MMM Group Limited

Traffic Impact Assessment

Sylvan Lake Subdivision Development

Prepared for:

Red Deer Properties
Developments Ltd.

COMMUNITIES

TRANSPORTATION

BUILDINGS

INFRASTRUCTURE

MMM GROUP

July 2010 | 5310029.000.E01-REP-01

Sylvan Lake Subdivision Development

Traffic Impact Assessment

Submitted To:

Red Deer Properties Developments Ltd.

Submitted By:

MMM Group

July, 2010

STANDARD LIMITATIONS

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EXECUTIVE SUMMARY

Methodology

MMM Group was retained to complete a traffic impact assessment (TIA) to support the rezoning and subdivision approval of approximately 53 lot subdivisions for single-unit family houses in Stage 1. Given that the total extend of the full development has yet to be agreed MMM were asked to assume a conservative estimate of a maximum of 450 single-unit family houses, for the ultimate stage (assumed in the 20 year horizon). Whilst it is unlikely that 450 single-unit family houses will be developed in the foreseeable future MMM shall use this figure during the analysis, to estimate the 'worst case scenario' impact on the community. This TIA includes an assessment of the impacts of the proposed development on the road network and access of the proposed development at the Twp Rd 400, by the Stage 1 and ultimate stage. Recommendations about the type and configuration of the intersection are made, as well as any recommendation where improvements are required.

This TIA analyzed the 2010 and 2030 weekday morning and afternoon peak hours as well as the estimated daily traffic volumes for the post-development scenario. Detail analysis using Synchro traffic modeling software is included for the ultimate stage (assuming full build-out by the year 2030).

Results

The intersection of Twp Rd 400 and proposed development access have one stop control on the access road and free flow on the Twp Rd 400. All approaches movements will operate at level of service LOS B or better. The results of the traffic analysis are summarized in the **Table ES1.1**

Table ES1.1: Development Access and Twp Rd 400 Intersection Analysis – Year 2030

Critical Movements – Ultimate Stage (Year 2030)						
Scenario	ICU LOS (Intersection Utilization)	Intersection Delay (sec)	WB Thru/Left		NB Right/Left	
			LOS (Delay)	Queue (meters)	LOS (Delay)	Queue (meters)
Weekday Morning Peak Hour	A (35%)	6.4	A (7.8 s)	1.5	B (11.5 s)	11.7
Weekday Afternoon Peak Hour	A (40%)	6.1	A (8.4 s)	6.3	B (11.7 s)	7.9

Conclusions

The analysis shows that a Type IVa intersection will be required at the development access and Twp Rd 400 intersection. The Synchro 7.0 traffic analysis software was used to confirm the need for storage bay and their length for right turn and left turn movements. The westbound left turn movement will require 100 metres of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100 metres of storage (120m from the centre line) and 140m of 40:1 taper, based on the Alberta Transportation Geometric Standard Guidelines and the detail analysis.

The assessment showed that the weekday afternoon peak hour flow is greater than the weekday morning peak hour flow. During the weekday afternoon peak hour period, the proposed development is expected to generate approximately 60 vehicle trips by the year 2010, and 450 vehicle trips by the year 2030. The total daily traffic generated by the proposed development is estimated to be about 580 and 4310 vehicle trips per day by the year 2010 and 2030, respectively.

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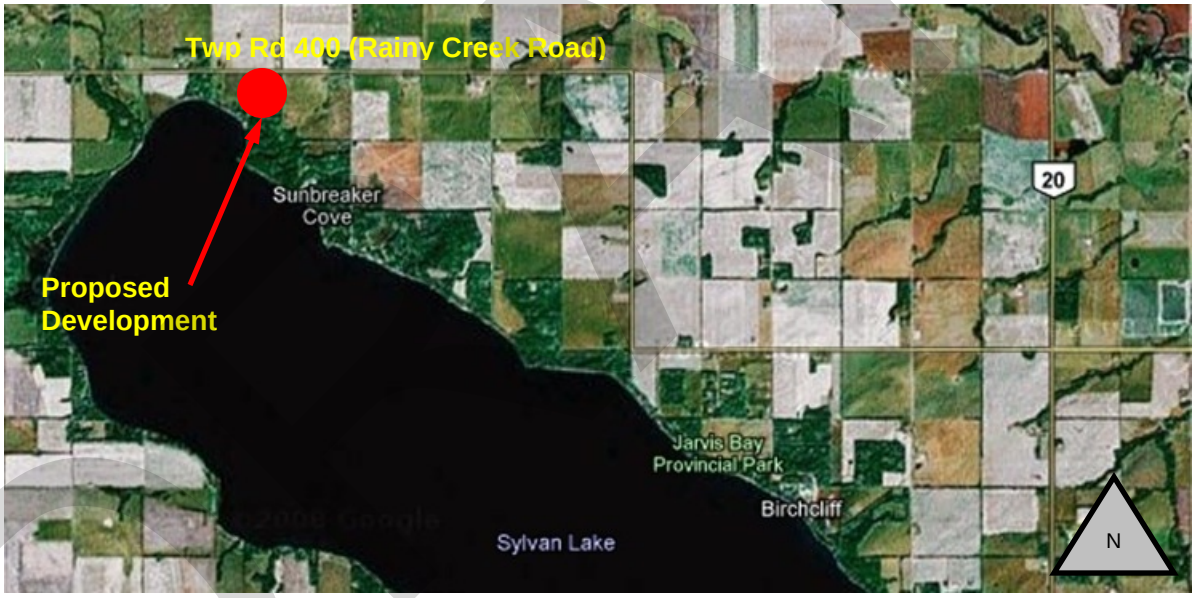
1.0 INTRODUCTION

1.1 Proposed Development

Red Deer Properties Development Ltd. c/o retained MMM Group Limited (MMM) to conduct a traffic impact assessment to support the rezoning and subdivision approval of a new proposed development. The proposed subdivision development contains approximately 63.73 hectares located on the north end of the Sylvan Lake in the Lacombe County, Alberta. The proposed development limits to the north with the Twp Rd 400 (Rainy Creek Road), between Rg Rd 22 and Rg Rd 24; and to the east with the proposed Skyy Country Golf and RV Park Development. The main access is planned to be located along Twp Rd 400, 360 m from the east property line and 450 m west of the nearest government road allowance. **Figure 1.1** shows the location of the proposed development.

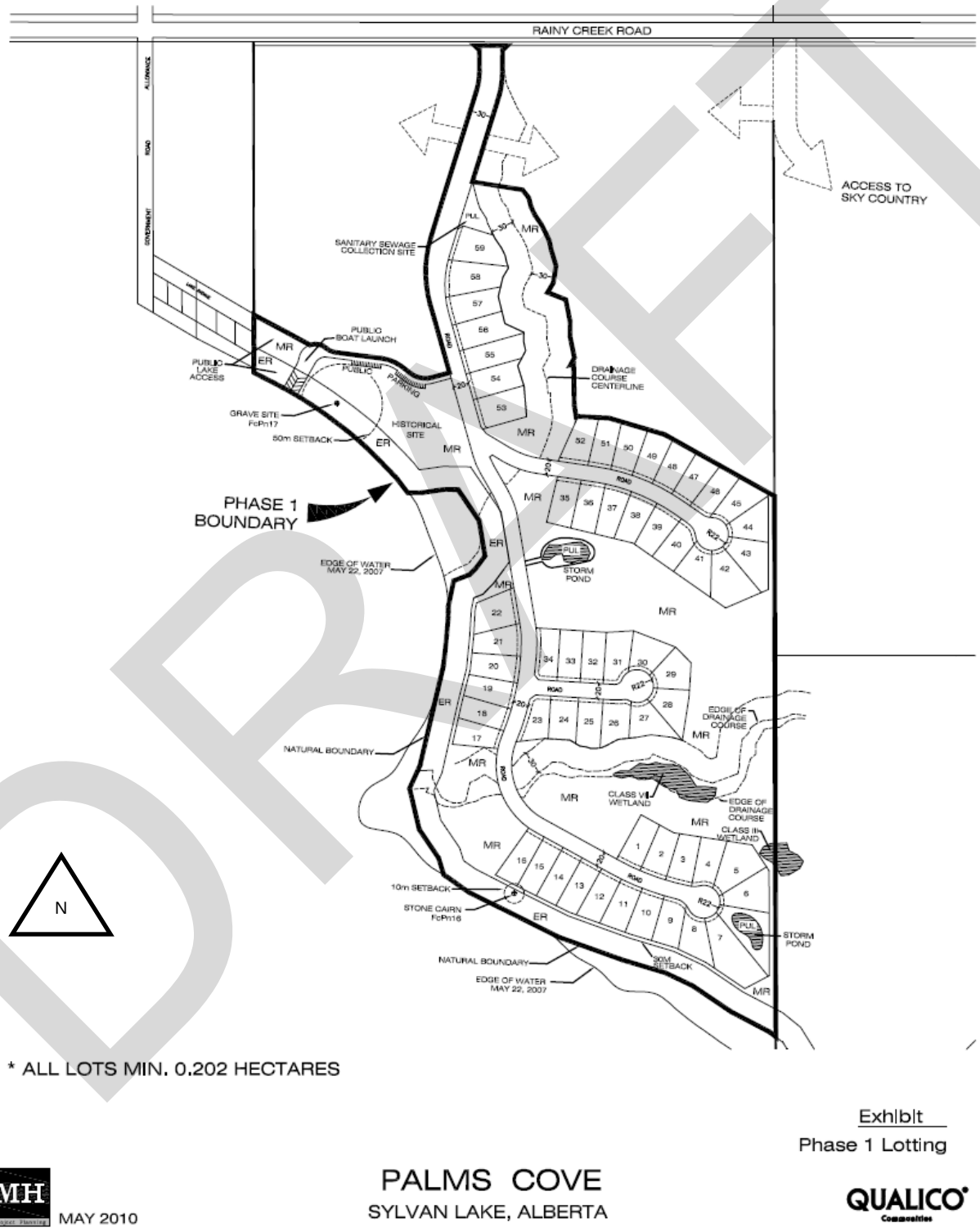
Figure 1.1: Site Location *(Source: Google maps, 2010)*



During the first stage of build-out, the proposed development will be limited to the rezoning and subdivision approval of approximately 53 residential single-unit family lots. Given that the total extend of the full development has yet to be agreed MMM were asked to assume a conservative estimate of a maximum of 450 single-unit family houses, for the ultimate stage (assumed in the 20 year horizon). Whilst it is unlikely that 450 single-unit family houses will be developed in the foreseeable future MMM shall use this figure during the analysis, to estimate

the ‘worst case scenario’ impact on the community. The current proposed site plan is illustrated in **Figure 1.2**.

Figure 1.2: Site Plan *(Source: Qualico, 2010)*



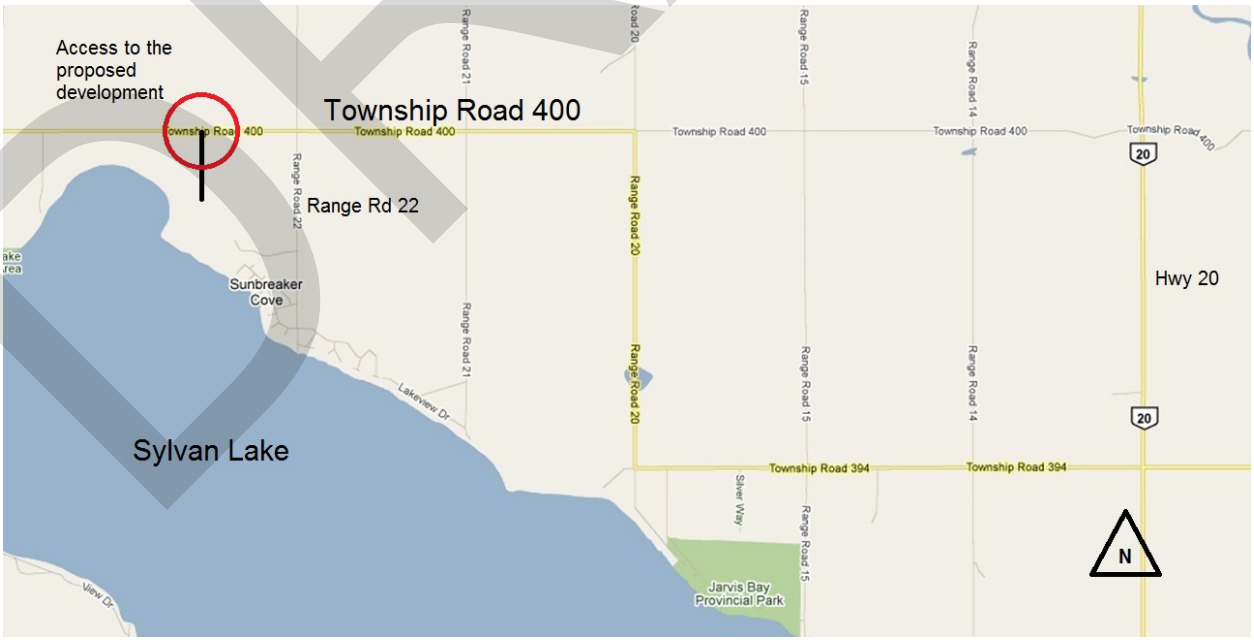
This study investigates the potential traffic impact of the proposed development on the Twp Rd 400 in terms of the capacity (daily and weekday peak hours), as well as determine the intersection treatments required for the development access. In addition, a Level 'A' (high level) cost estimate of the new intersection (proposed access on Twp Rd 400) and potential road improvements required for the Twp Rd 400 is also provided (see **Appendix E**).

1.2 Methodology

MMM first agreed the scope of the study with the approving authority, Lacombe County. MMM agreed to evaluate the post-development operations at the intersection of the proposed access road with Twp Rd 400 (shown in figure 1.3), for the 2030 horizon.

The proposed development required the introduction of a new intersection for access at Twp Rd 400 (Rainy Creek Road). This access was evaluated in terms of its: proximity to adjacent intersections, queuing capacity, intersection type and connectivity of the main roadway network. Error! Reference source not found. illustrates the key intersection evaluated in this TIA.

Figure 1.3: Key Intersection *(Source: Google maps, 2010)*



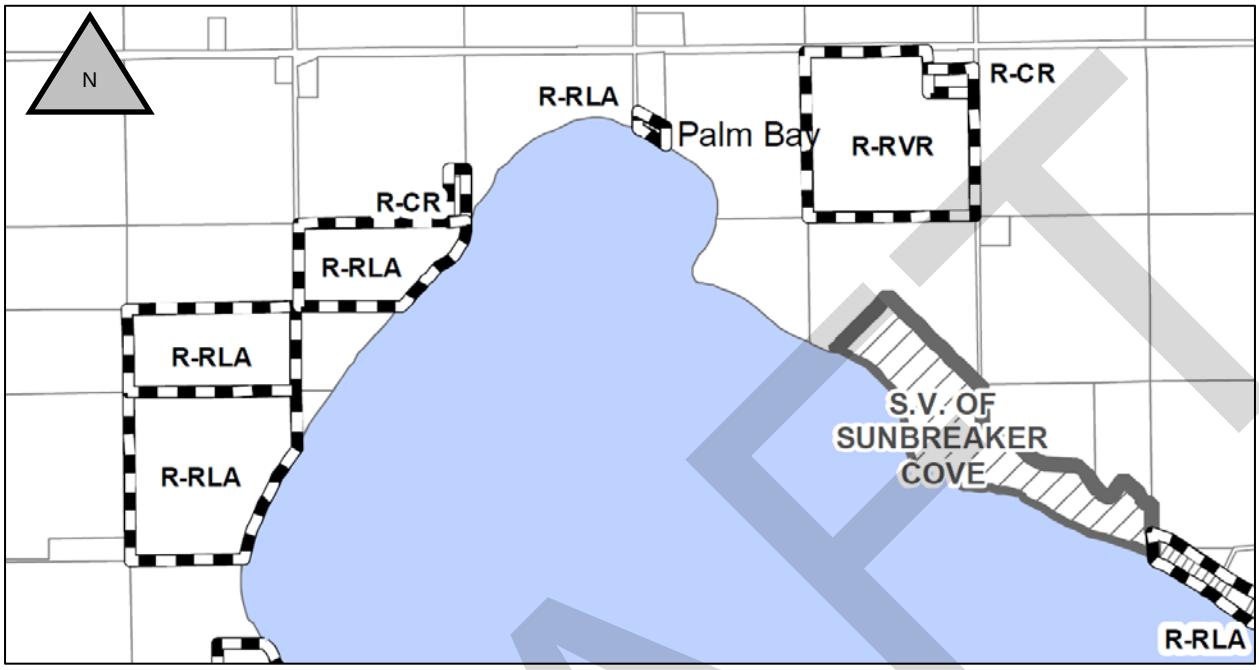
MMM undertook the following steps to develop the Traffic Impact Assessment Report:

- Identification and review of background information, including relevant details of previous studies and details concerning future local developments
- Confirmation of planned or existing geometric and operational conditions within the study area.
- Generation of site traffic estimates for the weekday AM and PM peak periods base on land use type and intensity of the proposed development, and using trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual. The project team also estimated daily traffic volumes generated by the site using ITE trip rates.
- Trip distribution and trip assignment of the vehicular trips generated by the proposed development and other major developments in the area by the 2010 and 2030 time horizons. Within this task, MMM Group prepared a regional trip distribution and a directional split, for each time horizon, at the key intersection. These travel patterns were based on available traffic data, the development location, the location of residential and employment centres, road network connectivity, and input from the Lacombe County. Our traffic distribution and assignment were agreed with the Lacombe County prior to the analysis.
- Review of traffic operations at the intersections identified above to determine if there are any deficiencies in the local transportation network for the 2010 and 2030 horizons at post-development traffic conditions (assuming full build-out). This involved a review of the following elements, of each intersection:
    - Control systems and traffic capacity,
    - Pedestrian and cyclist requirements,
    - Geometric constraints,
    - Left and right turn lane requirements and storage, and
    - Review of illumination requirements.
- Estimation of post-development daily traffic volumes and required road standard for the Twp Rd 400.

1.3 Existing and Future Developments

Currently the area located in the southwest quadrant of the intersection of Twp Rd 400 and Rg Rd 22 is dedicated as *Recreational Vehicle Resort District (R-RVR)* and *Country Residential District (R-CR)* base on the Land Use Bylaw No. 1056/07, as shown on the *Sylvan Lake Region Overview Map* (viewable on the Lacombe County website). The property west of the proposed residential developed (Palm Bay), is classified as *Residential Lake Area District (R-RLA)*. Error! Reference source not found. illustrates the existing land use bylaw.

Figure 1.4: Land Use Bylaw *(Source: Land Use Bylaw District Maps, Lacombe County, 2010)*



This traffic impact assessment (TIA) was prepared to support the rezoning and subdivision approval of approximately 53 lot subdivisions for single-unit family houses in Stage 1. As indicated in conversations with Red Deer Properties Developments Ltd, the size of the full development is unknown although MMM would assume a maximum of 450 single-unit family houses, in the ultimate stage (assuming a 20 year horizon).

The Lacombe County confirmed and provided the trips generated by the Skyy Country Golf and RV Park development. Trip distribution was also discussed and agreed with the County.

The Lacombe County confirmed that other developments, in various stages of approval, will also take place on the surrounding area. However, the County could not confirm the total number of trips generated by these developments. In order to account for these developments the County agreed that annual traffic growth rate should be assumed to be 4% (for comparison purposes the provincial average is normally between 2 to 3% pa).

2.0 ROAD DESCRIPTION

The proposed Red Deer development access will be located approximately 8.4 km west of the intersection of Hwy 12 and Twp Rd 400. Twp Rd 400 (or Rainy Creek Road) is classified as being a *County main asphalt road*. It is a two-way undivided paved road having a right of way of approximately 40.23 metres. Each lane is approximately 3.5 metres wide and the road has 1.2m wide shoulders on both sides. The posted speed is 100 kph and the design speed is 110 kph.

3.0 TRAFFIC VOLUMES

3.1 Background Traffic

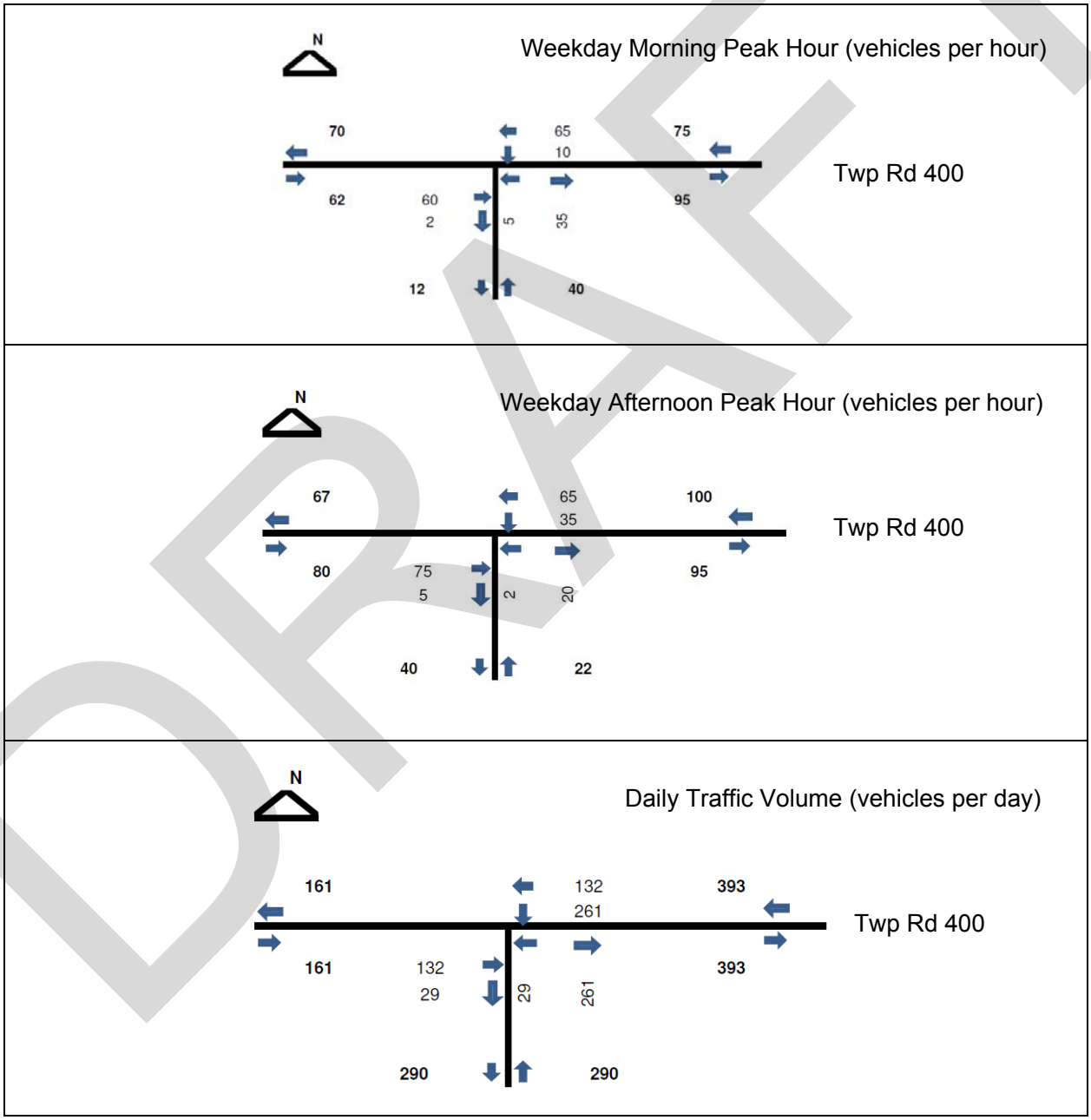
Background traffic refers to the traffic that already uses the roadway, or will use the roadway in the time horizon, irrespective of the proposed development. The existing (2010) traffic volume along Twp Rd 400, between Rg Rd 22 and Rg Rd 24, is approximately 717 vehicles per day (vpd). This figure was obtained by applying a 4% growth factor to the 2009 flows provided by the County. The design hour volume is assumed to be approximately 15 percent of the daily traffic volume. **Figure 3.1** shows the daily traffic volumes by the year 2010.

Figure 3.1: 2010 Daily Traffic Volumes *(Source: Google Maps, 2010)*

3.2 Post-Development Traffic By 2010

Post-Development traffic by 2010 refers to the background traffic (including any traffic generated by other developments) plus the additional traffic generated by the Red Deer development if stage one were opened by 2010. **Figure 3.2** illustrates the post-development traffic volumes by the year 2010.

Figure 3.2: Post-Development Traffic Volumes by Year 2010



3.3 Post-Development Traffic By 2030

Post-development traffic refers to the forecast background traffic volumes by the year 2030, with the addition of the traffic generated by the Skyy Country Golf and RV Park development assuming full build-out, and the traffic generated by the Red Deer residential development, assuming full built-out of 450 units. **Figure 3.3** illustrates the post-development traffic during the weekday morning and afternoon peak hour as well as the estimated combined daily traffic, by the year 2030.

The Lacombe County confirmed and provided the trips generated by the Skyy Country Golf and RV Park development. This development is estimated to generate approximately 2,650 vehicles per day at full built-out (assumed by the year 2030); 176 new trips during the weekday morning peak hour and 310 new trips during the weekday afternoon peak hour. **Table 3.1** illustrates the generation of new trips by the Skyy Country Golf and RV Park development and its distribution.

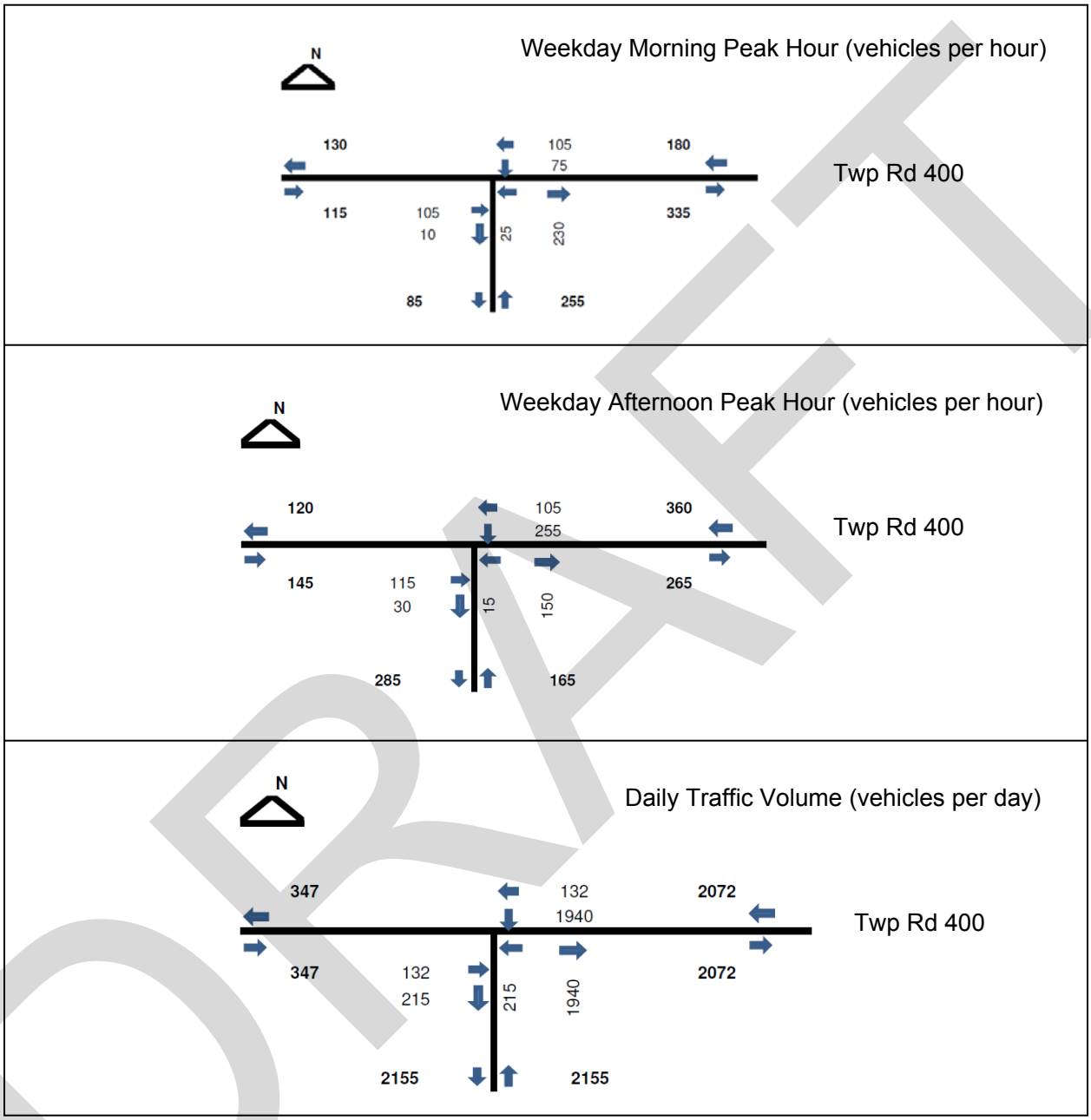
Table 3.1: Skyy Country Golf and RV Park Development Trip Generation

Estimate	Trip Direction		Trips Generated		
	In	Out	In	Out	Total
Daily Traffic Volume (ADT) *	50%	50%	1325	1325	2650
Weekday Morning Peak Hour **	43%	57%	76	100	176
Weekday Afternoon Peak Hour **	60%	40%	186	124	310

* Traffic volumes in vehicles per day
** Traffic volumes in vehicles per hour

Section 3.4 describes the methodology followed for estimating trip generation, trip distribution, and trip assignment for the post-development traffic.

Figure 3.3: Post-Development Traffic Volumes by Year 2030



3.4 Travel Forecasting For Future Traffic

3.4.1 Trip Generation

Trips generated by the proposed development were estimated for the weekday morning and afternoon peak hour. The generated daily traffic volumes were also estimated. Estimates of inbound and outbound trips per hour or day are based on trip rates obtained from the Institute of Transportation Engineers (ITE) Trip Generation - An ITE Informational Report, 8th Edition. Currently, the size of the proposed development is just 53 lot subdivisions for single-unit family houses in Stage 1. The full development size is assumed to be a maximum size of 450 single-unit family houses, in the ultimate stage (2030). **Table 3.2** summarizes the forecast trip generation for the proposed development. Trip estimates have been rounded to the nearest five vehicles per hour.

Table 3.2: Proposed Development Trip Generation

Development Size	Unit (1)	Fitted Curve Equation	Trip Direction		Trips Generated		
			In	Out	In	Out	Total
Year 2010 (Stage 1)							
Daily Traffic Volume (ADT) *	53	Ln(T) = 0.92Ln(X) + 2.71	50%	50%	290	290	580
Weekday Morning Peak Hour **	53	T = 0.70X + 9.43	25%	75%	13	38	50
Weekday Afternoon Peak Hour **	53	Ln(T) = 0.90Ln(X) + 0.53	63%	37%	38	22	60
Year 2030 (Ultimate Stage)							
Daily Traffic Volume (ADT) *	450	T = 9.57X	50%	50%	2155	2155	4310
Weekday Morning Peak Hour **	450	T = 0.75X	25%	75%	85	255	340
Weekday Afternoon Peak Hour **	450	T = 1.01X	63%	37%	284	167	450

(1) Single-unit family houses
* Traffic volumes in vehicles per day
** Traffic volumes in vehicles per hour

3.4.2 Trip Distribution and Assignment

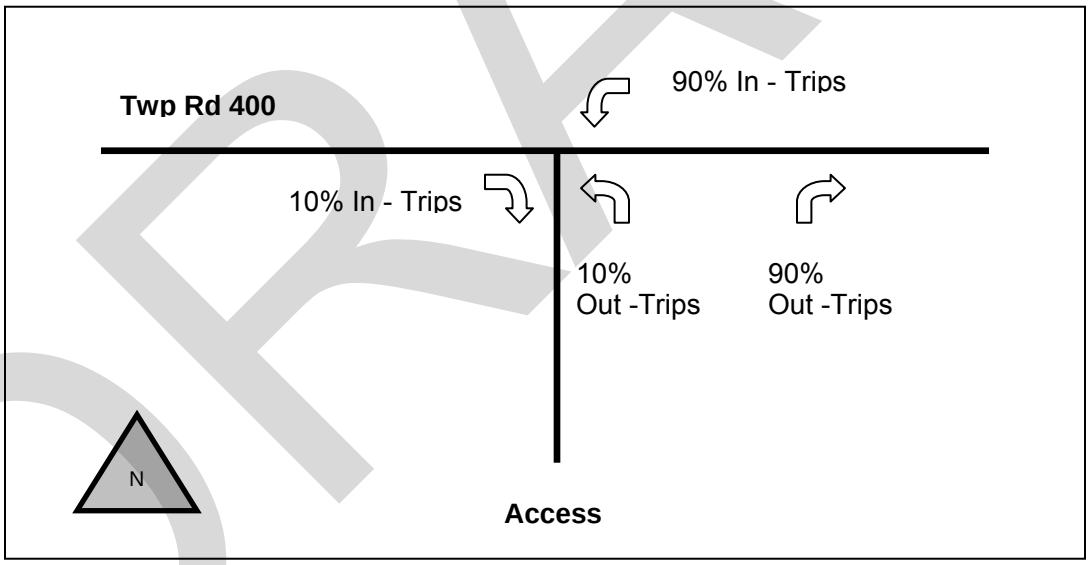
Trip distribution refers to the directional split of traffic entering and exiting the study area. Trip assignment refers to the allocation of the distributed trips to specific links into the road network.

Trip distribution for was discussed and agreed with the Lacombe County and is based on their local knowledge and on the current traffic patterns. The trip distribution was agreed as follows:

- 10% of development generated traffic will travel to/from the east along Twp Rd 400
- 90% of development generated traffic will travel to/from the west along Twp Rd 400 and will split through the local network
- Most of the traffic to/from the east will originate in the main residential areas along Hwy 2, such as Calgary, Edmonton and Red Deer.

Figure 3.3 illustrates trip assignment at the proposed development access along Twp Rd 400.

Figure 3.3: Trip Distribution at Access along Twp Rd 400 *(Source: MMM, 2010)*



4.0 TRAFFIC ANALYSIS

4.1 Intersection Analysis

The traffic analysis for the proposed development was undertaken using Synchro 7.0 traffic analysis software. The relative performance of an intersection is measured in terms of level of service (LOS) and the volume-to-capacity (v/c) ratio. Intersection level of service ranges from A (excellent) to F (beyond capacity). Level of service criteria for unsignalized intersections is defined in terms of the delay. Delay is the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. This includes the time required for the vehicle to travel from the last-in-queue position to the first. In the case of a two-way stop-controlled intersection the LOS is defined for each minor movement, and the LOS is not defined for the intersection as a whole.

Intersection capacity utilization level of service (ICU LOS) provides additional insight into how an intersection is functioning and how much extra capacity is available to handle traffic fluctuations and incidents. ICU LOS ranges from A (excellent) to H (beyond capacity), with ICU LOS E generally considered being at practical capacity.

4.1.1 Stage 1 - Year 2010

The procedure outlined in the Alberta Transportation Geometric Standard Guidelines, Section D, was followed to determine the type of intersection required at the access of the new development as well as warrant analysis for left and right turning movements (based on the forecasted traffic volumes and posted speed on the Twp Rd 400). The analysis shows that a "Type IIa" intersection will be suitable for the expected traffic operations in 2010.

4.1.2 Ultimate Stage – Year 2030

The procedure outlined in the Alberta Transportation Geometric Standard Guidelines, Section D, was follow to determine the type of intersection required at the access of the new development as well as warrant for left and right turns, based on the forecasted traffic volumes by the year 2030 and posted speed of 100 kph on the Twp Rd 400. The analysis shows that a Type IVa intersection will be required and that a more detailed traffic analysis was required in order to determine storage length requirements for left and right turns. Therefore, a detail traffic analysis was conducted using Synchro 7.0 traffic analysis software.

Error! Reference source not found. presents the results of the intersection analysis for the 2030 Post-Development weekday morning and afternoon peak traffic conditions.

The proposed development access at Twp Rd 400 will required a T Intersectional Treatment (Type IVa). The westbound left turn movement will require 100m of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100m of storage (120m from the centre line) and 140m of 40:1 taper.

Giving the proximity of the access to Skyy Country Golf and RV Park development (approximately 380m from centre line to centre line) and their intersection requirements, it might be necessary to extend the Left turn storage lane between both intersections. As result, Twp Rd 400 would have 2 lanes in the westbound direction (one for exclusive left turn movements and one for through movements) between both accesses.

Table 4.1: Development Access and Twp Rd 400 Intersection Analysis – Year 2030

Critical Movements – Ultimate Stage (Year 2030)											
Scenario	ICU LOS (Intersection Utilization)	Intersection Delay (sec)	EB Right			WB Thru/Left			NB Right/Left		
			V/C	LOS (Delay)	Queue (meters)	V/C	LOS (Delay)	Queue (meters)	V/C	LOS (Delay)	Queue (meters)
Weekday Morning Peak Hour	A (35%)	6.4	0.01	A (0 s)	0	0.06	A (7.8 s)	1.5	0.34	B (11.5 s)	11.7
Weekday Afternoon Peak Hour	A (40%)	6.1	0.02	A (0 s)	0	0.22	A (8.4 s)	6.3	0.26	B (11.7 s)	7.9

4.1.3 Illumination and Signal Warrant Analysis

Signal warrant calculations were not conducted since the operation analysis provided adequate traffic operational levels.

Based on the Alberta Transportation's warrants for illumination, illumination would be required at the development access and Twp Rd 400 by 2030. Collision data along Twp Rd 400 could not been obtained by this time; however delineation lighting is warranted due to the projected traffic even if the number of night time collisions is zero**. Appendix D** presents the illumination warrant calculations.

4.1.4 Road Segment Capacity

The Twp Rd 400 road segment between 500 m west of the proposed development access and 500 m east of the Skyy Country Golf and RV Park development access were analysed to identify the volume-to-capacity ratio and level of service. The analysis was done for the existing and post-development scenarios. The Highway Capacity Software HCS was used for the Two-Way analysis by the weekday afternoon peak hour as it was identify as the most critical design hour. Error! Reference source not found. presents the results of the two-way analysis. The analysis shows no major impact on the Twp Rd 400 in the vicinity area, except for the road segment east of the Skyy Country Golf and RV Park Access, where a LOS C could be expected for the post-development traffic volumes by the year 2030, during the weekday afternoon peak hour.

Table 4.2: Two-Way Twp Rd 400 Analysis

Critical Movements – Weekday Afternoon Peak Hour						
Scenario	West of Proposed Development Access		Btw Proposed Access		East of Skyy Country Golf & RV Park Access	
	V/C	LOS	V/C	LOS	V/C	LOS
2010 Existing	0.07	A	0.07	A	0.07	A
2010 Post-Development	0.09	A	0.12	A	0.19	A
2030 Post-Development	0.16	A	0.27	B	0.34	C

5.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the traffic operation review indicate that the key intersection (proposed development access at Twp Rd 400) is expected to operate satisfactorily as a T intersection with a stop sign control in the access approach and free flow along Twp Rd 400. By the year 2030, it is estimated an approach LOS A on the movements along Twp Rd 400 and an approach LOS B on the movements along the new development access.

The analysis shows that a Type IVa intersection will be required. The Synchro 7.0 traffic analysis software was used to confirm the need for storage bay and their length for right turn and left turn movements. The westbound left turn movement will require 100 metres of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100 metres of storage (120m from the centre line) and 140m of 40:1 taper, based on the Alberta Transportation Geometric Standard Guidelines and the detail analysis.

The analysis uses an assumed development of 450 single-unit family houses by the year 2030. This development is unlikely to happen any time soon but assumptions in type and size of the total development were necessary to estimate future possible demand and delays.

Special consideration must be give to the access of the Skyy Country Golf and RV Park development (approximately 380 metres from centre line to centre line) and their intersection requirements. The need for left turn storage lanes and tapers in both developments will lead to the practical solution of provide, along Twp Rd 400, 2 lanes in the westbound direction (one for exclusive left turn movements and one for through movements) between both accesses.

The assessment showed that the weekday afternoon peak hour flow is greater than the weekday morning peak hour flow. During the weekday afternoon peak hour period, the proposed development is expected to generate approximately 60 vehicle trips by the year 2010, and 450 vehicle trips by the year 2030. The total daily traffic generated by the proposed development is estimated to be about 580 and 4310 vehicle trips per day by the year 2010 and 2030, respectively.

APPENDIX A – Correspondence

Jorge Arango

From: Phil Lodermeier [plodermeier@lacombecounty.com]
Sent: Tuesday, May 11, 2010 4:33 PM
To: Jorge Arango
Cc: Allan Williams
Subject: RE: 4537 Sylvan Lake Residential Development

Hi Jorge

Both Allan and I have reviewed your work plan and you seem to have covered all requirements for the TIA that Lacombe County would normally expect.

If your report identifies issues that require further investigation we do reserve the right to ask for additional information.

Thanks

Phil

From: Jorge Arango [mailto:Arango-DiazJ@mmm.ca]
Sent: May 10, 2010 9:54 AM
To: Phil Lodermeier
Cc: Ryan Olson
Subject: 4537 Sylvan Lake Residential Development

Hello Phil,
On behave of Red Deer Properties Developments Ltd. I would like to confirm the scope and requirements for the TIA to support the rezoning and subdivision approval of approximately 53 lot subdivision single-unit family houses (stage 1).
I have attached our proposed plan for this TIA; our client would like to confirm with the Lacombe Authorities the work plan and scope.
Please let me know if you consider the proposed work plan and scope covers all the Lacombe's TIA requirements or if modifications are necessary.
Regards,

Jorge

Jorge Arango, MSc.
Transportation Planner
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E: arango-diazj@mmm.ca
www.mmm.ca

May 10, 2010 Ref. No.:9810TR5343

Lacombe County
Mr. Phil Lodermeier
RR 3
Lacombe, Alberta T4L 2N3

Dear Mr. Lodermeier,

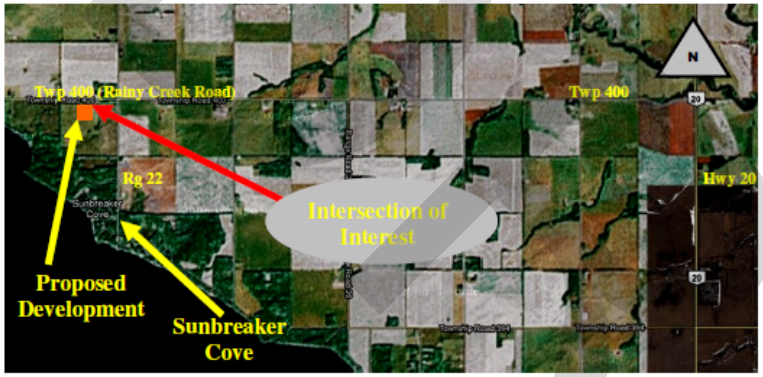
Re: Sylvan Lake Subdivision Development Traffic Impact Assessment

1.0 INTRODUCTION

MMM Group Limited (MMM) in behave of Red Deer Properties Developments Ltd. would like that the Lacombe County confirms the scope of work and its requirements for the Traffic Impact Assessment (TIA) to support the rezoning and subdivision approval of approximately 53 lot subdivisions for single-unit family houses in Stage 1. As indicated in conversations with Red Deer Properties Developments Ltd, the full development is unknown at this point. However, it is believed the development type would be residential with a maximum size of 450 single-unit family houses, in the ultimate stage (which will be assumed in the 20 year horizon for this TIA).

The proposed subdivision development is located on the northeast side of Sylvan Lake, south of Twp Rd 400 (Rainy Creek Road) and west of Sunbreaker Cove, in Alberta; as shown in Figure 1.

Figure 1. Site Location and Intersection of Interest *(Source: Google maps, 2010)*



2.0 WORK PLAN

From previous conversations with the Lacombe County, it is believe the scope of work for this TIA is limited to the following activities:

Existing Operations Review

- Define proposed land use type and size.
- Define existing roadway system in the vicinity of the proposed development.
- Establish current traffic volumes and conditions at proposed development access. This includes to confirm planned and existing road layout, and any existing issues that may affect the TIA or the future traffic operations with the authorities at the Lacombe County. The proposed development required the introduction of a new intersection for access at Twp Rd 400 (Rainy Creek Road). During this task MMM will consider this intersection in terms of its: proximity to the adjacent intersection (Skyy Country Development access to the east), queuing capacity, intersection type and connectivity of the main roadway network.
- Establish traffic growth rate base on historical data provided by the Lacombe County.

Future Operations Analysis

- Forecast the background and future traffic flows, for the weekday morning and afternoon peak period, using the proposed development plan, historical growth rates and the Institute of Transportation Engineers (ITE) Trip Generation Manual. The vehicular trips generated by the proposed development will be assigned to the road network for the 20 year time horizon, assuming full build-out of the development (450 single-unit family houses).
- Analyse the traffic operations for the 20 year time horizon of the proposed access at Twp Rd 400 to determine the impact the development will have on:
  - The control systems and traffic capacity,
  - The queue length,
  - The geometric constraints,
  - The required intersection type, and
  - The illumination requirements (illumination warrant).
- Determine whether there is a need to improve the intersection, the intersection treatment type, and any impact on right-of-way.
- Analyze capacity of the Twp Rd 400 in the vicinity of the proposed development. This is the estimated future volume to capacity ratio, or Average Annual Daily Traffic on Twp Rd 400 next to the proposed development.
- Produce a Level 'A' (high level) cost estimate of both the new intersection (proposed access on Twp Rd 400) and potential road improvements required for the Twp Rd 400 (cost per linear metre).
- Produce a technical report containing a complete set of supporting documentation, relevant historical correspondence, background information and traffic models, as part of the technical appendices

Please confirm that the proposed work plan is covering the totality of the Lacombe County requirements for this Traffic Impact Assessment.

Regards,

Jorge Arango

Jorge Arango

From: Jorge Arango
Sent: Friday, July 09, 2010 10:38 AM
To: 'Phil Lodermeier'
Subject: RE: Sylvan Lake Residential Development
Attachments: image001.png

Hi Phil,
I want to thank you for the input in this TIA, it's very appreciated. Following our phone conversation I wan

- 100% of the traffic generated by the Skyy Country Development will access through Twp R these, ten percent is to/from the west; and 90 percent to/from the east. Most of the traf east is likely attracted by Edmonton and Calgary.
- Same distribution will be assumed for the traffic generated by our development.
- Given that the information regarding the three subdivisions on the northwest side of the l available at this moment, an assumed annual growth rate of 4.0% (rather than 3.5%) is bel compensate for the uncertain trips generated by other developments in the area.

In addition, I would like to obtain data regarding the location and geometrical configuration of the Skyy Co

Once again, thank you and have a good weekend,

Jorge

Jorge Arango, MSc.
Transportation Planner
MMM GROUP
#200, 10576 - 113 Street
Edmonton, Alberta T5H 3H5
T: 780-423-4123 ext 231
F: 780-426-0659
E: arango-diazj@mmm.ca
www.mmm.ca

From: Phil Lodermeier [mailto:plodermeier@lacombecounty.com]
Sent: Monday, July 05, 2010 8:19 AM
To: Jorge Arango
Cc: Amanda-Brea Watson; Allan Williams
Subject: RE: Sylvan Lake Residential Development

Hi Jorge

1. You have the most current traffic counts though we will be doing some more in the near future.
2. 3.5% growth rate is adequate
3. According to their TIA (May 2008) – AM Peak 176, Pm Peak 310, AADT 2,650.
4. Other developments on the lake that may affect traffic volumes in the area – three subdivisions on the north west side of lake are in various stages of approval though only one that has started construction – the other two are in limbo at the moment.
5. We haven't discussed lowering the speed limit in this area but is would be considered if and when traffic volumes and turning movements reach a point of creating a dangerous situation. It is not a preferred solution since we have spent a great deal of money increasing the standard of the road to accommodate that speed.
6. I can't help you with the intersection of Highway # 20 and Rainy Creek other than the traffic volumes that are current for Rainy Creek. Traffic Volumes on Highway # 20 should be available on their (Alberta Transportation) web-site.

Phil

From: Jorge Arango [mailto:Arango-DiazJ@mmm.ca]
Sent: June 30, 2010 2:50 PM
To: Phil Lodermeier
Subject: RE: Sylvan Lake Residential Development

Hello Phil,

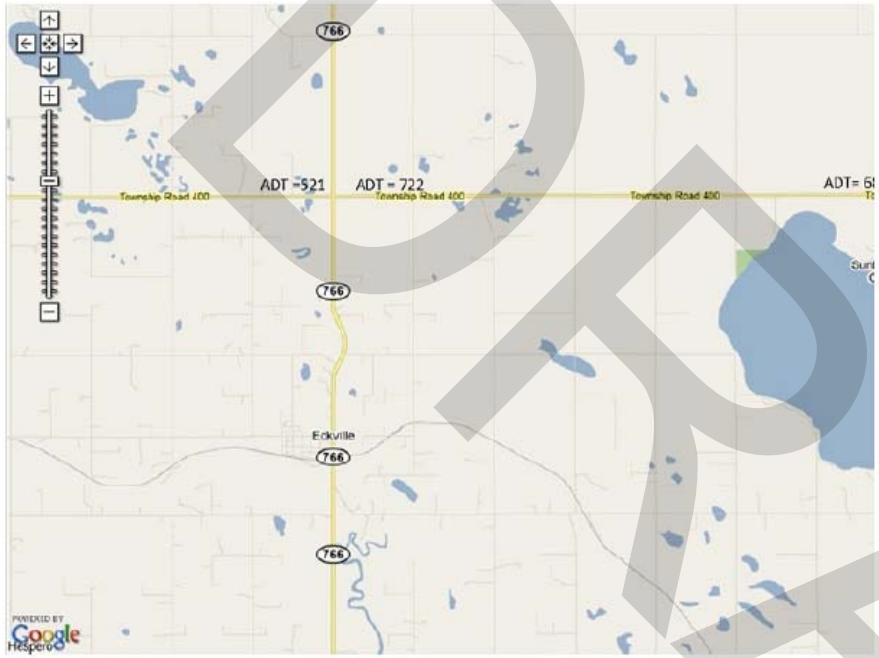
I hope you are having a great summer.

I am currently working on the TIA for the Sylvan Lake residential development, on behave of Red Deer Properties Developments Ltd.
This project refers to the rezoning and subdivision approval of approximately 53 lot subdivision single-unit family houses (stage 1). For the purposes of this TIA we assumed a maximum development of 450 single-unit family houses by the year 2030.

I would like to confirm the following information:

1. Is this the most recent traffic data available? 2009 Daily traffic Volumes:

Rainy Creek Rd	East of Sunbreaker Cove	Jul 2	1021
	West of Sunbreaker Cove	Jul 2	689
	East of Highway 766	Jul 2	722
	West of Highway 766	Jul 2	521
	East of Clearwater County line	Jul 2	385



2. I don't have any historical data along Rainy Creek Road but you recommended using a projected growth rate of 3.5% as used by the Skyy Country Development.

3. In order to estimated the future traffic volumes along Rainy Creek Road (for the 20 year horizon - year 2030), I would like to get the traffic generated by the Skyy Country Development (weekday morning and afternoon peak hours; and daily traffic volumes).

4. Please let me know if there is additional information regarding other developments in the area that could affect the traffic volumes at Rainy Creek Road. I will assess the access to the proposed residential development; and the intersection of Hwy 20 and Twp Rd 400 (Rainy Creek Rd).

5. I understand the current posted speed on Twp Rd 400 is 100 kph. I would like to know if the Lacombe County agrees in reducing the posted speed on Twp Rd 400 to 80 kph by the 20 year horizon (year 2030) for the purposes of this TIA.

6. Finally, we understand the Skyy County TIA was requested to assess the intersection of Hwy 20 and Twp Rd 400. However, traffic data at this location is not available. I wonder if the Lacombe County has traffic data available at this location (including traffic data generated by other developments in the area).

Thank you for your assistance,

Jorge

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E: arango-diazj@mmm.ca
www.mmm.ca

From: Phil Lodermeier [mailto:plodermeier@lacombecounty.com]
Sent: Monday, March 01, 2010 11:02 AM
To: Jorge Arango
Subject: RE: Sylvan Lake Residential Development

No problem and yes the traffic counts are ADT

From: Jorge Arango [mailto:Arango-DiazJ@mmm.ca]
Sent: March 1, 2010 10:59 AM
To: Phil Lodermeier
Subject: RE: Sylvan Lake Residential Development

Hi Phil,
For this preliminary analysis I would use a growth rate of 3.5%.
The volumes you sent me are the Average Daily Traffic volumes?
Thank you for your help and I will be in touch in case I need more information from the County.
Have a great day,

Jorge

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From: Phil Lodermeier [mailto:plodermeier@lacombecounty.com]
Sent: Monday, March 01, 2010 10:37 AM
To: Jorge Arango
Cc: Allan Williams
Subject: RE: Sylvan Lake Residential Development

Hi Jorge

Here are the 2009 traffic counts on Rainy Creek

Rainy Creek Rd	East of Sunbreaker Cove	Jul 2	1021
	West of Sunbreaker Cove	Jul 2	689
	East of Highway 766	Jul 2	722
	West of Highway 766	Jul 2	521
	East of Clearwater County line	Jul 2	385

You may want to provide your own estimate for projected growth rates but Skyy Country used 3.5%.

Phil

From: Jorge Arango [mailto:Arango-DiazJ@mmm.ca]
Sent: February 26, 2010 5:26 PM
To: Phil Lodermeier
Subject: Sylvan Lake Residential Development

Hi Phil,
Following our telephone conversation, can you please send me the directional or combined traffic data available for TWP 400 (Rainy Creek Road). Our development would be west of the potential Skyy Country Development access and east of the Government Road Allowance. For this preliminary assessment I probably will need also historical data or that you provide me with recommended growth rates.
Thank you for your help,

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Jorge Arango

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Have a great day,

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	West of Highway 766	Jul 2	521
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You may want to provide your own estimate for projected growth rates but Skyy Country used 3.5%.

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Hi Phil,
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Thank you for your help,

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APPENDIX B – Trip Generation & Distribution, Peak Hour Calcs.

TOTAL TRIP GENERATION (BASED ON ITE) - USING GENERATION RATES ONLY

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday Daily Traffic Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated Average Weekday Veh Trip Ends In	Trip Generated Average Weekday Veh Trip Ends Out	Trip Generated Average Weekday Veh Trip Ends Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	450	DU	T= 9.57*X	4,310	50	50	2,155	2,155	4,310			
OPT 2	0.00		210	Single-Family Detached Housing	450	DU	Ln(T) = 0.92*Ln(X) + 2.71	4,150	50	50	2,075	2,075	4,150			
TOTAL	**0**	**0**														

PHASE 1 TRIP GENERATION

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday Daily Traffic Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated Average Weekday Veh Trip Ends In	Trip Generated Average Weekday Veh Trip Ends Out	Trip Generated Average Weekday Veh Trip Ends Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	53	DU	T= 9.57*X	510	50	50	255	255	510			
OPT 2	0.00		210	Single-Family Detached Housing	53	DU	Ln(T) = 0.92*Ln(X) + 2.71	580	50	50	290	290	580			
TOTAL	**0**	**0**														

TOTAL TRIP GENERATION (BASED ON ITE) - USING GENERATION RATES ONLY

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday AM Peak Hour Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated AM Peak Hour In	Trip Generated AM Peak Hour Out	Trip Generated AM Peak Hour Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	450	DU	T= 0.75*X	340	25	75	85	255	340			
OPT 2	0.00		210	Single-Family Detached Housing	450	DU	T= 0.70*X + 9.43	320	25	75	80	240	320			
TOTAL	**0**	**0**					TOTAL									

PHASE 1 TRIP GENERATION

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday AM Peak Hour Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated AM Peak Hour In	Trip Generated AM Peak Hour Out	Trip Generated AM Peak Hour Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	53	DU	T= 0.75*X	40	25	75	10	30	40			
OPT 2	0.00		210	Single-Family Detached Housing	53	DU	T= 0.70*X + 9.43	50	25	75	13	38	50			
TOTAL	**0**	**0**					TOTAL									

TOTAL TRIP GENERATION (BASED ON ITE) - USING GENERATION RATES ONLY

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday PM Peak Hour Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated PM Peak Hour In	Trip Generated PM Peak Hour Out	Trip Generated PM Peak Hour Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	450	DU	T= 1.01*X	450	63	37	284	167	450			
OPT 2	0.00		210	Single-Family Detached Housing	450	DU	Ln(T) = 0.90*Ln(X) + 0.53	420	63	37	265	155	420			
TOTAL	**0**	**0**														

PHASE 1 TRIP GENERATION

Zone	Area Acres	Area Ha	Land Use	Land Use Description	X	X units	Weekday PM Peak Hour Trip Generation: Trip Rate Equation	Trips Generated	Trip Split % In	Trip Split % Out	Trip Generated PM Peak Hour In	Trip Generated PM Peak Hour Out	Trip Generated PM Peak Hour Total	5 % Internal Reduction In	5 % Internal Reduction Out	5 % Internal Reduction Total
OPT 1	0.00		210	Single-Family Detached Housing	53	DU	T= 1.01*X	50	63	37	32	19	50			
OPT 2	0.00		210	Single-Family Detached Housing	53	DU	Ln(T) = 0.90*Ln(X) + 0.53	60	63	37	38	22	60			
TOTAL	**0**	**0**														

Backgroud Traffic Data

Growth Rate **4.0%**

Location \ Year	**ADT 2009**	**ADT 2010**	**ADT 2030**
Twp Rd 400 West of Rg Rd 24	722	751	1328
Twp Rd 400 btw Rg Rd 24 and 22	689	717	1268
Twp Rd 400 East of Rg Rd 22	1021	1062	1879

K= 0.15

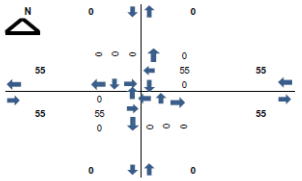
AM Peak Hour	**2009**	**2010**	**2030**
Twp Rd 400 West of Rg Rd 24	108.3	112.65	199.2
Twp Rd 400 btw Rg Rd 24 and 22	103.35	107.55	190.2
Twp Rd 400 East of Rg Rd 22	153.15	159.3	281.85

K= 0.15

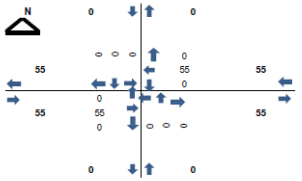
PM Peak Hour	**2009**	**2010**	**2030**
Twp Rd 400 West of Rg Rd 24	108.3	112.65	199.2
Twp Rd 400 btw Rg Rd 24 and 22	103.35	107.55	190.2
Twp Rd 400 East of Rg Rd 22	153.15	159.3	281.85

AM PEAK HOUR - SUMMARY YEAR 2010

		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09								52			52	
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2010	0	0	0	0	0	0	0	54	0	0	54	0
TOTAL	Estimated 2010	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**55**	**0**	**0**	**55**	**0**
		0			**0**			**55**			**55**		



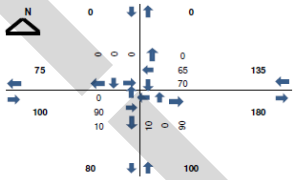
		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Skyy Access	Counted 09								52			52	
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2010	0	0	0	0	0	0	0	54	0	0	54	0
TOTAL	Estimated 2010	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**55**	**0**	**0**	**55**	**0**
		0			**0**			**55**			**55**		



POST-DEVELOPMENT AM PEAK HOUR - SUMMARY YEAR 2010

		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	54	0	0	54	0
	Skyy IN	0	0	0	0	0	0	0	0	0	0	8	0
	Skyy OUT	0	0	0	0	0	0	0	10	0	0	0	0
	IN							12					1
	OUT	4		34									
TOTAL	Estimated 2030	**5**	**0**	**35**	**0**	**0**	**0**	**10**	**65**	**0**	**0**	**60**	**0**
		40			**0**			**75**			**60**		

		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Skyy Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	54	0	0	54	0
	Skyy IN	0	0	0	0	0	0	68	0	0	0	0	8
	Skyy OUT	10	0	90	0	0	0	0	0	0	0	0	0
	IN								12				
	OUT											34	
TOTAL	Estimated 2030	**10**	**0**	**90**	**0**	**0**	**0**	**70**	**65**	**0**	**0**	**90**	**10**
		100			**0**			**135**			**100**		

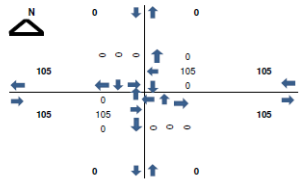


Trip Generation 2030	
Skyy IN	76
Skyy OUT	100

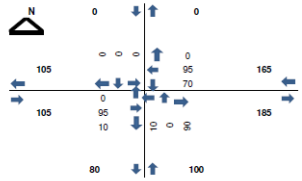
Generated IN	13
Generated OUT	38

BACKGROUND AM PEAK HOUR - SUMMARY YEAR 2030

		Northbound			Southbound			Westbound			Eastbound		
Location	**Trips**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Twp Rd 40 and Access	**Counted 09**	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN											8	
	Skyy OUT								10				
TOTAL	Estimated 2030	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**105**	**0**	**0**	**105**	**0**
		0			**0**			**105**			**105**		



		Northbound			Southbound			Westbound			Eastbound		
Location	**Trips**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Twp Rd 400 and Skyy Access	**Counted 09**	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN							68					8
	Skyy OUT	10		90									
TOTAL	Estimated 2030	**10**	**0**	**90**	**0**	**0**	**0**	**70**	**95**	**0**	**0**	**95**	**10**
		100			**0**			**165**			**105**		

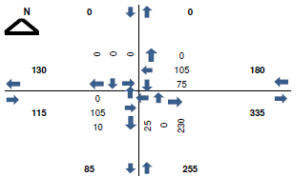


Trip Generation 2030

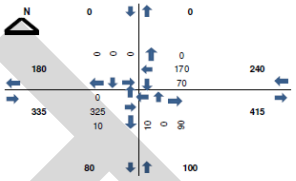
Skyy IN	76
Skyy OUT	100

POST-DEVELOPMENT AM PEAK HOUR - SUMMARY YEAR 2030

		Northbound			Southbound			Westbound			Eastbound		
Location	**Trips**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Twp Rd 40 and Access	**Counted 09**	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN	0	0	0	0	0	0	0	0	0	0	8	0
	Skyy OUT	0	0	0	0	0	0	0	10	0	0	0	0
	IN							77					9
	OUT	26		230									
TOTAL	Estimated 2030	**25**	**0**	**230**	**0**	**0**	**0**	**75**	**105**	**0**	**0**	**105**	**10**
		255			**0**			**180**			**115**		



		Northbound			Southbound			Westbound			Eastbound		
Location	**Trips**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Twp Rd 400 and Skyy Access	**Counted 09**	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN	0	0	0	0	0	0	68	0	0	0	0	8
	Skyy OUT	10	0	90	0	0	0	0	0	0	0	0	0
	IN								77				
	OUT											230	
TOTAL	Estimated 2030	**10**	**0**	**90**	**0**	**0**	**0**	**70**	**170**	**0**	**0**	**325**	**10**
		100			**0**			**240**			**335**		



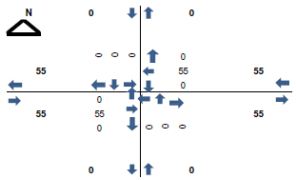
Trip Generation 2030

Skyy IN	76
Skyy OUT	100

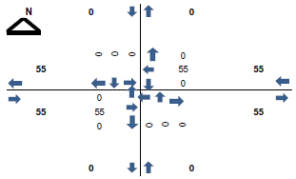
Generated IN	85
Generated OUT	255

PM PEAK HOUR - SUMMARY YEAR 2010

Location	Trips	Northbound			Southbound			Westbound			Eastbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09								52			52	
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2010	0	0	0	0	0	0	0	54	0	0	54	0
TOTAL	Estimated 2010	0	0	0	0	0	0	0	55	0	0	55	0
		0			0			55			55		

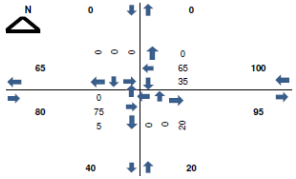


Location	Trips	Northbound			Southbound			Westbound			Eastbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Skyy Access	Counted 09								52			52	
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2010	0	0	0	0	0	0	0	54	0	0	54	0
TOTAL	Estimated 2010	0	0	0	0	0	0	0	55	0	0	55	0
		0			0			55			55		

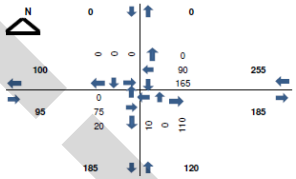


POST-DEVELOPMENT PM PEAK HOUR - SUMMARY YEAR 2010

Location	Trips	Northbound			Southbound			Westbound			Eastbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	54	0	0	54	0
	Skyy IN	0	0	0	0	0	0	0	0	0	0	19	0
	Skyy OUT	0	0	0	0	0	0	0	12	0	0	0	0
	IN							34					4
	OUT	2		20									
TOTAL	Estimated 2030	0	0	20	0	0	0	35	65	0	0	75	5
		20			0			100			80		



Location	Trips	Northbound			Southbound			Westbound			Eastbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Rg Rd 22	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	54	0	0	54	0
	Skyy IN	0	0	0	0	0	0	167	0	0	0	0	19
	Skyy OUT	12	0	112	0	0	0	0	0	0	0	0	0
	IN								34				
	OUT											20	
TOTAL	Estimated 2030	10	0	110	0	0	0	165	90	0	0	75	20
		120			0			255			95		



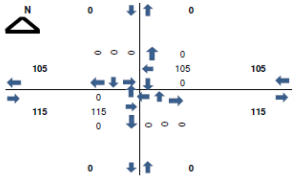
Trip Generation 2030

Skyy IN	186
Skyy OUT	124

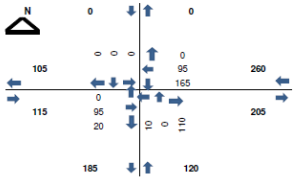
Generated IN	38
Generated OUT	22

BACKGROUND PM PEAK HOUR - SUMMARY YEAR 2030

		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN											19	
	Skyy OUT								12				
TOTAL	Estimated 2030	0	0	0	0	0	0	0	105	0	0	115	0
		0			0			105			115		



		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Skyy Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN							167					19
	Skyy OUT	12		112									
TOTAL	Estimated 2030	10	0	110	0	0	0	165	95	0	0	95	20
		120			0			260			115		

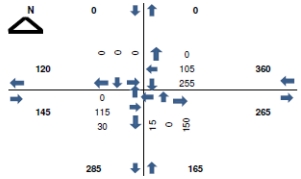


Trip Generation 2030

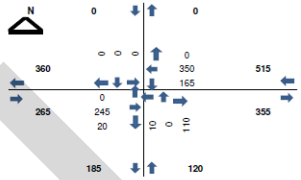
Skyy IN	186
Skyy OUT	124

POST-DEVELOPMENT PM PEAK HOUR - SUMMARY YEAR 2030

		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 40 and Access	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN	0	0	0	0	0	0	0	0	0	0	19	0
	Skyy OUT	0	0	0	0	0	0	0	12	0	0	0	0
	IN							256					28
	OUT	17		150									
TOTAL	Estimated 2030	15	0	150	0	0	0	255	105	0	0	115	30
		165			0			360			145		



		Northbound			Southbound			Westbound			Eastbound		
Location	Trips	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Twp Rd 400 and Rg Rd 22	Counted 09	0	0	0	0	0	0	0	52	0	0	52	0
	Growth rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Estimated 2030	0	0	0	0	0	0	0	95	0	0	95	0
	Skyy IN	0	0	0	0	0	0	167	0	0	0	0	19
	Skyy OUT	12	0	112	0	0	0	0	0	0	0	0	0
	IN								256				
	OUT											150	
TOTAL	Estimated 2030	10	0	110	0	0	0	165	350	0	0	245	20
		120			0			515			265		



Trip Generation 2030

Skyy IN	186
Skyy OUT	124

Generated IN	284
Generated OUT	167

APPENDIX C – Capacity Analysis (Synchro7)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	105	10	75	105	25	230
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	119	11	85	119	28	261
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			131		409	119
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			131		409	119
tC, single (s)			4.2		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			94		95	71
cM capacity (veh/h)			1378		539	898

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	119	11	85	119	290
Volume Left	0	0	85	0	28
Volume Right	0	11	0	0	261
cSH	1700	1700	1378	1700	843
Volume to Capacity	0.07	0.01	0.06	0.07	0.34
Queue Length 95th (m)	0.0	0.0	1.5	0.0	11.7
Control Delay (s)	0.0	0.0	7.8	0.0	11.5
Lane LOS			A		B
Approach Delay (s)	0.0		3.2		11.5
Approach LOS					B

Intersection Summary				
Average Delay	6.4			
Intersection Capacity Utilization	34.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	115	30	255	105	15	150
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	131	34	290	119	17	170
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			165		830	131
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		830	131
tC, single (s)			4.2		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			78		93	81
cM capacity (veh/h)			1338		253	885

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	131	34	290	119	188
Volume Left	0	0	290	0	17
Volume Right	0	34	0	0	170
cSH	1700	1700	1338	1700	722
Volume to Capacity	0.08	0.02	0.22	0.07	0.26
Queue Length 95th (m)	0.0	0.0	6.3	0.0	7.9
Control Delay (s)	0.0	0.0	8.4	0.0	11.7
Lane LOS			A		B
Approach Delay (s)	0.0		6.0		11.7
Approach LOS					B

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	105	10	75	105	25	230
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		100.0	100.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)		2.5	2.5		2.5	2.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.878	
Flt Protected			0.950		0.995	
Satd. Flow (prot)	1539	1308	1462	1539	1344	0
Flt Permitted			0.950		0.995	
Satd. Flow (perm)	1539	1308	1462	1539	1344	0
Link Speed (k/h)	100			100	50	
Link Distance (m)	1411.7			379.6	448.6	
Travel Time (s)	50.8			13.7	32.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	119	11	85	119	28	261
Shared Lane Traffic (%)						
Lane Group Flow (vph)	119	11	85	119	289	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.8%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	115	30	255	105	15	150
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		100.0	100.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)		2.5	2.5		2.5	2.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.877	
Flt Protected			0.950		0.995	
Satd. Flow (prot)	1539	1308	1462	1539	1343	0
Flt Permitted			0.950		0.995	
Satd. Flow (perm)	1539	1308	1462	1539	1343	0
Link Speed (k/h)	100			100	50	
Link Distance (m)	1411.7			379.5	448.6	
Travel Time (s)	50.8			13.7	32.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	131	34	290	119	17	170
Shared Lane Traffic (%)						
Lane Group Flow (vph)	131	34	290	119	187	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.6%		ICU Level of Service A	
Analysis Period (min) 15			

APPENDIX D – Illumination Warrants

Illumination of Isolated Rural Intersections
LIGHTING WARRANT SPREADSHEET

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

Township Rd 400	Main Road	Date	July 19, 2010
Site Access Rd.	Minor Road	Other	Post-Development-Year 2030
	City/Town		

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	100				OK	
Radius of Horizontal Curve (m)	0			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =	B	4				
Posted Speed Category =		0				
Posted Speed Category =		0				
Horizontal Curvature Factor		4	5		OK	20
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	1.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	3	1	3	Number of legs = 3 or more	OK	3
				Geometric Factors Subtotal		**23**

OPERATIONAL FACTORS

Is the intersection signalized ? (Y/ N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	7376	4	10	Either Use the two AADT inputs **OR** the Descriptive Signalization	OK	40
AADT on Minor Road (2-way)	4310	4	20	Warrant (Unused values should be set to Zero) Refer to Table	OK	80
Signalization Warrant	Descriptive	0	30	1(B) for description and rating values for signalization warrant.	OK	0
					OK	
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	4	5	Refer to Table 1(B) for ratings.	OK	20
Operating Speed or Posted Speed on Major Road (km/h)	100	4	5	Refer to Table 1(B), note #3	OK	20
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
				Operational Factors Subtotal		**160**

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
				Environmental Factor Subtotal		**0**

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	0.0	0	0	Enter **either** the annual frequency (See Table 1(C), note #4)	OK	0
OR				**OR** the number of collisions / MEV		
Collision Rate over last 3 years, due to inadequate lighting (/MEV)		0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of **all** night to day collisions >= 1.5 (Y/N)	n	0			OK	
					OK	
				Collision History Subtotal		**0**

Check Intersection Signalization:
Intersection is not Signalized

ILLUMINATION WARRANTED
DELINEATION LIGHTING TO ILLUMINATE PEDESTRIANS OR CROSS STREET TRAFFIC

SUMMARY	
Geometric Factors Subtotal	23
Operational Factor Subtotal	160
Environmental Factor Subtotal	0
Collision History Subtotal	0
TOTAL POINTS	**183**

APPENDIX E – Cost Estimate

A conceptual estimated (in 2010 dollars) of the cost incurred by the proposed Type IVa intersection on Twp Rd 400 is presented in this section. Table E.1 summarized the conceptual cost estimate.

Table E.1: Conceptual Cost Estimate

	Unit	Unit Cost	Quantity	Cost
North bypass lane and tapers				
Asphalt Concrete Pavement	m^2	$19.50	2,304	$44,923
Granular Base Course	m^2	$8.00	2,304	$18,432
South bypass lane and tapers				
Asphalt Concrete Pavement	m^2	$19.50	1,615	$31,493
Granular Base Course	m^2	$8.00	1,615	$12,920
Proposed Main Access Road (incl. corners and tapers)				
Asphalt Concrete Pavement	m^2	$19.50	368	$7,170
Granular Base Course	m^2	$8.00	368	$2,941
Common Fill	m^2	$2.25	368	$827
Common Excavation	m^2	$2.06	368	$758
			Sub-total	$119,464
			Contingency (15%)	$17,920
			Total	$137,384

The conceptual cost estimate was done base on the following assumptions:

- This cost estimate is to be used only for discussion and comparison of conceptual options. This cost estimate is not to be used to satisfy Section A – General Conditions, Section 3 Detailed Engineering Design, Item 8 of the Lacombe County Standards Manual.
- This estimate was prepared independently of a geometric review of the proposed intersection configuration and location.
- All costs in 2010 dollars.
- Unit rates obtained from in-house sources and from Alberta Transportation Unit Price Averages Report (2010).
- Existing Township Road 400 is a paved two-lane undivided roadway with lanes of 3.5m width and shoulders of 1.25m width (9.5m total width) and right-of-way of 40.23m.
- Proposed Main Access Road is a paved two-lane undivided roadway with lanes of 3.5m width and shoulders of 1.1m width (9.2m total width) and a right-of-way of 40.23m.
- No removal of existing roadway is required.

Cost does not include the following elements:

- provisions for additional drainage (if required), signage, pavement markings, illumination (if required), land purchase, utilities, noise, environmental, or cultural/historical requirements (if required), pedestrian/cyclist walkways (if required), cut and fill material (if required) barriers, guardrail or fencing, construction of the Main Access Road past the end of the intersection tapers, any imported material (if required), or slope and ditch construction (as required).

It is suggested that a contingency of $200k should be allowed for the above.