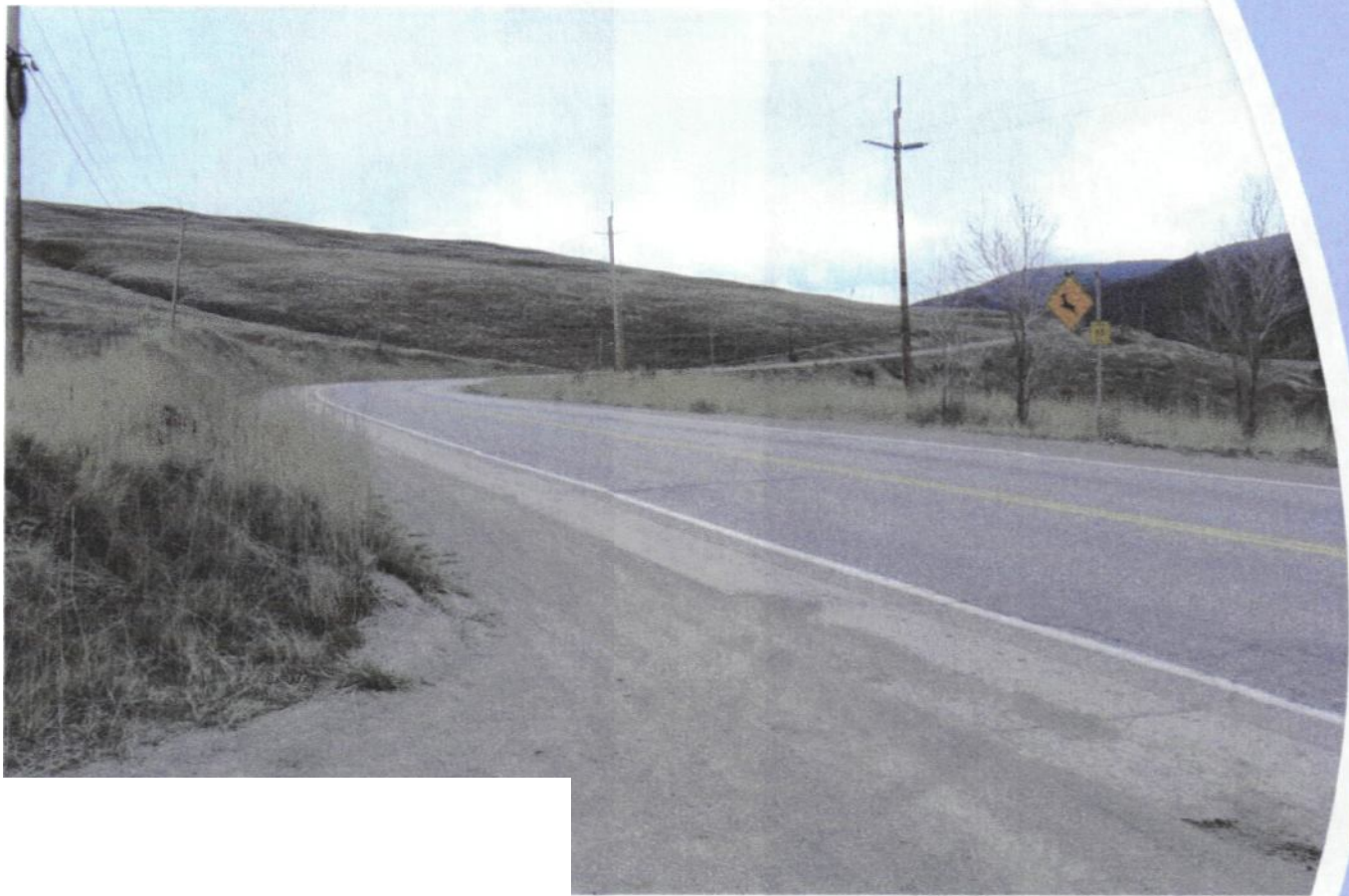


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HIGHWAY 33 & PYMAN ROAD INTERSECTION



Tr

act Assessment

A REPORT
PREPARED FOR
CRC DEVELOPMENTS LTD

This report is prepared for the sole use of CRC Developments Ltd., No representations of any kind are made by Urban Systems Ltd, or its employees to any party with whom Urban Systems Ltd. does not have a contract

38.0006.01
JULY 2008

TABLE OF CONTENTS

1.0 INTRODUCTION.....1

 1.1 STUDY AREA..... 1

2.0 LAND USES 4

 2.1 EXISTING UNO USES 4

 2.2 PROPOSED LAND USES 4

3.0 HIGHWAY 33 TRAFFIC CHARACTERISTICS.....5

 3.1 EXISTING TRAFFIC CHARACTERISTICS 5

 3.2 FORECAST TRAFFIC CHARACTERISTICS..... 6

 3.3 HISTORIC SAFETY PERFORMANCE 6

 3.4 DEVELOPMENT GENERATED TRAFFIC ACTIVITY 7

4.0 PERFORMANCE ANALYSIS..... 8

 4.1 HIGHWAY 33 & PYMAN ROAD INTERSECTION 8

5.0 OFF-SITE IMPROVEMENT SUMMARY..... 12

APPENDICES

Appendix A Highway 33 Widening (eastbound left turn lane and westbound right turn lane)
Cost Estimate



1.0 INTRODUCTION

This transportation impact assessment is prepared at the request of the Ministry of Transportation in response to a development application submitted by CRC Developments Ltd. The application relates to the development of a gravel pit operation northeast of the Highway 33 and Pyman Road intersection, east of the City of Kelowna. Urban Systems Ltd. has been retained to prepare this assessment of the impact that the proposed land use would have upon the adjacent roadway network.

The authority to apply for this type of development and appropriate discussion surrounding the application process, exclusion of the subject lands from the ALR and other related land use issues are dealt with in other documents and are not considered in this assessment, which is specifically focused upon the roadway network implications, and on the Highway 33 and Pyman Road intersection in particular.

1.1 Study Area

The subject property, approximately 605.9 hectares, is identified in **Figure 1.1** and is located within Electoral Area I of the Central Okanagan Regional District. It currently possesses access points onto Highway 33 from both Goudie Road and Pyman Road. The primary access point to the gravel pit operation is proposed via Pyman Road.

For the purposes of this assessment the focus of the technical work is on Highway 33 and its intersection with Pyman Road. **Figure 1.2** and **Figure 1.3** show both the east and west Highway 33 approaches to the intersection. As illustrated, both approaches are relatively flat with a slight upwards grade in the eastbound direction. Highway 33 has a posted speed limit of 90 km/hr. Pyman Road is currently a dirt road that is gated off, and is not currently a publicly used road.

Figure 1.1: Study Area

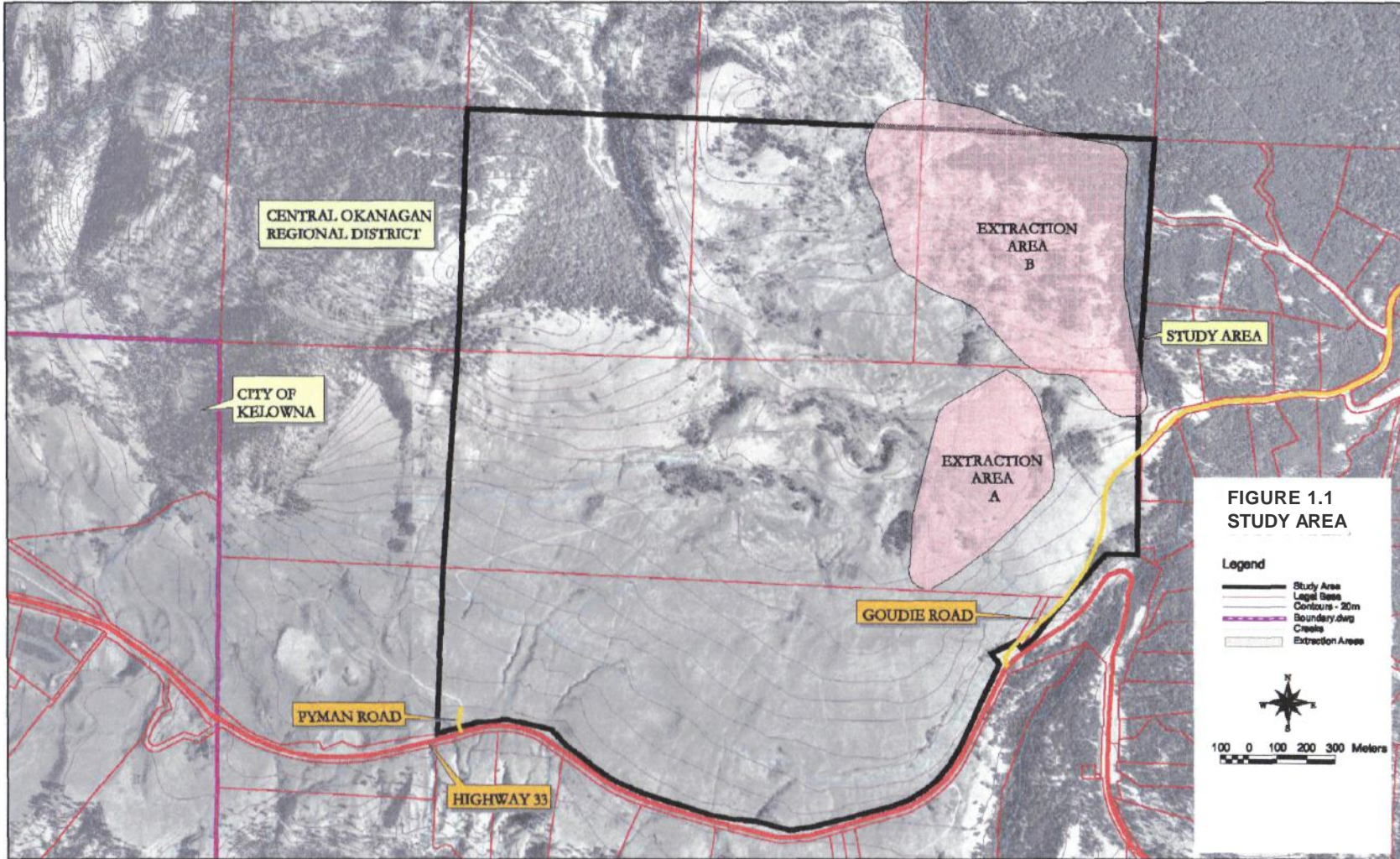
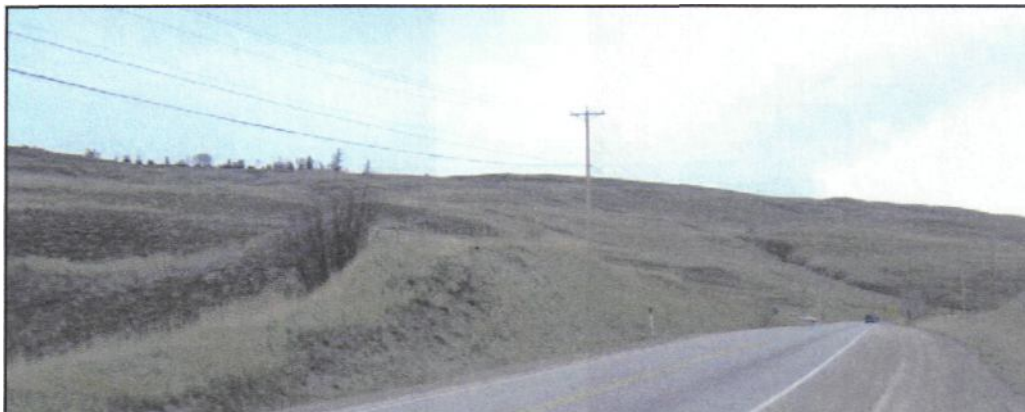


Figure 1.2: Highway 33 Looking West Towards Pyman Road



Figure 1.3: Highway 33 Looking East Towards Pyman Road



2.0 LAND USES

This section outlines the nature of the existing, forecast and proposed development related land uses in the area including and immediately surrounding the subject property.

2.1 Existing Land Uses

Currently, the subject property remains largely undeveloped, and there are no buildings on the site. It is located within the Joe Rich Land Use Bylaw #730, which designates the property as Large Holding (LH) land. It is currently held within the Agricultural Land Reserve; however, an application has received conditional approval (dependant upon the submission of an acceptable revegetation plan). The property is presently being leased out as cattle grazing land. Generally, the existing land use does not generate any traffic activity which can readily be quantified. Surrounding the site to the north and west are additional undeveloped lands forming the southwest slopes of Black Knight Mountain which possess similar negligible traffic impact characteristics.

East of the subject property is a conglomeration of rural acreage residential properties (the Tamarack subdivision) which access Highway 33 via the Goudie Road intersection. The area is primarily a residential suburb of the City of Kelowna, resulting in daily commuter type trip generation activity to and from the area, primarily during the AM and PM peak hours of activity. The Joe Rich Rural Land Use Plan places an emphasis upon preserving and enhancing the rural character of the area, and, as a result, little growth is forecast in this area beyond the occasional lot split.

2.2 Proposed Land Uses

As noted, the applicant is proposing to introduce a gravel mining operation (approximately 60 ha) in the eastern portion of the site, as identified in **Figure 1.1**. This land use is consistent with the 'Primary Aggregate Supply Potential' status of the lands as identified in the *Central Okanagan Growth Management Strategy Aggregate Supply and Demand Study*, which generally concludes that demand for aggregate in the Central Okanagan will exceed supply in less than 15 years if sources are confined to areas outside of the ALR.

A potential pit life of approximately 27 years has been identified, representing a potential aggregate supply of 3,400,000 m³. This aggregate source represents a key component of the urban development and growth strategy envisioned for the Central Okanagan Valley.

The gravel extraction potential is recognized by the BC Ministry of Mines as Mine Number 1620242. The site possesses a high quality source of organic soils suitable for landscaping at the surface underlain by a mixed and inter-layered sequence of sand and gravel suitable for use as structural grade fills beneath building sites and/or on roadway embankments, etc. The extraction license is expected to provide for a removal allowance of 136,000 m³ of material annually.

3.0 HIGHWAY 33 TRAFFIC CHARACTERISTICS

Statistics relating to traffic activity along Highway 33 at the Pyman Road intersection in particular are derived from the Ministry of Transportation traffic count database and from an intersection turning movement count undertaken at the Pyman Road intersection in April of 2008. Current and forecast traffic activity levels are summarized in this section.

3.1 Existing Traffic Characteristics

Existing traffic volume activity levels are derived from two Ministry of Transportation count stations, as identified in **Table 3.1**. Note that the two available traffic count stations are somewhat distant from the subject site; with one (25-016) being located immediately east of Springfield Road in Kefowna and the other (25-027) being located east of the Big White Road intersection considerably east of the subject site. Both areas possess attributes which are considerably different from the subject area, and the resulting information relating to the trends derived from this information is offered primarily for contextual consideration.

Table 3.1: Highway 33 Historic Traffic Volume Trends (AADT)

| | East of Springfield 25-016 | East of Big White 25-027 |
|-----------------------|-------------------------------|-----------------------------|
| | 9910 | n/a |
| 1997 | 9866 | n/a |
| 1998 | 9879 | n/a |
| 1999 | 10475 | 1896 |
| 2000 | 10387 | 1889 |
| 2001 | 10758 | |
| 2002 | 11068 | |
| Linear Growth Rate | 1.8 % | 0.3 % -7 |
| Avg Growth # Vehicles | 190 | |

As is noted in **Table 3.1**, traffic activity levels at these two stations vary considerably, as Station 25-016 is within the commuter shed of the City of Kelowna and is influenced by urban travel patterns and activity, while station 25-027 is completely rural in nature and affected only by travel patterns to and from the West Kootenay Region and beyond to the Central and East Kootenay Regions and the US Border. Note that the values represent Average Annual Daily Traffic volumes and the latest available data is six years old.

A peak hour traffic count was collected on Highway 33 in the vicinity of Pyman Road, recognizing that updated traffic data will provide a more reliable analysis result reflective of current and forecast conditions. Previous peak hour data collected at the Highway 33 & Goudie Road intersection at the eastern end of the site showed a daily peak period of 1700-1800. Therefore, the focus of the additional data collection was during this period, from 1600-1800 on Tuesday, April 8th, 2008. The actual peak



period at this intersection was determined to occur from 1630-1730 and represents the 'worst case' conditions for further analysis. Trucks comprise approximately 6% of the vehicle mix on Highway 33 at this location. The peak hour traffic volumes on Highway 33 at Pyman Road are:

- Eastbound Highway 33 - 216 veh/hr
- Westbound Highway 33 - 93 veh/hr

3.2 Forecast Traffic Characteristics

Forecast traffic volumes (i.e. without development of the subject property) at the Pyman Road intersection to a ten (10) year planning horizon will be generated based upon observed growth rates and professional judgment. As noted, growth trends in the subject area are expected to be minimal. East of the subject area, demonstrated trends have actually been declining, while in the Black Mountain area of Kelowna, west of the subject area, strong growth is expected.

The selection of the identified background traffic growth rates is subjective in this circumstance, as no local historic traffic data is available from Ministry of Transportation sources. Based upon the available information, a background annual traffic growth rate of 1% will be utilized to capture the effect of increased traffic activity to and from the Joe Rich area over the planning horizon. This rate is thought to be conservative and will effectively capture the worst case condition. The forecast (2018) traffic volumes on Highway 33 are therefore estimated to be:

- Eastbound Highway 33 - 239 veh/hr
- Westbound Highway 33 - 103 veh/hr

3.3 Historic Safety Performance

A review of historical safety data on Highway 33 in the vicinity of Pyman Road was undertaken in order to identify any existing safety concerns that may be further aggravated by the upgrade and full use of the Pyman Road intersection.

Generally for Provincial Highways, historic collision information is used to determine collision rates, which are then compared to Provincial benchmarks to determine the general hazard level posed on the intersection. In this regard, historic collision information was collected from the Ministry of Transportation's HAS (Highway Accident System) and analyzed for the 5-year period, 2002-2006 inclusively. A distance of 500 metres to either side of Pyman Road was considered. During this period, only three collisions were recorded at this location, as follows:

- 1 Rear End Collision (Property Damage Only)
- 1 Off-Road Right Collision (Injury)
- 1 Off-Road Left Collision (Injury)

The results of the historic safety analysis are provided in **Table 3.2**.

**Table 3.2: Historic Accident Rate Summary
Highway 33 at Pyman Road (2002-2006) Within 500 m**

| Safety Indicator | Performance Result | Provincial Average |
|--------------------|--------------------|--------------------|
| Accident Frequency | 0.6/Year | 2/Year |
| Accident Rate | 0.53/MVK | 0.8/MVK |
| Critical Rate | 1.51/MVK | n/a |
| Severity Ind | 7.00 | 6.24 |

The results quite clearly show that the collision frequency and rate are well below the average benchmarks for similar facilities across the Province. Statistically, there is no existing safety concern on Highway 33 in the vicinity of Pyman Road at this point in time.

3.4 Development Generated Traffic Activity

Traffic activity generated by the development of an aggregate mining operation is expected to be primarily comprised of truck haul traffic. Based upon the annual mining allowance limit, 50-75 haul trips (trips in and out of the site) are anticipated per standard work day during the construction season. These trips will access the site via Pyman Road.

Traffic generated by the few on-site employees will be minimal, and will be captured through the addition of five (5) peak hour trips.

Vehicle trip distribution and assignment rationale are straightforward and were applied manually. All haul trips were assumed to be between the site and the City of Kelowna, resulting in arrival left turns at the Pyman Road intersection and departure right turns.

The results of the intersection performance analysis after the introduction of the development are included in **Section 4.0**.

4.0 PERFORMANCE ANALYSIS

This section considers the roadway network implications of all of the previously noted impacts relating to background traffic growth in addition to the traffic generated by the proposed new land use.

4.1 Highway 33 & Pyman Road Intersection

With the statistics provided, an intersection performance assessment was undertaken to establish the performance of the Highway 33 and Pyman Road intersection assuming full use of the gravel mining operation. This was completed assuming an opening day of 2008 and a forecast horizon of 2018.

The methodology employed for the performance assessment is an industry standard, and is based upon the Transportation Research Boards' (Washington, DC) Highway Capacity Manual (2000). This methodology utilizes delay to determine appropriate levels of service for various intersection movements to establish the appropriate performance benchmarks. Generally, intersection performance (from a capacity perspective) is ranked according to how long drivers are forced to wait to be able to undertake their desired movement. These benchmarks are stratified into various LOS (Levels of Service) as outlined in **Table 4.1**. At a stop controlled intersection, such as Pyman Road at Highway 33, a minimum performance benchmark of LOS C is expected for the stop controlled approach as well as for the left turn off Highway 33. Through traffic on Highway 33 operates at LOS A as no delay is typically encountered where no form of traffic control exists.

Table 4.1: Unsignalized Intersection Level of Service Criteria

| Level of Service (LOS) | Average Total Delay (seconds per vehicle) |
|------------------------|---|
| | >10 and <15 |
| C D | >15 and <25 |
| E | >25 and <35 |
| | >35 and <50 |

The results of the current and forecast capacity performance analysis are tabulated in **Table 4.2**. Other performance indicators are offered for context and information; namely the average delay encountered in the identified direction during the PM peak hour (in seconds), the volume to capacity ratio (which is a function of the traffic volumes and the lane capacity of the intersecting roadways), and the 95th percentile queue length (in metres).

**Table 4.2: Existing Intersection Performance
Highway 33 & Pyman Road (Weekday PM Peak - Worst Case)**

| iESHSI | Opening Day 2008 | | | | | Forecast 2018 | | | | | |
|---------------------|------------------|---|-------|------|-------|-------------------|-----|-------|------|-----|-------|
| | LOS | I | Delay | V/C | Queue | Volume | LOS | Delay | V/C | I | Queue |
| S/B Left Off Pyman | 1 veh | B | 10.8 | 0.01 | 0.2 | 1veh | B | 11.1 | 0.01 | 0.2 | |
| S/B Right Off Pyman | 13 veh | A | 8.9 | 0.02 | 0.3 | 13veh | A | 8.9 | 0.02 | 0.4 | |
| E/B Left Off Hwy 33 | 8 veh | A | 8.2 | 0.01 | 0.2 | 8veh •HiiHHHHH | A | 8.2 | 0.01 | 0.2 | |

Generally, the results generated in **Table 4.2** indicate that the intersection performs quite well from a capacity perspective. Very little delay is encountered, traffic volumes are well within the theoretical capacity of the intersection, negligible queuing occurs (typically less than one vehicle length) and substantial capacity exists for growth or fluctuations in the identified and forecast traffic volumes. All approach traffic volumes are all well within reasonable limits, and the added traffic generated by the proposed new land use introduces a negligible effect from a roadway capacity perspective.

These results are consistent with expectation, given the very low traffic volumes on Highway 33 through this area and the low forecast growth.

From a roadway safety perspective, the intersection visibility and configuration are the principal considerations. Field measurements confirm approximately 260 m of site distance to the west of Pyman Road, which is limited by a vertical downhill curve, and in excess of 450 m of site distance to the east of Pyman Road (see **Figure 4.1** and **Figure 4.2**). The TAG (Transportation Association of Canada) guideline for decision sight distance at 90 km/h is 275 m for traffic on Highway 33 and 310 m for turning movements out of Pyman Road. Note that the decision sight distance exceeds the critical design criteria of stopping sight distance, which is 170 m under the same circumstances. As a result, it can be concluded that while the intersection alignment and configuration are less than ideal, particularly for traffic coming from the west, the minimum critical visibility criteria are achieved.

Also, while this visibility concern relating to the vertical curve in the alignment of Highway 33 remains despite adequate stopping sight distance, it is important to note that conditions are not exacerbated by the proposed land use traffic as the increased driver eye height and vehicle size associated with the typical vehicle using the site actually reduces the implication of this visibility limitation, which exists as an ambient condition today. Essentially, the field measured 255 m of visibility length is substantially increased with the design vehicle in question (ie. dump trucks).

Figure 4.1: Visibility to East of Pyman Road

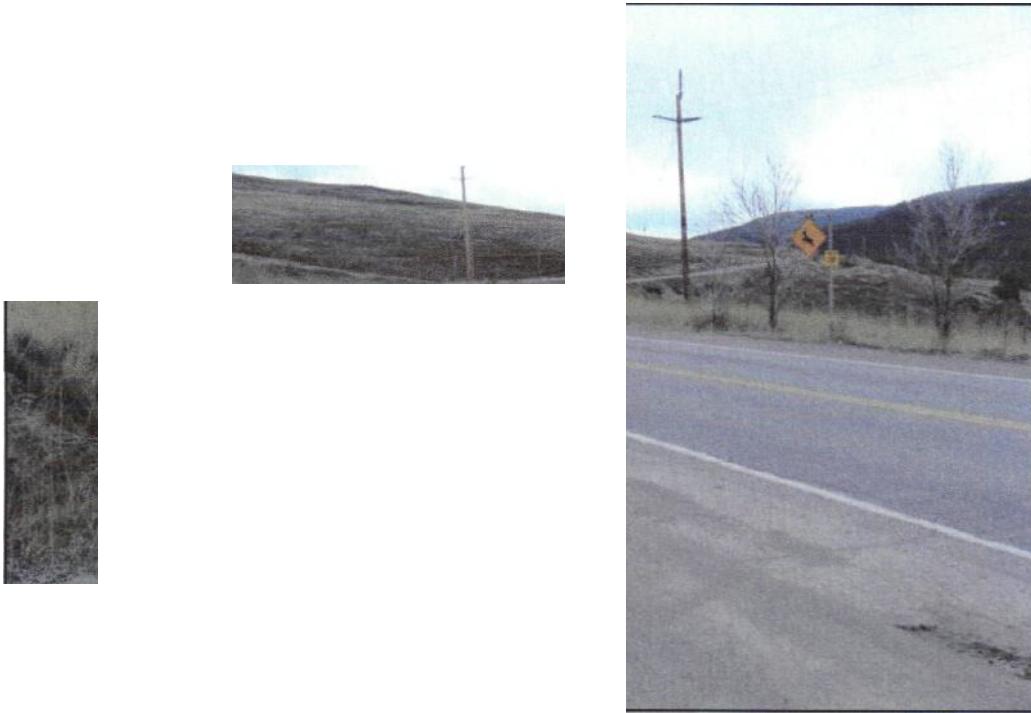


Figure 2.2: Visibility to West of Pyman Road



The grade of Highway 33 through the Pyman Road intersection is approximately level, with, if anything, a very slight downhill gradient towards the City of Kelowna. Special provisions for truck acceleration facilities (turning right out of Pyman Road) are not required, and the grade may even help in decreasing deceleration length needs for trucks turning left off of the highway.

Although a designated left turn deceleration and storage bay on Highway 33 is not required strictly from a capacity related perspective, it is recommended that one be provided, recognizing that decelerating trucks may provide a safety hazard given the high travel speed on Highway 33. As demonstrated in the analysis, minimal storage length is required. The BC Supplement to the TAG Geometric Design Guide (2007, Section 710) specifies a minimum storage length of 30 m plus 50 m of parallel length, and a 50 m taper length for a left turn lane on a rural highway.

Some recognition of the fact that truck activity levels will inherently increase at this location should be contemplated, as the vehicle mix utilizing Pyman Road will be primarily heavy vehicles. This is best accomplished through the introduction of truck crossing/truck turning signage (W-317R) signage along Highway 33 in for eastbound traffic. Such signage is designed to *"warn motorists that trucks or heavy equipment may be frequently entering, crossing or turning from or onto the roadway ahead creating a potentially hazardous situation."* Such a signage installation would only be required for westbound traffic, should be installed 235 m upstream from the Pyman Road intersection (Manual of Standard Traffic Signs, MoT).

The general visibility and safety of the intersection during low light and evening conditions can also be improved through the addition of illumination at the intersection, if minimum warrant criteria are met for this upgrade.

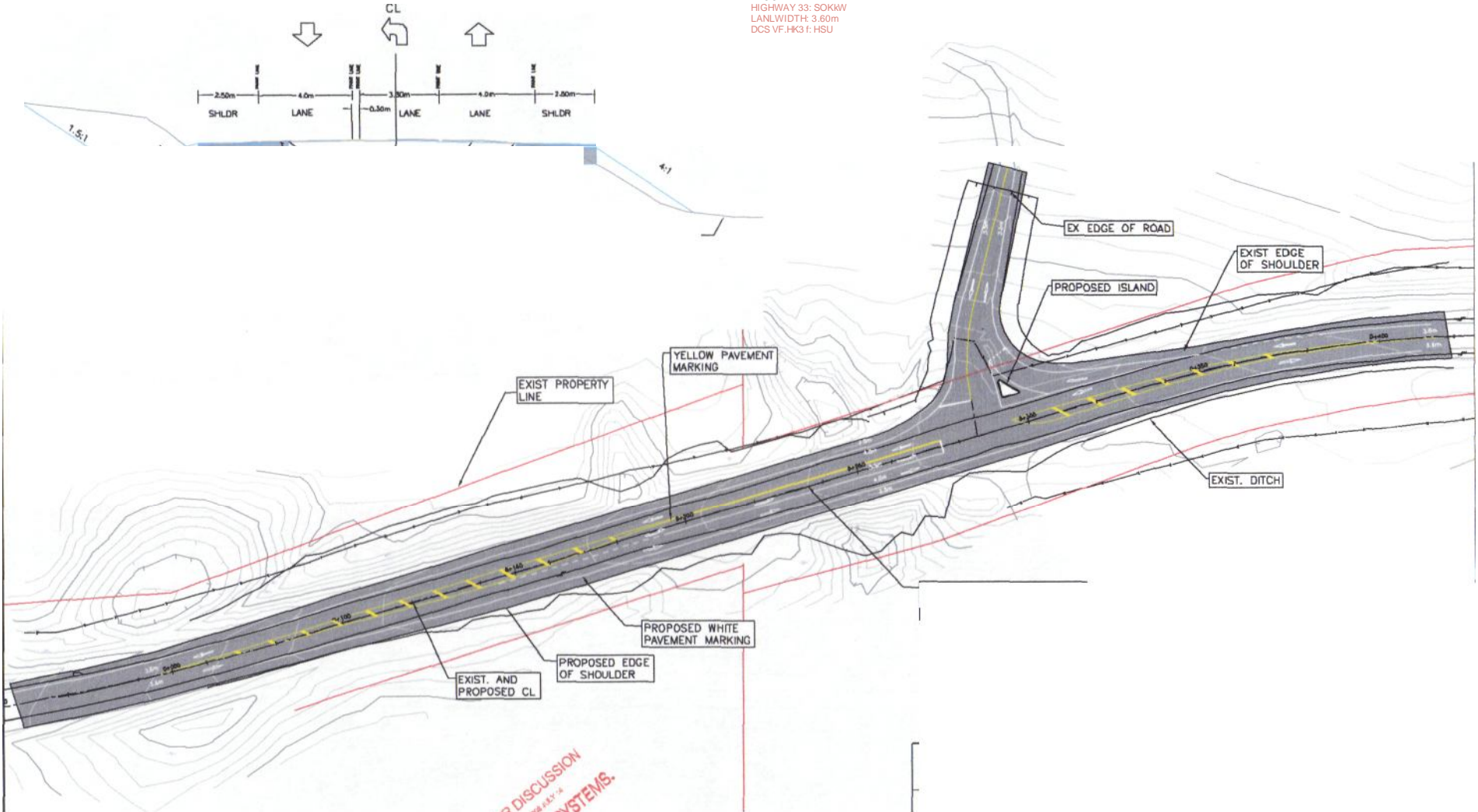


OFF-SITE IMPROVEMENT SUMMARY

As discussed, although the Highway 33 & Pyman Road intersection can operate with no capacity limitations given the proposed new development traffic, several upgrades are recommended in order to ensure the safe operation of the intersection. The most significant of these is the addition of a new eastbound left turn deceleration and storage lane and a westbound right turn taper, as illustrated in **Figure 5.1**. The cost to complete these two upgrades is estimated to be \$710,000. This estimate includes the provision of appropriate approach warning signage and intersection illumination.



DES SPEED:
HIGHWAY 33: SOKKW
LANLWIDTH: 3.60m
DCS VF.HK31: HSU



FOR DISCUSSION
2024.12.17-18
URBAN SYSTEMS

HWY 33

REVISIONS

FIGURE 5.1