO only at Highway 1 both have the same negative impacts to the 6th / 7th Street intersection at Highway 1 and to other intersections on 3rd Street NW, 6th Street SW and Gershaw Drive east of Highway 1. The traffic presently using 1st Street SW will simply move to these other streets where it will cause further congestion and more traffic in other neighborhoods. This would tend to move the concerns from one neighborhood to another.

As discussed earlier in the report, a solution may be to allow the southeast bound Highway 1 to east bound 1st Street SW left turns in and a right in / right out for the other traffic movements at the intersection. This would eliminate the other left turning movements and through movements at the intersection which will improve safety at the intersection but still allow some access to 1st Street SW off the Highway. The modeling work we performed did not show any increase in traffic along 1st Street as a result of this improvement. If the CMH is interested in an improvement at this intersection, this is the improvement that would be recommended. As far as timing goes, this improvement could be implemented at any time.

Sequencing of AT Improvements

Of all the recommended upgrades examined, the closure of 16th Street SW and 6th / 7th Street SW intersections and improvements to the Highway 1 and 3 interchange provides the greatest improvement in the operation for the CMH roadway network.

There is potential for funding constraints surrounding the implementation of the full Highway 1 improvements so we investigated interim phasing solutions that could be undertaken. The phasing of the proposed upgrades and development of interim solutions will allow for immediate low cost high value actions to occur. The following phasing plan is being recommended and it will result in completion of the full upgrades proposed by AT:

- **Phase 1** - Construct an all turns intersection on Highway 3 at 8th Avenue SW, upgrade Highway 3 by adding signals at the SE exit ramp off Highway 1. It may be necessary to perform other improvements in the SW Industrial Area like changing Bomford Crescent to a one way road and reorient traffic control signage within the SW Industrial area, however these should be investigated in a SW Industrial Area Traffic Study before implementing changes at 8th Avenue SW.
- **Phase 2** - Provide either a full or partial closure (right-in only) of Bullivant Crescent at Highway 1. Before implementing this improvement AE recommends that the City complete an access management study for the Kensington Area to address Emergency Services concerns with only one access, resident concerns with challenging routes in and out of the neighborhood and added travel time concerns raised by the Public.
- **Phase 3** - Upgrade the SE exit ramp from Highway 1 to Highway 3 to a dual left turn ramp at Highway 3, upgrade Highway 3 from 10th Avenue SW to just east of Highway 1, including adding a signal at the NW exit ramp off Highway 1 at Highway 3 and close 16th Street SW access to Highway 1.
- **Phase 4** - Upgrade the NE and SW ramps at the Highway 1 / 3 interchange including the removal of the slip ramps, upgrade the NW exit ramp from Highway 1 to Highway 3, construct a service road from 1st Street SW to the Suntec area SW of Highway 1 and close 6th Street SW / 7th Street SW accesses to Highway 1. We found a small increase in traffic on Red Deer Drive with the closure of 6th / 7th Street SW at Highway 1. Look into the possibility of adding a RI / RO on the NE entrance ramp for Highway 3 to Highway 1.
- **Phase 5** - Relocate Red Deer Drive and 1st Street SW Intersection farther east and construct the 1st Street SW/Highway 1 interchange. We looked at the impacts this improvement has on 1st Street SW and we found very little increase in traffic and no congestion issues at 4th Avenue SE or Division Avenue intersections.

Travel Time Impacts

The scenarios with the greatest improvement in travel time are the ones that involve removal of the signals at the 6th / 7th Street SW and 16th Street SW intersections with up to 1.3 minutes less travel time than the existing condition. This change would be noticed by motorists and seen as a significant improvement in level of service along the corridor. Upgrades to Highway 3 as a means of attracting traffic from the Highway 1 corridor would also contribute to reducing travel time in the area. It is important to note that the improvements being recommended may have increased travel times for some of the business communities and neighborhoods adjacent to the highway.

We expect that the ultimate highway improvements proposed by AT will improve the travel time for the city as a whole; however, there will be areas within the City that may see increased travel times. The largest travel time savings will be seen by motorists who use Highway 1 to travel within the City.

Future Planning

Some of the Key issues that were identified during the Public Process that should be considered in future plans include the following:

- There was significant support for beginning the proposed improvements as soon as possible and not to wait until existing problems get worse.
- The Public and City Emergency Services had concerns with only one access to the Kensington Neighborhood. AE recommends a study be undertaken to assess how an alternate access could be provided and to include how access in and out of the neighborhood could be improved.
- There was public concern with adding traffic onto 1st Street SW once the highway improvements are completed. Our modeling is showing very little impact to 1st Street SW as a result of the proposed highway improvements. Consideration could be given to adding traffic calming on 1st Street west of 4th Avenue SE.
- The alignment of the existing Highway 1 / 3 Interchange SE ramp connection at Highway 3 was raised with respect to challenging truck turning conditions. The NW bound to westbound left turn is challenging for trucks traveling from Highway 1 to 3. This results in slower turn and delays at the intersections. Improvements to ramp geometry should be considered as part of the proposed Phase 1 improvements.
- Business access on and off Highway 1 once 6th Street and 7th Street are closed at Highway 1 was a big concern.
 - The businesses in the area wanted to be involved with selection of the alignment for the west service road from Power House Road to the businesses close to the 7th Street area and they wanted to ensure good guide signage was provided along Highway 1.
 - The businesses east of Highway 1 and south of 6th Street SW were concerned with the removal of the NW bound slip ramp off Highway 1 to Red Deer Drive. This removal eliminates access to their businesses off the Highway. They asked if a RI / RO could be provided off the NE Highway 1 / 3 Interchange Ramp.
- The public suggested that follow-up open Houses take place in advance of finalizing the phased upgrades to Highway 1 and intersecting roadways.

4.2 CITY OF MEDICINE HAT - TECHNICAL COORDINATING COMMITTEE COMMENTS

The City circulated this report to a number of City departments and this circulation resulted in a list of comments that will need to be addressed before implementation of the proposed upgrades. A couple of example comments related to AT proposed improvements were:

- Assess the impacts of the AT proposed improvements on the Kensington Area prior to closing Bulivant Crescent connection to Highway 1.
- Build the west service road between Power House Road and the Suntec area early to ensure good access to the power Plant and Water Treatment Plant. A Dangerous Goods Route will be required for access to these facilities.

REPORT

Certification Page

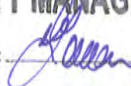
City of Medicine Hat, Assessment of Alberta Transportation Highway 1 and 3 Proposed Improvements

The Services provided by Associated Engineering in the preparation of this report were conducted in a manner consistent with the skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.



Monique Kealey, P.Eng.
Transportation Engineer


For Randy Stevenson
Manager, Transportation Infrastructure

ASSOCIATED ENGINEERING	
QUALITY MANAGEMENT SIGN-OFF	
Signature:	
Date:	2013-4-10

APEGA Permit to Practice P 3979

A

Appendix A - Proposed Highway 1 and 3 Phasing Improvements



1 Phasing Approach for Highway 1 & 3 Improvements

1.1 Introduction

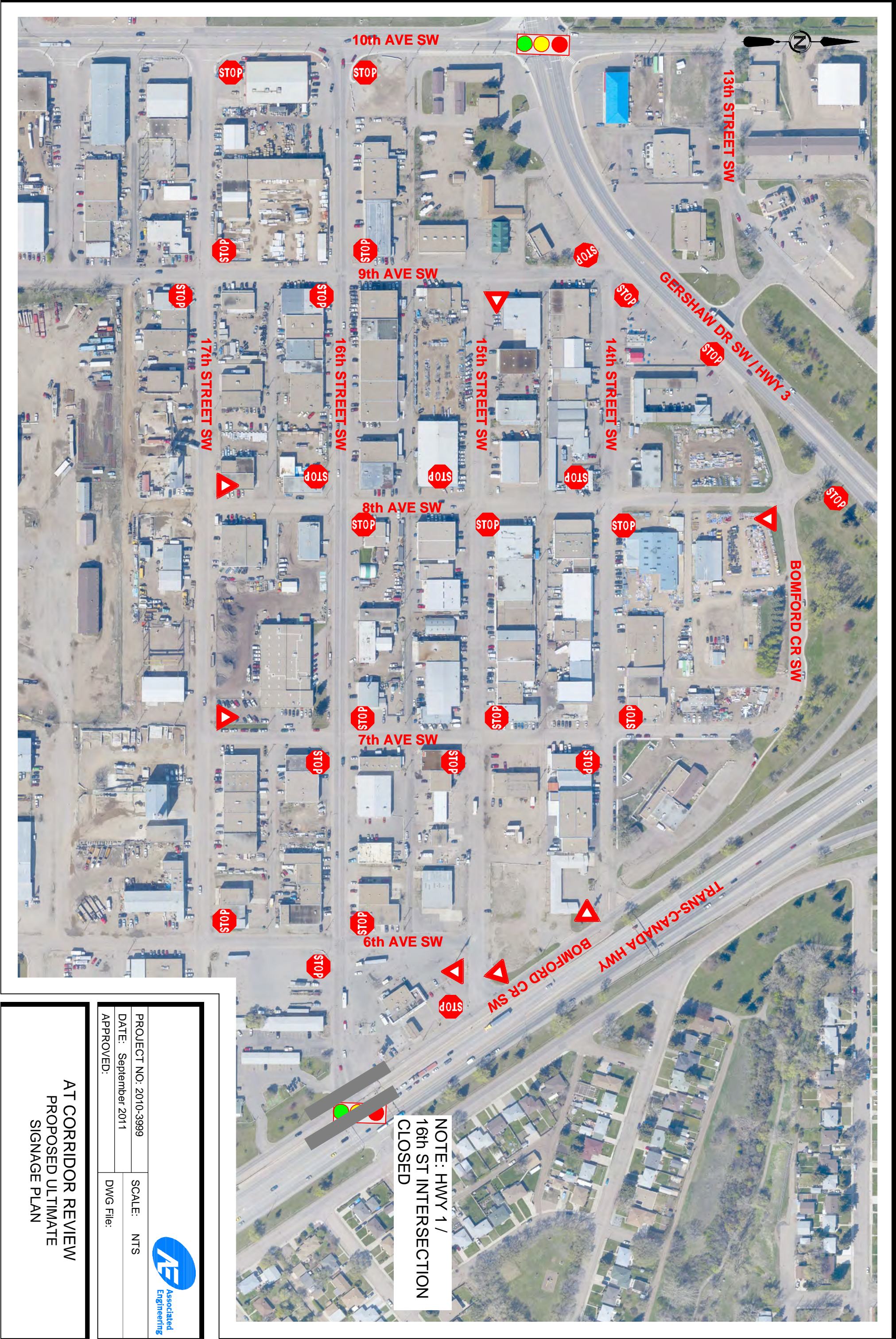
The City of Medicine Hat (CMH) requested Associated Engineering (AE) look at implementing phasing in advance of the proposed full upgrades to the Highway 1 and 3 study corridors. The purpose of the phasing is to attract traffic to use Highway 3 to access the South West Industrial area to increase Level of Service (LOS) and reduce travel delays at 16th Street South West (SW) intersection.

Two phasing solutions were considered. Phasing Option 1 suggested improvements of Highway 3 and incorporates the following road upgrades:

- Signalize South East (SE) ramp on Highway 3
- Open median and add west bound left turn at 8th Avenue SW
- Internal Traffic Management within the SW Industrial Area incorporating the reverse of the stop and yield signs on 8th Avenue SW, Bomford Crescent, 14th Street SW and 8th Avenue SW to provide right of way to traffic on 8th Avenue SW
- Signal the North West (NW) ramp off the Highway 1 interchange on Highway 3 (optional).

Phasing Solution Option 2 suggests the same roadway upgrades as option 1 except it adds the closure of Bullivant Crescent access to 16th Street SW.

We would suggest the changes suggested in options 1 and 2 will result in traffic on Highway 3 wishing to access the SW Industrial Area. The intent of these upgrades is to better distribute traffic into the SW Industrial Area by making 8th Avenue access more attractive. As identified in the AT Functional Planning report a median opening which accommodates southbound left turns on Highway 3 at 8th Avenue SW is required. Additionally a reversing of the internal stop signs along the 8th Avenue SW route is needed to make the route more attractive for drivers from a travel time perspective. Figure 1-1 details the revised access management strategy for the South West Industrial lands.



PROJECT NO: 2010-3999

DATE: September 2011

APPROVED:

SCALE: NTS

DWG File:

AT CORRIDOR REVIEW
PROPOSED ULTIMATE
SIGNAGE PLAN

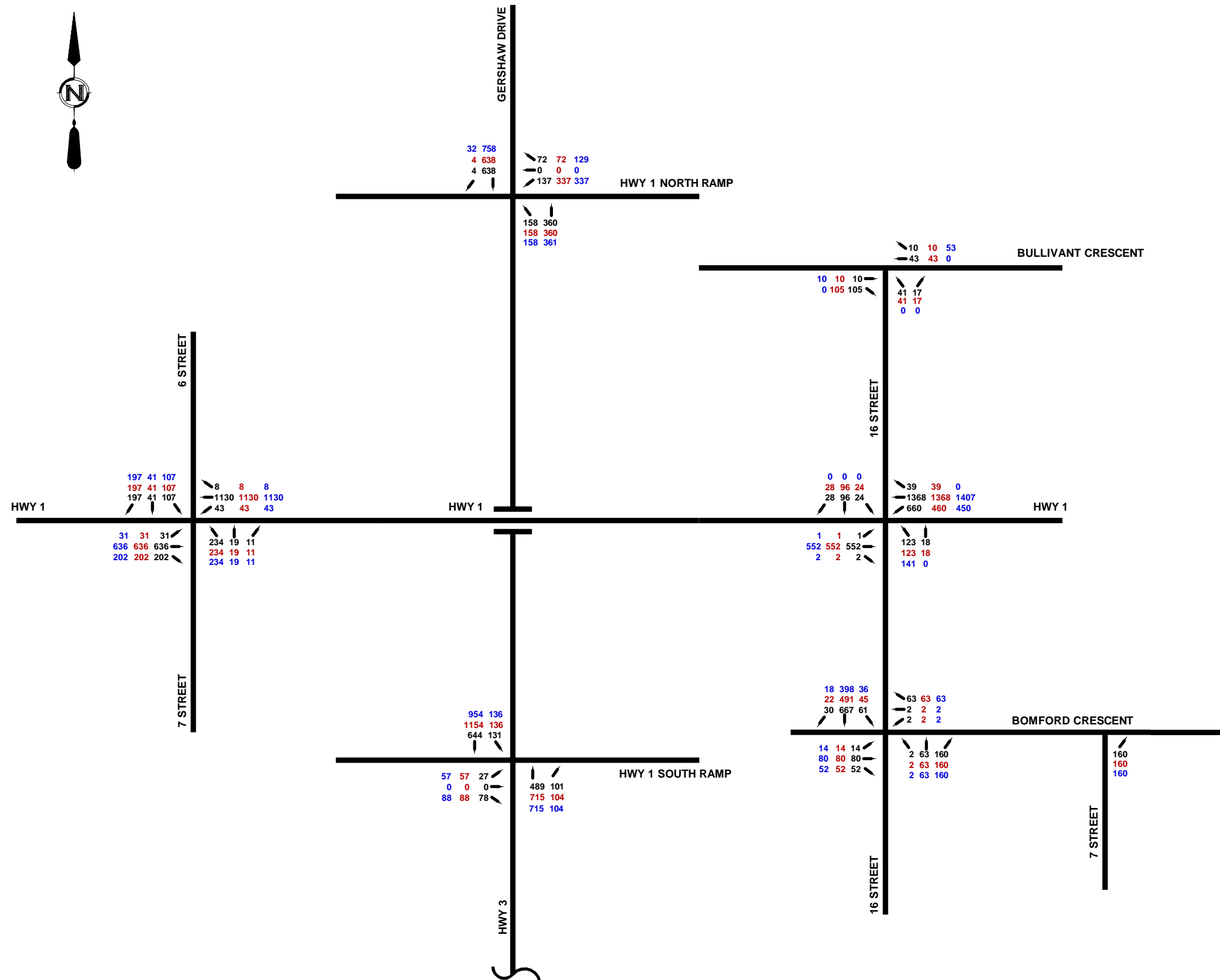
The evaluation of the phasing solutions was completed for the A.M. peak period because this is when the delays and congestion at the 16th Street SW intersection is at its worst. The evaluation was completed for both the existing and 75K population horizon.

For the existing conditions assessment, (2011 A.M. Peak) traffic count data was sourced from Alberta Transportation (AT). This traffic count data was then compared with the 2006 traffic count data within the AT Functional Planning Report. From this comparison it was evident that traffic volumes within the study area have been reducing over the period 2006 - 2011, so for consistency with AT Functional Planning Report it was decided to use the 2006 traffic count data for the existing conditions assessment.

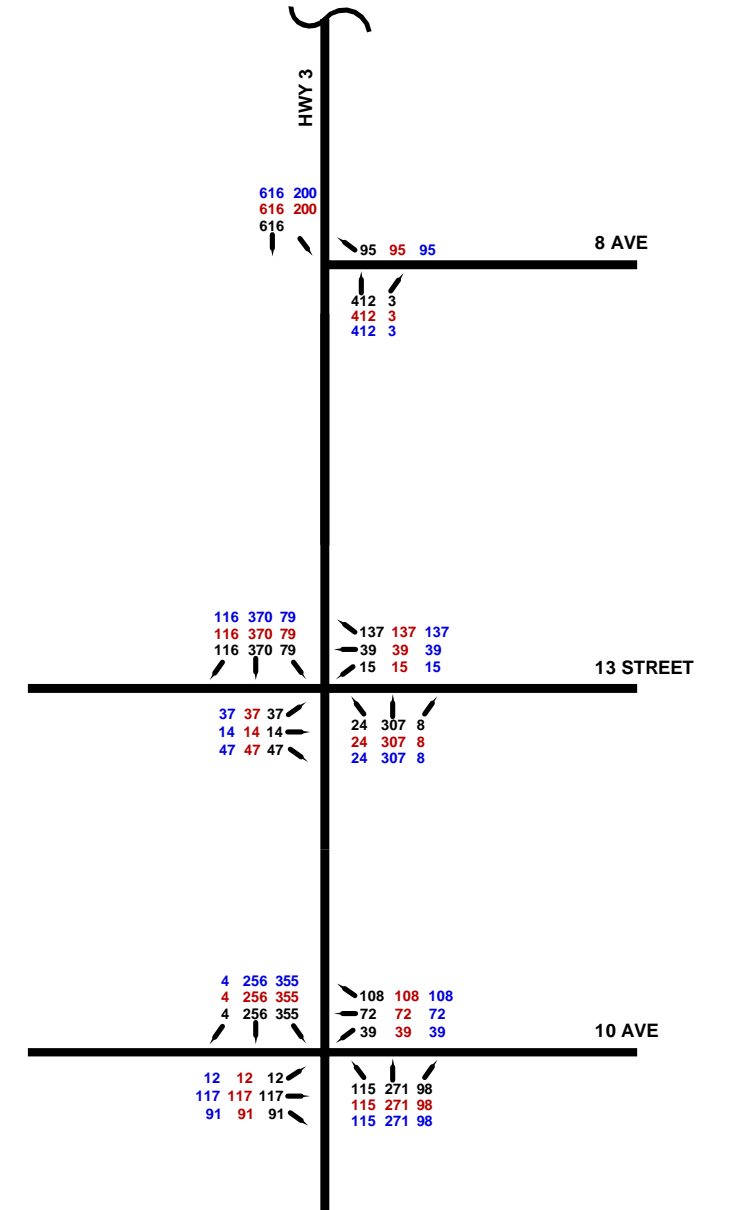
2 Existing Conditions

2.1 Existing Traffic Volumes

The existing traffic volumes used in the assessment are detailed in Figure 2-1 and are enclosed in the accompanying CD to this report. Analysis of existing traffic volumes indicate high volumes of North West bound left turning vehicles from Highway 1 to 16th Street SW.



INTERIM OPTION 2 - EXISTING TRAFFIC WITH RAMPS & BULLIVANT CLOSED



APPROVED:

AT CORRIDOR REVIEW STUDY TRAFFIC COUNT EXISTING SCENARIO

2.2 Potential to Shift Traffic from 16th Street SW to Highway 3

2.2.1 Sensitivity Analysis at 16th Street SW

A sensitivity analysis was undertaken to determine the traffic volumes required to shift from 16th Street SW intersection before an improvement in the operation of the intersection was realized. The sensitivity analysis involved transferring 100 left turning vehicles from the intersection to the northbound ramp at a time and re-running the capacity analysis until zero traffic was turning left at 16th Street SW. The sensitivity analysis indicates the number of vehicles required to shift to the SE ramp to improve the operation of the 16th Street SW intersection is in the range of 200 vehicles per hour (VPH). The full results of the sensitivity analysis are enclosed in the accompanying CD for your consideration.

Table 2-1
Sensitivity Analysis for Capacity at Highway 1 and 16th Street SW

Control Type	Westbound Left Turn Traffic on Hwy 1	Movement LOS	Movement Delay (sec)	Overall Intersection LOS	Overall Intersection Delay (sec)
Signalized	660	F	231	F	107
Signalized	560	F	149	F	84
Signalized	460	F	83	E	65
Signalized	360	E	73	E	61
Signalized	260	E	75	E	60
Signalized	160	E	76	E	58
Signalized	60	E	67	E	57
Signalized	0	/	/	D	42

2.2.2 Southwest Industrial Area Traffic

Currently there are 650 Vehicles per Hour (VPH) making the north westbound left turn from Highway 1 to 16th Street SW. With the improvements to the access arrangements to the SW Industrial Area from Highway 3 it is most likely that the traffic generators closest to Highway 3 would shift to this route. This accounts for approximately one-third of the industrial area, which equates to approximately 200 vehicles in the a.m. peak period. This amount coincides with the results of the sensitivity analysis undertaken for 16th Street SW.

2.2.3 Sensitivity Analysis at Highway 3 - Highway 1 SE Ramps

The Highway 1/Highway 3 SE interchange ramp is currently operating at a LOS of A and an intersection delay of 9.3 seconds. However, the westbound left turning movement is operating at a LOS F and a delay of 53.5 seconds. The installation of traffic signals at this intersection increases capacity for the westbound left turning movement to a LOS C and reduces delay at this intersection by 29.6 seconds. With the additional 200 left turning VPH, the intersection under the signalized conditions, it was seen to cope effectively. Once signalized the intersection has the capacity to accommodate 537 VPH before the double left lanes are needed. This would coincide with the closure of the 16th Street SW intersection.

Table 2-2
Sensitivity Analysis for Capacity at Highway 3 and SE Ramp

Control Type	Westbound Left Turn Traffic on Hwy 1	Movement LOS	Movement Delay (sec)	Overall Intersection LOS	Overall Intersection Delay (sec)
Unsignalized	137	F	54	A	9
Signalized	137	B	17	A	9
Signalized	237	B	20	B	10
Signalized	337	C	24	B	11
Signalized	437	C	33	B	14
Signalized	537	D	61	C	24
Signalized	637	F	120	D	46
Signalized with additional Westbound Left Turn Lane	637	C	22	B	13
Signalized with additional Westbound Left Turn Lane	737	C	25	B	15
Signalized with additional Westbound Left Turn Lane	797	C	27	B	16

2.3 Phasing Option 1 - Highway 3 Upgrades Traffic Volumes and Level of Service Analysis

The installation of traffic signals at the SE ramp of the Highway 1/Highway 3 interchange was seen to have a positive impact on the intersection as we are assuming it will reduce the volume of left turning vehicles at 16th Street SW from 660 VPH to 460 VPH. The revised traffic volumes with phasing Option 1 upgrades in place are detailed in Figure 2.1 and enclosed on the accompanying CD.

While still operating under significant congestion, the reduced traffic volumes increased the LOS at the 16th street SW intersection from LOS F to E and also reduced the overall intersection delay by 42.3 seconds. The reduction of the 200 west bound left turn vehicles intersection improves the west bound movement delay by 147 seconds (230 to 83 seconds) with the movement itself still operating under unacceptable conditions (LOS F).

With the additional traffic volumes and the installation of the traffic signals, the Highway 1/Highway 3 SE ramp is still working well within capacity at a LOS B. There is a modest increase in overall delay time of 1.8 seconds at the intersection. For the west bound left movement there is an improvement in LOS from F to C.

The analysis indicates that with the installation of the traffic signals the Highway 1/Highway 3 SE ramp can cope effectively with the additional traffic volumes. Therefore the construction of the dual left turn is not required until the full closure of the 16th Street SW intersection is in place. The NW bound ramp is inconsequential during this scenario and traffic signals are not warranted at this time.

This phasing solution also requires an all movement unsignalized intersection at Highway 3/8th Avenue SW. During this scenario with the increased turning movements the intersection operates at a LOS A with a minimal delay of 2.1 seconds. Table 2-3 summarizes the LOS for the existing scenario Phasing Solution Option 1.

Table 2-3
Capacity Analysis - Existing Scenario Phasing Solution Option 1

Intersection	Control Type	A.M. Peak Hour		
		LOS	V / C Ratio	Delay
Hwy 1 & 16 th Street SW	Signalized	E	2.82	64.6
16 th Street SW & Bomford Road	Signalized	F	2.82	510.3
16 th Street SW & Bullivant Crescent	Unsignalized	A	-	8.4
Highway 3 & SE Ramp	Signalized	B	0.62	11.1
Highway 3 & NW Ramp	Signalized	A	0.29	3.1
Highway 3 & 8 th Avenue SW	Unsignalized	A	-	2.1
Highway 3 & 13 th Street SW	Unsignalized	A	-	5.7
Highway 3 & 10 th Avenue SW	Signalized	C	0.55	23.2

2.4 Phasing Option 2 Highway 3 Upgrades with Bullivant Crescent Access to 16th Street SW Closed Traffic Volume and Level of Service Analysis

With the proposed road improvements in place traffic volumes at the 16th Street SW/Highway 1 intersection reduces by some 406 two way vehicles in the A.M. peak period. The revised traffic volumes for the Phasing Option 2 upgrades are outlined in Figure 2-1 and enclosed on the accompanying CD.

The closure of Bullivant Crescent provides additional signal cycle lengths for the remaining traffic signal phases. With these additional signal cycle lengths and a reduction in traffic volumes a significant improvement in the operation of the intersection would occur. Overall the intersection would operate at a LOS B and a reduced overall intersection delay of 15.7 seconds.

This phasing solution also provides for the signalization of both the SE and NW ramps at the Highway 1/Highway 3 interchange. With the addition of the signals and the additional westbound traffic both the SE (LOS B) and NW ramps (LOS A) operate effectively and within capacity.

The remaining intersections are all operating within capacity and with an acceptable LOS except 16th Street SW/Bomford Crescent. This intersection is still operating at LOS F however, the

increased signal timing and reduced traffic volumes has a significant benefit in reducing delay time at the intersection. (Savings of 615 seconds overall).

Under this scenario the Highway 3/8th Avenue SW intersection is unsignalized and operates at a LOS A with a minimal delay of 2.1 seconds.

Table 2-4 provides a brief summary of the overall operation of the intersections within the study area while the accompanying CD provides a full summary table outlining LOS for all movements at the intersections and a copy of the modelling results.

Table 2-4
Capacity Analysis - Existing Scenario Phasing Solution Option 2

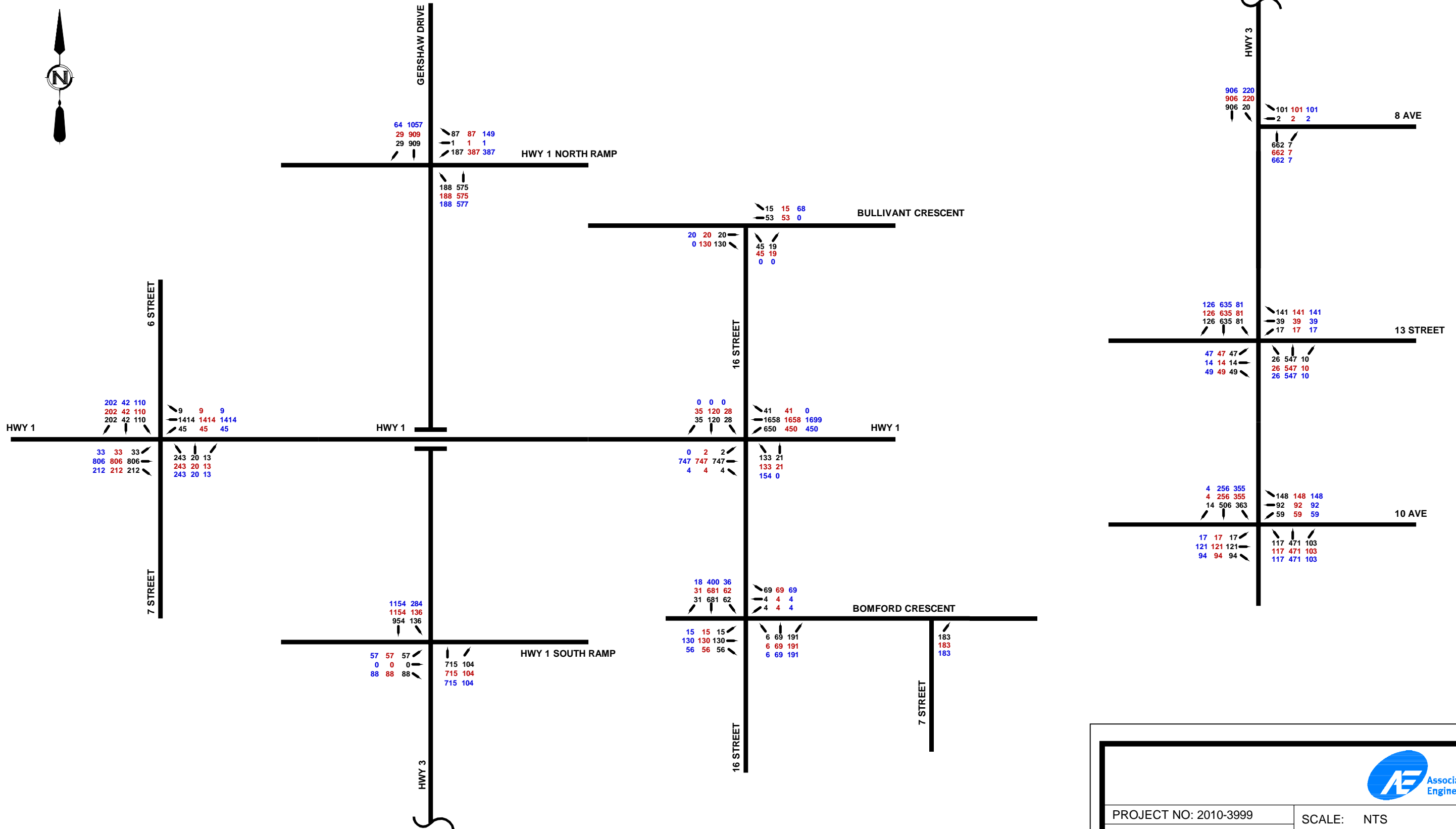
Intersection	Control Type	A.M. Peak Hour		
		LOS	V / C Ratio	Delay
Hwy 1 & 16 th Street SW	Signalized	B	1.08	15.7
16 th Street SW & Bomford Road	Signalized	F	1.08	216.6
BULLIVANT CRESCENT CLOSED				
Highway 1 & SE Ramp	Signalized	B	0.70	11.2
Highway 1 & NW Ramp	Signalized	A	0.34	2.6
Highway 1 & 8 th Avenue SW	Unsignalized	A	-	2.1
Highway 1 & 13 th Street SW	Unsignalized	A	-	5.7
Highway 1 & 10 th Avenue SW	Signalized	C	0.55	23.2

3 75K Population Traffic

3.1 75K Forecast Traffic Volume and Level of Service Analysis

The traffic volumes used for the 75K scenario were extracted from the 75K PM Peak EMME model and reversed to provide A.M. peak volume information. During this scenario there is an increase in traffic volumes on the road network to reflect the growth in population. Figure 3-1 details the 75K traffic volumes for the three scenarios.

This Drawing Is For The Use Of The Client And Project Indicated
No Representations Of Any Kind Are Made To Other Parties



LEGEND

- 75K TRAFFIC**
- INTERIM OPTION 1 - 75K TRAFFIC WITH RAMPS SIGNALIZED**
- INTERIM OPTION 2 - 75K TRAFFIC WITH RAMPS & BULLIVANT CLOSED**



PROJECT NO: 2010-3999	SCALE: NTS
DATE: September 2011	DWG File:
APPROVED:	

AT CORRIDOR REVIEW
STUDY TRAFFIC COUNT
75K SCENARIO

During this “Do Nothing” scenario all intersections except Highway 1/16th Street SW (LOS F, delay 107 seconds) and 16th Street SW/Bomford Crescent (LOS F, delay 833 seconds) are operating within capacity. There is a significant increase in delay at the Highway 1/Highway 3 north ramp which goes from 53 seconds in the existing to 740 seconds for the west bound left movement without traffic signals.

Table 3-1 provides a brief summary of the overall operation of the intersections within the study area during the 75K A.M. peak scenario while the accompanying CD provides a summary table and full copy of the results for your consideration.

Table 3-1
Capacity Analysis - 75K “Do Nothing” Scenario

Intersection	Control Type	A.M. Peak Hour		
		LOS	V / C Ratio	Delay
Hwy 1 & 16 th Street SW	Signalized	F	3.81	150.2
16 Street SW & Bomford Road	Signalized	F	3.81	778.7
16 Street SW & Bullivant Crescent	Unsignalized	A	-	8.8
Highway 3 & SE Ramp	Unsignalized	B	-	104.2
Highway 3 & NW Ramp	Unsignalized	B	-	4.2
Highway 3 & 8 th Avenue SW	Unsignalized	A	-	0.8
Highway 3 & 13 th Street SW	Unsignalized	A	-	10.6
Highway 3 & 10 th Avenue SW	Signalized	C	0.65	26.9

3.2 75K Forecast with Phasing Option 1 Traffic Volume Level of Service Analysis (Highway 3 Upgrades)

The results from this scenario are similar to those obtained from the Phasing Option 1 for existing conditions. While there is no improvement in the LOS at Highway 1/16th Street SW intersection a reduction in intersection delay time was experienced. Overall intersection delay was reduced by 58 seconds.

The westbound left turn movement at Highway 1 to 16th Street SW is still operating under unacceptable conditions; however, there has been a reduction in the delay time (131 seconds) experienced at the intersection for this movement.

There is also a significant reduction in overall delay experienced at the 16th Street SW/Bomford Crescent intersection (313 seconds).

The Highway 1/Highway 3 SE and NW ramps are still operating well within capacity with the installation of the traffic signals and the additional traffic. With the upgrades in place the SE ramp is operating at a LOS of B and the NW ramp at LOS A. As the SE ramp is operating well within capacity, the dual left turn is not required until the full closure of 16th Street SW intersection is in place. With the installation of the traffic signals there is significant savings in intersection delay for the west bound left turning movement (713 Seconds) when compared with the 75K “Do Nothing” Scenario.

This phasing approach also requires an all movement unsignalized intersection at Highway 3 / 8th Avenue SW. With the movement in place, the intersection operates at a LOS A with a minimal delay of 1.8 seconds. Table 3-2 provides a brief summary of the overall operation of the intersections within the study area while the accompanying CD provides a copy of the full results on the analysis undertaken.

Table 3-2
Capacity Analysis - 75K Scenario Phasing Option 1

Intersection	Control Type	A.M. Peak Hour		
		LOS	V / C Ratio	Delay
Hwy 1 & 16 Street SW	Signalized	F	2.83	92.4
16 Street SW & Bomford Road	Signalized	F	2.83	465.9
16 Street SW & Bullivant Crescent	Unsignalized	A	-	8.8
Highway 3 & SE Ramp	Signalized	B	0.71	13.2
Highway 3 & NW Ramp	Signalized	A	0.43	4.1
Highway 3 & 8 Avenue SW	Unsignalized	A	-	1.8
Highway 3 & 13 Street SW	Signalized	A	0.44	7.3
Highway 3 & 10 Avenue SW	Signalized	C	0.65	26.9

3.3 75K Forecast with Phasing Option 2 Traffic Volume and Level of Service Analysis (Highway 3 Upgrades with Bullivant Crescent Access to 16th Street SW Closed)

The results from this scenario are similar to those obtained from the Existing Conditions Phasing Option 2 scenario. Again the closure of Bullivant Crescent provides additional cycle lengths for the remaining signal phases at the 16th Street SW intersection. With this additional signal time and reduced traffic volumes, a significant improvement in the operation of the intersection would occur. The intersection would operate at a LOS B and an overall delay time of 16 seconds. Improvements in the LOS and a reduction in delay time for the westbound left turning movement from Highway 1 to 16th Street SW also occur.

This option also provides for the signalization of both the SE and NW ramps at the Highway 1/Highway 3 interchange. With the addition of the traffic signals and the additional westbound traffic both the north (LOS B) and south ramps (LOS A) operate effectively and within capacity with minimal variance in the intersection delay time.

The remaining intersections are all operating within capacity and at an acceptable LOS except 16th Street SW/Bomford Crescent. This intersection is still operating at LOS F however, the increased signal timing and reduced traffic volumes has a significant benefit in reducing delay at the intersection. (478 intersection delay savings overall).

The Highway 3/8th Avenue SW intersection is unsignalized and operates at a LOS A with a minimal delay of 1.7 seconds.

Table 3-3 provides a brief summary of the overall operation of the intersections within the study area while the accompanying CD provides a summary table outlining LOS for all movements at the intersections and a full copy of the results.

Table 3-3
Capacity Analysis - 75K Scenario Phasing Option 2

Intersection	Control Type	A.M. Peak Hour		
		LOS	V/C Ratio	Delay
Hwy 1 & 16 th Street SW	Signalized	B	1.34	16.4
16 Street SW & Bomford Road	Signalized	F	1.34	300.3
BULLIVANT CRESCENT CLOSED				
Highway 3 & SE Ramp	Signalized	B	0.81	13.6
Highway 3 & NW Ramp	Signalized	A	0.51	4.0
Highway 3 & 8 th Avenue SW	Unsignalized	A	-	1.7
Highway 3 & 13 th Street SW	Signalized	A	0.44	7.3
Highway 3 & 10 th Avenue SW	Signalized	C	0.65	26.9

4 Signal Warrant Analysis

4.1 Introduction

A signal warrant analysis was undertaken for the following intersections for both the existing and 75K scenarios:

- Highway 1/Highway 3 SE ramp
- Highway 1/Highway 3 NW ramp
- Highway 3/8th Avenue SW
- Highway 3/13th Street SW.

4.2 Existing Conditions Analysis

The signal warrant analysis highlights the requirements for the signalization of the Highway 1/Highway 3 north ramp immediately. The installation of signals at Highway 1/Highway 3 NW ramp is not warranted until the closure of Bullivant Crescent occurs. Signals are not required at Highway 3/8th Avenue SW and Highway 3/13th Street SW under the existing traffic volumes for both options analysed. Table 4-1 provides a summary of the signal warrant analysis for the existing situation.

**Table 4-1
Signal Warrant Analysis**

SIGNAL WARRANTS SUMMARY						
Intersection	Existing Scenario			75K Population Scenario		
	Existing Traffic	200 WB Left Turns at Hwy 1/16 Street SW shifted to the North Ramp	Bullivant Closed & 200 WB Left Turns at Hwy 1/16 Street SW shifted to the North Ramp	75K Traffic	200 WB Left Turns at Hwy 1/16 Street SW shifted to the North Ramp	Bullivant Closed & 200 WB Left Turns at Hwy 1/16 Street SW shifted to the North Ramp
Gershaw Dr. & SE Ramp	Warranted	Warranted	Warranted	Warranted	Warranted	Warranted
Gershaw Dr. & NW Ramp	Not Warranted	Not Warranted	Warranted	Warranted	Warranted	Warranted
Gershaw Dr. & 8 Avenue SW	Not Warranted	Not Warranted	Not Warranted	Not Warranted	Warranted	Warranted
Gershaw Dr. & 13 Street SW	Not Warranted	Not Warranted	Not Warranted	Warranted	Warranted	Warranted

*Note that signals are not recommended at 8th Avenue SW.

4.3 75K Scenario

In the 75K “Do Nothing” scenario signals are required at:

- Highway 3/SE ramp
- Highway 3/NW ramp
- Highway 3/13th Street SW.

For both options analysed in the 75K scenario all intersections require traffic signals; however, it doesn't make sense to add traffic signals at 8th Avenue SW because the intersection is a T-intersection and westbound left turns are prohibited. TAC Signal Warrant procedure does not adequately address this situation. Table 4-1 provides a summary of the signal warrant analysis. A full copy of the signal warrant analysis is enclosed on the accompanying CD.

5 Conceptual Reconfiguration Concept for Phasing

Following is the review of the phasing solutions available at Highway 1/16th Street SW intersection and Highway 1/Highway 3 interchange. The following interchange reconfiguration was provided to generate discussion on the potential for a second stage phasing solution before a full Highway 1/3 interchange upgrade. This concept is shown in figure 3.1. AE did not spend a lot of time proving out this concept as it was not in the project budget however we were just trying to make the point that with some innovative thinking it may be possible to develop a second stage phasing solution that may be more cost effective than constructing the complete Highway 1/3 interchange upgrade noted in the AT Functional Planning Report. The upgrades provide for the following:



B Appendix B - Swanson Transportation Memorandum

**SWANSON
TRANSPORTATION
CONSULTANTS**

MEMORANDUM

PROJECT NO.:	1113	PAGE:	1 of 4
FROM:	Al Swanson	DATE:	May 16, 2012
TO:	Randy Stevenson, Associated Engineering		
CC:			
RE:	Speed Limit on Highway 1 – Trans Canada Highway		

This is in response to our phone conversation yesterday concerning the above matter and our subsequent meeting today. This memo is to outline some considerations that should be given when speed limit changes are under discussion. It is my understanding that the City of Medicine Hat is considering lowering the speed limit from 80 km/h to 60 km/h in the segment between the west approach to 1st Street SW to the east approach to 16th Street SW. Currently the speed limit for the entire corridor from west of 3rd Street NW to east of Dunmore Road is 80 km/h. This memo will also make some suggested changes to the geometrics at the 1st Street SW intersection that would affect whether a possible reduced speed limit would need to be initiated in advance of this location.

Assessment of Speed Limits

The primary factors that should be considered when setting a speed limit on a street or highway are as follows:

- Roadway conditions – surface characteristics, shoulder conditions, grade, alignment and sight distance.
- Existing vehicle speeds in the road segment as evidenced by the 85th percentile speed and pace speed.
- Roadside environment – the nature of development adjacent the highway, local culture as well as roadside friction (the extent of access points and driveways in the road segment).
- Parking practices and pedestrian activity.
- Reported crash experience over a specified period (1 to 3 years).¹

The primary factor used by traffic engineers to set speed limits is the 85th percentile speed. I won't go on to discuss the rationale for this consideration as we do not have any existing speed data along Highway 1.

¹ Traffic Engineering Handbook, Institute of Transportation Engineers, p 245, 1999.

**SWANSON
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MEMORANDUM

DATE: May 16, 2012
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The existing road conditions also play an important role in speed limit decision-making. A key issue is where to commence a lower speed limit should it be operational prior to the 1st Street SW intersection. I would expect that such a reduced zone would need to be in effect near the east end of the river bridge, resulting in the advanced reduce speed warning signs (WB-9) to be installed either near the mid-point of the bridge or near the west end of the bridge. This may cause some compliance issues as eastbound traffic is descending down as steep grade to the bridge resulting in higher speeds on the west approach to the bridge. However, for eastbound traffic, there is a gentle uphill grade starting east of 1st Street SW to about the Highway 3 interchange. On the east approach to the subject highway section, there is the Kin Coulee which results in a significant downgrade for westbound traffic as they traverse the coulee, followed by a steep upgrade on the east approach to 16th Street SW. This coulee can cause speeding as motorists (particularly those driving larger trucks) increase their speed as they go down the grade to compensate for the slowing down that occurs on the upgrade. However, from a speed limit change perspective, it is better to introduce the reduced speed on an uphill grade, as compared to the natural instinct of motorists to increase their speed on a downhill grade. For this reason, it would be preferable to have the proposed reduced speed zone instituted on the west approach to 6th Street SW to the east approach to 16th Street SW.

Of the other road conditions considerations, shoulder condition (there are none), alignment and sight distance which are factors that need not be addressed in this speed limit reduction assessment.

The roadside environment does come into consideration for this speed limit reassessment. In the segment along the Trans Canada Highway from about 6th to 16th Streets SW, the right-of-way is narrow and urban development is readily apparent to passing motorists. There is highway commercial along the south side of this road segment, while along the north side there is a mix of highway commercial on the west portion and single family residential on the east portion. West of 6th Street SW, the roadside environment tends to be low density suburban/rural in appearance. In the segment from 1st Street SW to 6th Street SW, there is urban development along the north side of the highway, albeit setback from the highway due to the service road – Red Deer Drive. However, there is no development on the south side due to the river valley escarpment. To the east of 16th Street SW, the development is setback more from the highway and sometimes hidden behind berms. Hence, the more urbanized segment of the highway is between 6th Street SW and 16th Street SW. This condition gives some positive rationale for lowering the speed limit below 80 km/h in this area.

The other roadside environment consideration deals with roadside friction. This friction can be a result of the frequency of access points and driveways and/or the presence of parking activity. In this highway segment, there is no roadside friction because of the limited access nature of this provincial through route, and there is no curbside parking. Hence, these two considerations do not play a part in the speed limit reassessment other than suggesting maintaining a reasonably high speed limit level. Furthermore, there is no significant occurrence of pedestrian crossings at the two

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SWANSON TRANSPORTATION CONSULTANTS

MEMORANDUM

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signalized intersections in the subject road segment such that the concern for pedestrian safety will not influence a reduced speed limit decision.

The motor vehicle collision experience does play an important role in speed limit changes. It is understood that there are rear-end collision issues on the west approach to the 6th Street intersection, and a similar pattern on the east approach to 16th Street. Rear end collisions are prevalent at signalized intersections. Similarly, as vehicle congestion increases at signalized intersections, the accident frequency tends to increase. While reducing the speed limit in this road segment may increase traffic congestion/queuing, it may also have a positive benefit of reducing the severity when collisions do occur. The potential increase in intersection congestion due to the lower speed is essentially due to the lower speed decreases the number of vehicles that can proceed through a signalized intersection for a given amount of green time. Higher speeds enable motorists to leave the intersection area faster resulting in more time available for the following vehicles to pass through it. Hence, a speed limit reduction may engender a mixed bag of benefits and disbenefits.

One of the key issues when considering speed limit changes is whether the motorists will see the need for a change in their driving speed based on the road conditions, roadside environment and access management. This tends to be a human factors consideration where experience and past research plays an important role in a subjective judgment, and not easily put into a mathematical equation. I am of the opinion that **reducing the speed limit to 60 km/h in the subject road segment is too low** and may create speed enforcement issues. The enforcement issues include local residents/motorists feeling that the low speed limit and regular police enforcement actions create a speed trap, and a means to increase the revenue generated by fines. Similarly, this “unenforceable” speed limit creates a level of frustration among police officers as they are unable to achieve a reasonable level of compliance from motorists without spending extensive efforts and repetitive police enforcement actions. However, **a 70 km/h speed limit would be reasonable** considering the difference in the roadside environment in this area.

We do know that from a traffic flow theory perspective, the maximum vehicle flow per lane occurs when the traffic platoon is traveling at about 70 km/h in a free flow traffic environment. Traffic signals breakup vehicle platoons such the optimum traffic condition tends to be defined by traffic operations analysis, based on Highway Capacity Manual techniques.

The following is a summary of the advantages and disadvantages of reducing the speed limit along the Trans Canada Highway are shown below:

Positive Features: that support a lower speed

Negative Features: that do not support a lower speed

- Lower speed limit reflects the change in the
- May increase congestion/queuing at the two

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roadside environment in the area between 6th Street and 16th Street. intersections.

- The uphill slope on the west approach to 6th Street and the east approach to 16th Street.
- Increased congestion at the two intersections may also increase the collision frequency.
- Reduce the severity of collisions.
- Too low of a speed limit may cause enforcement issues.
- There is no roadside friction nor a significant amount of pedestrian crossings

1st Street Intersection Geometrics

As indicated earlier, should the speed limit be reduced, it would be preferable to initiate the advance warning and maximum speed signs in the area between 1st Street SW and 6th Street SW. This would leave the current unsignalized 1st Street intersection to remain within the current 80 km/h speed zone. It is understood that consideration is being given to restricting the number of movements that can be made at this intersection to “right turns in and out” only. This can have an effect on emergency services access to the hospital for vehicles originating from the west.

An alternative geometric treatment is to make access to and from the highway be on a “right turns in and out” basis, but to also allow eastbound traffic to make a left turn from the highway on to 1st Street. The turn lane geometrics would need to be designed such that only the eastbound left turn is allowed, and the median design prohibit crossing movements from the side street.

The implementation timing of this new intersection design is not easy to define, but changing the intersection geometrics should be done prior to when signalization becomes warranted.

Recommendations

Based on the considerations outlined in this document, I recommend the following:

1. The City of Medicine Hat install a lower speed limit of 70 km/h for the central segment of the Trans Canada Highway.
2. The reduced speed limit be from the west approach to 6th Street SW and the east approach to 16th Street SW.

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3. When traffic warrants, the design of the 1st Street SW intersection be changed such that access to the highway becomes restricted to “right turns in and out” only, and to allow for a eastbound to northbound left turn lane using positive guidance design of the median opening.

C Appendix C - Open House Presentation Boards



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ROADWAY SYSTEM MASTER PLAN (RSMP) UPDATE

Public Open House - January 23, 2013

WHAT IS A ROADWAY SYSTEM MASTER PLAN?

- Roadway Network that aligns with the Municipal Development Plan
- Updates City of Medicine Hat Computer Traffic Model
- Identifies Roadway System Improvements (10 Year Capital Plan)
- Identifies Long Range Road Network Improvements
- Identifies Impacts of Highway Connections to the community
- Studies other critical aspects of the City Road Network (e.g. Downtown Parking Study)
- Reviews / Updates City of Medicine Hat Transportation Bylaw

WHAT'S IN THE CITY OF MEDICINE HAT'S ROADWAY SYSTEM PLAN?

- Downtown Parking Study (approved by Council)
- Cycling Master Plan (approved by Council)
- Assessment of converting Downtown one-way streets to two-way streets (approved by Council)
- Installation guidelines for traffic control devices (i.e. stop/yield, school & playground zone, pedestrian crossings, and parking restrictions)
- Preliminary assessment for the Southwest Medicine Hat connector
- Assessment of proposed AT upgrades along TCH corridor
- Assessment of interim measures/upgrades and phasing of AT's proposed upgrades along TCH corridor



Associated
Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.



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RSMP UPDATE - KEY FINDINGS

The RSMP identified the following roadway upgrades, in support to projected MDP growth in the City.

ROADS:

- West Boundary Road
(TCH to Box Springs Blvd)
- Box Springs Road NW
(Brier Park Road to 23rd Street NW)
- Box Springs Road NW
(23rd Street NW to Box Springs Street NW)
- 13th Avenue SE
(Strachan Road to South Boundary Road)
- 11th Avenue SW
(extension to TCH)
- South Boundary Road
(South Ridge Drive to Range Road 61)
- Southwest Connector
(between South Boundary Road and Highway 3)
- Burnside Drive
(TCH to Redcliff Way)

INTERSECTIONS:

- Maple Avenue and 1st Street SE
- College Avenue and Kipling Street
- 23rd Street and Box Springs Road NW
- Kingsway Avenue and Spencer Street SE
- 13th Ave and TransCanada Way
- Dunmore Road and TransCanada Way
- 3rd Street NW - Highway 1 off ramp
- TCH and 6th/7th Street SW
(AT jurisdiction)
- TCH and 16th Street SW
(AT jurisdiction)
- Eastbound TCH off-ramp at 13th Avenue SE
(AT jurisdiction)
- Eastbound off-ramp at TCH & South Ridge Drive
(AT jurisdiction)



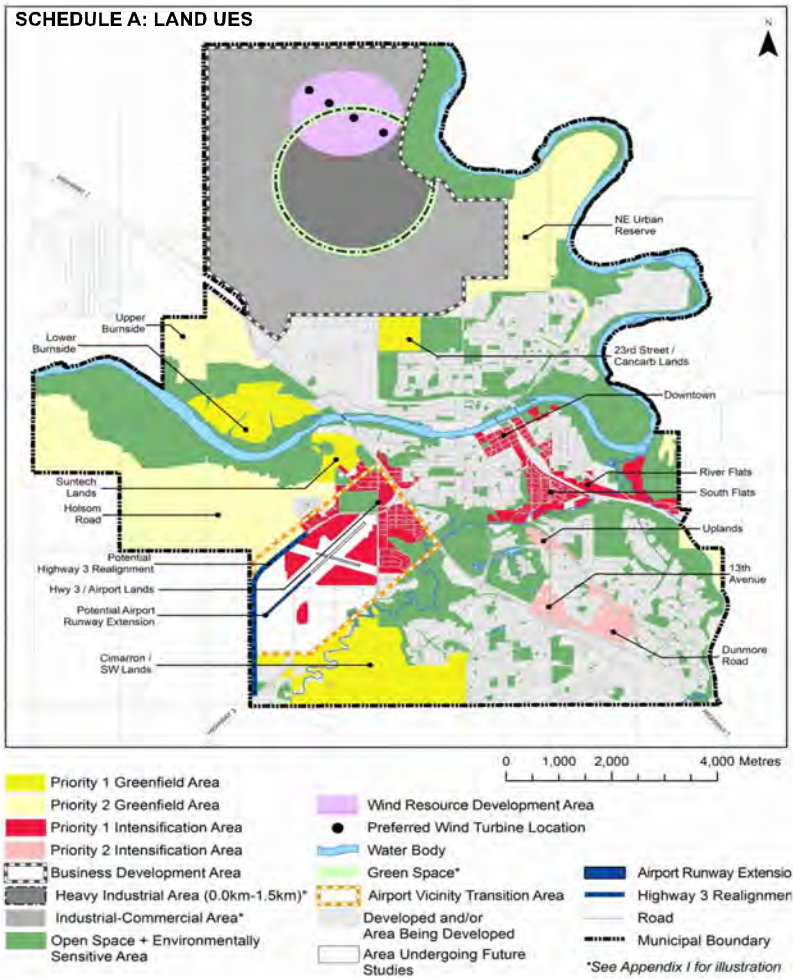
Associated
Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

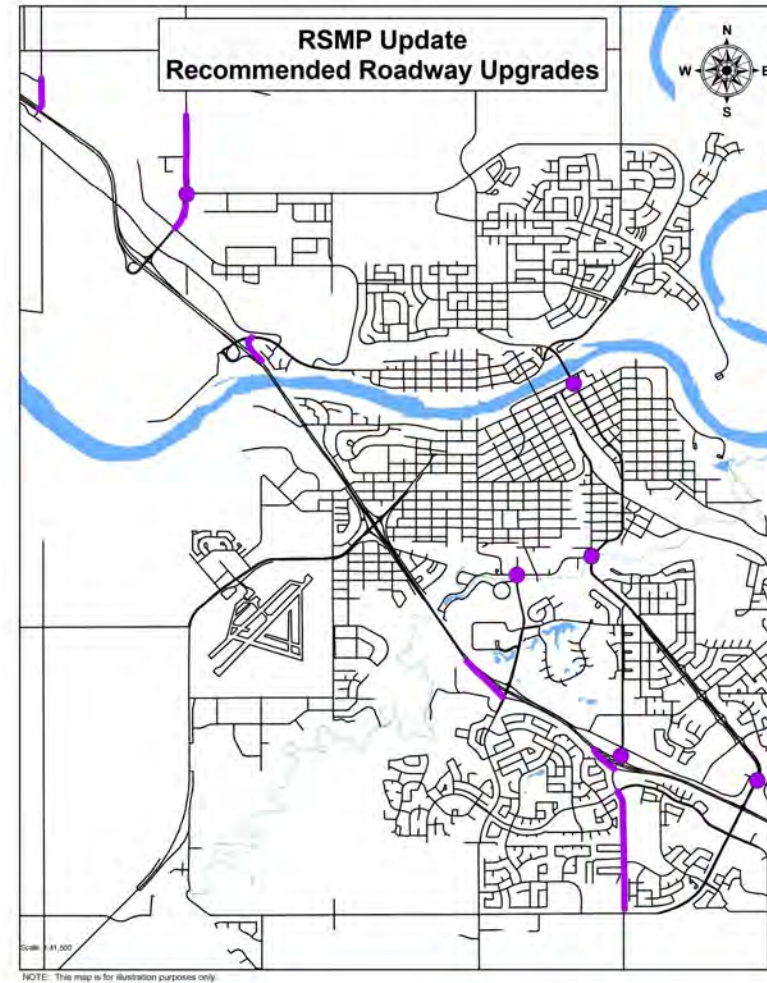


A Community of Choice

City of Medicine Hat Municipal Development Plan



City of Medicine Hat Roadway System - 10 year Capital Improvement Plan



WHAT ARE ALBERTA TRANSPORTATIONS PROPOSED IMPROVEMENTS TO HIGHWAY 1?

- Close 16th Street, 6th Street and 7th Street SW intersections on Highway 1
- Upgrade the Highway 1 and Highway 3/Gershaw Drive interchange
- Construct an interchange at Highway 1 and 1st Street SW.

ALBERTA TRANSPORTATION PROPOSED UPGRADES

- Full interchange at Highway 1 and 1st Street SW
- Closing of 6/7th Street SW intersection on Highway 1



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ALBERTA TRANSPORTATION PROPOSED UPGRADES

- Highway 1 and 3 interchange upgrades
- Closing of 16th Street SW Intersection on Highway 1



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SEQUENCING OF ALBERTA TRANSPORTATION UPGRADES TO HIGHWAY 1

WHY:

- There may be funding constraints
- There's a need to make improvements along Highway 1 now
- Improved community access needs
- Intersections are currently congested & failing
- Improves safety
- Improvements will benefit city of Medicine Hat roadways
- Provides for the future growth of the City
- Community concerns

ARE THERE INTERIM MEASURES THAT CAN BE IMPLEMENTED? Yes

- Changes at Highway 1 & 3 Interchange
- All turns intersection at 8th Street SW & Highway 3
- Changes at 16th Street SW Intersection at Highway 1
- Changes at 1st Street SW Intersection at Highway 1
- Provision of a service road from 1st Street SW to Suntec area



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Alberta Transportation Phasing Plan - Phase 1

Upgrades to Highway 1 & 3 Interchange



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Alberta Transportation Phasing Plan - Phase 2

Changes at 16th Street Intersection



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Alberta Transportation Phasing Plan - Phase 3

Upgrades to Highway 1 & 3 Interchange & 16th Street Intersection



Alberta Transportation Phasing Plan - Phase 4

Upgrades to Highway 1 & 3 Interchange & Close 6th and 7th Street Intersection



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Alberta Transportation Phasing Plan - Phase 5

1st Street SW & Highway 1 intersection upgrades



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INTERIM IMPROVEMENTS - 1 STREET SW

Why?

- Community concerns
- Left Turn Safety concerns from Highway 1

CONCEPTUAL DESIGN LAYOUT FOR LEFT TURN ACCESS FROM HIGHWAY 1



WHY DO WE NEED A SERVICE ROAD TO SUNTEC?

- Connectivity
- Facilitate a connection to future development
- Access to Suntec

OTHER INTERIM IMPROVEMENTS



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WHY THE NEED FOR THE SOUTH WEST CONNECTOR?

- Facilitate growth in the Southwest
- Improve roadway connectivity to the City
- Reduce traffic on existing roadways within the Southwest



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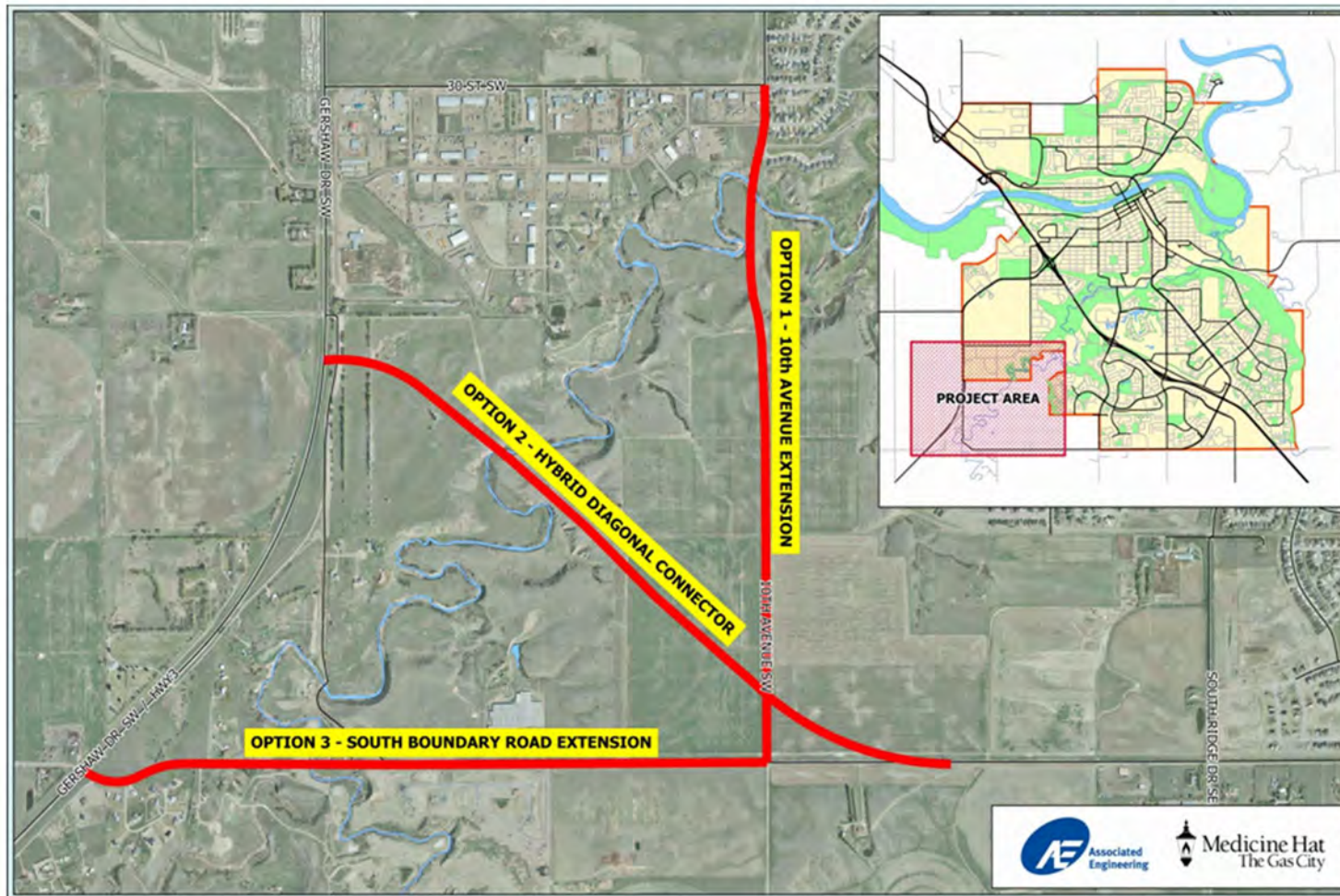
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SOUTHWEST CONNECTOR OPTIONS



SOUTHWEST CONNECTOR ANALYSIS

- Assessment of future preferred alignment for connecting South Boundary Road to Highway 3
- Transportation model suggests that the SW connector would not be required until Cimarron development is well underway (2025)
- Assessment included:
 - Analysis and identification of alternative alignments
 - Area Structure Plan/Neighbourhood/Property impacts
 - High level cost estimates
 - Environmental and geotechnical considerations
 - Travel time forecast and road network connections
- All three options are viable



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SOUTHWEST CONNECTOR OPTIONS

Consultant evaluation of Impacts

Options Evaluation Criteria	Option 1	Option 2	Option 3
Impacts on Property	High	Low	Medium
Cost	High	Low	Medium
Social Impacts on Amenities	High	Low	Medium
Environmental Impacts	High	Low	Medium
Noise Impacts	High	Low	Medium
Safety Impacts	High	Low	Medium
Geotechnical	High	Low	Medium
Travel Time Savings	Low	Medium	High
Existing Road Network	High	Low	Medium
Network Connectivity	Medium	Low	High
Impacts on Cimarron ASP	Low	High	Low



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NEXT STEPS

- Solicit Public Feedback (January 2013)
- Finalize Roadway System Master Plan Report (March 2013)
- Present Report to Council (April 2013)



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D Appendix D - Public Comments Summary

Public Meeting - Chamber of Commerce	
Location: Best Western Inn on Redcliff Drive	
Date Jan. 15, 2013	
Number of Participants 48	
Participant Comments	
<i>AT Corridor</i>	<i>Number of Responses</i>
More information requested for proposed options for hospital & 16 Street SW intersection.	1
Concerns on the lack of discussion and information on the Highway 1 and 6th Street SW intersection.	1
<i>RSMP</i>	<i>Number of Responses</i>
General positive feedback.	1
1st Street SW Open House	
Location: Esplanade - Studio Theatre	
Date Jan. 16, 2013	
Number of Participants 72	
Participant Comments	
<i>AT Corridor</i>	<i>Number of Responses</i>
Concerns on the potential traffic volume on 1 Street SW.	10
Concerns on the speed limit on 1 Street SW. Feels that drivers are going too fast.	2
Concerns on the potential noise pollution on 1 Street SW.	2
Concerns on closing of 6 Street SW and Red Deer Drive access from Highway 1 which will negatively impact local businesses.	3
Concerns on the speed limit on 6 Street SW.	1
Concerns on the closing of highway 1 and 16 Street intersection.	1
Suggestion for a service road to the Power Plant on the west side of Highway 1.	1
Positive feedback on the interim changes to Highway 1 and 1st Interchange.	3
Positive feedback on the phasing of work with opportunity for input from the public.	3
<i>RSMP</i>	<i>Number of Responses</i>
Positive feedback on the 4 way stop implemented at Division Avenue.	1
Concerns on the timeline of the phasing and plan. Request more information on the estimated cost.	4
Concerns on the lack of a signal light at Redcliff Drive.	1
Suggests directing traffic from Highway 1 onto Township Road 120.	1
Suggests seeking alternative to direct crescent height traffic away from Highway 1.	1
RSMP Public Open House	
Location: Exhibition Grounds - Higdon Hall	
Date Jan. 23, 2013	
Number of Participants 138	
Participant Comments	
<i>AT Corridor</i>	<i>Number of Responses</i>
Concerns on potential traffic volume on 1 Street SW as it is a historical road.	5
Concerns on the potential noise pollution on 1 Street SW.	1
Positive feedback on the overall Highway 1 and Highway 3 upgrades. Agrees with closure of 16 Street SW and 6 Street SW.	3
Concerns on the closure of the hospital exit ramp, and 6 Street SW exit as it is very highly used. Very concerned on the affect it will have on local businesses.	4
Suggestion on removing left turn lane concrete median on Highway 1.	1
Concerns on the timeline of the phasing of the plan. Taking way too long to implement.	3
<i>RSMP</i>	<i>Number of Responses</i>
Request more information on airport expansion, no additional comment.	1
Request more information on Crescent Heights area, no additional comment.	1
Request more information on estimated cost of the overall plan.	1
Positive feedback on overall plan. The sooner the better.	3
Post Public Meeting - Online Survey Comments Collected By Chamber of Commerce	
Date "January 2013"	
Number of Participants 9	
Participant Comments	
<i>AT Corridor</i>	<i>Number of Responses</i>
Concerns on the closure of the hospital exit ramp as it is very highly used. Concern on the affect it will have on local businesses.	3
Positive feedback on overall Highway 1 upgrades, concerns on timeline.	2
Suggests removing left hand turns and traffic lights at the intersection and adding off ramp from Highway 1 to Redcliff Drive SW.	1
<i>SW Connector</i>	<i>Number of Responses</i>
South Boundary Road to Highway 3 is a good idea, Option 2 (middle alignment) is the most ideal.	1
Email Information from Contact with the Public and Private Property Owners	
Date "January 2013"	
Number of Participants 4	
Participant Comments	
<i>AT Corridor</i>	<i>Number of Responses</i>
Concerns with making Bomford Crescent a one way (eastbound) access as it will take out the one and only street exit for businesses.	2
Safety concerns with respect to access for ambulance and fire services.	1
Concern on the 16 Street and Highway 1 intersection, suggest possibility to divert large truck traffic onto Township Road 120.	1
Museum land property currently owned by new owners, portion associated with Bomford is no longer a roadway.	
<i>SW Connector</i>	<i>Number of Responses</i>
Unsure of the need for the 3 options for SW Connector.	1
A landowner west of Seven Persons Creek was concerned with Option 2 severing his parcel of land & making development difficult	