BLACK DIAMOND

TRANSPORTATION STUDY

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Southern Region

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Executive Summary

Background

The Town of Black Diamond (Town) expects future developments to take place within the 10, 20 and 30 year horizons in order to cope with the Town's growth and needs. These developments are expected to generate trips which would impact the highway network within the Town. Alberta Transportation (AT) proposed to conduct an in-house Transportation Study in order to identify necessary upgrades to intersections along Highway 7 and Highway 22 within the Town. 11 intersections were identified for this study where the Town performed Traffic Counts at the following locations listed below,

1. Hwy 7 and Range Road 23
2. Hwy 7 and 6th Street East
3. Hwy 7 and 3rd Street East
4. Hwy 7 and 1st Street East
5. Hwy 7 and Hwy 22
6. Hwy 22 and 1st Street West
7. Hwy 22 and 3rd Street West
8. Hwy 22 and 1st Avenue South
9. Hwy 22 and 2nd Avenue South
10. Hwy 22 and 4th Avenue South
11. Hwy 22 and Willow Ridge Boulevard

Identifying the necessary upgrades will allow the Town to plan for the construction and financing of these upgrades. It will also give the Town, the Province, and developers some long-term certainty of the future transportation network to accommodate present and future needs.

Key Findings

Background Traffic Conditions

A traffic analysis was conducted using Synchro on the existing 2014 traffic volumes and the only intersection that is not meeting acceptable LOS is the intersection of Hwy 7 and Hwy 22 in the Town's core. The intersection warranted signalization which would improve LOS, however the lack of space around the intersection due to the existing Town infrastructure restricts the installation of a conventional traffic signal. It was suggested that an innovative method of "stringing up" the traffic signals should be looked at further by a Consultant who specializes in traffic signal infrastructure design.

A 2.5% linear growth was used to forecast the background conditions without any development impact in the 10, 20, 30 year horizons. In the 10 year horizon most intersections are operating at an acceptable LOS, the intersection that requires attention is Hwy 7 and 3rd Street East, a Type IVc intersection

treatment would be needed in order to increase the through movement capacity of the westbound and eastbound traffic so that the minor streets would have acceptable gap opportunities to make their turn movements. The 20 year horizon analysis shows that Hwy 7 and 3rd St. West and Hwy 7 and 3rd St. East both warrant signalization. A Type IVc intersection treatment is needed for the intersection of Hwy 7 and 4th Ave. South. The intersection of Hwy 7 and Hwy 22 also requires right turn bays in all legs of the intersection to accommodate the increase of traffic entering and exiting the Town core. This can be accommodated by simply limiting the on street parking away from the intersection and adding line makrings. In the 30 year horizon removing on-street parking between Hwy 22 and 1st St. West to Hwy 7 and 1st St. East is vital to increase the capacity at the centre of the Town. The intersection of Hwy 22 and 4th Ave. South warrants traffic signals. The table blow summarizes the upgrades required in table format.

With increasing traffic volume over the 10, 20 and 30 year horizons, it was found that eastbound and westbound traffic capacity as you enter the Town core would need to be increased to meet through traffic volume. Some of the approaches that do not meet acceptable LOS are approaches from a minor road turning into a major road. It is expected that these motorist will either wait for an acceptable gap to make their turn or revise their route to meet their needs. Table 1 below summarizes the required upgrades to accommodate the increase in traffic volume in the 10, 20, 30 year background conditions.

Background Traffic Conditions		
Horizon	Intersection	Upgrades Required
10 Year	Hwy 7 & 3rd St. East	• Type IVc intersection treatment
20 Year	Hwy 7 & 3rd St. East	• Traffic Signal
	Hwy 22 & 3rd St. West	• Traffic Signal
	Hwy 7 & Hwy 22	• All Directions – Right Turn Bays
	Hwy 22 & 4th Ave South	• Type IVc intersection treatment
30 Year	Hwy 7 and Hwy 22	• Removing on-street parking between Hwy 22 and 1st St. West to Hwy 7 and 1st St. East and pavement marking revisions
	Hwy 22 and 4 Ave. South	• Traffic Signal

Table 1: Upgrade Requirements for Background Conditions

Development Impact

Traffic volumes were forecasted in the 10, 20, 30 year horizons with expected developments to progress in Town. Trips were generated using the Trip Generation Manual. Development within the Town is to progress on the east side of Town as shown. At the 10 Year Horizon the intersections greatly impacted are, 3rd St. East and 6th St. East along Highway 7, with 3rd St. East warranting signalization. Hwy 7 and Hwy 22 will also require an eastbound left turn bay and a northbound right turn bay to meet the increased traffic volume in the Town's downtown core. It is recommended that the 6 St. East road be built and maintained by the Town. It would be ideal if 6th St. East extends all the way south to connect to 4th Ave South, as this will help alleviate traffic from the Town's downtown core and improve traffic flow by providing an alternate route through 6th Street East as shown in Figure 1.

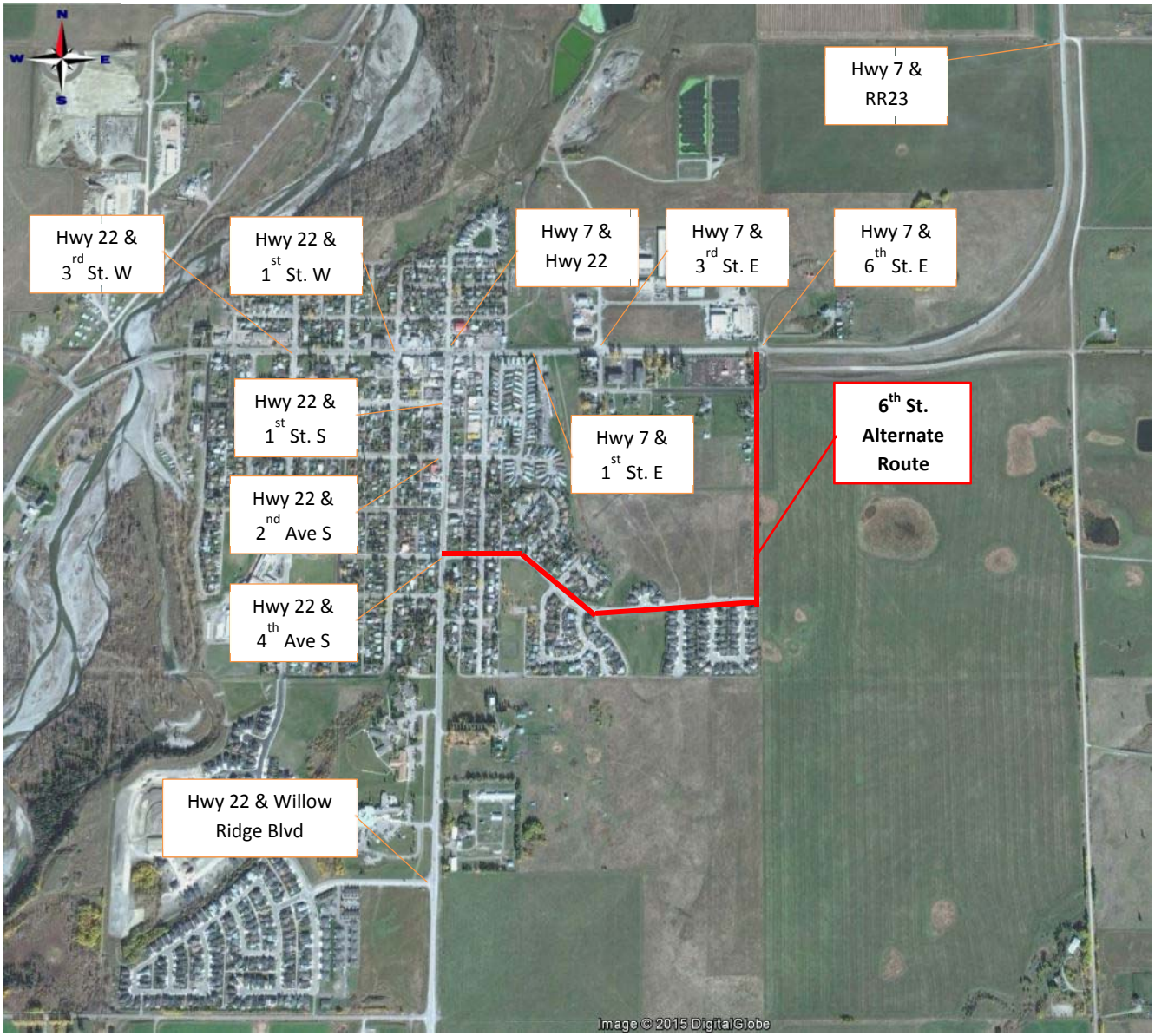


Figure 1: Proposed Alternate 6 Street East Route

At the 20 Year Horizon, development is expected to more than double the 10 Year Horizon development. 6th St. East along Highway 7 will be significantly impacted as it is the only gateway to the development. It is recommended that RR 23 be built and maintained by the Town to provide an alternate access to and from the development. It would be ideal if this road extended all the way south as a collector standard to the Willow Ridge Blvd intersection on Hwy 22, to provide an alternate route as shown in Figure 2. If built properly to accommodate commercial trucks, it could serve as an alternate route for commercial heavy vehicles commuting east, which would relieve the movement of eastbound commercial heavy vehicle traffic within the Town. This route would provide a more ideal route for commercial heavy vehicles because it would impact less residential development compared to using the 6th St. East route for commercial heavy vehicles.

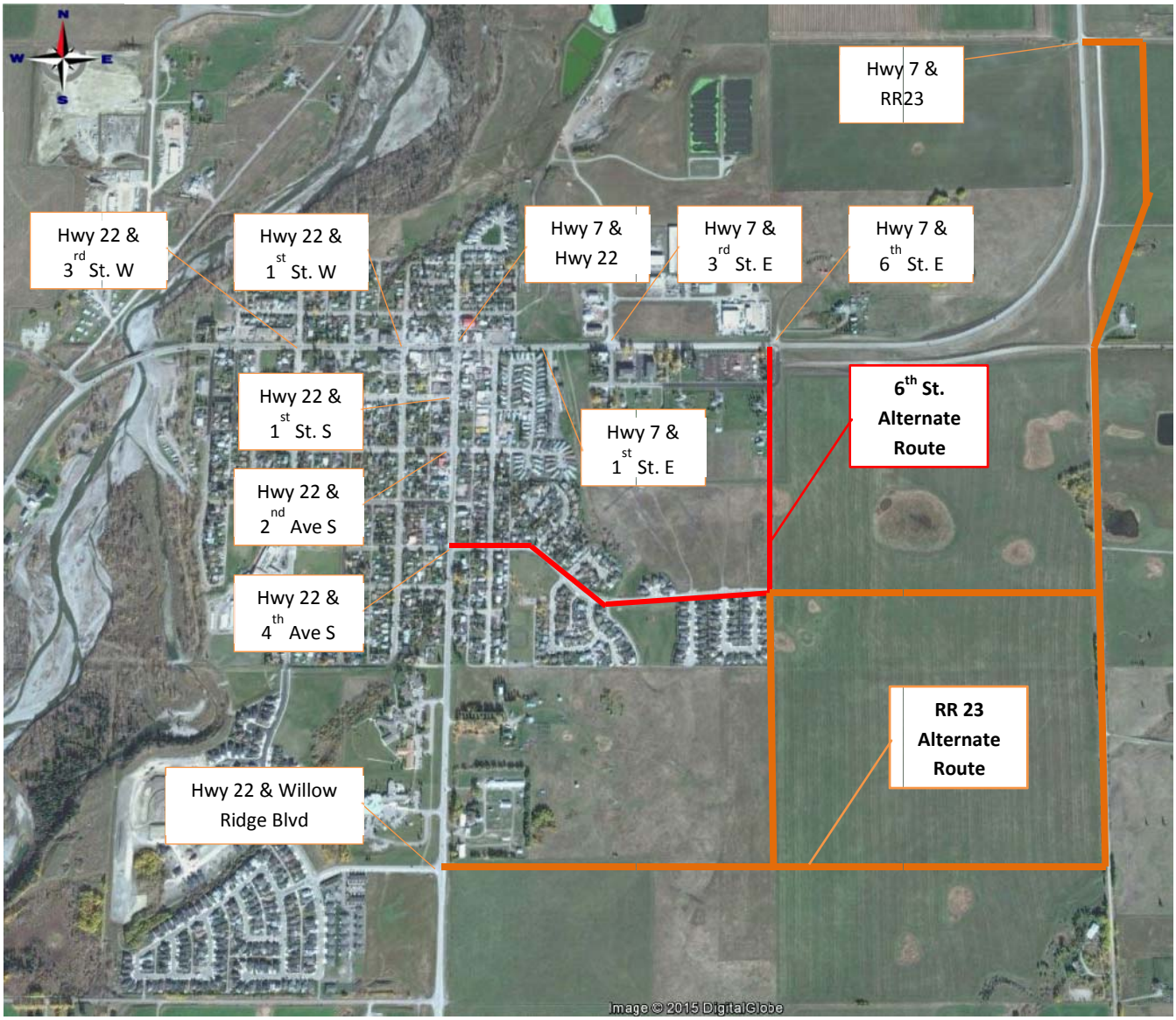


Figure 2: Proposed Alternate Routes in the 20 Year Development Horizon

It was determined that at the 30 Year Horizon development phase, the upgrades required to the roadway infrastructure was deemed not feasible as it requires significant land space which would adversely impact the Town's existing building infrastructure. It is possible that a bypass of the Town would need to be implemented to maintain a high level of service on the highway. This horizon may be longer if development does not proceed as expected.

Table 2 below summarizes the expected upgrades required with each horizon as development progresses.

Development Impact Traffic Conditions		
Horizon	Intersection	Upgrades Required
10 Year	Hwy 7 & 6th St. East	• Traffic Signal
	Hwy 7 & 3rd St. E	• Traffic Signal
	Hwy 7 & Hwy 22	• Westbound – Left Turn Bay • Northbound – Right Turn Bay
	Hwy 7 & 3rd St. W	• Traffic Signals
20 Year	Hwy 7 & RR23	• Westbound – Channelized Free Right Turn • Northbound / Southbound – Twinning
	Hwy 7 & 6th St. East	• Eastbound / Westbound – Twinning • Northbound – Channelized Free Right Turn
	Hwy 22 & 3rd St. W	• Eastbound / Westbound – Twinning
	Hwy 7 & Hwy 22	• All Directions – Twinning
	Hwy 22 & 1st St. West	• Eastbound / Westbound – Twinning
	Hwy 22 & 3rd St. West	• Eastbound / Westbound – Twinning
	Hwy 22 & 4th Ave South	• Traffic Signals
30 Year	Hwy 7 & RR23	• Traffic Signals • Southbound – Dual Left Turns
	Hwy 7 & 6th St. East	• Westbound – Dual Left Turns • Eastbound – Left Turn Bay • Northbound / Southbound – Twinning
	Hwy 7 & Hwy 22	• Westbound – Left Turn Bay • Eastbound / Northbound – Dual Left Turns • Eastbound – Channelized Free Right Turn
	Hwy 22 & 1st St. West	• Eastbound – Left Turn Bay
	Hwy 22 & 1st Ave. South	• Southbound / Northbound - Twinning
	Hwy 22 & 2nd Ave. South	• Southbound / Northbound – Twinning
	Hwy 22 & 4th Ave. South	• Eastbound / Westbound – Twinning • Northbound / Southbound – Twinning • Southbound – Left Turn Bay
	Hwy 22 & Willow Ridge Blvd.	• All Directions - Twinning

Table 2: Upgrade Requirements for Traffic Conditions Impacted by Development

1.0 INTRODUCTION

1.1 Purpose

This report was prepared by Alberta Transportation (AT) in response to a request from the Town of Black Diamond (the Town) in regards to conducting a transportation study to identify necessary upgrades to intersections along Highways 7 and 22 within the Town. These upgrades are necessary to accommodate the additional traffic at these intersections as a result of increased traffic volumes on the highways, new development within the Town and to accommodate future developments. Identifying the necessary upgrades will allow the Town to plan for the construction and financing of these upgrades. It will also give the Town, the Province, and developers some long-term certainty of the future transportation network to accommodate present and future needs. This Transportation study included safety, traffic and operational analysis.

1.2 Site Description

The Town of Black Diamond is located south of Calgary, 18.1km West of the Town of Okotoks. The Town of Turner Valley is approximately 3.1 km west of the Town. As shown in Figure 3, Highway 7 runs east of the town where it intersects with Highway 22 which runs west and south of the town. Highway 22 is a Level 2 highway which accommodates the intra-provincial movement of goods, people and services. This roadway typically serves longer trip lengths. Highway 7:08 is a Level 3 highway that carry traffic from major generators such as communities and developments with shorter travel distances.

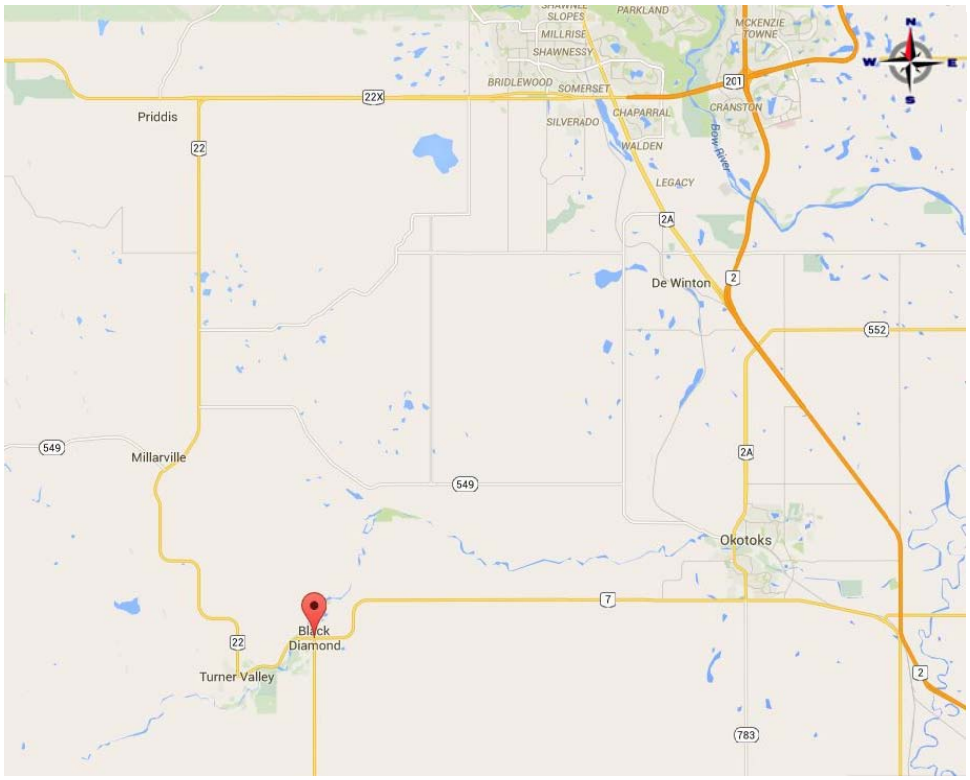


Figure 3: Location of the Town of Black Diamond – Google Map

1.3 Town Background

The Town of Black Diamond is a small town community with a population of 2,474. It is a closely knit community and home to many talented artists and musicians. Together with the sister town, Turner Valley, the Town holds several events such as the Diamond Valley Parade, a Canada Celebration and the Diamond Valley Christmas Market and Light-up in December. There are several amenities within the Town such as the Oilfields General Hospital, several local eateries and retail stores, and schools accommodating K to 12 , just to name a few. The Town receives a daily average traffic of 5,000 to 10,000 vehicles travelling through. The following intersections on Highway 7:08 and Highway 22:12 were reviewed as shown in Figure 4.

Figure 4: Intersections Reviewed in the Transportation Study

1.3 Proposed Development

The Kaiser Area Structural Plan (Kaiser ASP) that was developed in 1992 provided the framework for subsequent subdivision and development of an area of land within the Town's Municipal boundaries. This plan specifically outlined the future development of the southeast quadrant of the Town. There have been several amendments to the plan thus far in order to meet the evolving needs of the community. The current proposed development can be seen in Figure 5, shows three stages of future land use and infrastructure. The stages are separated by several years and comprise of commercial, residential and general business use. It can be seen that the proposed development will continue to take place in the SE quadrant of the town, adhering to the Kaiser ASP. The Town also expects to re-densify over the next 20 years as the Town re-develops as shown in Figure 6.

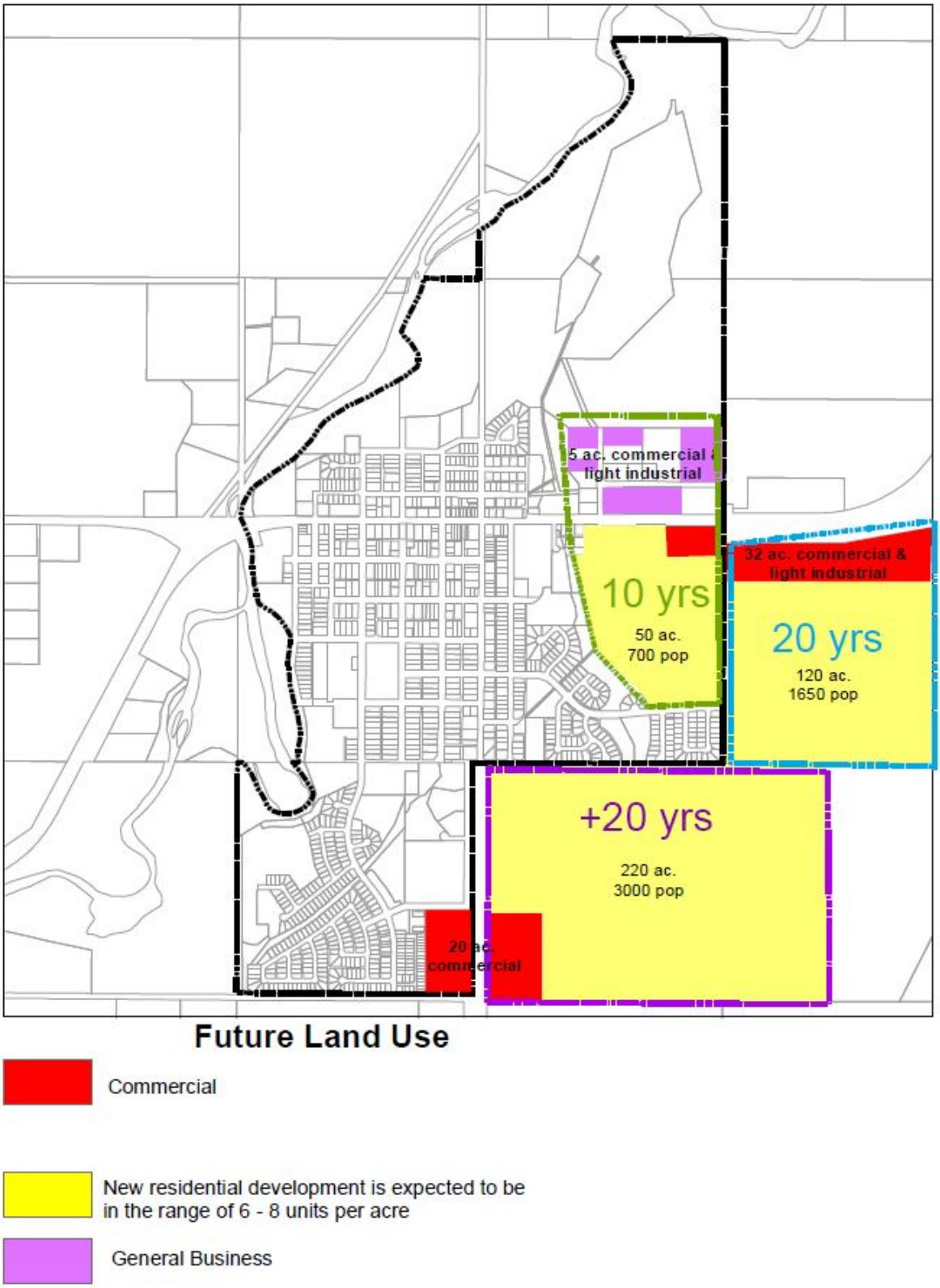


Figure 5: Town of Black Diamond Proposed Development Areas

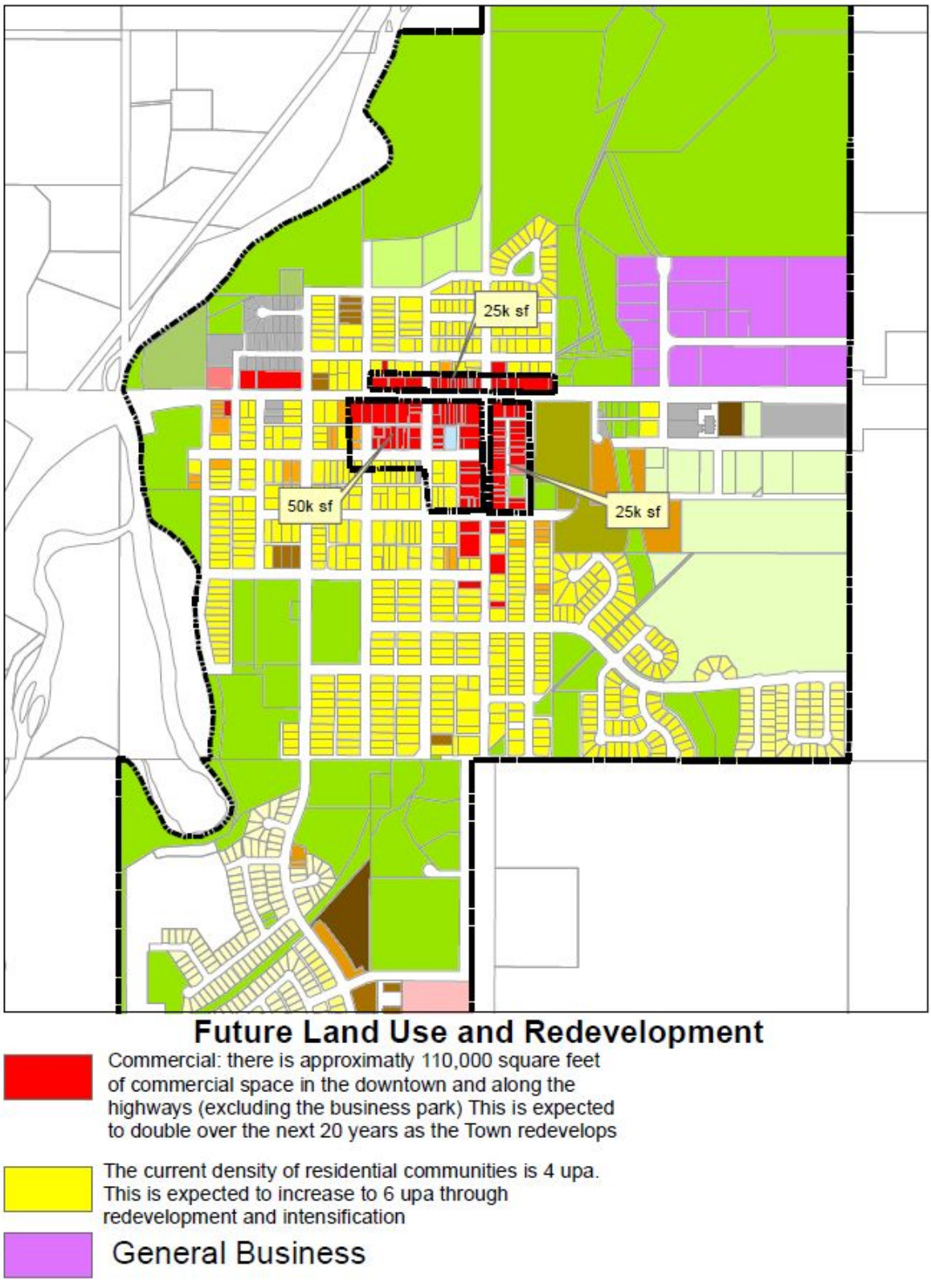


Figure 6: Town of Black Diamond Proposed Re-densification

1.4 Previous Study

A mini functional study for Highway 7 within the Town's limits was conducted by BSEI Municipal Consulting Engineers (BSEI) and Bunt & Associates in August 2006. The study was to undertake a cursory planning review of laning and right of way requirements. Their objectives were to confirm the long term (25 year) lane requirement, identify left turn requirement at the intersection with Highway 22 and provide recommendation for a reasonable road cross section based on the laning requirements. The recommendation was a four lane divided highway section with a raised median, left/right turn lanes and tapers at access intersection locations by 2031. The right/left turn lanes were implemented through the use of a painted median in which motorist were allowed to turn both ways. AT did not support this recommendation of a two way left turn lane due to safety concerns as well as not meeting AT standards. Figure 7 below shows the proposed two way left turn lane.

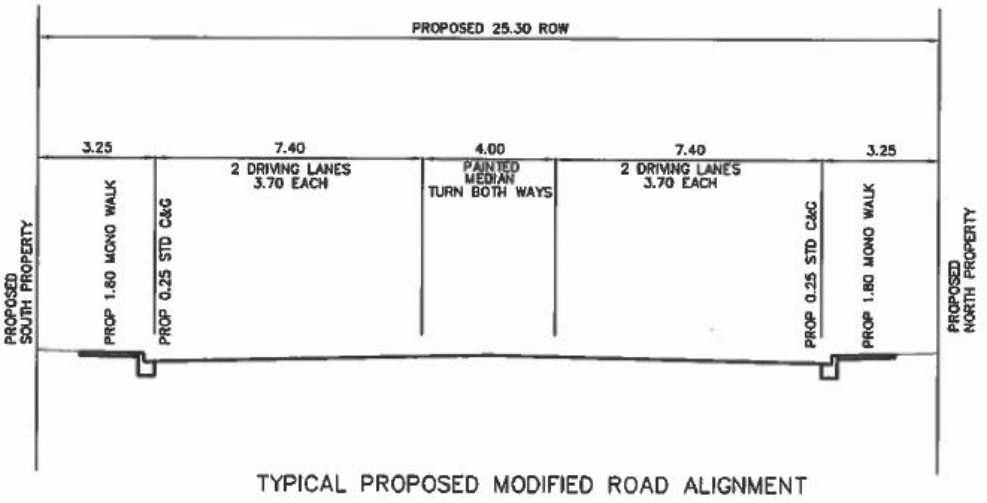


Figure 7: BSEI Proposed 4-Laned Section with Two-way Left Turns

2.0 METHODOLOGY

The methodology used to complete this study is summarized in the following subsections.

2.1 Safety Analysis

Using the AT's Network Expansion Support System (NESS), an application designed to support department staff in managing roadway infrastructure and network expansion needs. NESS collects data on collisions that have occurred near or at the intersection and computes a total collision rate measured as the total number of collisions occurring at the intersection per 100 million vehicles entering the intersection site over a 5 year period. A Benchmark (BM) is used as a threshold to compare the actual and the expected rate. This is determined using the average number of total collisions plus one standard deviation for intersections having similar volumes. If the actual rate were to be significantly higher than what was expected then further investigation would have to be conducted. Using the data that NESS collects, we are able to determine collision patterns and if intervention is required to reduce the number of collisions.

2.2 Establish Traffic Volumes

AT requested the Town to conduct traffic counts on the intersections of interest along Highway 7 and Highway 22 within the Town limits as well as the intersection on Highway 7 at Range Road 23. Traffic counts were conducted in March, October and December 2014 during weekdays in the probable peak hours in the morning from 7:00 – 9:00 am and in the afternoon from 4:00 – 6:00 pm. A template was provided by AT for the Town to use. These traffic counts are found in the Appendix A. Turning Movement Diagrams were generated based on these traffic counts which can be found in the Appendix B.

2.3 Establish 100th Highest Hour Estimates

The 100th highest hour estimates were converted from the peak hours from the traffic counts conducted by the Town. The nearest Automated Traffic Recorders (ATR) was used to determine the ratios required to convert to 100th highest hour. In order to get an accurate representation of the traffic volume at each intersection, ATR 50070880 was used for intersections East or West of Highway 7 and 22 and ATR 60221260 was used for intersections South of Highway 7 and 22.

For intersections East or West of Highway 7 and Highway 22, a calculated ratio of 1.896 and 1.048 were used for the morning and afternoon peak hours. For intersections South of Highway 7 and 22, a calculated ratio of 2.165 and 1.333 were used for the morning and afternoon peak hours.

See Appendix # for a copy of the ATR printouts and the methodology used to obtain the conversion ratios. These 100th highest hour estimates were put into a Turning Movement Diagram (TMD) to better showcase the traffic volume at each intersection.

2.4 Projecting Traffic Volumes – 10, 20, 30

Using a linear growth model, traffic volumes were projected to 10, 20 and 30 years. It was determined that the growth rate used at the time of the study was 2.5%. See Appendix B for the turning movement diagrams of the projected traffic volumes.

2.5 Trip Generation due to developments

Trips were generated using the Trip Generation Manual 7th Edition published by the Institute of Transportation Engineers. A map was given by the Town which showed the forecasted development to take place in the next 10, 20 and 20 plus years. These trips were then distributed throughout the intersections of interest along Highway 7 and Highway 22 based on what the author considered reasonable at the time.

3.0 EXISTING CONDITIONS

3.1 Highway 7 and Range Road 23

The intersection of Highway 7:08 at Range Road 23 is located outside of the Town limits prior to the East entrance of the Town. Using Alberta Transportation's Linear Referencing System (LRS) the approximate centre of the intersection is located at LRS: 7:08 C1 2.247 and it is identified in TIMS as intersection 12521. This intersection is classified as a Type 1a at-grade t-intersection with a field access on the west side as shown in Appendix C. Highway 7:08 runs in a north-south direction and Range Road 23 runs in the east direction. Highway 7:08 at this area is that of a 2-lane highway with painted shoulders on each side. The posted speed limit on Highway 7 as you approach the intersection from the North and South is 100 km/h. A stop control sign is located on the east leg and there is no posted speed limit on the gravel road. See Figure 8 for a view of the intersection looking south.

Figure 8: Hwy 7 and RR 23 – Looking South

3.2 Highway 7 and 6th Street East

The intersection of Highway 7:08 at 6th Street is located in the North East quadrant within the Town and identified in TIMS as intersection 12520. Using Alberta Transportation's Linear Referencing System (LRS) the approximate centre of the intersection is located at LRS: 7:08 C1 0.829. This intersection is classified as a Type 1b at-grade intersection as shown in Appendix C. The posted speed limit on Highway 7 as you approach the intersection from the East and West is 70 km/h and 50 km/h respectively. A stop control sign is located on the south leg of the intersection, 6th Street is assumed have a speed limit of 50 km/h. An access exists on the north leg of the intersection that services a few residential houses. Highway 7 transitions from a 2 lane highway with painted shoulders as you approach the intersection and becomes a 4 lane unmarked roadway as you leave the intersection. On-street parking is evident as you travel further west into the Town. See Figure 9 for a view of the intersection looking west.

Figure 9: Hwy 7 and 6th Street East – Looking West

3.3 Highway 7 and 3rd Street East

The intersection of Highway 7:08 at 3rd Street is located in the North East quadrant within the Town and identified in TIMS as intersection 12519. Using Alberta Transportation's Linear Referencing System (LRS) the approximate centre of the intersection is situated at LRS: 7:08 C1 0.401. This intersection is classified as a Type 2b right angled intersection as shown in Appendix C. The posted speed limit on Highway 7 as you approach the intersection from both the East and West leg is 50 km/h. The posted speed limit on the South and North leg is 50 km/h, each with a stop control sign. Figure 8 below shows a view of the intersection looking west. Figure 10 shows a view of the intersection looking west.

Figure 10: Hwy 7 and 3rd Street East – Looking West

3.4 Highway 7 and 1st Street East

The intersection of Highway 7:08 and 1st Street is located east of the Town and identified in TIMS as intersection 12548. Using Alberta Transportation's LRS the approximate centre of the intersection is situated at LRS: 7:08 C1 0.100. This intersection is classified as a Type 2a t-intersection. The posted speed limit as you approach the intersection is 50km/h in all directions. A stop control sign is located at the south leg. Figure 11 shows a view of the intersection looking west.

Figure 11: Hwy 7 and 1st Street East – Looking West

3.5 Highway 7 and Highway 22

The intersection of Highway 7:08 and Highway 22:12 is located in the centre of the Town and identified in TIMS as intersection 1411. Using Alberta Transportation's Linear Referencing System (LRS) the approximate centre of the intersection is located at LRS: 7:08 C1 0.000. This intersection is classified as a Type 2c right angled intersection as shown in Appendix C. The posted speed limit is 50 km/h as you approach the intersection from all directions. A 4-Way stop sign is implemented at the intersection and painted pedestrian crossings are evident. Figure 12 shows a view of the intersection looking west.

Figure 12: Hwy 7 and Hwy 22 – Looking West

3.6 Highway 22:12 and 1st Street West

The intersection of Highway 22:12 and 1st Street is located West of the Town and identified in TIMS as intersection 9052. The approximate centre of the intersection is located at LRS: 22:12 C1 17.947. This intersection is classified as a Type 2c right angled intersection as shown in Appendix C. A pedestrian control exists on the north – south direction of the intersection, crossing Highway 22:12. The posted speed limit is 50km/h as you approach the intersection from all directions. Figure 13 below shows a view of the intersection looking west.

Figure 13 – Looking West: Hwy 22 and 1st Street West

3.7 Highway 22:12 and 3rd Street West

The intersection of Highway 22:12 and 3rd Street is located west of the Town and identified in TIMS as intersection 2579. The approximate centre of the intersection is located at LRS: 22:12 C1 18.215. This intersection is classified as a Type 2b right angle intersection as shown in Appendix C. A pedestrian control exists on the north-south direction of the intersection, crossing Highway 22:12. The posted speed limit is 50km/h as you approach the intersection from all directions. Figure 12 shows a view of the intersection looking west.

Figure 14: Hwy 22 and 3rd Street West – Looking West

3.8 Highway 22:12 and 1st Avenue South

The intersection of Highway 22:12 and 1st Ave is located south of the Town and identified in TIMS as intersection 4636. The approximate centre of the intersection is located at LRS 22:12 C1 17.680. The intersection is classified as a Type 2a t- intersection as shown in Appendix C. A pedestrian control exists on the south leg of the intersection crossing Highway 22:12. Posted speed limits are 50km/h in all directions. Figure 15 shows a view of the intersection looking south.

Figure 15: Hwy 22 and 1st Ave South – Looking South

3.9 Highway 22:12 and 2nd Avenue South

The intersection of Highway 22:12 and 4th Ave is located South of the Town and identified in TIMS as intersection 9051. The approximate centre of the intersection is located at LRS 22:12 C1 17.549. The intersection is classified as a Type 2b right angled intersection as shown in Appendix C. Posted speed limits are 50km/h in all directions. Figure 16 below shows a view of the intersection looking south.

Figure 16: Hwy 22 and 2nd Ave South – Looking South

3.11 Highway 22:12 and 4th Avenue South

The intersection of Highway 22:12 and 4th Ave is located South of the Town and identified in TIMS as intersection 2574. The approximate centre of the intersection is located at LRS 22:12 C1 17.298. The intersection is classified as a Type 2b right angled intersection as shown in Appendix C. A pedestrian control exists on the North leg of the intersection crossing Highway 22:12. Posted speed limits are 50km/h. Figure 17 shows a view of the intersection looking south.

Figure 17: Hwy 22 and 4th Ave South – Looking South

3.12 Highway 22:12 and Willow Ridge Blvd.

The intersection of Highway 22:12 and Willow Ridge Blvd is located at the South end of the Town and identified in TIMS as intersection 9045. The approximate centre of the intersection is located at LRS: 22:12 C1 16.517. It is classified as a Type 4d t-intersection with a stop control sign on the West leg. The posted speed limit as you approach the intersection is 50 km/h in all directions. As you keep travelling south, the speed limit increases to 70 km/h. Figure 18 below shows a view of the intersection looking south.

Figure 18: Hwy 22 and Willow Ridge Blvd – Looking South

4.0 SAFETY ANALYSIS

The latest accident collisions for the intersections were obtained from Alberta Transportation's Network Expansion Support System (NESS) over a five year period from 2008 – 2012. The findings are summarized in Table 1. The data reveals that there have been little to no collisions at the intersections and the Actual Collision Rate falls behind the Benchmark Collision Rate, hence there was no need to go further with the analysis.

Intersection	Collision Type				Collision Rate	
	Property Damage Only	Minor	Major	Fatal	Actual	Benchmark
Hwy 7 & RR23	0	0	0	0	0	62.3
Hwy 7 & 6th St. E	0	0	0	0	0	62.3
Hwy 7 & 3rd St. E	1	1	0	0	18.8	62.3
Hwy 7 & 1st St. E	1	1	0	0	18.8	62.3
Hwy 7 & Hwy 22	6	1	0	0	37.8	62.3
Hwy 22 & 1st St. W	0	0	0	0	0	64.2
Hwy 22 & 3rd St. W	0	0	0	0	0	64.2
Hwy 22 & 1st Ave. S	1	0	0	0	9.4	62.3
Hwy 22 & 2nd Ave. S	2	0	0	0	32.7	63.3
Hwy 22 & 4th Ave. S	0	0	0	0	0	63.3
Hwy 22 & Willow Ridge Blvd.	0	1	0	0	16.4	63.3

Table 3: Collision Statistics from 2008 – 2012

5.0 TRAFFIC VOLUMES

5.1 Existing Volumes

From the Turning Movement Diagrams (TMD) found in Appendix B, it can be seen that for intersections along Highway 7:08, a majority of the commuters are turning into Highway 7 and proceeding through, heading East or West. This traffic movement is most likely due to commuters exiting out of the Town. Commuters travelling west are likely commuting to travel to Turner Valley or connecting to Highway 22X from Highway 22. Commuters traveling east are likely commuting to Okotoks or connecting to Highway 2 to travel North to Calgary or South to High River.

The majority of the traffic of the intersections along Highway 22:12 running South of the Town are through traffic heading North or South, with Northbound traffic slightly higher than Southbound traffic. It can be seen that a majority of the local traffic movement are turning into Highway 22:12.

The traffic volumes in the afternoon peak hours are slightly higher than the traffic volumes on the morning peak hours, but the distribution of the traffic are virtually the same from the morning and the afternoon. The slight increase in afternoon traffic volumes can be attributed to visitors visiting the Town.

It is evident from the TMDs that the majority of the traffic of the Town relies heavily on the two provincial highways. Most of the movements seen are either through traffic along the highways or movements that enable the motorist to turn onto the highway.

Refer to Appendix E for traffic volumes at various horizons.

6.0 TRIP GENERATION

6.1 Future Land use and Infrastructure

Discussions with the Town were setup in order to determine the type of development expected over the next several years. During the discussions with the Town it was mentioned that the Town would like to see more multi-family residential dwellings such as townhouses and apartment buildings. They expect that with the increasing population as living dwellings are built, it would entice 'Big Box' stores such as Wal-Mart to construct a store to serve the population. Fast food chains such as Tim Hortons and McDonalds were also expected to be placed in town. Also with increasing population, the Town will require supplementary infrastructure such as schools and other facilities such as a Recreational Community Centre to meet the needs of the community.

Table 4 and 5 summarizes the estimation of Peak Hour Morning and Afternoon Trips expected at each stage of development. A more detailed table can be found in Appendix D.

Stage	Land Use	Units	AM Average Trip Generations per unit	AM Trips (Enter)	AM Trips (Exit)	Total
10 Years	Single-Family Detached Housing	350 Dwelling Units	0.77 / Dwelling (26% / 74%)	70	200	270
	General Light Industrial	10 Acres	7.96 / Acre (85% / 15%)	68	12	80
	Shopping Centre	214,000 Sq. Ft	1.03 / 1000 Sq. Ft (61% / 39%)	137	88	225
	Fast Food Restaurant with Drive-Thru	2703 Sq. Ft	53.11 (50% / 50%)	72	72	144
20 Years	Single-Family Detached Housing	630 Dwelling Units	0.77 / Dwelling (26% / 74%)	126	360	486
	Residential Condominium/Townhouse	210 Dwelling Units	0.44 / Dwelling (18% / 82%)	17	76	93
	General Light Industrial	16 Acres	7.96 / Acre (85% / 15%)	109	20	129
	Elementary School	75,000 Sq. Ft	4.69 / 1000 Sq. Ft (54% / 46%)	191	162	353
	Shopping Centre	175,000 Sq. Ft	1.03 / 1000 Sq. Ft (61% / 39%)	110	71	181
	General Office Building	175,000 Sq. Ft	1.55 / 1000 Sq. Ft (88% / 12%)	239	33	272
	North Downtown Specialty Retail Centre	25,000 Sq. Ft	6.84 / 1000 Sq. Ft (48% / 52%)	83	89	172
	Southwest Downtown Specialty Retail Centre	50,000 Sq. Ft	6.84 / 1000 Sq. Ft (48% / 52%)	165	178	343
	Southeast Downtown Specialty Retail Centre	25,000 Sq. Ft	6.84 / 1000 Sq. Ft (48% / 52%)	83	89	172
30 Years	Single-Family Detached Housing	1155 Dwelling Units	0.77 / Dwelling (26% / 74%)	232	659	891
	Residential Condominium/Townhouse	385 Dwelling Units	0.44 / Dwelling (18% / 82%)	31	140	171
	Middle School / Junior High	75,000 Sq. Ft	4.35 / 1000 Sq. Ft (55% / 45%)	180	148	328
	High School	100,000 Sq. Ft	3.06 / 1000 Sq. Ft (71% / 29%)	218	89	237
	Shopping Centre	175,000 Sq. Ft	1.03 / 1000 Sq. Ft (61%/ 39%)	110	71	181

	General Office Centre	175,000 Sq. Ft	1.55 / 1000 Sq. Ft (88% / 12%)	239	33	272
	Recreational Community Centre	131,000 Sq. Ft	2.69 / 1000 Sq. Ft (53% / 47%)	187	166	353

Table 4: AM Peak Hour Trip Generation

Stage	Land Use	Units	PM Average Trip Generations per Unit	PM Trips (Enter)	PM Trips (Exit)	Total
10 Years	Single-Family Detached Housing	350 Dwelling units	1.02 / Dwelling (64% / 36%)	229	129	358
	General Light Industrial	10 Acres	8.77 / Acre (30% / 70%)	27	62	89
	Shopping Centre	214,000 Sq. Ft	1.1 / 1000 Sq. Ft (48% / 52%)	115	125	240
	Fast Food Restaurant with Drive-Thru	2703 Sq. Ft	34.64/ 1000 Sq. Ft (52% / 48%)	49	46	95
20 Years	Single-Family Detached Housing	630 Dwelling units	1.02 / Dwelling (64% / 36%)	412	232	644
	Residential Condominium/Townhouse	210 Dwelling units	0.52 / Dwelling (64% / 36%)	71	40	111
	General Light Industrial	16 Acres	8.77 / Acre (30% / 70%)	43	99	142
	Elementary School	75,000 Sq. Ft	3.13 / 1000 Sq. Ft (43% /57 %)	102	134	236
	Shopping Centre	175,000 Sq. Ft	3.75 / 1000 Sq. Ft (48% / 52%)	314	341	655
	General Office Building	175,000 Sq. Ft	1.49 / 1000 Sq. Ft (17% / 83%)	45	216	261
	North Downtown Specialty Retail Centre	25,000 Sq. Ft	5.02 / 1000 Sq. Ft (56% / 44%)	71	56	127
	Southwest Downtown Specialty Retail Centre	50,000 Sq. Ft	5.02 / 1000 Sq. Ft (56% / 44%)	141	111	252
	Southeast Downtown Specialty Retail Centre	25,000 Sq. Ft	5.02 / 1000 Sq. Ft (56% / 44%)	71	56	127
30 Years	Single-Family Detached Housing	1155 Dwelling units	1.02 / Dwelling (64% / 36%)	755	425	1180
	Residential Condominium/Townhouse	385 Dwelling	0.52 / Dwelling (64% / 36%)	129	73	202

		units				
	Middle School / Junior High	75,000 Sq. Ft	2.52 / 1000 Sq. Ft (45% / 55%)	86	104	190
	High School	100,000 Sq. Ft	2.12 / 1000 Sq. Ft (31% / 69%)	66	147	213
	Shopping Centre	175,000 Sq. Ft	3.75 / 1000 Sq. Ft (48% / 52%)	314	341	655
	General Office Centre	175,000 Sq. Ft	1.49 / 1000 Sq. Ft (17% / 83%)	45	216	261
	Recreational Community Centre	131,000 Sq. Ft	2.39 / 1000 Sq. Ft (40% / 60%)	126	188	314

Table 5: PM Peak Hour Trip Generation

6.2 Trip Distribution

Trips were distributed using Engineering judgement. A vital factor to consider in the distribution of these trips is the geographical location of the Town. Calgary and Okotoks are located north and east respectively while High River is found southeast of the Town. It is expected that the majority of the non-local traffic in the Town will be concentrated on the east side of Town. Millarville and Turner Valley would contribute to the non-local traffic entering from the West side of the Town, while Longview would contribute to the non-local traffic entering from the South. As the Town develops providing more services, it is expected that there will be an increase in exchange of traffic entering and exiting the Town. As such the distribution assignments are found in the tables below. It was assumed that 10% of the distributed trips were to be local traffic at each stages of the development. Table 6 below summarizes the distribution assignment over the three stages of development. Appendix E shows the traffic volumes in each stage of development.

Stage	Direction	Assignment
10 Years	To / From the East on Highway 7	70%
	To / From the West on Highway 7	15%
	To / From the South on Highway 22	5%
	Local Traffic	10%
20 Years	To / From the East on Highway 7	70%
	To / From the West on Highway 7	15%
	To / From the South on Highway 22	5%
	Local Traffic	10%
30 Years	To / From the East on Highway 7	70%
	To / From the West on Highway 7	15%
	To / From the South on Highway 22	5%
	Local Traffic	10%

Table 6: Trip Generation Distribution

7.0 TRAFFIC CAPACITY ANALYSIS

Synchro, a macroscopic analysis and optimization traffic software was used to determine the Level of Service (LOS) for each intersection. The software supports the Highway Capacity Manual's methodology (2000 and 2010 methods) for determining capacity. Level of Service is a quantitative classification of a performance measure or measures that represents quality of service. The criteria for defining LOS for an intersection is based on the length of time the motorist waits at the intersection, known as "Average Control Delay (sec/veh)" and the Volume to Capacity ratio (v/c), a ratio of flow rate to capacity for a transportation facility. These two key parameters are widely used in the profession to assess the performance of an intersection.

The following tables represent the LOS criteria measures taken from the Highway Capacity Manual. The LOS criteria are different for the un-signalized and signalized intersections due to motorist perceptions differ among the transportation facility. Table 7 represents the LOS criteria for un-signalized intersections and Table 8 represents the LOS criteria for signalized intersections. Appendix F shows the results of the Synchro analysis. The acceptable limits under AT standard are a LOS D and a v/c < 0.9.

Control Delay (sec/veh)	LOS by Volume-to-Capacity Ratio
	v/c ≤ 1.0
0 – 10	A
> 10 – 15	B
> 15 – 25	C
> 25 – 35	D
> 35 – 50	E
>50	F

Table 7: LOS Criteria for Un-signalized Intersections

Control Delay (sec/veh)	LOS by Volume-to-Capacity Ratio
	v/c ≤ 1.0
≤ 10	A
> 10 – 20	B
> 20 – 35	C
> 35 – 55	D
> 55 – 80	E
>80	F

Table 8: LOS Criteria for Signalized Intersections

7.1 Background Traffic Capacity Analysis

To assess the impacts of the proposed development on the roadway infrastructure, it was first necessary to establish background traffic volumes without taking into consideration the trips generated from the developments. The estimation of traffic volumes is discussed in the previous sections of this report. The following sections describe the traffic operations of the infrastructure associated with the existing traffic volumes and the growth in traffic volumes in the next 10, 20, and 30 year horizons. Intersection upgrades were implemented to meet acceptable LOS and these upgrades were carried through to the next horizons.

7.1.1 2014 Background Traffic Conditions

Existing conditions show that most intersections are operating at an acceptable LOS based on the criteria presented Table 7, with the exception of the intersection of Hwy 7 and Hwy 22, which is operating at a LOS F in the Eastbound, Westbound and Northbound approach movements in the morning traffic as shown in Table 9 and LOS E in the Westbound approach movement in the afternoon as shown in Table 10.

Signalizing the intersection of Hwy 7 and Hwy 22 with an optimized cycle length would yield a better LOS for all movements in the morning and afternoon peak hour as shown in Table 11 and 12. However the existing infrastructure of Hwy 7 and Hwy 22 restricts the installation of normal traffic signals. The minimum space required to install traffic signals are not met due to the existing building infrastructure. It was proposed that an innovative method of stringing up the traffic signals would be a feasible option in order to signalize the intersection and improve LOS. The detailed design of this option is outside of the scope of this study and would have to be designed by a Consultant specialized in traffic signal infrastructure design.

2014 100th Highest Hour – Background AM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.00	0.21	0.00
	95% Queue	NA	0.1	0.0	0.0
Hwy 7 & 6th St. E	LOS	A	A	A	A
	v/c	0.00	0.01	NA	NA
	95% Queue	0.0	0.2	NA	NA
Hwy 7 & 3rd St. E	LOS	A	A	C	B
	v/c	0.06	0.00	0.07	0.11
	95% Queue	1.3	0.0	1.6	2.7
Hwy 7 & 1st St. E	LOS	A	A	B	NA
	v/c	0.27	0.00	0.13	NA
	95% Queue	0.0	0.0	3.3	NA
Hwy 7 & Hwy 22	LOS	F	F	F	C
	v/c	1.21	1.08	0.96	0.31
	95% Queue	NA	NA	NA	NA
Hwy 22 & 1st St. W	LOS	A	A	C	C
	v/c	0.02	0.02	0.10	0.02
	95% Queue	0.3	0.5	2.6	0.5
Hwy 22 & 3rd St. W	LOS	A	A	C	C
	v/c	0.03	0.03	0.40	0.11
	95% Queue	0.8	0.7	14.1	2.7
Hwy 22 & 1st Ave. S	LOS	A	NA	NA	A
	v/c	0.02	NA	NA	0.14
	95% Queue	0.6	NA	NA	0.0
Hwy 22 & 2nd Ave. S	LOS	B	B	A	A
	v/c	0.03	0.09	0.00	0.00
	95% Queue	0.8	2.2	0.0	0.0
Hwy 22 & 4th Ave. S	LOS	B	B	NA	A
	v/c	0.07	0.21	NA	0.03
	95% Queue	1.6	5.8	NA	0.6
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA	A	A
	v/c	0.15	NA	0.02	0.11
	95% Queue	3.9	NA	0.6	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 9: Traffic Capacity Analysis – 2014 100th Highest Hour AM Background Traffic Conditions

2014 100th Highest Hour – Background PM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	NA	A	A
	v/c	NA	NA	0.11	0.00
	95% Queue (m)	NA	NA	0.0	0.0
Hwy 7 & 6th St. E	LOS	A	A	B	NA
	v/c	0.00	0.00	0.02	NA
	95% Queue (m)	0.0	0.1	0.5	NA
Hwy 7 & 3rd St. E	LOS	A	A	B	B
	v/c	0.03	0.00	0.01	0.17
	95% Queue (m)	0.6	0.0	0.2	4.6
Hwy 7 & 1st St. E	LOS	A	A	B	NA
	v/c	0.19	0.04	0.08	NA
	95% Queue (m)	0.0	0.8	1.9	NA
Hwy 7 & Hwy 22	LOS	C	E	C	B
	v/c	0.61	0.88	0.49	0.14
	95% Queue (m)	NA	NA	NA	NA
Hwy 22 & 1st St. W	LOS	A	A	B	B
	v/c	0.01	0.02	0.06	0.02
	95% Queue (m)	0.2	0.5	1.5	0.5
Hwy 22 & 3rd St. W	LOS	A	A	C	C
	v/c	0.01	0.02	0.19	0.17
	95% Queue (m)	0.3	0.5	5.3	4.6
Hwy 22 & 1st Ave. S	LOS	B	A	A	NA
	v/c	0.04	0.01	0.11	NA
	95% Queue (m)	1.0	0.2	0.0	NA
Hwy 22 & 2nd Ave. S	LOS	B	B	A	A
	v/c	0.02	0.08	0.00	0.01
	95% Queue (m)	0.5	2.0	0.1	0.2
Hwy 22 & 4th Ave. S	LOS	C	B	A	A
	v/c	0.03	0.09	0.00	0.04
	95% Queue (m)	0.7	2.3	0.0	1.1
Hwy 22 & Willow Ridge Blvd.	LOS	NA	NA	A	A
	v/c	NA	NA	0.02	0.13
	95% Queue (m)	NA	NA	0.4	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 10: Traffic Capacity Analysis – 2014 100th Highest Hour PM Background Traffic Conditions

2014 100th Highest Hour – Background AM Traffic Conditions – Signalized					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & Hwy 22	LOS	C	C	C	A
	v/c	0.75	0.84	0.80	0.19
	95% Queue (m)	44.0	44.7	34.2	4.6

Table 11: Traffic Capacity Analysis – Highway 7 and Highway 22 Signalized – Background AM Traffic Conditions

2014 100th Highest Hour – Background PM Traffic Conditions – Signalized					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & Hwy 22	LOS	A	C	B	B
	v/c	0.48	0.81	0.67	0.17
	95% Queue (m)	34.4	92.0	34.2	10.0

Table 12: Traffic Capacity Analysis – Highway 7 and Highway 22 Signalized – Background PM Traffic Conditions

7.1.2 10 Year Horizon Background Traffic Conditions – 2024

Most of the intersections are operating at a LOS D or greater. The intersection of Highway 7 and 3rd Street East required a Type IVc intersection treatment in order to increase the through movement capacity of the westbound and eastbound traffic so that the minor street would have acceptable gap opportunities to make their turn movements. The results from the Traffic Capacity Analysis for the 10 Year Horizon Background Traffic Conditions are found in Tables 13 and 14.

Since the intersection of Hwy 7 and Hwy 22 warranted a signalization of the intersection in the existing conditions, this warrant was carried through to the 10 year horizon.

2024 – Background AM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.00	0.28	0.00
	95% Queue (m)	NA	0.1	0.0	0.0
Hwy 7 & 6th St. E	LOS	A	A	C	C
	v/c	0.00	0.01	0.01	0.07
	95% Queue (m)	0.0	0.2	0.2	1.6
Hwy 7 & 3rd St. E	LOS	A	A	D	B
	v/c	0.31	0.00	0.13	0.12
	95% Queue (m)	2.9	0.0	3.3	3.1
Hwy 7 & 1st St. E	LOS	A	A	B	NA
	v/c	0.34	0.00	0.19	NA
	95% Queue (m)	0.0	0.1	5.1	NA
Hwy 7 & Hwy 22	LOS	D	C	D	A
	v/c	0.95	0.80	0.96	0.23
	95% Queue (m)	69.1	55.9	58.6	10.3
Hwy 22 & 1st St. W	LOS	A	A	C	C
	v/c	0.02	0.03	0.18	0.03
	95% Queue (m)	0.5	0.7	4.8	0.8
Hwy 22 & 3rd St. W	LOS	A	A	D	D
	v/c	0.05	0.02	0.54	0.18
	95% Queue (m)	1.2	0.6	23.2	4.9
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.04	NA	0.01	0.17
	95% Queue (m)	1.0	NA	0.3	0.0
Hwy 22 & 2nd Ave. S	LOS	B	B	A	A
	v/c	0.06	0.08	0.00	0.00
	95% Queue (m)	0.6	1.9	0.0	0.0
Hwy 22 & 4th Ave. S	LOS	C	C	A	A
	v/c	0.12	0.33	0.00	0.03
	95% Queue (m)	3.0	10.8	0.1	0.8
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA	A	A
	v/c	0.22	NA	0.03	0.14
	95% Queue (m)	6.2	NA	0.7	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 13: Traffic Capacity Analysis – 2024 100th Highest Hour AM Background Traffic Conditions

2024 100th Highest Hour – PM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.00	0.14	0.00
	95% Queue (m)	NA	0.1	0.0	0.1
Hwy 7 & 6th St. E	LOS	A	A	C	NA
	v/c	0.00	0.00	0.03	NA
	95% Queue (m)	0.0	0.1	0.7	NA
Hwy 7 & 3rd St. E	LOS	A	A	C	C
	v/c	0.03	0.00	0.04	0.23
	95% Queue (m)	0.8	0.0	0.8	6.5
Hwy 7 & 1st St. E	LOS	A	A	B	NA
	v/c	0.27	0.05	0.13	NA
	95% Queue (m)	0.0	1.2	3.1	NA
Hwy 7 & Hwy 22	LOS	B	C	C	B
	v/c	0.56	0.86	0.77	0.19
	95% Queue (m)	51.2	116.4	60.3	13.3
Hwy 22 & 1st St. W	LOS	A	A	C	B
	v/c	0.01	0.03	0.09	0.03
	95% Queue (m)	0.3	0.6	2.4	0.7
Hwy 22 & 3rd St. W	LOS	A	A	C	C
	v/c	0.02	0.03	0.30	0.27
	95% Queue (m)	0.4	0.7	9.4	8.0
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.05	NA	0.01	0.13
	95% Queue (m)	1.2	NA	0.3	0.0
Hwy 22 & 2nd Ave. S	LOS	B	B	A	A
	v/c	0.03	0.10	0.01	0.01
	95% Queue (m)	0.8	2.5	0.2	0.2
Hwy 22 & 4th Ave. S	LOS	C	B	A	A
	v/c	0.05	0.12	0.01	0.06
	95% Queue (m)	1.2	3.0	0.2	1.4
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA	A	A
	v/c	0.09	NA	0.02	0.16
	95% Queue (m)	2.3	NA	0.5	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 14: Traffic Capacity Analysis – 2024 100th Highest Hour PM Background Traffic Conditions

7.1.3 20 Year Horizon Background Traffic Conditions – 2034

A majority of the intersections were operating at an acceptable LOS. There were some movements which did not meet acceptable LOS, these movements prompted the following upgrades in order to meet acceptable LOS as shown in Table 15 below.

The results from the Traffic Capacity Analysis for the 20 Year Horizon Background Traffic Conditions are found in Tables 16 and 17. Highway 7 and 4th Ave South has a LOS F due to the minor street left turn movements. Geometric upgrades were applied but it did not improve the LOS to an acceptable LOS. A Traffic Signal Warrant was conducted and it was found that the intersection did not warrant Traffic Signals. Traffic signals would be implemented when it is warranted.

Intersection	Upgrades Required – 2034 Background Traffic
Hwy 7 & 3rd St. East	• Traffic Signal
Hwy 22 & 3rd St. West	• Traffic Signal
Hwy 7 & Hwy 22	• All Directions – Right Turn Bays
Hwy 22 & 4th Ave South	• Type IVc intersection treatment

Table 15: Intersection Upgrades Required to Meet Acceptable LOS in the 2034 Background Traffic Conditions

2034 100th Highest Hour – AM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.01	0.33	0.00
	95% Queue (m)	NA	0.1	0.0	0.1
Hwy 7 & 6th St. E	LOS	A	A	C	C
	v/c	0.00	0.01	0.13	0.01
	95% Queue (m)	0.0	0.3	3.3	0.3
Hwy 7 & 3rd St. E	LOS	C	B	B	A
	v/c	0.92	0.53	0.06	0.20
	95% Queue (m)	133.2	49.5	6.6	9.0
Hwy 7 & 1st St. E	LOS	A	A	C	NA
	v/c	0.42	0.00	0.27	NA
	95% Queue (m)	0.0	0.1	8.2	NA
Hwy 7 & Hwy 22	LOS	C	D	D	A
	v/c	0.80	0.94	0.92	0.22
	95% Queue (m)	114.5	120.7	104.3	15.9
Hwy 22 & 1st St. W	LOS	A	A	D	D
	v/c	0.03	0.04	0.29	0.07
	95% Queue (m)	0.6	0.9	8.7	1.8
Hwy 22 & 3rd St. W	LOS	B	B	B	B
	v/c	0.62	0.80	0.55	0.12
	95% Queue (m)	59.1	114.1	29.6	8.3
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.05	NA	0.02	0.20
	95% Queue (m)	1.2	NA	0.4	0.0
Hwy 22 & 2nd Ave. S	LOS	C	C	A	A
	v/c	0.07	0.19	0.00	0.00
	95% Queue (m)	1.8	5.3	0.1	0.1
Hwy 22 & 4th Ave. S	LOS	F	D	A	A
	v/c	0.35	0.59	0.01	0.06
	95% Queue (m)	10.2	27.6	0.2	1.4
Hwy 22 & Willow Ridge Blvd.	LOS	C	NA	A	A
	v/c	0.30	NA	0.04	0.17
	95% Queue (m)	9.3	NA	0.9	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 16: Traffic Capacity Analysis – 2034 100th Highest Hour AM Background Traffic Conditions

2034 100th Highest Hour – PM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.00	0.17	0.00
	95% Queue (m)	NA	0.1	0.0	0.1
Hwy 7 & 6th St. E	LOS	A	A	C	C
	v/c	0.00	0.00	0.05	0.01
	95% Queue (m)	0.0	0.0	1.3	0.2
Hwy 7 & 3rd St. E	LOS	A	A	D	C
	v/c	0.05	0.00	0.06	0.33
	95% Queue (m)	1.1	0.0	1.4	10.6
Hwy 7 & 1st St. E	LOS	A	A	C	NA
	v/c	0.28	0.06	0.17	NA
	95% Queue (m)	0.0	1.4	4.6	NA
Hwy 7 & Hwy 22	LOS	A	D	C	B
	v/c	0.48	1.00	0.80	0.22
	95% Queue (m)	53.6	173.1	58	17.5
Hwy 22 & 1st St. W	LOS	A	A	C	C
	v/c	0.01	0.03	0.13	0.05
	95% Queue (m)	0.3	0.8	3.3	1.1
Hwy 22 & 3rd St. W	LOS	A	B	B	B
	v/c	0.53	0.69	0.30	0.25
	95% Queue (m)	31.8	46.1	14.8	13.7
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.07	NA	0.01	0.16
	95% Queue (m)	1.7	NA	0.3	0.0
Hwy 22 & 2nd Ave. S	LOS	B	B	A	A
	v/c	0.04	0.16	0.01	0.01
	95% Queue (m)	0.9	4.3	0.2	0.3
Hwy 22 & 4th Ave. S	LOS	C	B	A	A
	v/c	0.04	0.08	0.01	0.24
	95% Queue (m)	0.9	2.0	0.0	1.7
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA	A	A
	v/c	0.12	NA	0.03	0.19
	95% Queue (m)	3.2	NA	0.7	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 17: Traffic Capacity Analysis – 2034 100th Highest Hour PM Background Traffic Conditions

7.1.4 30 Year Horizon Background Traffic Conditions – 2044

With the increased traffic volume, a few intersection required intersection treatments in order to meet acceptable LOS. The following Table 18 summarizes the required upgrades for acceptable LOS.

Intersection	Upgrades Required – 2044 Background Traffic
Hwy 7 and Hwy 22	• Removing on-street parking between Hwy 22 and 1st St. West to Hwy 7 and 1st St. East
Hwy 22 and 4 Ave. South	• Traffic Signal

Table 18: Intersection Upgrades Required to Meet Acceptable LOS for the 2044 Background Conditions

Geometric upgrades were applied to the intersection of Hwy 7 and 6th East but improvements to the LOS did not change. Traffic signals were not warranted and would be implemented once it is warranted. The results from the Traffic Capacity Analysis for the 30 Year Horizon Background Traffic Conditions are found in Tables 19 and 20.

2044 100th Highest Hour – AM Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	C	A	A
	v/c	NA	0.01	0.43	0.00
	95% Queue (m)	NA	0.3	0.0	0.1
Hwy 7 & 6th St. E	LOS	A	A	E	C
	v/c	0.00	0.02	0.32	0.05
	95% Queue (m)	0.0	0.4	9.7	1.1
Hwy 7 & 3rd St. E	LOS	B	A	C	B
	v/c	0.86	0.59	0.22	0.46
	95% Queue (m)	116.8	48.8	9.8	12.3
Hwy 7 & 1st St. E	LOS	A	A	C	NA
	v/c	0.49	0.00	0.39	NA
	95% Queue (m)	0.0	0.1	13.4	NA
Hwy 7 & Hwy 22	LOS	A	C	C	B
	v/c	0.55	0.92	0.85	0.20
	95% Queue (m)	64.2	140.2	82.5	19.7
Hwy 22 & 1st St. W	LOS	A	A	D	D
	v/c	0.04	0.05	0.33	0.07
	95% Queue (m)	0.8	1.2	10.3	1.6
Hwy 22 & 3rd St. W	LOS	B	C	C	B
	v/c	0.66	0.88	0.70	0.15
	95% Queue (m)	77.0	168.6	45.0	11.2
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.07	NA	0.02	0.23
	95% Queue (m)	1.6	NA	0.5	0.0
Hwy 22 & 2nd Ave. S	LOS	D	C	A	A
	v/c	0.10	0.28	0.00	0.00
	95% Queue (m)	2.6	8.3	0.1	0.1

Hwy 22 & 4th Ave. S	LOS	B	B	A	A
	v/c	0.12	0.33	0.54	0.47
	95% Queue (m)	5.5	14.9	34.8	29.1
Hwy 22 & Willow Ridge Blvd.	LOS	C	NA	A	A
	v/c	0.42	NA	0.05	0.19
	95% Queue (m)	15.4	NA	1.1	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.				

Table 19: Traffic Capacity Analysis – 2044 100th Highest Hour AM Background Traffic Conditions

2044 100th Highest Hour – PM Background Traffic Conditions					
Intersection		Approach Movement			
		Eastbound	Westbound	Northbound	Southbound
Hwy 7 & RR23	LOS	NA	B	A	A
	v/c	NA	0.00	0.20	0.00
	95% Queue (m)	NA	0.1	0.0	0.1
Hwy 7 & 6th St. E	LOS	A	A	C	NA
	v/c	0.00	0.01	0.07	NA
	95% Queue (m)	0.0	0.1	1.7	NA
Hwy 7 & 3rd St. E	LOS	A	B	B	B
	v/c	0.50	0.72	0.04	0.38
	95% Queue (m)	32.0	58.7	4.2	15.2
Hwy 7 & 1st St. E	LOS	A	A	D	NA
	v/c	0.44	0.09	0.33	NA
	95% Queue (m)	0.0	2.2	10.6	NA
Hwy 7 & Hwy 22	LOS	A	C	C	B
	v/c	0.53	0.88	0.78	0.22
	95% Queue (m)	33.0	79.4	56.4	16.1
Hwy 22 & 1st St. W	LOS	A	A	D	C
	v/c	0.02	0.05	0.25	0.08
	95% Queue (m)	0.4	1.1	7.4	2.0
Hwy 22 & 3rd St. W	LOS	B	B	B	B
	v/c	0.74	0.77	0.39	0.32
	95% Queue (m)	70.6	74.2	18.9	17.6
Hwy 22 & 1st Ave. S	LOS	B	NA	A	A
	v/c	0.09	NA	0.02	0.19
	95% Queue (m)	2.2	NA	0.4	0.0
Hwy 22 & 2nd Ave. S	LOS	C	C	A	A
	v/c	0.07	0.23	0.01	0.01
	95% Queue (m)	1.6	6.6	0.2	0.3
Hwy 22 & 4th Ave. S	LOS	D	C	A	A
	v/c	0.10	0.22	0.00	0.09
	95% Queue (m)	2.5	6.1	0.0	2.1
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA	A	A
	v/c	0.16	NA	0.04	0.23
	95% Queue (m)	4.4	NA	0.8	0.0

Table 20: Traffic Capacity Analysis – 2044 100th Highest Hour PM Background Traffic Conditions

7.1.5 Summary of Background Traffic Conditions

A linear growth model with a 2.5% growth rate to project traffic volumes to 10, 20, 30 year horizons was used to project traffic volumes on the highway network. As the traffic volume increased with each 10 year horizons, intersection upgrades were required throughout the network in order to maintain an acceptable LOS.

Hwy 7 and Hwy 22 are heavily used as primary routes to get in and out of town. As you move towards the Town core, traffic volume becomes congested especially at the intersection of Hwy 7 and Hwy 22. Significant upgrades are required over the projected 10 year horizons in order to meet acceptable LOS in this particular intersection. In the current existing 2014 background conditions this Hwy 7 and 22 warrants signalization. However the lack of space restricts the installation of congenital traffic signals. An innovate method of “stringing up” the traffic signals should be reviewed and considered. As mentioned earlier in the study this method is beyond the scope of the study and requires further investigation by a Consultant if things were to proceed with the implementation of signalization.

The Town core will eventually require more capacity for through movement as 10 year horizons are reached. Four-laning the Town core by removing on street parking would resolve this capacity issue and improve traffic flow especially in the 30 Year horizon.

7.2 Traffic Capacity Analysis – Development Impact

7.2.1 2024 Development Impact – 10 Year Horizon

The 10 year development area is forecasted to occur just between 3rd St. East and 6th St. East as shown in Figure 3. The intersections directly impacted are the 3rd St. and 6th St. East along Hwy 7. It was assumed that the 6th St East road would be built and maintained by the Town.

Upgrades to the intersections were implemented in the traffic model as required to obtain an acceptable LOS as shown in Table 21. Based on the existing roadway infrastructure and the needs of the Town, the author implemented upgrades that would have the least impact to the Town's existing infrastructure.

The upgrades required are the signalization of Hwy 7 and 3rd St. East and Hwy 22 and 3rd St. West. It was found that Hwy 7 and Hwy 22 warranted signalization in the existing 2014 Background Traffic conditions, hence this upgrade was carried through. Roadway infrastructure upgrades were directed to the intersection of Hwy 7 and Hwy 22. In order to obtain acceptable LOS, the westbound approach requires a Left Turn Bay and the northbound approach requires Right Turn Bay. These could be accomplished by limiting on street parking and revising pavement markings. The turn bays would serve a majority of the traffic movements in and out of the Town's downtown core. The results from the Traffic Capacity Analysis for the 10 Year Horizon Development Impact are found in Tables 22 and 23.

Intersection	Upgrades Required – 2024 Development Impact
Hwy 7 & 6th St. East	• Traffic Signal
Hwy 7 & 3rd St. E	• Traffic Signal
Hwy 7 & Hwy 22	• Westbound – Left Turn Bay by limiting on street parking and revised pavement makings • Northbound – Right Turn Bay by limiting on street parking and revised pavement makings
Hwy 7 & 3rd St. W	• Traffic Signals

Table 21: Upgrades Required to Meet Acceptable LOS in the 2024 Development Impact

2024 Development Impact – AM Traffic Conditions							
Intersection		Approach Movement					
		Eastbound	Westbound		Northbound		Southbound
Hwy 7 & RR23	LOS	NA	C		A		A
	v/c	NA	0.01		0.44		0.00
	95% Queue (m)	NA	0.3		0.0		0.1
Hwy 7 & 6th St. E	LOS	B	B		B		B
	v/c	0.69	0.66		0.14		0.18
	95% Queue (m)	44.7	39.7		8.0		9.6
Hwy 7 & 3rd St. E	LOS	C	A		B		B
	v/c	0.94	0.55		0.32		0.36
	95% Queue (m)	145.9	48.2		15.0		16.6
Hwy 7 & 1st St. E	LOS	A	A		C		NA
	v/c	0.43	0.00		0.23		NA
	95% Queue (m)	0.0	0.1		17.4		NA
Hwy 7 & Hwy 22			WBL	WBT/R	NBT/L	NBR	
	LOS	C	B	B	C	A	B
	v/c	0.88	0.57	0.55	0.75	0.39	0.27
	95% Queue (m)	64.9	18.7	36.5	37.2	4.6	11.8
Hwy 22 & 1st St. W	LOS	A	A		D		D
	v/c	0.02	0.03		00.23		0.19
	95% Queue (m)	0.5	0.7		6.5		5.0
Hwy 22 & 3rd St. W	LOS	B	B		B		B
	v/c	0.62	0.75		0.47		0.16
	95% Queue (m)	51.2	69.7		24.1		11.1
Hwy 22 & 1st Ave. S	LOS	B	NA		A		A
	v/c	0.04	NA		0.01		0.19
	95% Queue (m)	1.0	NA		0.3		0.0
Hwy 22 & 2nd Ave. S	LOS	C	C		A		A
	v/c	0.05	0.14		0.00		0.00
	95% Queue (m)	1.1	3.6		0.0		0.0
Hwy 22 & 4th Ave. S	LOS	D	D		A		A
	v/c	0.23	0.50		0.01		0.05
	95% Queue (m)	6.5	20.6		0.1		1.2
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA		A		A
	v/c	0.23	NA		0.03		0.16
	95% Queue (m)	6.5	NA		0.8		0.0
*Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.						

Table 22: Traffic Capacity Analysis – 2024 Development Impact AM Traffic Conditions

2024 Development Impact – PM Traffic Conditions							
Intersection		Approach Movement					
		Eastbound	Westbound		Northbound		Southbound
Hwy 7 & RR23	LOS	NA	B		A		A
	v/c	NA	0.00		0.29		0.00
	95% Queue (m)	NA	0.0		0.0		0.1
Hwy 7 & 6th St. E	LOS	B	C		B		A
	v/c	0.48	0.82		0.02		0.25
	95% Queue (m)	38.4	76.9		3.9		17.8
Hwy 7 & 3rd St. E	LOS	B	C		B		C
	v/c	0.60	0.92		0.03		0.75
	95% Queue (m)	45.2	118.9		3.8		62.8
Hwy 7 & 1st St. E	LOS	A	A		C		NA
	v/c	0.30	0.05		0.13		NA
	95% Queue (m)	0.0	1.1		3.3		NA
Hwy 7 & Hwy 22			WBL	WBT/R	NBT/L	NBR	
	LOS	C	D	B	C	A	B
	v/c	0.95	0.91	0.76	0.64	0.37	0.26
	95% Queue (m)	69.3	36.9	56.1	34.8	5.1	13.7
Hwy 22 & 1st St. W	LOS	A	A		C		C
	v/c	0.01	0.03		0.12		0.04
	95% Queue (m)	0.3	0.7		3.1		1.0
Hwy 22 & 3rd St. W	LOS	B	C		A		B
	v/c	0.68	0.79		0.14		0.11
	95% Queue (m)	50.9	63.5		10.5		9.8
Hwy 22 & 1st Ave. S	LOS	B	NA		A		A
	v/c	0.06	NA		0.01		0.15
	95% Queue (m)	1.4	NA		0.3		0.0
Hwy 22 & 2nd Ave. S	LOS	B	B		A		A
	v/c	0.03	0.10		0.01		0.01
	95% Queue (m)	0.8	2.4		0.1		0.2
Hwy 22 & 4th Ave. S	LOS	C	C		A		A
	v/c	0.09	0.16		0.01		0.08
	95% Queue (m)	2.3	4.3		0.2		2.0
Hwy 22 & Willow Ridge Blvd.	LOS	B	NA		A		A
	v/c	0.10	NA		0.02		0.18
	95% Queue (m)	2.6	NA		0.6		0.0

Table 23: Traffic Capacity Analysis – 2024 Development Impact PM Traffic Conditions

7.2.2 2034 Development Impact – 20 Year Horizon

The 20 year development horizon is planned to be developed on the lands east of 6th St. East to the gravel road RR 23 as shown in Figure 3. The Town also expects that the core downtown of the Town to redevelop and intensify as the Town continues to grow as shown in Figure 4. The intersection significantly affected by this development is 6th St. East as it is the only entrance to the development coming from the East. It was assumed that RR 23 would be taken over and maintained by the Town, thus providing an alternate route to the proposed development.

Upgrades to the intersections were implemented in the traffic model as required to obtain an acceptable LOS. Based on the existing roadway infrastructure and the needs of the Town, the upgrades implemented would have the least impact to the Town's existing infrastructure. The upgrades are summarized in Table 24. Upgrades from the 10 Year Development Impact horizon were carried to the 20 Year horizon.

The upgrades required include the twinning of Hwy 7 inside the Town and outside the Town. The author recommends that by getting rid of on street parking and revising pavement markings, Hwy 7 within the Town limits would be able to transition into a 4-lane highway increasing capacity and providing a better LOS. Hwy 7 and 6th St. East and Hwy 22 and 4th Ave South intersections would need to be signalized as well. Hwy 7 and 6th St. East would also require a free channelized right turn in the Northbound approach.

It was found that the minor streets of the intersection of Highway 22 and 1st Street West were operating at a LOS F. Geometric upgrades were applied to the intersection but had little to no improvement on the LOS. Signalizing the intersection was not feasible as the nearest signalized intersection is approximately 128m away. Unfortunately there isn't much that can be done to improve the LOS. It is expected that motorist will either wait for an acceptable gap to make their turn or revise their route to meet their needs.

The intersection of Hwy 7 and Hwy 22 experiences a LOS E in the northbound direction. Further geometric upgrades cannot be applied without significantly impacting the surrounding existing infrastructure, It is assumed that motorist will likely take an alternate route or wait to make their turn movement.

With the forecasted development, it is imperative that the intersection of Hwy 7 and RR 23 be utilized in order to divert traffic from Hwy 7 and 6th St. East as well as divert traffic away from the Town's downtown core. By developing RR 23 into a collector standard, it would provide a majority of the access for the 20 Year development and by connecting it to 4th Ave. South it would also provide an alternate route to the Town. With the utilization of Hwy 7 and RR23, a channelized free right turn would be required in the westbound approach to accommodate the diverted traffic using this route to exit the Town specifically in the morning traffic commute. RR23 would also need to be realigned due to its close proximity to the intersection at Hwy 7.The results from the traffic capacity analysis can be found in Table 25 and 26.

Intersection	Upgrades Required – 2034 Development Impact
Hwy 7 & RR23	• Westbound – Channelized Free Right Turn • Northbound / Southbound – Twinning
Hwy 7 & 6th St. East	• Eastbound / Westbound – Twinning • Northbound – Channelized Free Right Turn
Hwy 22 & 3rd St. W	• Eastbound / Westbound – Twinning
Hwy 7 & Hwy 22	• All Directions – Twinning
Hwy 22 & 1st St. West	• Eastbound / Westbound – Twinning
Hwy 22 & 3rd St. West	• Eastbound / Westbound – Twinning
Hwy 22 & 4th Ave South	• Traffic Signals

Table 24: Upgrades Required to Meet Acceptable LOS in the 20 Year Horizon

2034 Development Impact – AM Traffic Conditions													
Intersection		Approach Movement											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Hwy 7 & RR23	LOS	NA	NA	NA	NA	NA	D	NA	A	A	C	A	NA
	v/c	NA	NA	NA	NA	NA	0.75	NA	0.44	0.22	0.72	0.72	NA
	95% Queue	NA	NA	NA	NA	NA	47.7	NA	0.0	0.0	45.1	45.1	NA
Hwy 7 & 6th St. E	LOS	B	B	B	C	C	C	D	D	C	C	C	C
	v/c	0.62	0.62	0.62	1.36	1.36	1.36	0.60	0.60	0.73	0.21	0.21	0.21
	95% Queue	68.3	68.3	68.3	139.6	139.6	139.6	44.2	44.2	59.7	15.4	15.4	15.4
Hwy 7 & 3rd St. E	LOS	C	C	C	A	A	A	B	B	B	B	B	B
	v/c	0.94	0.94	0.94	0.38	0.38	0.38	0.35	0.35	0.35	0.41	0.41	0.41
	95% Queue	112.0	112.0	112.0	31.1	31.1	31.1	17.4	17.4	17.4	19.3	19.3	19.3
Hwy 7 & 1st St. E	LOS	NA	A	A	A	A	NA	C	C	C	NA	NA	NA
	v/c	NA	0.48	0.28	0.11	0.19	NA	0.26	0.26	0.26	NA	NA	NA
	95% Queue	NA	0.0	0.0	2.7	2.7	NA	7.8	7.8	7.8	NA	NA	NA
Hwy 7 & Hwy 22	LOS	C	C	C	C	C	C	D	D	D	A	A	A
	v/c	0.97	0.97	0.97	1.80	1.80	1.80	0.94	0.94	0.94	0.35	0.35	0.35
	95% Queue	60.4	60.4	60.4	41.4	41.4	41.4	35.7	35.7	35.7	6.9	6.9	6.9
Hwy 22 & 1st St. W	LOS	A	A	A	A	A	A	E	E	E	F	F	F
	v/c	0.03	0.34	0.34	0.05	0.21	0.21	0.49	0.49	0.49	0.57	0.57	0.57
	95% Queue	0.7	0.7	0.0	1.3	1.3	0	18.5	18.5	18.5	19.9	19.9	19.9
Hwy 22 & 3rd St. W	LOS	B	B	B	B	B	B	A	A	A	A	A	A
	v/c	0.80	0.80	0.80	0.64	0.64	0.64	0.36	0.36	0.36	0.08	0.08	0.08
	95% Queue	60.6	60.6	60.6	33.0	33.0	33.0	18.8	18.8	18.8	6.2	6.2	6.2
Hwy 22 & 1st	LOS	B	NA	B	NA	NA	NA	A	A	NA	NA	A	A

Ave. S	v/c	0.06	NA	0.06	NA	NA	NA	0.02	0.02	NA	NA	0.14	0.07
	95% Queue	1.4	NA	1.4	NA	NA	NA	0.4	0.4	NA	NA	0.0	0.0
Hwy 22 & 2nd Ave. S	LOS	C	C	C	C	C	C	A	A	A	A	A	NA
	v/c	0.08	0.08	0.08	0.24	0.24	0.24	0.00	0.00	0.00	0.00	0.00	NA
	95% Queue	2.0	2.0	2.0	7.0	7.0	7.0	0.1	0.1	0.1	0.1	0.1	NA
Hwy 22 & 4th Ave. S	LOS	B	B	B	B	B	B	B	B	B	B	B	B
	v/c	0.11	0.11	0.11	0.57	0.57	0.57	0.66	0.66	0.66	0.59	0.59	0.59
	95% Queue	7.0	7.0	7.0	28.0	28.0	28.0	45.7	45.7	45.7	38.1	38.1	38.1
Hwy 22 & Willow Ridge Blvd.	LOS	D	D	D	NA	NA	NA	A	A	A	A	A	A
	v/c	0.47	0.47	0.47	NA	NA	NA	0.04	0.04	0.04	0.00	0.00	0.00
	95% Queue	17.8	17.8	17.8	NA	NA	NA	1.0	1.0	1.0	0.0	0.0	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.												

Table 25: Traffic Capacity Analysis – 2034 Development Impact AM Traffic Conditions

2034 Development Impact – PM Traffic Conditions													
Intersection		Approach Movement											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Hwy 7 & RR23	LOS	NA	NA	NA	NA	NA	B	NA	A	NA	C	A	NA
	v/c	NA	NA	NA	NA	NA	0.00	NA	0.27	NA	0.69	0.69	NA
	95% Queue	NA	NA	NA	NA	NA	0.0	NA	0.0	NA	41.4	42.4	NA
Hwy 7 & 6th St. E	LOS	A	A	A	C	C	C	D	D	A	C	C	C
	v/c	0.40	0.40	0.40	1.40	1.40	1.40	0.62	0.62	0.50	0.42	0.42	0.42
	95% Queue	27.8	27.8	27.8	108.8	108.8	108.8	49.9	49.9	17.5	27.3	27.3	27.3
Hwy 7 & 3rd St. E	LOS	C	C	C	D	D	D	A	A	A	A	A	A
	v/c	0.81	0.81	0.81	0.93	0.93	0.93	0.14	0.14	0.14	0.46	0.46	0.46
	95% Queue	56.5	56.5	56.5	62.7	62.7	62.7	6.0	6.0	6.0	24.8	24.8	24.8
Hwy 7 & 1st St. E	LOS	NA	A	A	A	A	NA	C	NA	C	NA	NA	NA
	v/c	NA	0.31	0.19	0.08	0.24	NA	0.21	NA	0.21	NA	NA	NA
	95% Queue	NA	0.0	0.0	2.0	2.0	NA	5.8	NA	5.8	NA	NA	NA
Hwy 7 & Hwy 22	LOS	B	B	B	D	D	D	E	E	E	B	B	B
	v/c	0.86	0.86	0.86	1.38	1.38	1.38	1.00	1.00	1.00	0.29	0.29	0.29
	95% Queue	67.8	67.8	67.8	68.4	68.4	68.4	46.8	46.8	46.8	10.6	10.6	10.6
Hwy 22 & 1st St. W	LOS	A	A	A	A	A	A	D	D	D	D	D	D
	v/c	0.02	0.27	0.27	0.05	0.20	0.20	0.25	0.25	0.25	0.10	0.10	0.10
	95% Queue	0.4	0.4	0.0	1.2	1.2	0.0	7.0	7.0	7.0	2.4	2.4	2.4
Hwy 22 & 3rd St. W	LOS	B	B	B	B	B	B	A	A	A	A	A	A
	v/c	0.73	0.73	0.73	0.57	0.57	0.57	0.17	0.17	0.17	0.14	0.14	0.14
	95% Queue	45.9	45.9	45.9	29.5	29.5	29.5	10.5	10.5	10.5	9.8	9.8	9.8
Hwy 22 & 1st Ave. S	LOS	B	NA	B	NA	NA	NA	A	A	NA	NA	A	A
	v/c	0.10	NA	0.10	NA	NA	NA	0.02	0.02	NA	NA	0.15	0.15
	95% Queue	2.6	NA	2.6	NA	NA	NA	0.4	0.4	NA	NA	0.0	0.0
Hwy 22 & 2nd Ave. S	LOS	B	B	B	C	C	C	A	A	A	A	A	A
	v/c	0.04	0.04	0.04	0.19	0.19	0.19	0.01	0.01	0.01	0.01	0.01	0.01
	95% Queue	1.0	1.0	1.0	5.1	5.1	5.1	0.2	0.2	0.2	0.3	0.3	0.3
Hwy 22 & 4th Ave. S	LOS	B	B	B	C	C	C	A	A	A	B	B	B
	v/c	0.08	0.08	0.08	0.62	0.62	0.62	0.46	0.46	0.46	0.69	0.69	0.69
	95% Queue	4.5	4.5	4.5	17.7	17.7	17.7	31.7	31.7	31.7	54.2	54.2	54.2
Hwy 22 & Willow Ridge Blvd.	LOS	C	NA	C	NA	NA	NA	A	A	A	A	A	A
	v/c	0.20	NA	0.20	NA	NA	NA	0.03	0.03	0.03	0.00	0.00	0.00
	95% Queue	5.5	NA	5.5	NA	NA	NA	0.8	0.8	0.8	0.0	0.0	0.0
Note	For traffic circles and all-way stops, the method does not define a queue, so none is shown.												

Table 26: Traffic Capacity Analysis – 2034 Development Impact PM Traffic Conditions

7.2.3 2044 Development Impact – 30 Year Horizon

The 30 year development horizon is planned to be developed on the lands south of 5th Ave. South as shown in Figure 3. Intersections along Hwy 7 East and Hwy 2 South would be greatly impacted as the key entrances to the development are the 6th St. East intersection along Hwy 7 and Willow Ridge Blvd intersection along Hwy 22.

The traffic growth due to the 30 Year horizon, brought about upgrades to the roadway infrastructure that was deemed not feasible, due to the land space necessary to implement these upgrades. The Town's existing building infrastructure along Hwy 7 and Hwy 22 would be significantly affected.

Nevertheless the 30 Year Horizon Development impact traffic analysis was conducted and upgrades to the intersections were implemented in the traffic model as required to obtain an acceptable LOS as shown in Table 27. Based on the existing roadway infrastructure and the needs of the Town, the author implemented upgrades that would have the least impact to the Town's existing infrastructure. Overall most intersections operated at an acceptable LOS. There were movements that did not meet the minimum LOS but these movements had significantly less traffic than their counterparts and upgrading the infrastructure for these movements were significantly not feasible. It is expected that motorists will adapt and revise their route to which allows them to reach their destination in the shortest amount of time.

It was identified that a local bypass route at RR23 connecting to the intersection of Hwy 22 and Willow Ridge Blvd. was necessary in making the transportation network operate at an acceptable LOS. This route was critical in diverting traffic away from the Town's downtown area as much as possible. If built properly to accommodate commercial trucks, it would relieve Hwy 7 and Hwy 22's eastbound heavy vehicle traffic within the Town and resolve the issue with turning movements of eastbound commercial trucks at the intersection of Hwy 7 and Hwy 22. Diverting traffic to this route would require further upgrades to the intersection of Hwy 7 and RR23. The intersection would have to be signalized and dual left turns would be needed to accommodate the traffic diverted to this route as shown in Figure 19.

Figure 19: Highway 7 and Range Road 23 Required Upgrades

Intersection	Upgrades Required – 2044 Development Impact
Hwy 7 & RR23	• Traffic Signals • Southbound – Dual Left Turns
Hwy 7 & 6th St. East	• Westbound – Dual Left Turns • Eastbound – Left Turn Bay • Northbound / Southbound – Twinning
Hwy 7 & Hwy 22	• Westbound – Left Turn Bay • Eastbound / Northbound – Dual Left Turns • Eastbound – Channelized Free Right Turn
Hwy 22 & 1st St. West	• Eastbound – Left Turn Bay
Hwy 22 & 1st Ave. South	• Southbound / Northbound - Twinning
Hwy 22 & 2nd Ave. South	• Southbound / Northbound – Twinning
Hwy 22 & 4th Ave. South	• Eastbound / Westbound – Twinning • Northbound / Southbound – Twinning • Southbound – Left Turn Bay
Hwy 22 & Willow Ridge Blvd.	• All Directions - Twinning

Table 27: Upgrades Required to Meet Acceptable LOS in the 2044 Development Impact

2044 Development Impact – AM Traffic Conditions													
Intersection		Approach Movement											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Hwy 7 & RR23	LOS	NA	NA	NA	NA	NA	A	NA	B	NA	D	A	NA
	v/c	NA	NA	NA	NA	NA	0.43	NA	0.84	NA	0.84	0.49	NA
	95% Queue	NA	NA	NA	NA	NA	0.0	NA	218.2	NA	83.3	0.0	NA
Hwy 7 & 6th St. E	LOS	C	B	B	C	D	A	C	C	A	D	C	C
	v/c	0.49	0.73	0.73	0.80	1.00	0.06	0.31	0.31	0.35	0.18	0.01	0.01
	95% Queue	13.8	105.3	105.3	38.6	273.0	2.7	25.6	25.6	0.0	16.7	0.0	0.0
Hwy 7 & 3rd St. E	LOS	D	D	D	A	A	A	D	D	D	B	B	B
	v/c	1.02	1.02	1.02	0.55	0.55	0.55	0.63	0.63	0.63	0.43	0.43	0.43
	95% Queue	81.1	81.1	81.1	78.2	78.2	78.2	18.3	18.3	18.3	16.5	16.5	16.5
Hwy 7 & 1st St. E	LOS	NA	A	A	A	A	NA	C	NA	C	NA	NA	NA
	v/c	NA	0.50	0.30	0.11	0.29	NA	0.39	NA	0.39	NA	NA	NA
	95% Queue	NA	0.0	0.0	2.9	2.9	NA	13.8	NA	13.8	NA	NA	NA
Hwy 7 & Hwy 22	LOS	C	D	B	E	B	B	E	A	A	C	C	C
	v/c	0.32	0.98	0.72	0.99	0.40	0.40	0.97	0.30	0.30	0.61	0.61	0.61
	95% Queue	16.3	100.0	11.7	44.3	36.8	36.8	47.7	4.5	4.5	21.4	21.4	21.4
Hwy 22 & 1st St. W	LOS	B	A	A	A	A	A	F	F	F	F	F	F
	v/c	0.05	0.51	0.31	0.08	0.35	0.35	0.64	0.64	0.64	0.65	0.65	0.65
	95% Queue	1.1	0.0	0.0	2.0	2.0	2.0	24.2	24.2	24.2	22.8	22.8	22.8
Hwy 22 & 3rd St. W	LOS	B	B	B	B	B	B	B	B	B	B	B	B
	v/c	0.84	0.84	0.84	0.75	0.75	0.75	0.55	0.55	0.55	0.13	0.13	0.13
	95% Queue	87.4	87.4	87.4	63.6	63.6	63.6	16.8	16.8	16.8	10.4	10.4	10.4
Hwy 22 & 1st Ave. S	LOS	C	NA	C	NA	NA	NA	A	A	NA	NA	A	A
	v/c	0.10	NA	0.10	NA	NA	NA	0.04	0.28	NA	NA	0.41	0.21
	95% Queue	2.6	NA	2.6	NA	NA	NA	0.9	0.9	NA	NA	0.0	0.0
Hwy 22 & 2nd Ave. S	LOS	E	E	E	E	E	E	A	A	A	A	A	A
	v/c	0.20	0.20	0.20	0.43	0.43	0.43	0.01	0.22	0.22	0.00	0.27	0.27
	95% Queue	5.4	5.4	5.4	15.0	15.0	15.0	0.1	0.1	0.0	0.1	0.1	0.1
Hwy 22 & 4th Ave. S	LOS	D	D	D	D	D	D	D	D	D	F	A	A
	v/c	0.20	0.20	0.20	0.76	0.76	0.76	0.86	0.86	0.86	1.10	0.41	0.41
	95% Queue	8.6	8.6	8.6	29.4	29.4	29.4	106.3	106.3	106.3	169.1	32.7	32.7
Hwy 22 & Willow Ridge Blvd.	LOS	B	B	B	A	A	A	B	B	B	A	A	A
	v/c	0.29	0.29	0.29	0.44	0.44	0.44	0.47	0.47	0.47	0.34	0.34	0.34
	95% Queue	8.5	8.5	8.5	10.7	10.7	10.7	33.3	33.3	33.3	22.3	22.3	22.3

Table 28: Traffic Capacity Analysis – 2044 Development Impact AM Traffic Conditions

2044 Development Impact – PM Traffic Conditions													
Intersection		Approach Movement											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Hwy 7 & RR23	LOS	NA	NA	NA	NA	NA	A	NA	B	NA	B	B	NA
	v/c	NA	NA	NA	NA	NA	0.11	NA	0.73	NA	0.73	0.73	NA
	95% Queue	NA	NA	NA	NA	NA	0.0	NA	73.6	NA	73.6	73.6	NA
Hwy 7 & 6th St. E	LOS	A	E	E	E	A	A	D	NA	NA	C	A	A
	v/c	0.04	1.02	1.02	1.01	0.51	0.51	0.71	NA	NA	0.29	0.09	0.09
	95% Queue	1.9	172.2	172.2	107.4	77.0	77.0	60.1	NA	NA	24.4	0.0	0.0
Hwy 7 & 3rd St. E	LOS	C	C	C	D	D	D	C	C	C	F	F	F
	v/c	0.89	0.89	0.89	1.00	1.00	1.00	0.31	0.31	0.31	1.14	1.14	1.14
	95% Queue	151.5	151.5	151.5	185.6	185.6	185.6	22.7	22.7	22.7	121.6	121.6	121.6
Hwy 7 & 1st St. E	LOS	NA	A	A	A	A	NA	D	NA	D	NA	NA	NA
	v/c	NA	0.62	0.35	0.16	0.47	NA	0.29	NA	0.29	NA	NA	NA
	95% Queue	NA	0.0	0.0	4.3	4.3	NA	8.9	NA	8.9	NA	NA	NA
Hwy 7 & Hwy 22	LOS	C	F	C	F	B	B	D	E	E	D	D	D
	v/c	0.25	1.08	0.84	1.11	0.43	0.43	0.85	1.64	1.64	0.55	0.55	0.55
	95% Queue	15.7	163.8	51.5	94.0	54.2	54.2	69.0	102.0	102.0	20.6	20.6	20.6
Hwy 22 & 1st St. W	LOS	A	A	A	A	A	A	F	F	F	F	F	F
	v/c	0.02	0.56	0.30	0.08	0.23	0.23	0.75	0.75	0.75	0.28	0.28	0.28
	95% Queue	0.6	0.0	0.0	1.9	1.9	0.0	26.8	26.8	26.8	7.5	7.5	7.5
Hwy 22 & 3rd St. W	LOS	C	C	C	A	A	A	B	B	B	B	B	B
	v/c	0.92	0.92	0.92	0.58	0.58	0.58	0.30	0.30	0.30	0.24	0.24	0.24
	95% Queue	140.7	140.7	140.7	38.7	38.7	38.7	21.0	21.0	21.0	18.9	18.9	18.9
Hwy 22 & 1st Ave. S	LOS	D	NA	D	NA	NA	NA	A	A	NA	NA	A	A
	v/c	0.24	NA	0.24	NA	NA	NA	0.05	0.50	NA	NA	0.51	0.26
	95% Queue	6.9	NA	6.9	NA	NA	NA	1.1	1.1	NA	NA	0.0	0.0
Hwy 22 & 2nd Ave. S	LOS	F	F	F	F	F	F	A	A	A	A	A	A
	v/c	0.28	0.28	0.28	0.65	0.65	0.65	0.02	0.38	0.38	0.02	0.38	0.38
	95% Queue	7.9	7.9	7.9	25.9	25.9	25.9	0.5	0.5	0.0	0.6	0.6	0.0
Hwy 22 & 4th Ave. S	LOS	C	C	C	B	B	B	B	B	B	B	A	A
	v/c	0.07	0.07	0.07	0.51	0.51	0.51	0.73	0.73	0.73	0.54	0.69	0.69
	95% Queue	3.3	3.3	3.3	10.4	10.4	10.4	66.3	66.3	66.3	9.3	48.1	48.1
Hwy 22 & Willow Ridge Blvd.	LOS	C	C	C	E	E	E	B	B	B	E	E	E
	v/c	0.21	0.21	0.21	1.27	1.27	1.27	0.36	0.36	0.36	1.76	1.76	1.76
	95% Queue	13.8	13.8	13.8	139.5	139.5	139.5	46.2	46.2	46.2	232.9	232.9	232.9

Table 29: Traffic Capacity Analysis – 2044 Development Impact PM Traffic Conditions

8.0 Conclusions and Recommendations

8.1 Background Traffic Volumes

A majority of the traffic volume primarily relies on Hwy 7 and Hwy 22. Analyzing the Town's existing traffic volume, it was found that the intersection not meeting the minimum LOS is the intersection of Hwy 7 and Hwy 22 with the eastbound, westbound and northbound approaches having a LOS F. Signalizing this intersection would improve LOS to LOS C for the three approaches. As mentioned earlier in the study, the lack of space due to existing Town infrastructure restricts the installation of conventional traffic signals. It was suggested that an innovated method of "stringing up" the traffic signals should be looked at in further detail.

Using a linear growth model with a 2.5% growth rate to project traffic volumes to 10, 20, 30 year horizons, it was found that most intersections are operating at an acceptable LOS. A majority of the approaches that do not meet acceptable LOS are approaches from a minor road turning into a major road. It is expected that these motorist will either wait for an acceptable gap to make their turn or revise their route to meet their needs.

With increasing traffic volume over the 10, 20 and 30 year horizons, it was found that eastbound and westbound traffic capacity as you enter the Town core would need to be increased to meet through entering and exiting the Town.

8.2 Traffic Volumes Impacted by Development

Development within the Town is to progress on the east side of Town as shown in Figure 3 and re-densification of the downtown core as shown in Figure 4. At the 10 Year Horizon the intersections greatly impacted are, 3rd St. East and 6th St. East along Highway 7, both warranting signalization. Hwy 7 and Hwy 22 will also require an eastbound left turn bay and a northbound right turn bay to meet the increased traffic volume in the Town's downtown core. It is recommended that the 6 St. East road be built and maintained by the Town. It would be ideal if 6th St. East extends all the way south to connect to 4th Ave South, as this will help alleviate traffic from the Town's downtown core and improve traffic flow by providing an alternate route as shown in Figure 18.

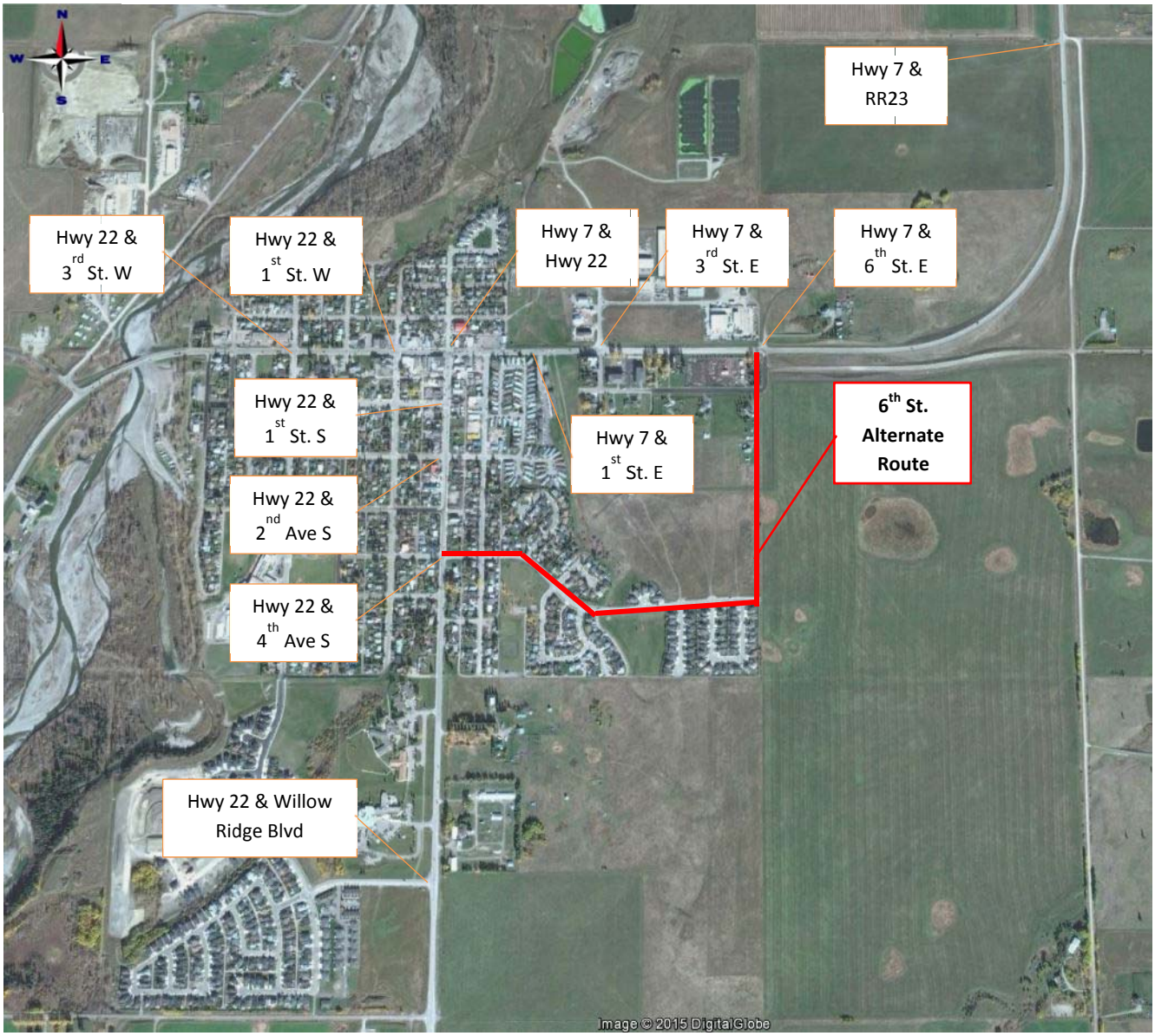


Figure 20: 10 Year Horizon Development Impact - 6 Street East Recommended Alternate Route

At the 20 Year Horizon, development is expected to more than double the 10 Year Horizon development. 6th St. East along Highway 7 will be significantly impacted as it is the only gateway to the development. It is recommended that RR 23 be built into a collector standard and maintained by the Town to provide an alternate access to and from the development. It would be ideal if this road extended all the way south to the Willow Ridge Blvd intersection on Hwy 22, to provide an alternate route as shown in Figure 19. If built properly to accommodate commercial trucks, it could serve as an alternate route for commercial heavy vehicles commuting east, which would relieve the movement of eastbound commercial heavy vehicle traffic within the Town. This route would be more ideal for commercial heavy vehicles because it would impact less residential development compared to using the 6th St. East route for commercial heavy vehicles.

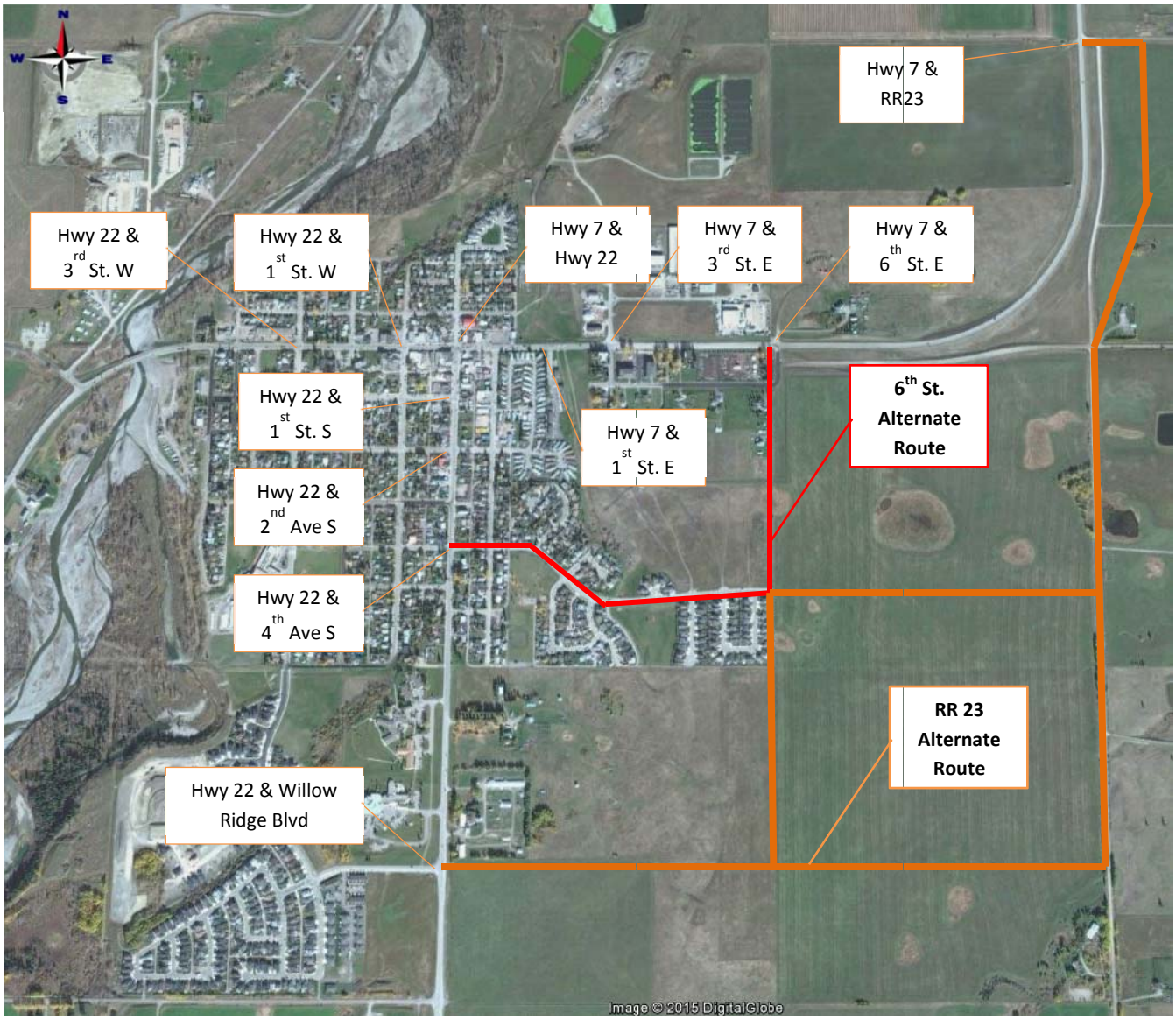


Figure 21: 20 Year Horizon Development Impact – Range Road 23 Recommended Alternate Route

It was determined that at the 30 Year Horizon development phase, the upgrades required to the roadway infrastructure was deemed not feasible as it requires significant land space which would adversely impact the Town's existing building infrastructure. A possible bypass of the Town would have to be implemented to maintain a high level of service on they highway. This horizon may be longer if development does not proceed as expected.

8.3 Proposed Cross Sections to Accommodate Future Volumes

With the increased traffic volume from the developments and re-densification of the Town core, Highway 7 and Highway 22 in the east/west direction would need to be four-laned in order to meet the forecasted traffic demands. Fortunately Alberta Transportation owns adequate Highway Right of Way to implement this twinning. Figure 22 shows a map of the roadway right of way through Town. Four laning of the paved roadway can be achieved by removing on-street parking and revising pavement markings. Proposed cross-sections as shown in Figures 23-37 make a comparison between the existing cross-section and what is proposed. A boulevard is implemented where necessary to provide a physical barrier between the pedestrians and the motorists. The proposed ultimate configurations are conceptual and further design detail would be required during the design stage if these upgrades are to be implemented.

Figure 22: Roadway Right of Way

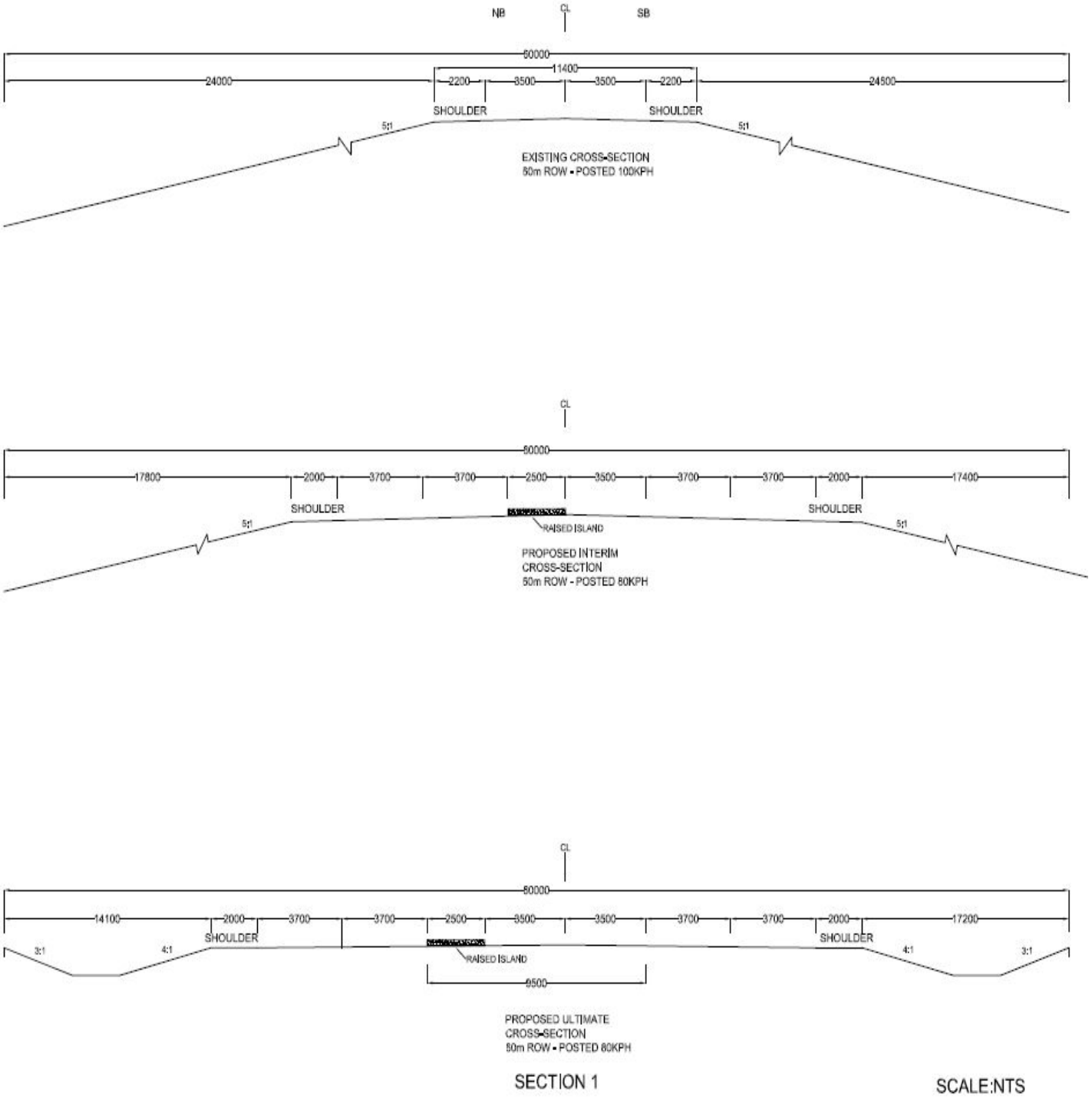


Figure 23: Proposed Cross Section 1 – Hwy 7 at RR 23

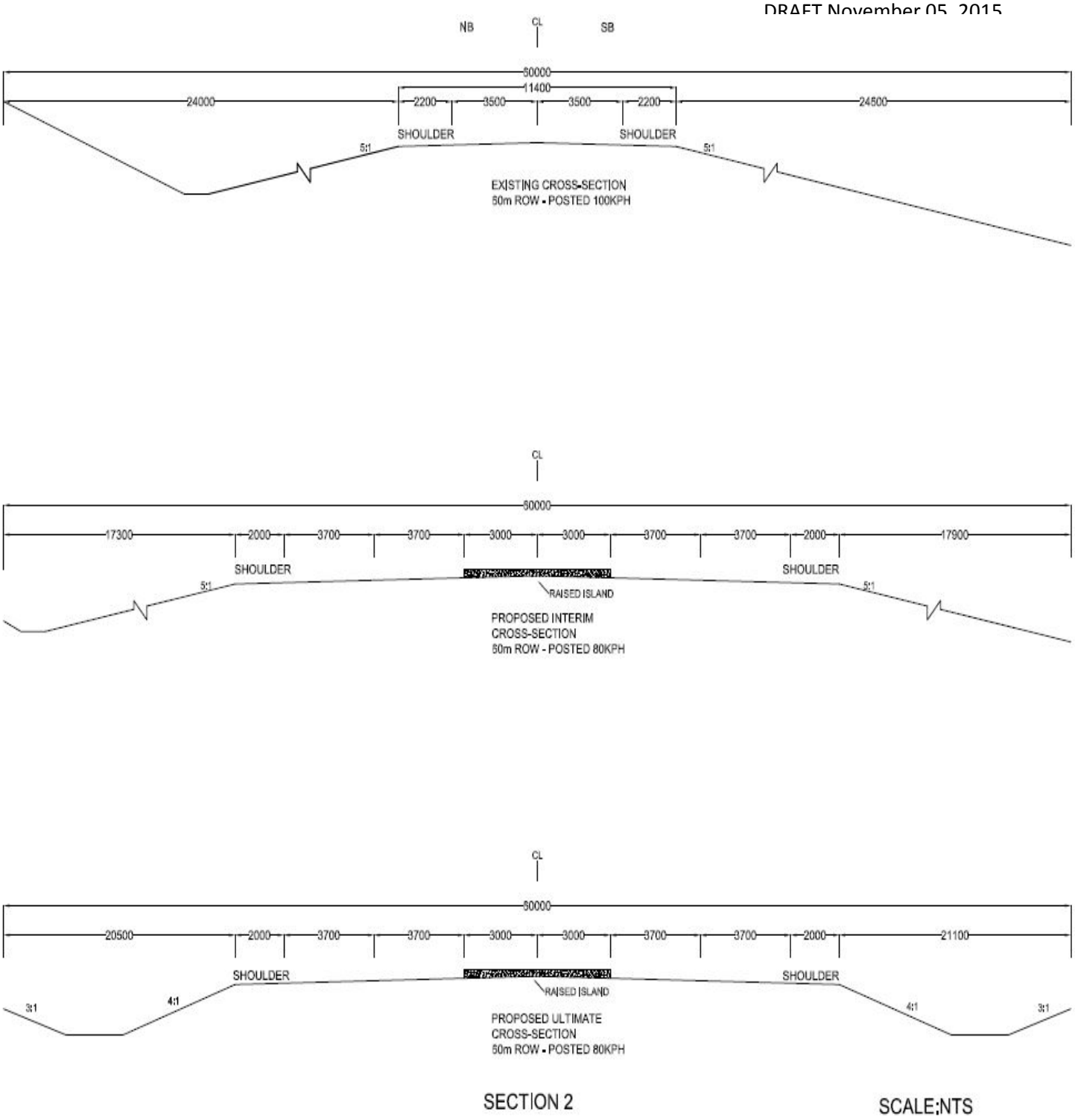


Figure 24: Proposed Section 2 – Hwy 7 South of RR 23

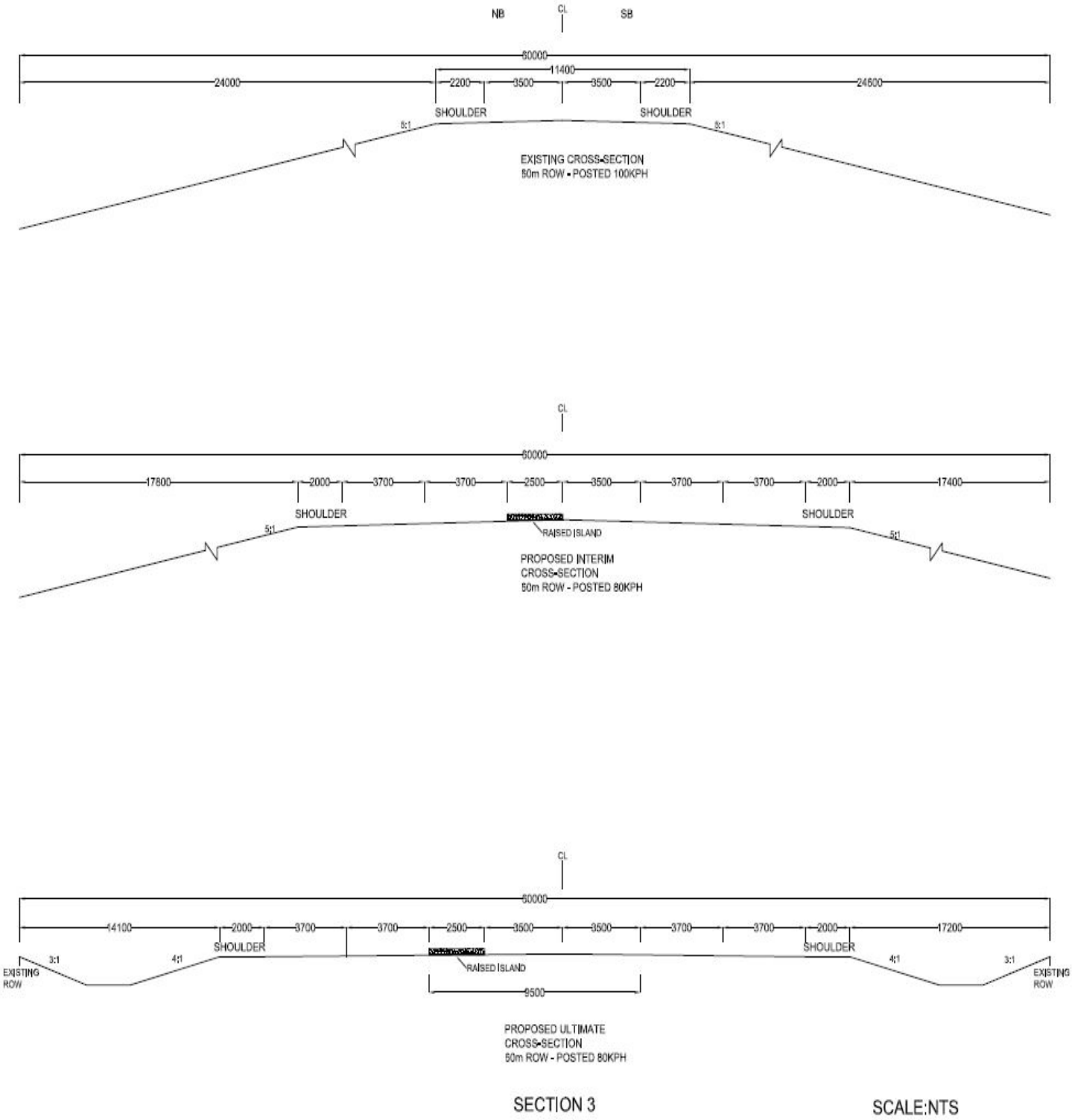


Figure 25: Proposed Section 3 – Hwy 7 at 6th St East

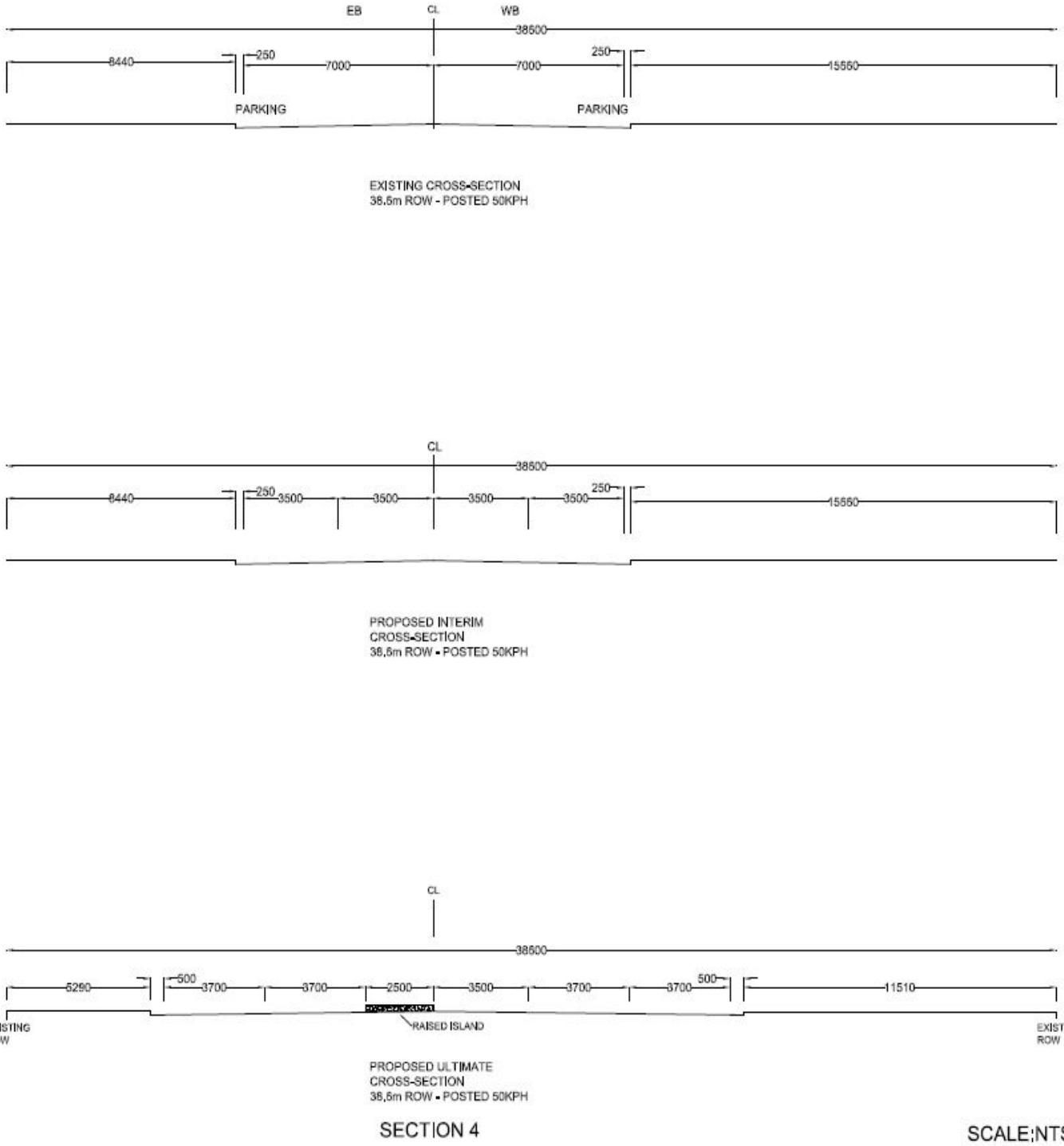


Figure 26: Proposed Section 4 – Hwy 7 West of 6th St. East

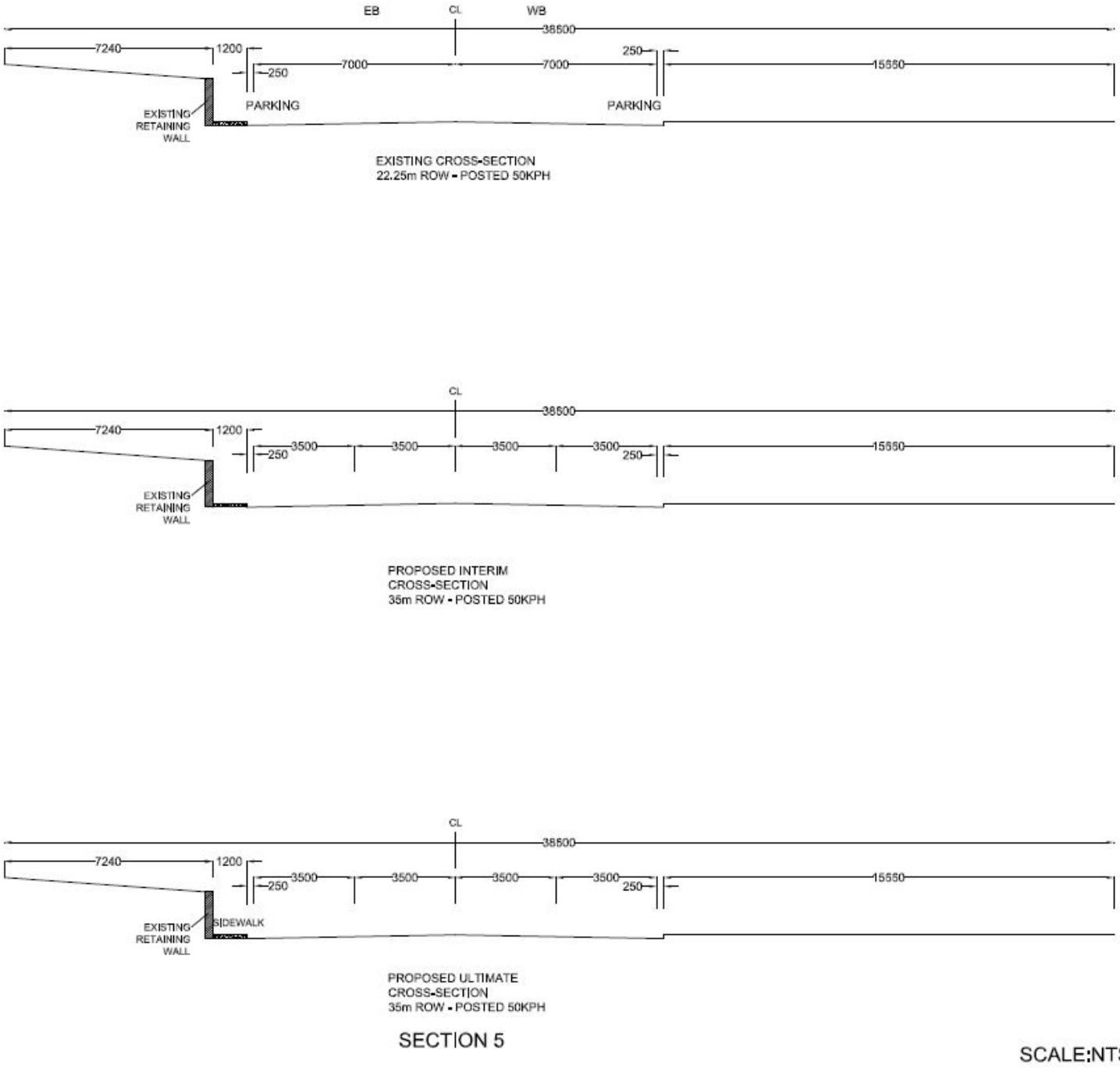
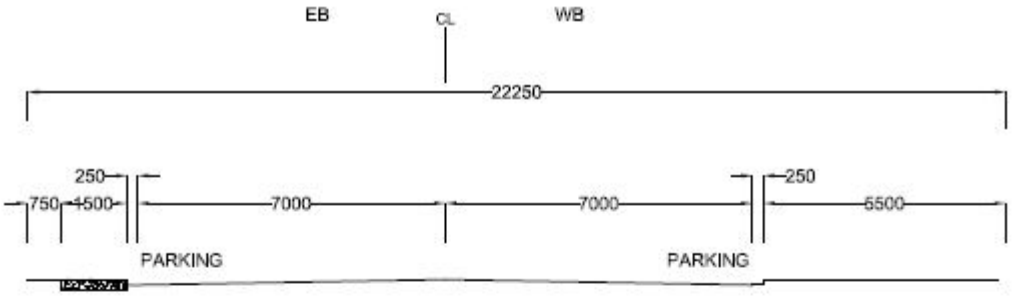
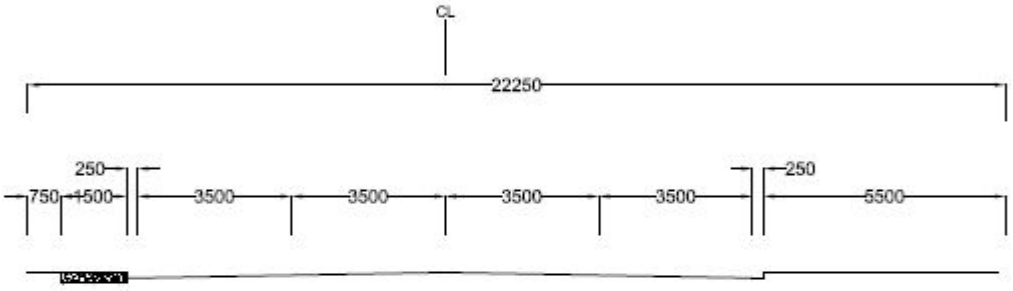


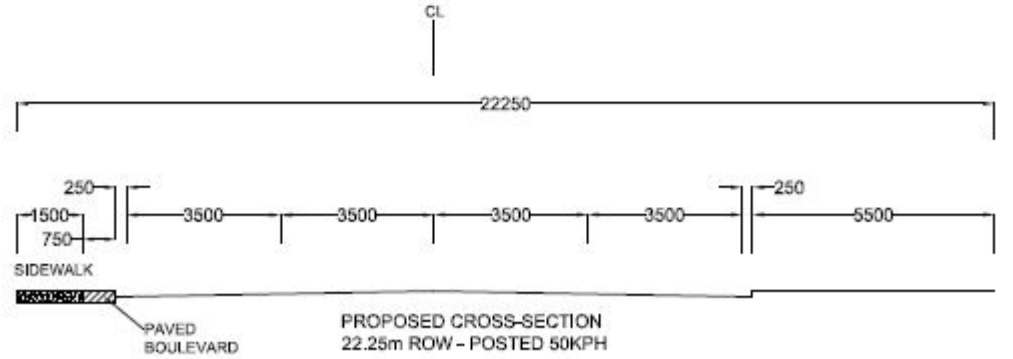
Figure 27: Proposed Section 5 – Hwy 7 East of 3rd Street East



EXISTING CROSS-SECTION
22.25m ROW – POSTED 50KPH



PROPOSED INTERIM
CROSS-SECTION
22.25m ROW – POSTED 50KPH



SECTION 6

SCALE:NTS

Figure 28: Proposed Section 6 – Hwy 7 at 1st Street East

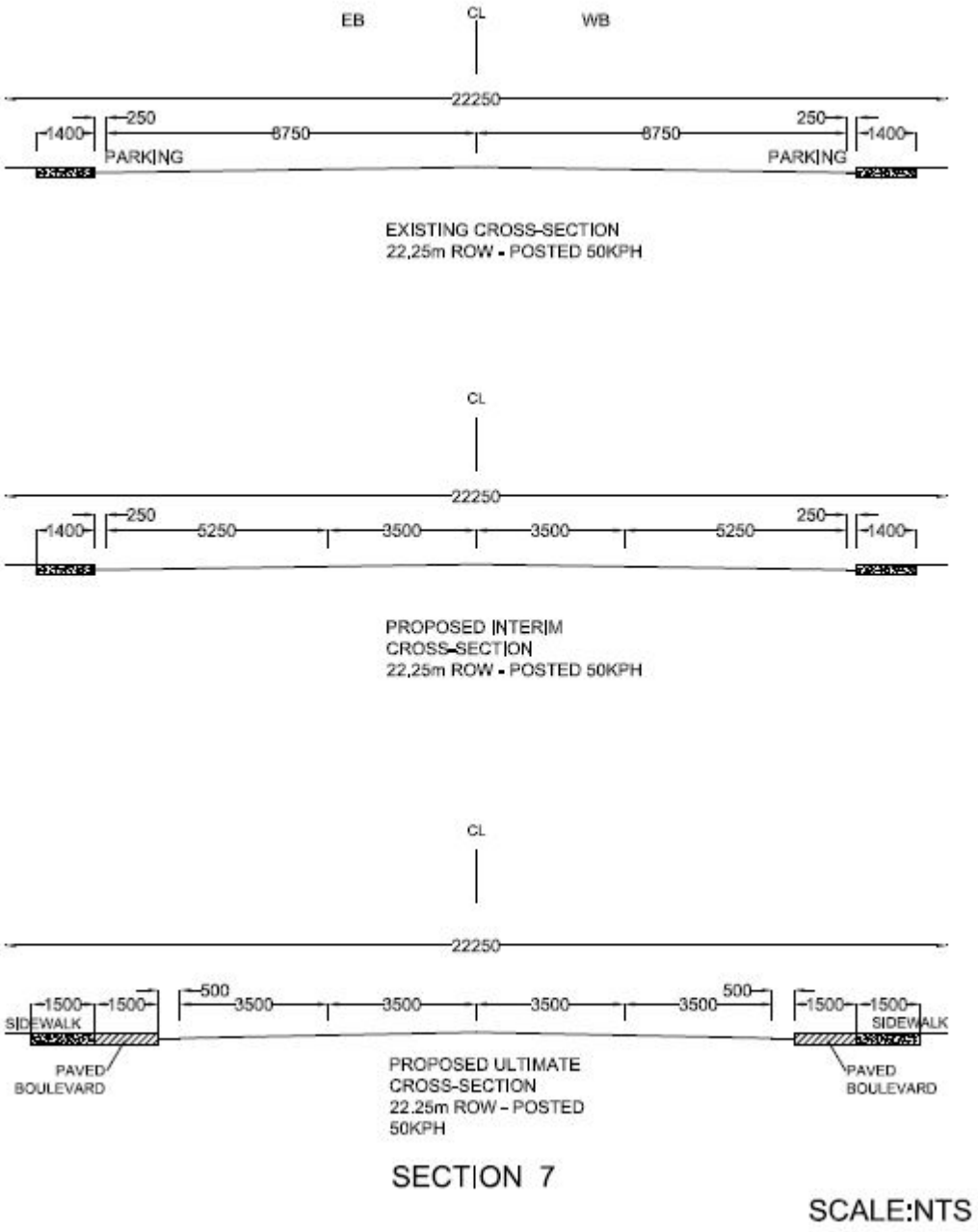


Figure 29: Proposed Section 7 – Hwy 22 at 1st Street West

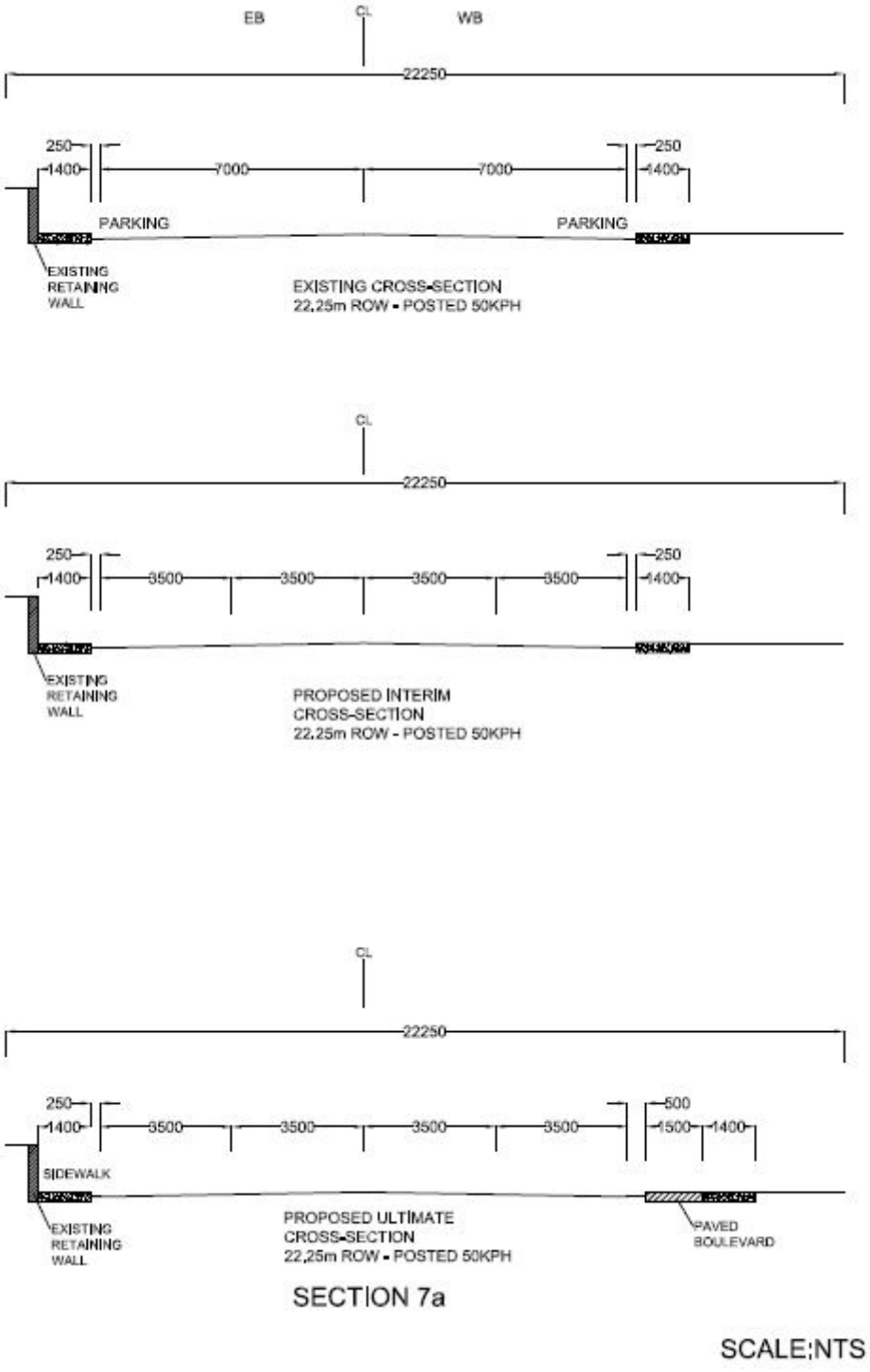


Figure 30: Proposed Section 7a - Hwy 22 West of 1st Street West

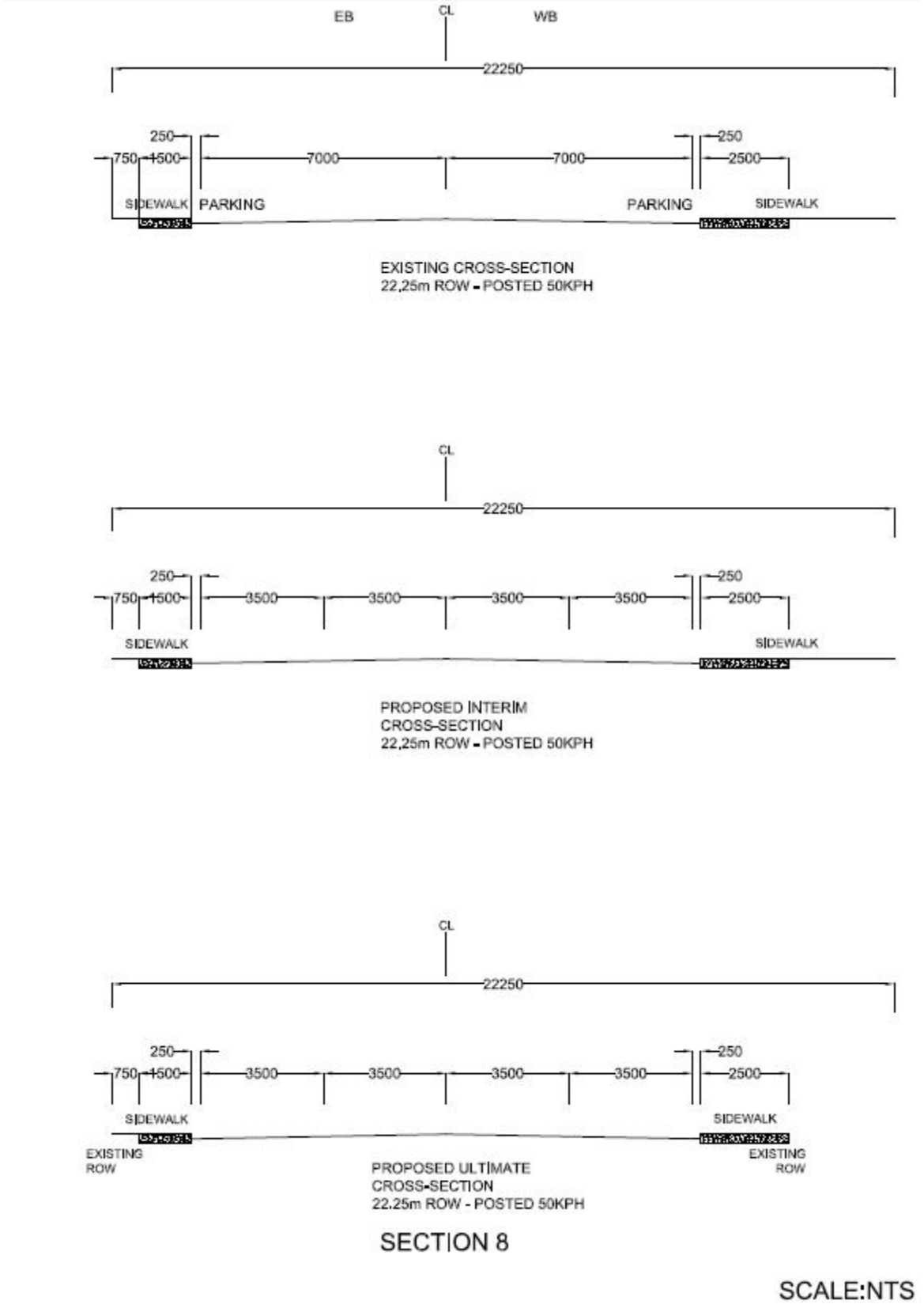


Figure 31: Proposed Section 8 – Hwy 22 West of 3rd Street West

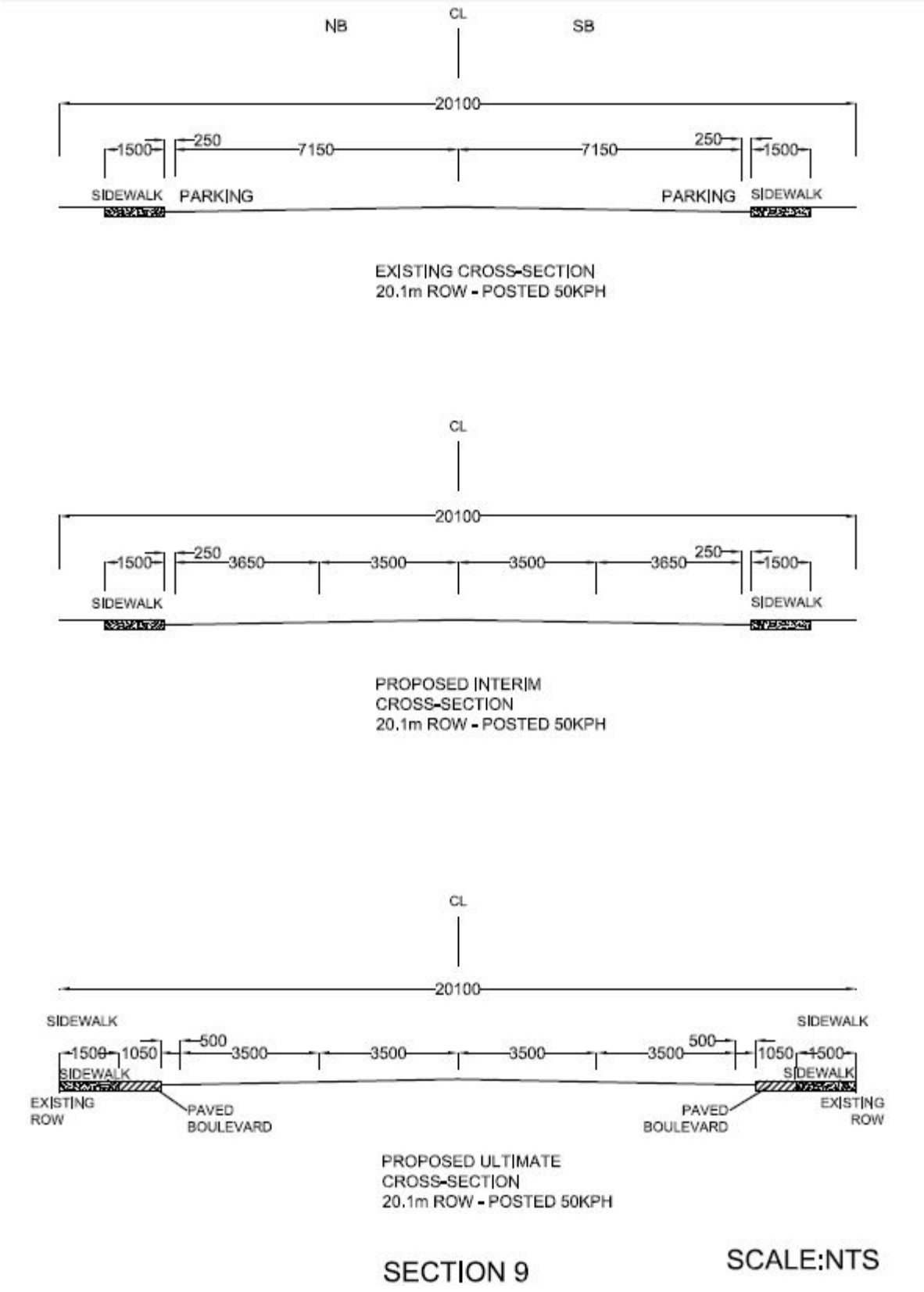


Figure 32: Proposed Section 9 – Hwy 22 South of the Hwy 7 and Hwy 22 Intersection

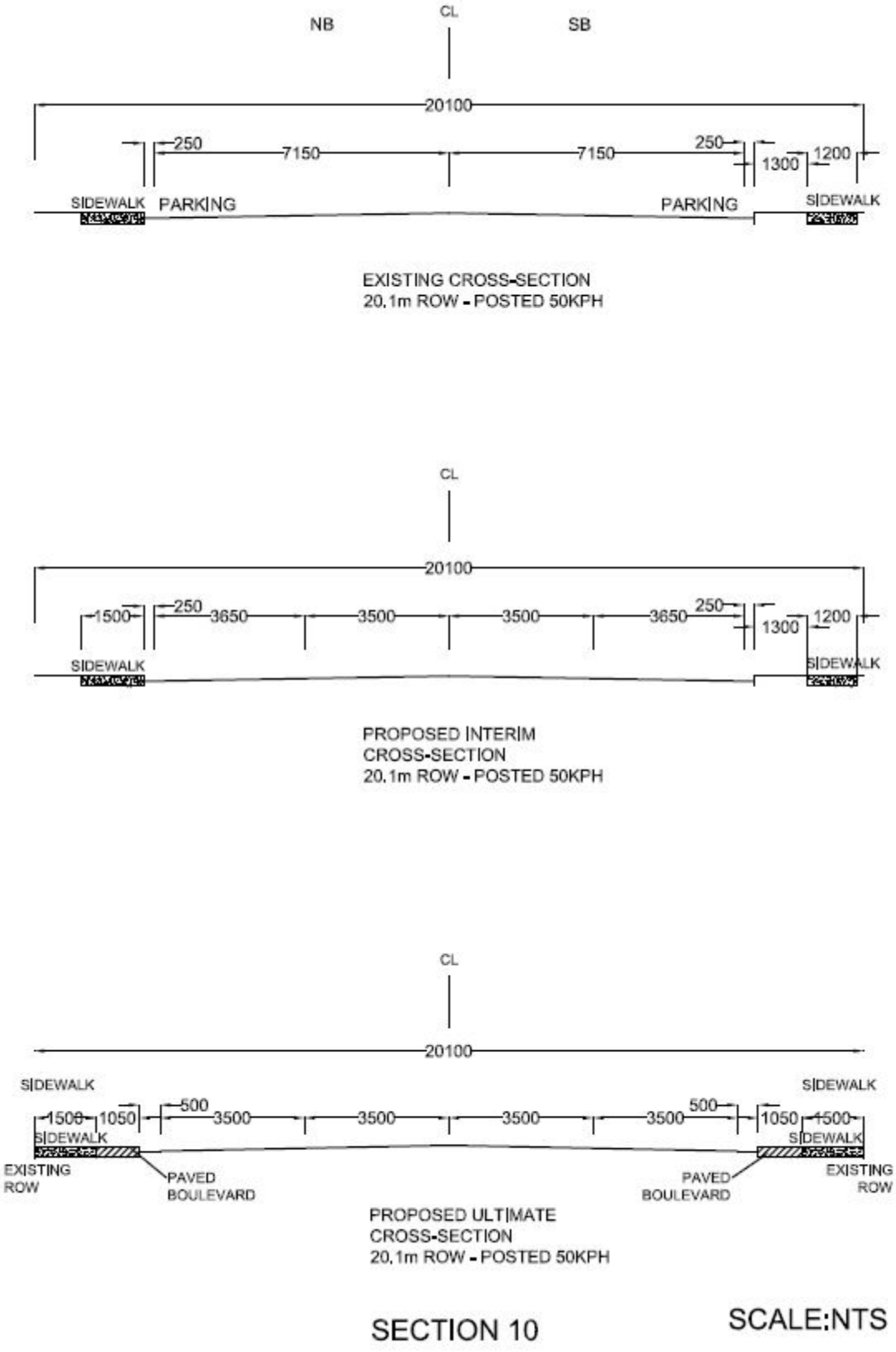


Figure 33: Proposed Section 10 – Hwy 22 South of 1st Ave

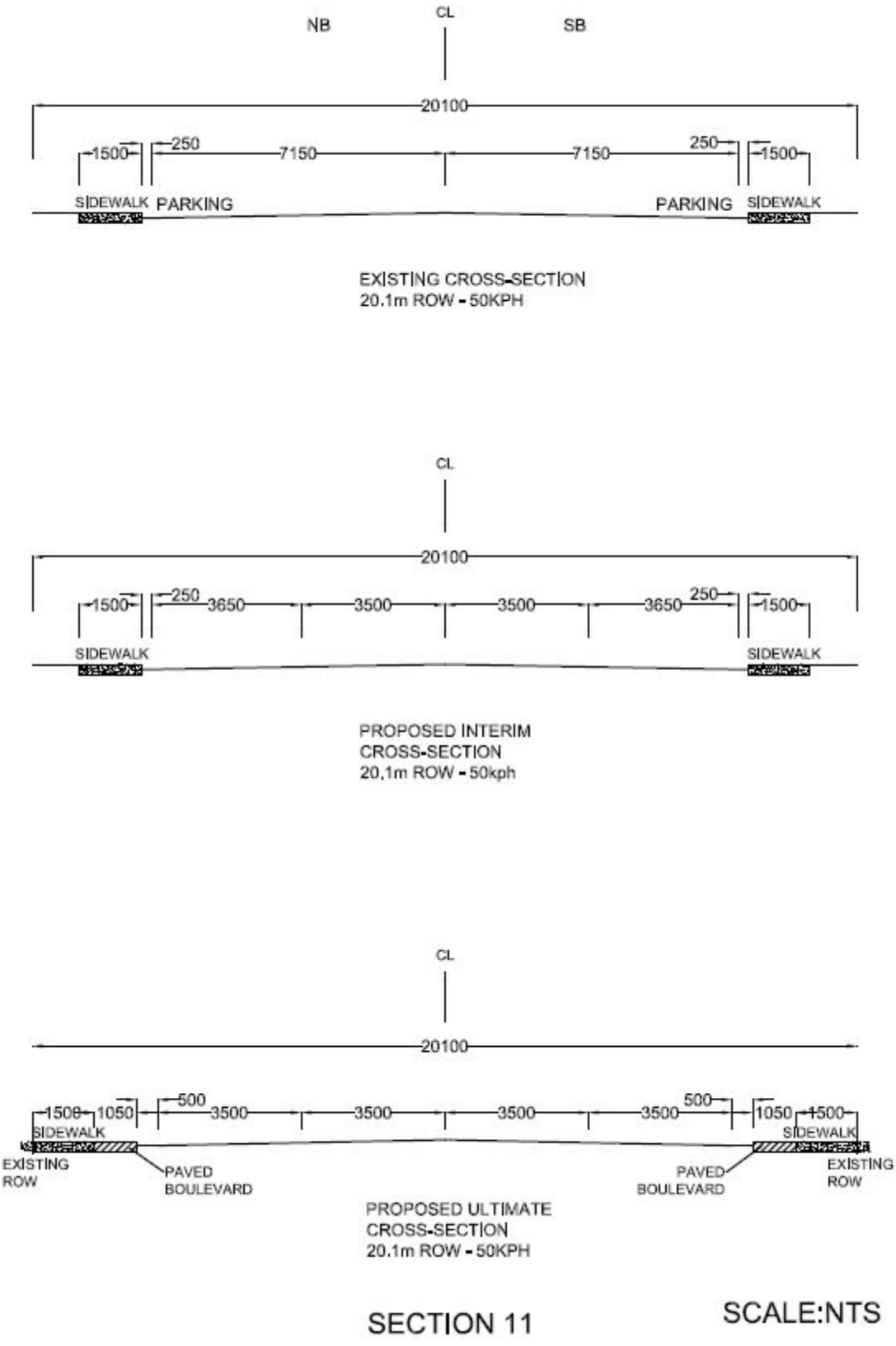


Figure 34: Proposed Section 11 – Hwy 22 South of 2nd Ave

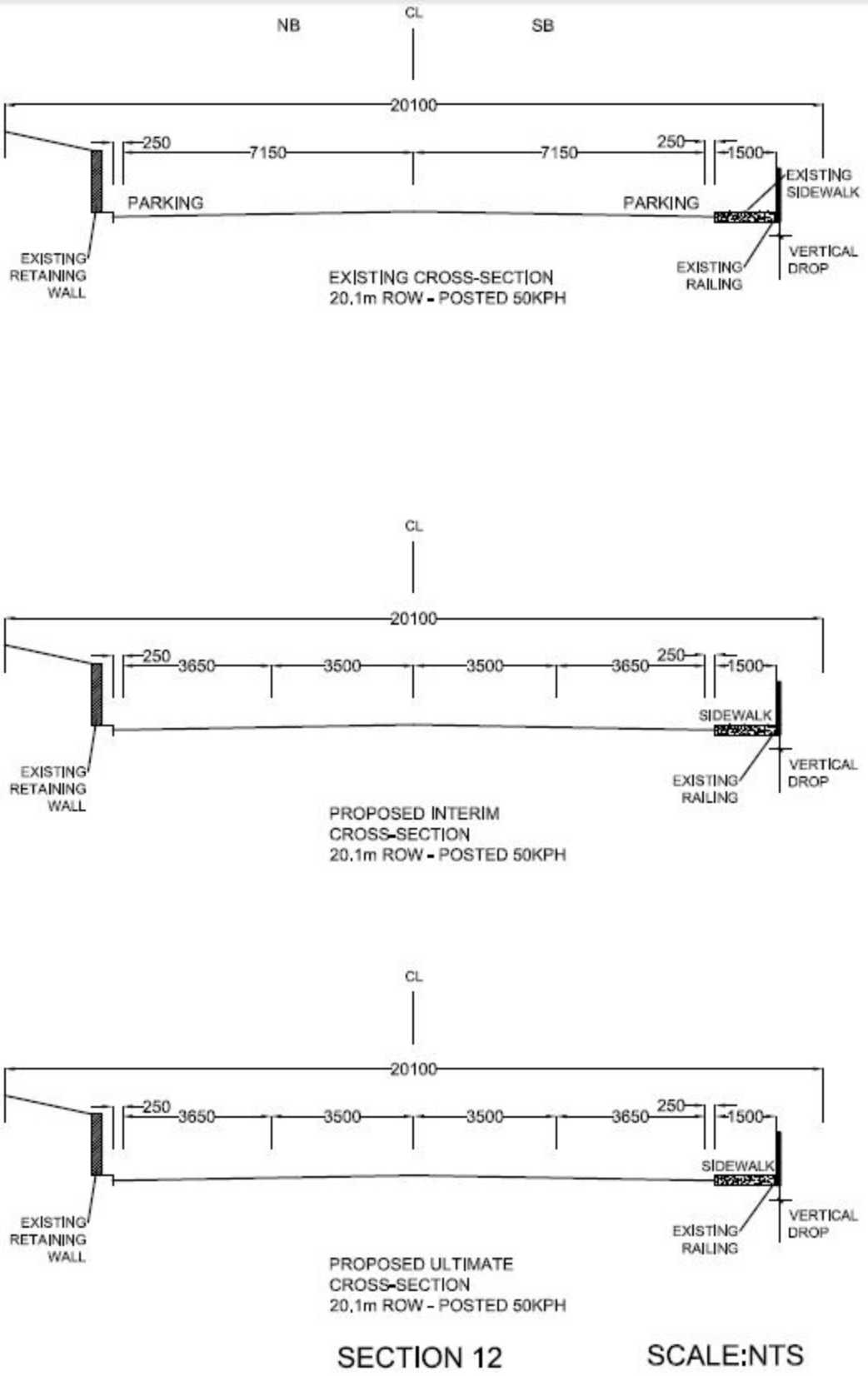


Figure 35: Proposed Section 12 – Hwy 22 South of 4th Ave

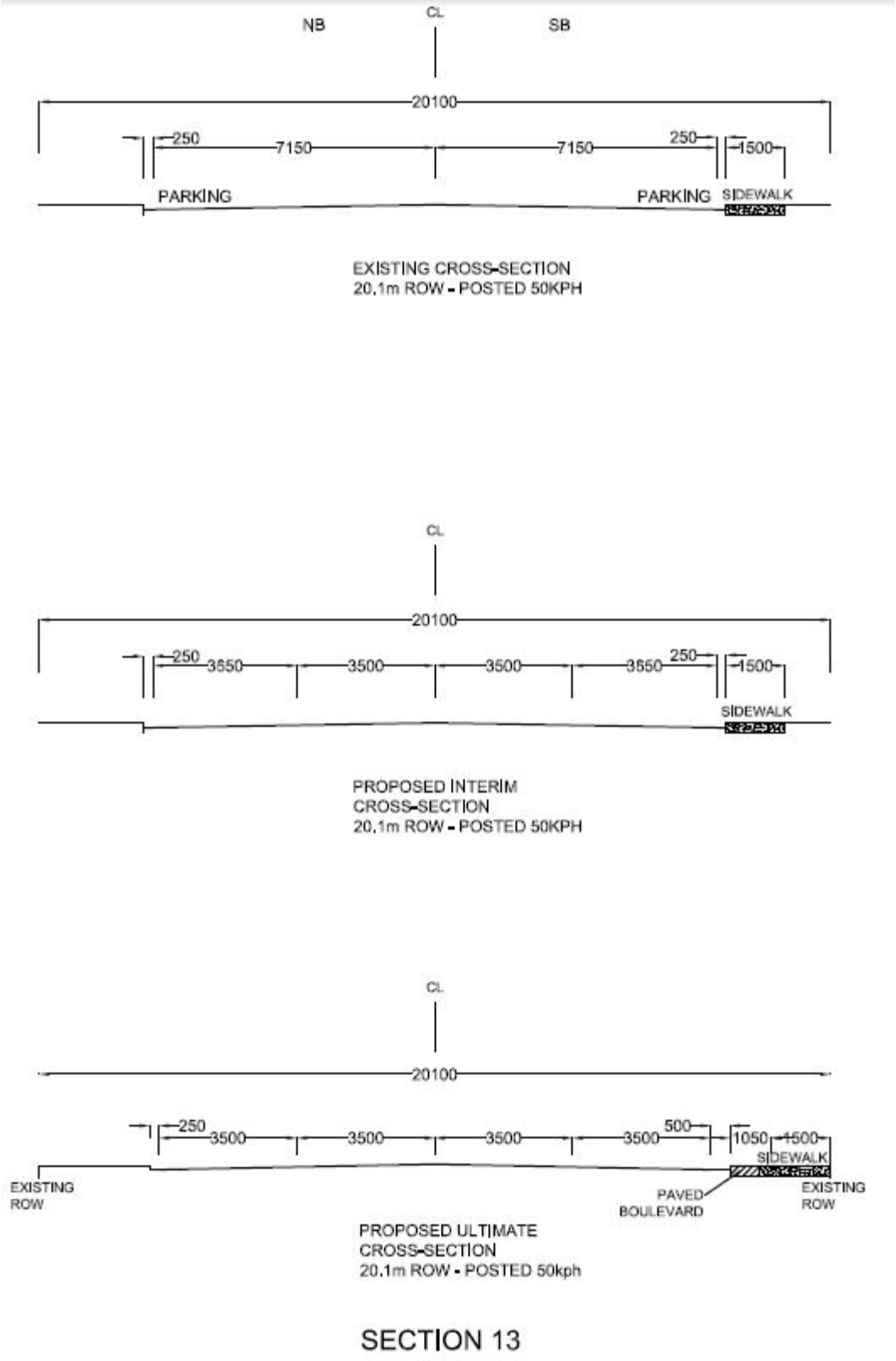


Figure 36: Proposed Section 13 – Hwy 22 South of 5th Ave

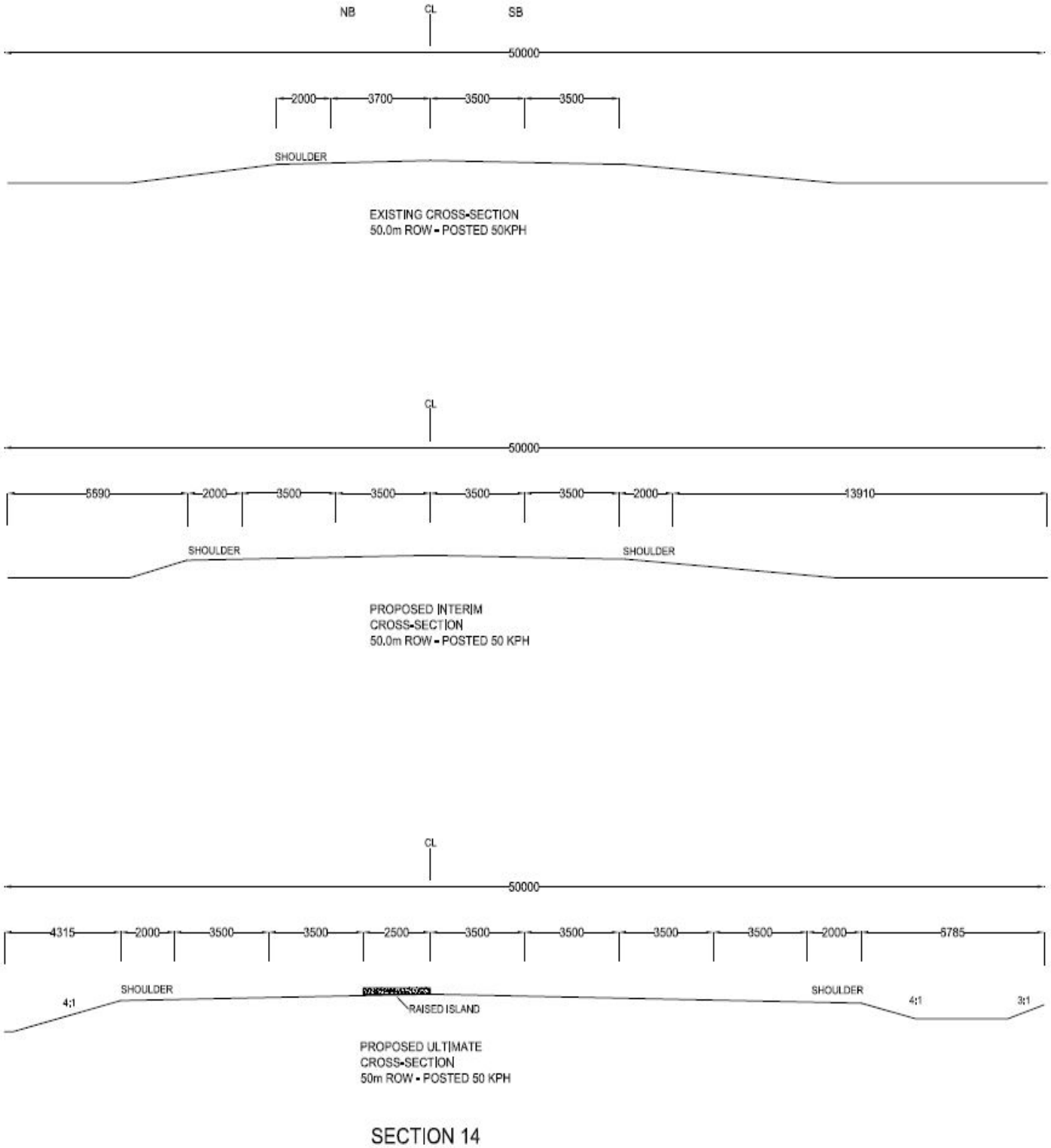


Figure 37: Proposed Cross Section 14 – Hwy 22 at Willow Ridge Blvd

An example of AT's guideline for a 4-Laned Urban Highway can be seen in Figure 37. This would be modified to meet the Town's needs and AT standards. As for replacing the on-street parking, the Town should look into designated parking lots strategically placed along the Town.

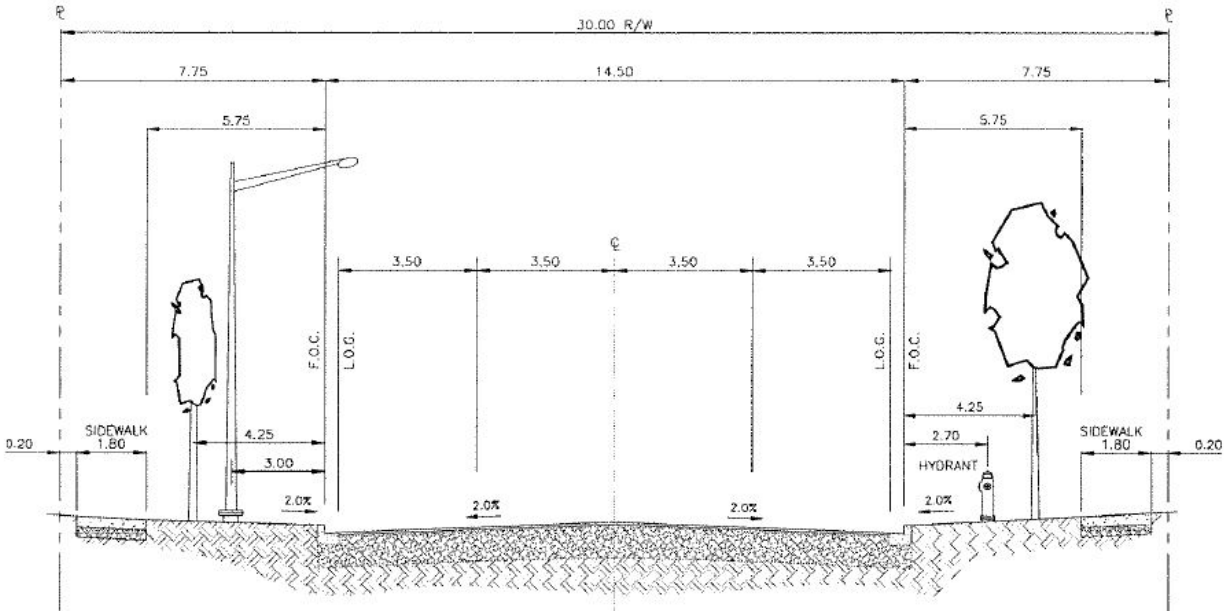


Figure 38: Alberta Transportation Urban 4 Laned Highway Typical Cross Section

8.3 Other Recommendations to Improve the Town's Transportation Network

As the Town continues to grow and develop, traffic volumes are increasing relative to the growth and development of the Town. Highway 7 and 22 are heavily relied on to meet the traffic demands of the Town, resulting in a decreased LOS. Other alternatives were reviewed and recommended in order to alleviate some of the traffic demand from Highway 7 and 22.

8.3.1 Improving the Town's Local Network

The Town should consider investing in improving their local network to alleviate some of the traffic volumes off of Highway 7 and 22. By improving roads such as paving or simply maintaining gravel roads so these roads attract motorist away from Highway 7 and 22.

8.3.2 Active Modes of Transportation

Active transportation is human powered travel such as walking and cycling. There are many benefits to active transportation such as:

- Offers independent mobility to those who can be left out when cars are required to get around such as children, youth, seniors, persons with disabilities and low income people.
- Brings economic benefits by reducing the social cost of transportation, supporting local stores and services, and attracting tourist who wish to get around without a car.
- Enhances street life by increasing citizen interaction and improving personal security.

As the Town continues to grow and develop, increasing pathways throughout the town to promote active modes of transportation will reduce traffic volumes on the transportation network and help improve the LOS on many intersections.

8.3.3 Community Shuttle Bus

A community shuttle bus could be implemented in partnership with the Town of Turner Valley to bring commuters to Okotoks and Calgary. Strategic drop offs in Airdrie and Calgary to serve the working population could be utilized and reduce the number of vehicles on Hwy 22 and Hwy 7. A study would be required in order to determine the most efficient way this system will run to meet the needs of both towns.

This type of public transit could be funded by the Green TRansit Incentive Program (GreenTRIP). GreenTRIP is one of the many programs municipalities can take advantage of to provide sustainable public transit alternatives. It allows municipalities to apply for capital funding to help purchase transit vehicles and technologies. More information with regards to the program can be found on the Alberta Transportation website.

8.3.4 Strategic Parking Lots

Placing strategic parking lots behind the highway would resolve parking capacity issues as the on-street parking would be taken out in order to accommodate 4-laning Hwy 7 and Hwy 22 in the eastbound and westbound direction. It would also reduce congestion within the Town core and encourage walking.

Appendices

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

Appendix F