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SUMMIT ENVIRONMENTAL CONSULTANTS INC.
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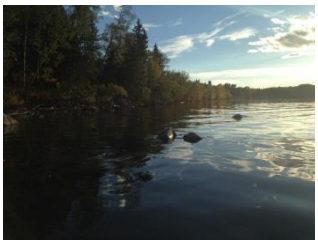
REPORT

Lacombe & Red Deer Counties, Town of Sylvan Lake & Summer Villages of Sylvan Lake

Sylvan Lake Boat Launch Access Strategy
and Action Plan for Recreational Lake Access



January 2016

Executive Summary

In recent years, the Communities around Sylvan Lake (the Lake) have experienced a rapid growth in population resulting in a high demand of seasonal and year-round residential development. With the increase in population, there have been subsequent recreational (i.e. boating, fishing, picnicking, camping) pressures in and around the Lake. The Lake is currently governed by eight municipal bodies including Lacombe County, Red Deer County, The Town of Sylvan Lake, and the Summer Villages of Birchcliff, Half Moon Bay, Jarvis Bay, Norglenwold and Sunbreaker Cove, which make up the Sylvan Lake Access Management Steering Committee (the Committee).

The Committee retained Associated Engineering (AE), Summit Environmental Consultants Inc. (Summit), and EIDOS Consultants Incorporated (EIDOS) to review the existing studies, evaluate the existing and potential locations for suitable recreational lake access, and develop an Action and Implementation Plan for recreational access to the Lake.

The intent of the Action and Implementation Plan is to incorporate the public's needs, safety and environmental values of the area, and develop decision-making criteria that will enable the municipalities to prioritize and justify locations for new recreational areas or provide justification for reduced recreational access at specific locations.

In addition to the Action and Implementation Plan, the Committee had selected the informal boat launch located at Range Road 21 to be reviewed for the development of a formal boat launch site. Upon review of Range Road 21, it was determined that this site does not meet the minimum design criteria for a double boat launch. Upon further discussion with the Committee, two additional sites are reviewed for the development of a formal boat launch and day use area, and two additional sites were reviewed for the development of day use areas. Results of the additional sites have been incorporated in this report.

As part of background and document data review, AE conducted a literature review. The information gathered is compiled in Appendix A. *Selection of a New Boat Launch Site on Sylvan Lake* completed by MPE Engineering Ltd. (MPE) in 2011 identified two sites (5P and 2F) as possible new boat launch sites. After comparison of site 5P and 2F, MPE recommended the selection of site 5P for final design due to its lower environmental classification and lower cost. The A&IP ranked site 5P as moderate and site 2F as high.

The feasibility study for the development of a boat launch at Range Road 21 is included in Appendix E.

1 ASSESSMENT MATRIX AND IMPLEMENTATION PLAN

An assessment matrix was prepared to identify and classify both public lake access points and private lands with shoreline and lake access. New potential lake and existing access locations are identified on

Figure 2-1, within the report. Each of the identified lake access locations were classified into one of five recreational use categories:

- Existing Boat Launches
- New Boat Launches.
- Non-Motorized Boat Hand Launches.
- Environmental/Community Reserve & Lake Access.
- Natural Preservation & Mitigation Areas.

Each category was established to relate to the types of lake access and land use defined in current planning documents.

The Assessment Matrix was used to evaluate the suitability of each location based on the following criteria;

- Natural/ Environmental factors such as mapped known fish habitat, riparian vegetation, etc.
- Regional/ Community factors such as site access and egress requirements, surrounding land use, etc.

Each criterion was evaluated based on a 1 to 10 scale with 1 indicating a low impact and 10 indicating a high impact. Within the matrix different weighting factors from 1 to 5 were applied to take into account the sensitivity of different criteria. To provide a comparative sensitivity of each site, a ranking scale of least, moderate, high, and very high was attributed to each site.

The Action and Implementation Plan (A&IP) was prepared and structured based on the assessment matrix, for each public site and private land parcel. The A&IP provides a flexible approach to the future management, mitigation and development of public and private lands with respect to responsible shoreline and lake access. Key items addressed in the A&IP include:

- A lake access category, complete with a proposed action and implementation direction and description;
- Identified mitigation and management requirements;
- Targets of Opportunity (i.e., key stakeholders and decision-makers);
- The specific roles and responsibilities in implementing the proposed actions;
- An estimated capital costs (where applicable) for either development or mitigation; and

2 EMERGENCY RESPONSE PLAN

To assist in mitigating on-lake emergencies it is important to increase the boater awareness on the Lake. It was recommended that additional signage be implemented to educate boaters/ lake users of the following:

- The specific location and address or location name of the launch site.
- Basic lake bathometry.
- Launch location in relation to the rest of the Lake.
- Emergency Contact numbers.

3 RANGE ROAD 21 REVIEW AND ADDITIONAL SITE ASSESSMENT

For the development of new formal boat launch at Sylvan Lake, the Committee requested a review of the existing (informal) boat launch at Range Road 21 in Red Deer County.

The findings of the Range Road 21 Feasibility Study identified that the does not meet the minimum design criteria outlined by the Committee.

Due to these findings for Range Road 21, the Committee requested that a desktop review be completed for two additional sites, site 5S and 5V in Red Deer County.

4 CONCLUSIONS/ RECOMMENDATION

The following is a summary of the conclusions/recommendations made in this report:

- Due to increased demand from lake users, the current formal and informal launches boat are not able to meet demand. Additionally, many of the informal lake access point, which are naturally and environmental sensitive, are being negatively impacted.
- The Action and Implementation Plan provides a flexible planning tool to assist the Committee members to mitigate and redevelop existing public lake access location and to assess and guide the future development of private lands with shoreline and lake access.
- Additional signage should be installed at lake access points to improve public awareness of the Lake and provide emergency contact information.
- Range Road 21 is not recommended for the development for a new formal boat launch as it did not meet the minimum design criteria. Should Range Road 21 be developed, it would have a reduced level of service as compared to the Sunbreaker Cove facility.
- For the review of Sites 5S and 5V, the desktop review found that both sites have environmental constraints associated with the development of a day use and boat launch. The field assessment confirmed the physical, as well as environmental constraints of the site. Although these sites have constraints, mitigation efforts through design may be implemented which would allow development of these locations.

As development occurs around the lake, the Committee should review the Action and Implementation Plan for ways to incorporate public lake access at these locations.

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1 Introduction

Sylvan Lake (the Lake) is a popular destination for regional and provincial-wide water related activities. In recent years, there has been rapid growth in residential development and recreational (i.e. boating, fishing, picnicking, camping) activities in and around the Lake.

Currently there are numerous locations along the Lake that provide formal and informal shoreline and lake access. The formal boat launches are: Sunbreaker Cove (public), Marina Bay (private), and Sylvan Lake Marina (private). These existing facilities are not able to meet the demand arising from popular water activities. In particular, water-users are:

- experiencing long wait-times for launching and loading at formal boat launches;
- dealing with insufficient parking areas, including parking vehicles up to 1 km away from launch; and
- using informal boat launches located at road ends, which impact the existing lake and shoreline environment.

There are growing concerns with public safety at the existing facilities with respect to increased vehicle/boat traffic. In addition there are increasing potential environmental impacts affecting fish habitat, water quality, riparian vegetation as well as the threat of introducing invasive species to the natural ecosystem at the informal boat launch locations.

The Lake is currently governed by eight municipal bodies including Lacombe County, Red Deer County, The Town of Sylvan Lake, and the Summer Villages of Birchcliff, Half Moon Bay, Jarvis Bay, Norglenwold and Sunbreaker Cove. These municipal bodies also make up the Sylvan Lake Access Management Steering Committee (the Committee).

The Committee is responsible for working collaboratively to manage the ever-growing pressures of shoreline and lake access. The Committee retained Associated Engineering (AE), Summit Environmental Consultants Inc. (Summit), and EIDOS Consultants Incorporated (EIDOS) to establish an adaptable management approach to respond to the growing pressures on the Lake. This approach will involve the development of an Action and Implementation Plan. The intent of the Action and Implementation Plan is to:

1. to incorporate public needs, safety and environmental values of the area, and
2. develop decision-making criteria that will enable the eight municipalities to prioritize and justify locations for new recreational areas or reduced recreational access at specific locations.

The following report summarizes the review of existing lake data, reports/studies and, the site-specific assessments that were undertaken to develop the Action and Implementation Plan.

1.1 PROJECT SCOPE

This study was initially separated into four (4) tasks; a fifth task was added to the scope of the project based on the findings of the Range Road 21 boat launch assessment.

Task1
The first task of the study was data collection and literature review. As part of this task, the following was undertaken:

- Review and provide a summary of relevant existing literature from Sylvan Lake.
- Review of Federal and Provincial Environmental Legislation.
- Perform a site assessment of potential boat launch and recreational sites along the lakeshore.
- Liaise with Federal and Provincial Regulators.

Task 2
The second task of the study was to utilize the collected data, and develop the Assessment Matrix to evaluate potential boat launch and recreational sites along the lakeshore. Using the Assessment Matrix, the Action and Implementation Plan was developed.

Task 3
The third task was to provide an Emergency Response Plan for boat launch and lake users.

Task 4
The fourth task entailed an assessment of the existing informal boat launch at Range Road 21 to identify the sites capability for development as a formal public boat launch facility. As part of this assessment the following was undertaken:

- Performed a field assessment of Boat Launch on Range Road 21.
- Reviewed Federal and Provincial Policies and Design Standards.
- Completed a Traffic Impact Assessment on Range Road 21.
- Provided Design Criteria and Investigate Layout Configurations for a new boat launch at Range Road 21.

The findings of this task are provided in a separate technical memo attached in Appendix E.

Task 5
The fifth task involved the review of the development of two private sites in Red Deer County (Site 5S and 5V) into day use and boat launch facilities. The items involved in the assessment included the following:

- Perform a desktop study for the sites.
- Perform a fish habitat assessment.
- Provide conceptual layouts of the options for the sites.
- Provide a cost estimate to develop the sites.

In addition to reviewing these sites, concept plans to develop Range Road 21 (site 1A) and Kuusamo Krest (site 2F) were also developed.

In discussion with the Committee members, the intent of this additional study is to provide potential developers with a feasible concept(s) to provide public lake access at these locations.

2 Background and Document Data Review

2.1 LITERATURE REVIEW

Information was gathered from past studies, both in relation to the environmental management and lake recreational activities.

Documents reviewed for the literature review include the following:

- Sylvan Lake Parks and Recreation & Open Space Plan, Lacombe County, 2012.
- Highland Park Concept Plan, Cu-Consulting Ltd., 2012
- Sylvan Lake/Red Deer County Inter-municipal Development Plan, Town of Sylvan Lake/Red Deer County and Park Land Community Planning Services, 2011.
- Birchcliff - The Slopes Concept Plan, Longview Planning and Design and MPE Engineering Ltd., 2011.
- Palm Bay Resort - Biophysical Assessment, Stantec, 2010.
- Lacombe County/Sylvan Lake Area Structure Plan, AECOM, 2010 (draft).
- Palm Cove Concept Plan, MH Project Planning, 2010.
- Selection of a New Boat Launch Site on Sylvan Lake, MPE Engineering Ltd., 2010 (draft).
- Fisheries Assessment of Proposed Boat Launches at Sylvan Lake, Palliser Environmental, 2010.
- Lacombe County - Sylvan Lake Boat Launch Study Policies, Standards and Practices, Armstrong Consulting Services, 2010.
- Red Deer County Municipal Development Plan, Red Deer County - Planning and Development Services, 2010.
- SKYY Country Golf and R.V. Plan, Bemoco Land Surveying ltd., 2009.
- Historical Resources Clearance Letter, Government of Alberta, 2009.
- Historical Resource Impact Assessment - Kuusamo Krest & Boy Scout Camp, Bison Historical Services Ltd., 2009.
- Baker Thesis Groundwater Contribution to Sylvan Lake, Jennette Baker - University of Calgary, 2009.
- Red Deer County Open Space Master Plan, Dillon & evds urban lab, 2009.
- Red Deer River State of the Watershed Report, Red Deer Watershed Alliance, 2009.
- Handbook for state of the Watershed Reporting, Alberta, 2008.
- Municipal Guide - Planning for a Healthy and Sustainable North Saskatchewan Watershed, NSWA, 2008.
- MDP Lacombe County, Armin A. Preiksaitis & Associates, 2007 (updated 2010).
- LakeWatch 2006 Report, Alberta Lake Management Society, 2006.
- Association of Summer Villages of Alberta Lake Stewardship Reference Guide, ASVA Lake Stewardship, 2006 edition.
- Review and Analysis of the Science Based documents and Associated Governing and Management Documents for the Sylvan Lake Watershed, Planned Environmental Associates, 2006.

- Sylvan Lake Water Quality Assessment and Watershed Management Considerations, AXYS Environmental Consultants Ltd., 2005.
- Administration Report, Red Deer County, Planning and Development, 2004.
- MDP Birchcliff, Parkland Community Planning Services, 2003.
- MDP Sunbreaker Cove, Parkland Community Planning Services, 2003.
- MDP Town of Sylvan Lake, 2003.
- A Review of Three Development Proposals in Vicinity of Sylvan Lake, Komex International Ltd., 2003.
- County of Red Deer – ESA Management Plan, Golder Associates, 2009.

Key findings from the literature review include:

- Development along the Lake has increased over recent years, resulting in pressure for more recreational opportunities.
- There are currently three (3) formal boat launch areas, and several informal locations.
- The majority of public access locations that would be suitable for boat launches have already been studied and have been identified as incompatible due to environmental constraints.
- Private land opportunities should be considered for future public boat launches and lake access to accommodate regional growth and visitations.

Sites 5P and 2F, MPE's sites SE and SW respectfully, were identified as possible new boat launch sites in *Selection of a New Boat Launch Site on Sylvan Lake* completed by MPE Engineering Ltd. (MPE) in 2011. In the report, MPE conducted an aquatic environment assessment, a historic resources review, and a hydrotechnical analysis of Sylvan Lake at the two sites. MPE identified that site 2F provided superior fish habitat due to large emergent beds of vegetation being present but was already being used as an *ad hoc* boat launch by the public. MPE identified that site 5P was not identified as having key fish habitat. Neither site was found to be historically significant based on the historic resources review and a subsequent Historical Resource Impact Assessment.

Based on hydrotechnical analysis of Sylvan Lake including water levels, wave height, ice formation, and bathymetry, MPE completed a boat launch analysis and proposed a double-ramp, pre-cast concrete slab floating dock. Parking and day use facilities were also conceptually designed in the report. After further cost comparison of site 5P and 2F, MPE recommended the selection of site 5P for final design. A copy of MPE's report is provided in Appendix A.

Several of the reviewed documents are no longer applicable or dated (Appendix A). Related findings have been applied in this study and the development of the Assessment and Action and Implementation Plan matrices.

The detailed literature review is in Appendix A of this report.

2.2 BOAT CAPACITY

The recreational capacity and overall boating capacity was reviewed during the literature review. The estimated overall boat capacity of the Lake is provided in the *Sylvan Lake Public Access Study* (the Study) prepared by ISL Infrastructure System Ltd. Below is a summary of the criteria used in the Study to determine the estimated boat capacity.

- Estimated Lake Recreational area = 3,400 hectares
- Maximum boat density = 1 boat per 8 hectares
- Percentage of boats used that are moored at the Lake = 65%
- Current use of moored boats used at once = 1 in 6
- Current use of launched boats used at once = 1 in 2

Table 2.1 describes the estimated overall boat capacity based on the criteria listed above.

Table 2-1
Boat Capacity Estimate

	Current Estimated Value	Future Estimated Value
Peak Boats in use on the Lake	300	425
Total Boats Moored on the Lake	1200	1660
Total Boats Launched on Peak Day	200	300
Total Truck/Trailer Stalls	75	150

As discussed in the Study, these values show that the Lake can accommodate an additional 100 launches per day. This value provides a basis for the future boat launch requirements. Based on the ISL study, an additional 125 parking stalls (distributed across several boat launch areas) are required along the Lake to meet future demands.

Currently there are three formal boat launches on the Lake:

1) Sunbreaker Cover (Public, Double launch)
2) Sylvan Lake Marina (Fee for services, double launch)
3) Marina Bay (Private launch, no public access)

Based on the two formal publically accessible boat launches, the Lake's estimated launch capacity is 192 total launches/retrievals per day. This estimate assumes that the average time to launch and retrieve is 10 minutes per user, over an 8 hour period. According to the ISL report, this number is just below the current demand for the Lake.

2.3 ENVIRONMENTAL REGULATIONS AND LEGISLATION

A review of the Provincial and Federal legislation was undertaken to identify the relevant environmental legislation that may (depending on design, location, and construction timing) apply to the construction of a boat launch or recreational facility on Sylvan Lake.

The following acts were reviewed and are summarized in Table 2-2

- Fisheries Act (Federal)
- Species at Risk (Federal)
- Migratory Birds Convention Act (Federal)
- Fisheries (Alberta) Act (Provincial)
- Water Act (Provincial)
- Public Lands Act (Provincial)
- Wildlife Act (Provincial)
- Weed Control Act (Provincial)
- Agricultural Pests Act (Provincial)
- Sylvan Lake Management Plan: 2000 Update (Municipal)
- Red Deer County ESA (Municipal)

It is important to note that the (former) federal Navigable Water Protection Act does not appear in Table 2-2, as this Act was amended in 2013 and recently became the Navigation Protection Act (NPA). This amended Act retains many of the requirements of the former version, but applies to fewer waterbodies. No review by Transport Canada is required, provided that the Common Law right of navigation is maintained in the design, construction, and implementation of any structure in, though, or over the Lake. As under NPA, Sylvan Lake is not included in the list of scheduled waterbodies.

Table 2-2
Relevant Legislation or Requirements and Corresponding Compliance Measures

Title and description	Complying with the Act
Fisheries Act (federal): Any activities with potential to cause harm to fish or fish habitat are regulated under this Act. Activities are subject to self-assessment, review, or authorization.	If construction of a boat launch requires placing fill or structures of any kind below the high-water mark, the project will require review by the Department of Fisheries and Oceans Canada (DFO). Depending on the scope of impact and quality of fish habitat, the project may require authorization from DFO, fish habitat assessment, and fish habitat compensation. All projects near water should implement the **Measures to Avoid Causing Harm to Fish and Fish Habitat** (Government of Canada 2013) to reduce the risk of harming fish and fish habitat.
Species At Risk Act (SARA) (federal): Activities with potential to impact a species at risk / species of concern and/or their habitat are regulated under this Act.	A desktop assessment of potential project effects to SARA-scheduled species and their habitat should be completed, followed by field assessment if such species are suspected to occur within or surrounding a proposed boat launch area. A qualified environmental professional should undertake surveys for such species and produce recommendations to avoid impacting a species at risk / species of concern and/or its habitat.
Migratory Birds Convention Act (federal): Any activities which involve the removal of vegetation or migratory bird habitat during nesting seasons are regulated by this Act.	Complete vegetation removal activities outside the migratory bird nesting season (April 10 to August 31 in the B4 Bird Conservation Region) (Government of Canada 2014a). If clearing is required during the nesting season, a qualified environmental professional should undertake surveys for migratory birds and their nests, provide recommendations for operating around migratory birds, and establish appropriate buffers (zones where no construction activities, equipment, or personnel are permitted) around nests. Note special considerations apply to raptors and are covered in further detail under the Alberta *Wildlife Act*.
Fisheries (Alberta) Act (provincial): This Act regulates Alberta fisheries and requires all forms of fishing to be licensed.	A qualified environmental professional must obtain and adhere to the conditions of a Fish Research Licence if handling or investigating fish during any stage of the project. A Fish Research Licence will be required if a fish

Title and description	Complying with the Act
	salvage is to be conducted. Fish salvage is required when isolation measures are implemented for in stream work.
Water Act (provincial): Any project activities that involve work in or near a water body are subject to this Act and are generally regulated by the Code of Practice. This Act identifies Restricted Activity Periods (RAPs) for waterbodies (i.e. periods when in stream work should be avoided) and requirements for completing works in waterbodies.	Permanent boat launches are not regulated under the Code of Practice documents and, as such, will require an approval under the Act.
Public Lands Act (provincial) All bed and banks of waterbodies are Crown land and are administered by Alberta Environment and Sustainable Resource Development.	Obtain a disposition for a proposed boat launch and/or access road(s) and parking lot(s). A temporary field authorization will be required if equipment storage and laydown areas are to be located on public lands. These dispositions may be joint applications under both the *Public Lands Act* and the *Water Act*.
Wildlife Act (provincial): This Act prohibits the willful molestation, disruption, or destruction of wildlife, or a house, nest, or den of wildlife. Special provision for the protection of raptors and their nests/habitat are made under this Act.	Conduct a desktop assessment to determine what wildlife species may be present in and around any proposed work site. A qualified environmental professional should complete field surveys and provide recommendations to avoid impacting wildlife. Complete surveys for houses, nests, or dens of wildlife and specific surveys for raptors and their nests. If a raptor nest is identified, it may only be removed with a permit or if the nest is not used by a raptor for two or more consecutive years.
Weed Control Act (provincial): Schedule 1 and 2 weed species are regulated by the Act, which requires the destruction of Schedule 1 prohibited noxious weeds and the control of Schedule 2 noxious weeds. This Act prohibits the spread and increase in density of weeds.	Develop a weed management plan for the proposed construction, including a commitment to ensure equipment is weed and seed free before entering or leaving work sites. Employ weed control measures on work sites. Maintain a copy of the **Alberta Invasive Plant Identification Guide** on work sites to identify suspected plants (Government of Alberta 2012).

Title and description	Complying with the Act
Agricultural Pests Act (provincial): This Act regulates species and pathogens with potential to harm agricultural productivity, and requires that measures are employed to mitigate the spread of scheduled pest species and pathogens.	Conduct a desktop assessment of potential pest species and pathogens, and employ appropriate measures to mitigate their spread. Employ specific measures to prevent the spread of clubroot (*Plasmodiophora brassicae*).
Sylvan Lake Management Plan: 2000 Update (municipal): This management plan provides the general locations of environmentally sensitive areas in and around Sylvan Lake. In these areas, development is only permitted after rigorous study demonstrates that impacts can be effectively mitigated.	Restrict development in or near environmentally sensitive areas to that which is compatible with conservation efforts. Complete an environmental review of proposed projects. Consult with provincial environmental regulators through the design, build, and use of projects in environmentally sensitive areas. Periodically re-assess environmentally sensitive areas to monitor change, impacts, or previously unmapped environmentally sensitive areas.

Due to the project being in the conceptual design phases a formal meeting with Federal and Provincial regulators was not granted at this time. A formal meeting with all appropriate parties should be completed in the preliminary design stages. Summit completed an interview with Alberta Environment and Parks (AEP, formerly Environment and Sustainable Resource Development) concerning the construction of a boat facility and Protective Notations at Sylvan Lake; this discussion is summarized in Section 2.4.4 of this report.

2.4 ENVIRONMENTAL CONSTRAINTS

Numerous environmental constraints must be considered in order to establish a boat launch facility on Sylvan Lake. Generally, these relate to fish habitat, water quality, and include terrestrial and anthropogenic factors. This section discusses these considerations.

2.4.1 Fish and Wildlife Habitat

Healthy lake ecosystems exhibit a diverse fish population and community structure that is capable of supporting a managed fishery (subsistence, recreational, and/or commercial). Studying the habitat needs of resident species and monitoring fish populations provide valuable information on the health of the lake in question.

A search of the Fish and Wildlife Management Information System (FWMIS) database identified seven fish species present in Sylvan Lake and two wildlife species using habitats around the Lake (Table 2-3), none of which are listed. Querying the FWMIS database for native ranges of sensitive species revealed that the southeast shore of Sylvan Lake (including part of the town of Sylvan Lake) contains potential habitat for bald eagle (*Haliaeetus leucocephalus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) (Table 2-3) (Government of Alberta [GOA] 2014).

Areas that contain sensitive fish, waterfowl, or ungulate habitat are identified in the Shoreline Habitat Assessment of Sylvan Lake. These habitat areas are located in numerous locations surrounding the Lake and its shores (Environmental Management Associates 1990). The Shoreline Habitat Assessment of Sylvan Lake identifies 11 areas of key fish habitat, eight areas of key ungulate habitat, and five areas of key waterfowl habitat (Appendix B). These areas were determined based on a review of existing published data sources, and they have been designated as “environmentally sensitive” in the Sylvan Lake Management Plan: 2000 Update (IBI Group 2000).

Table 2-3
Fish and Wildlife Species In and Around Sylvan Lake and their Conservation Statuses

Common Name	Scientific Name	General Status of Alberta Wild Species 2010*	Species at Risk**	COSEWIC Status***
Burbot	*Lota lota*	Secure	No	Not assessed
Emerald shiner	*Notropis atherinoides*	Secure	No	Not assessed
Lake whitefish	*Coregonus clupeaformis*	Secure	No	No listed in Alberta
Northern pike	*Esox lucius*	Secure	No	Not assessed
Walleye	*Stizostedion vitreum*	Secure	No	Not assessed
White sucker	*Catostomus commersoni*	Secure	No	Not assessed
Yellow perch	*Perca flavescens*	Secure	No	Not assessed
Canadian toad	*Anaxyrus hemiophrys*, a.k.a. *Bufo hemiophrys*	May be at risk	No	Not at risk
Vagrant shrew	*Sorex vagrans*	May be at risk	No	Not assessed
Bald eagle	*Haliaeetus leucocephalus*	Sensitive	No	Not at risk
Sharp-tailed grouse	*Tympanuchus phasianellus*	Sensitive	No	Not assessed

Note:
* Listing in the General Status of Alberta Wild Species 2010 (GOA 2014)
** Listing under Schedule 1 of the *Species at Risk Act* (Government of Canada (Government of Canada) 2012)
*** Assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2014)

2.4.2 Emergent Vegetation

Emergent vegetation provides important structure habitat for fish, including shelter, forage, spawning, and rearing habitats. These plants also provide benefits for water quality by sequestering nutrient inputs and oxygenating lake water (Dodds and Whiles 2010). Emergent vegetation is rooted in the lake substrate and requires shallow water to grow. Rising water levels in Sylvan Lake are reducing the area of suitable habitat for emergent vegetation and, consequently, reducing shelter, forage, spawning, and rearing habitats for fish. Areas that contain emergent vegetation are secured by protective notations (see details in section 2.4.4) and only limited development may proceed in these areas after adequate study.

2.4.3 Fractured Sandstone Channel

Sylvan Lake is located on the Paskapoo Bedrock Aquifer. Along the northwest shore of the Lake, the bedrock is separated by channel sandstone that contains fractures which are thought to facilitate ground and surface water interactions between the Lake and the aquifer. Thirty-one percent of water inputs to Sylvan Lake are thought to originate from groundwater, and the Lake is thought to flush every 25 to 40 years (Baker 2009). These processes may play roles in maintaining the Lake's mesotrophic status. Development on the north side of the Lake may have more significant impacts on lake water quality than development elsewhere on the Lake (Baker 2009).

2.4.4 Protective Notations

Protective notations (PNTs) are land dispositions that are placed on areas with specific land use or conservation objectives. These dispositions are held by the Government of Alberta (GOA) and are designated through consultation with public land managers. They provide information such as allowable land uses, management guidelines, restrictions, and regulatory contacts (GOA 1997). Currently, there are numerous PNTs along the Sylvan Lake shore and extending into the Lake. These cover areas can be as small as one legal subdivision to as large as several quarter sections. The PNTs on Sylvan Lake serve primarily to protect the declining emergent vegetation noted above.

Summit and AEP discussed the construction of boat launch facilities and environmental constraints associated with the PNTs. Construction of boat launch facilities for motorized craft should be avoided within or near areas with PNTs, since motorized craft can impact emergent and aquatic vegetation. Since emergent and aquatic vegetation typically grows in shallower areas, it is at risk from motorized craft, which often requires greater depths to operate (J. Reilly, personal communication, 2014). Non-motorized water craft, such as canoes, pose lower risk to emergent and aquatic vegetation. Hand-launch facilities, however, should be avoided in areas with abundant aquatic vegetation. After appropriate impact study and discussion with regulators, it is deemed that impacts to emergent and aquatic vegetation can be sufficiently nullified or mitigated. The locations of current PNTs on Sylvan Lake are shown in Figure 2-1.

AEP currently holds all PNTs on Sylvan Lake and has placed these notations to protect emergent vegetation. AEP will allow various types of development to take place below the high water mark; however, discussions with AEP regarding the type, duration, impact level, and expected cumulative effects will be required. Due to rising water levels, increased recreational demand, and increased lake front development, AEP wishes to increase their role in the planning and construction of future developments on Sylvan Lake (J. Reilly, personal communication, 2014).

2.4.5 Parks and Natural Areas

Three protected areas are located along the shores of Sylvan Lake. At the south end of the Lake, in legal subdivisions (LSDs) 5 and 11 to 15 of 33-38-01-W5M, is Sylvan Lake Provincial Park (165.6 acres). This park encompasses the entire lakefront and public beach area within the Town of Sylvan Lake. Along the northeast shore of the Lake in LSDs 9 to 11 and 13 to 16 of 09-39-01-W5M is Jarvis Bay Provincial Park

(212.1 acres), which contains the Jarvis Bay Campground. At the north end of the Lake in LSD 4 of 33-39-02-W5M and LSD 13 of 28-39-02-W5M is the Sylvan Lake Natural Area (33.2 acres) (GOA undated).

Provincial parks and designated Natural Areas are administered by AEP. Both categories are protected areas designated for public use (i.e. low-impact recreation, nature appreciation, outdoor recreation, heritage tourism, and natural heritage appreciation), but they differ with respect to the level of management applied. Provincial parks typically feature relatively more road access, recreation infrastructure, and park facilities than designated natural areas, which tend to have only rudimentary park infrastructure (GOA undated).

Additional environmental assessment requirements apply for any proposed project in a provincial park. Construction of low-impact, hand-launch infrastructure for non-motorized craft is more consistent with the mandates of provincial parks and designated natural areas than launch facilities for motorized craft. Construction of road infrastructure in the Sylvan Lake Natural Area to access a boat launch would not be consistent with the mandate of designated natural areas and therefore this natural area would not be conducive to the construction of either hand launch or motorized launch facilities.

2.4.6 Cumulative Effects

With regards to a new boat launch facility or any form of proposed development, the potential environmental impacts to the Lake and the surrounding area are not limited to construction alone. The cumulative effects of multiple developments over time must also be evaluated when considering any new recreation facility. A new boat launch may draw more users to the Lake, and several related factors should be considered, including:

- increased fishing pressure on the Lake;
- increased boat traffic on the Lake;
- increased total impact of cottage footprint (including, increased septic input, garbage, increased utility installation, increased phosphorous and nitrogen input, reduced riparian buffering capacity, increased ground compaction [reduced ground water infiltration, increased residential erosion and sediment control issues]);
- increased deforestation required to provide roads and parking surfaces;
- increased contamination to the Lake and surrounding lands (e.g. from vehicle and watercraft fluid leaks, tires);
- reduced habitat area and connectivity for wildlife;
- increased weed issues;
- increased erosion and sediment control issues;
- increased impacts to groundwater; and
- increased carbon emissions.

Potential impacts from ice huts, washroom and parking facilities, septage receiving stations, and fueling station impacts were reviewed and are summarized in Table 2-4 below.

Table 2-4
Potential Impacts of Lake Recreation

Activity/Amenity	Impact to the Lake
Ice Huts - Abandonment of ice fishing huts on lake property.	• Debris such as wood, gasoline, furniture, plastics, and metal settles to the bottom of the Lake and poses a hazard for both boating and swimming. • Materials that wash up onto the shoreline cause contamination to both fish and waterfowl habitat.
Boat Fuel/Parking Facilities - Unburned fuel being released into lake water.	• Mixtures of unburned gas and oil pollute water and directly affect the pH and dissolved oxygen content. These two factors then influence the type and abundance of fish and wildlife within the ecosystem. (RMBEL, 2013)
Septic Tank – Cracked or damaged tanks due to improper maintenance	• Septic tanks that are neglected have the potential to spew raw sewage into the Lake. This can result in an accelerated eutrophication of a lake. • Release of human pathogenic viruses causing health issues. • These viruses released from malfunctioning septic tanks have the potential to move through saturated soils and aquifers and therefore into drinking water supplies. (Sinton et al. 1997)

Current and potential mitigation efforts to control the potential impacts from the activities listed above are summarized in Table 2-5 below.

Table 2-5
Current and Potential Mitigation Efforts

Activity/Amenity	Mitigation Efforts
Ice Huts	• Sylvan Lake, in conjunction with the RCMP, has implemented the "Take it Off" program where Fishermen can voluntarily register their huts. This provided the RCMP with contact information of the hut owner in case of vandalism or if a hut is left after close. • Public education – 'Take it Off" brochure to educate the public of the impacts of leaving fishing huts.
Boat Fuel/Parking Facilities	• Parking lot will be built at a safe distance from the Lake so that in the event of an oil or gas spill, it will not reach the Lake. • Have spill kit and absorbent pads at the launch and fueling station locations for public use.

Activity/Amenity	Mitigation Efforts
Septic Tank	Build new septic tanks to Codes strictly regulating the design, placement, and maintenance of septic systems to protect the ecological resources of Sylvan Lake.

2.4.7 Land Use

There are four land use types in the area surrounding Sylvan Lake: agriculture (crop farming and livestock ranching), lake cottage and municipal development, recreation (e.g. existing public/private boat launches, public/private beaches, waterfront parks, recreation trails, camping infrastructure), and protected areas (provincial parks and designated natural areas). Land use considerations constitute a variety of constraints on site selection for a boat launch facility on Sylvan Lake, as most of the lands that would be required for a boat launch and parking lot are privately owned. Land purchase may be required to obtain the amount of land that would be needed to build the proposed boat launch facilities.

2.4.8 Invasive Species

A number of invasive species are of concern at Sylvan Lake, these include the following:

- Eurasian watermilfoil (*Myriophyllum spicatum*);
- flowering rush (*Butomus umbellatus*);
- purple loosestrife (*Lythrum salicaria*);
- didymo (*Didymosphenia geminata*);
- Quagga mussel (*Dreissena bugensis*);
- zebra mussel (*Dreissena polymorpha*); and
- Prussian carp (*Carassius gibelio*).

Zebra mussels and Prussian carp are of particular concern across North America and have the potential to incur significant monetary costs for maintenance of infrastructure. These species can have significant negative impacts on the Sylvan Lake fisheries. Prussian carp have already invaded the Red Deer River system in Alberta, and boats, fouled by zebra mussels fouled and bound for Sylvan Lake, were intercepted in 2014. Another was intercepted during the May long-weekend of 2015 (K. Wilson, personal communication, 2015). Table 2-6 provides additional background on these two invasive species.

Table 2-6
Invasive Species of Note

Invasive Species	Description and Impacts of Invasive Species
Zebra Mussels  *http://www.100thmeridian.org/photobank/*	• Zebra Mussels spread very quickly and are extremely resilient with the ability to live outside of water for 30 days. • Affect a lake's food chain by filtering water to the point where food sources such as plankton are removed. • The filtering of water causes clearer water which allows deeper penetration of sunlight and increases growth of aquatic vegetation. And can increase toxic algal blooms. • Recreational activities can be impacted as the sharp mussel shell can cut lake users/swimmers. *Source: http://www.invadingspecies.com/invaders/invertebrates/zebra-and-quagga-mussels/*
Prussian Carp  *http://esrd.alberta.ca/recreation-public-use/invasive-species/fish.aspx*	• Prussian carp are highly tolerant of poor water quality conditions and readily out compete other fish species. • Prussian carp reach sexual maturity early and produce large broods relative to native fish species. • Intentional release from household aquariums is the primary vector of introduction (K. Wilson, personal communication, 2014).

Trailered boats are generally the vector of introduction. Invasive species are a concern for Alberta Lake communities. Initiatives that have been enacted by other communities and legislation are summarized in Table 2-7.

Table 2-7
Methods to Combat Invasive Species

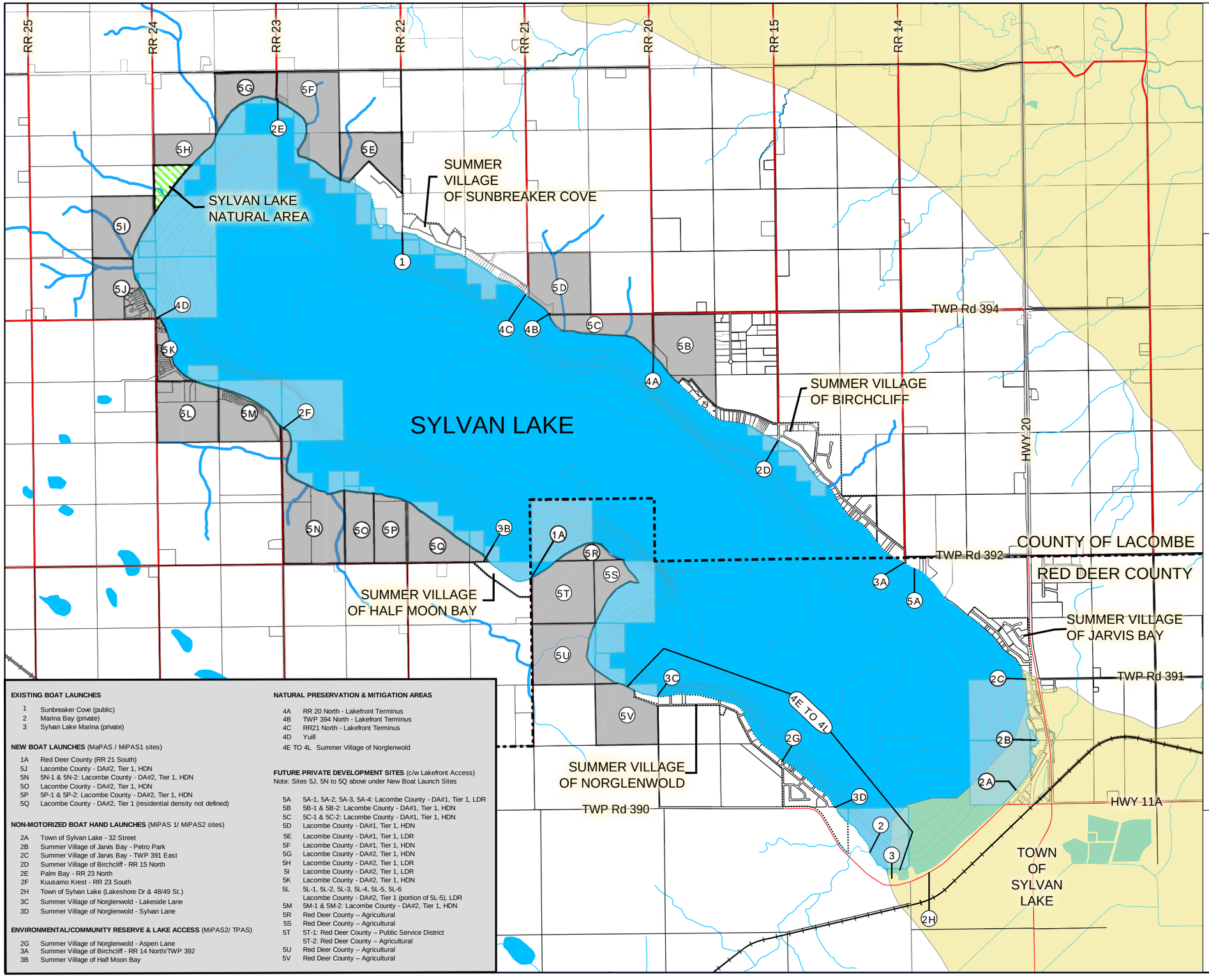
Initiative	Description
Alberta Government: **Bill 13: Fisheries (Alberta) Amendment Act**	• When highway signage indicates that a watercraft inspection station is open, it is mandatory that all carriers of water-based vessels must report to the on-site inspectors to have their boats, trailers and other water-related equipment checked for invasive species such as the zebra and quagga mussels. • http://esrd.alberta.ca/recreation-public-use/invasive-species/aquatic-invasive-species/watercraft-inspections.aspx
AEP: **Clean, Drain, Dry Campaign**	• Provides tips and steps for boat users to avoid spreading aquatic species by focusing on how to clean your boat after lake use.

Certain jurisdictions have implemented mandatory washing stations at popular boating locations, and have installed boat inspection stations at state borders. Although targeting select invasive plant species, these campaigns, inspections, and wash stations have been shown to be effective in slowing or halting the spread of invasive species (K. Wilson, personal communication, 2014). Table 2-8 provides a summary of what other jurisdictions have implemented.

Table 2-8
Initiatives to Combat Invasive Species

Initiative	Description
Lake Tahoe **Clean Drain Dry Program**	• Specific program to Lake Tahoe, boat users are required to get their boat inspected at a designated location. Inspected boats receive an inspection sticker upon completion. • Collaborative program between the state of California and Nevada. • Boaters are required to purchase the sticker.
Manitoba **Clean, Drain, Dry**	• Water protection Act (Bill 12) passed February 13, 2015. Provides regulatory measures to prevent the introduction and spread of invasive species.

Initiative	Description
State of Idaho	• Inspection station sticker program • There are several inspection wash stations set-up throughout the state. • Mandatory program for boats to obtain an inspection sticker prior to launching the water craft. • User pay system.



EXISTING BOAT LAUNCHES

1	Sunbreaker Cove (public)
2	Marina Bay (private)
3	Sylvan Lake Marina (private)

NEW BOAT LAUNCHES (MaPAS / MiPAS1 sites)

1A	Red Deer County (RR 21 South)
5J	Lacombe County - DA#2, Tier 1, HDN
5N	5N-1 & 5N-2: Lacombe County - DA#2, Tier 1, HDN
5O	Lacombe County - DA#2, Tier 1, HDN
5P	5P-1 & 5P-2: Lacombe County - DA#2, Tier 1, HDN
5Q	Lacombe County - DA#2, Tier 1 (residential density not defined)

NON-MOTORIZED BOAT HAND LAUNCHES (MiPAS 1/ MiPAS2 sites)

2A	Town of Sylvan Lake - 32 Street
2B	Summer Village of Jarvis Bay - Petro Park
2C	Summer Village of Jarvis Bay - TWP 391 East
2D	Summer Village of Birchcliff - RR 15 North
2E	Palm Bay - RR 23 North
2F	Kuusamo Krest - RR 23 South
2H	Town of Sylvan Lake (Lakeshore Dr & 48/49 St.)
3C	Summer Village of Norglenwold - Lakeside Lane
3D	Summer Village of Norglenwold - Sylvan Lane

ENVIRONMENTAL/COMMUNITY RESERVE & LAKE ACCESS (MiPAS2/ TPAS)

2G	Summer Village of Norglenwold - Aspen Lane
3A	Summer Village of Birchcliff - RR 14 North/TWP 392
3B	Summer Village of Half Moon Bay

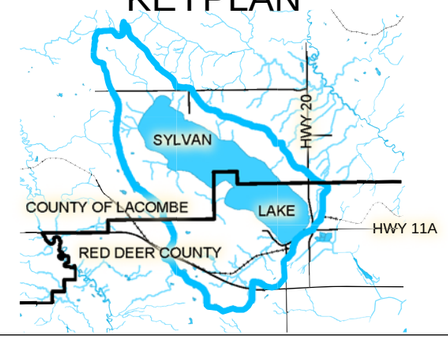
NATURAL PRESERVATION & MITIGATION AREAS

4A	RR 20 North - Lakefront Terminus
4B	TWP 394 North - Lakefront Terminus
4C	RR21 North - Lakefront Terminus
4D	Yuill
4E TO 4L	Summer Village of Norglenwold

FUTURE PRIVATE DEVELOPMENT SITES (c/w Lakefront Access)
Note: Sites 5J, 5N to 5Q above under New Boat Launch Sites

5A	5A-1, 5A-2, 5A-3, 5A-4: Lacombe County - DA#1, Tier 1, LDR
5B	5B-1 & 5B-2: Lacombe County - DA#1, Tier 1, HDN
5C	5C-1 & 5C-2: Lacombe County - DA#1, Tier 1, HDN
5D	Lacombe County - DA#1, Tier 1, HDN
5E	Lacombe County - DA#1, Tier 1, LDR
5F	Lacombe County - DA#1, Tier 1, HDN
5G	Lacombe County - DA#2, Tier 1, HDN
5H	Lacombe County - DA#2, Tier 1, LDR
5I	Lacombe County - DA#2, Tier 1, LDR
5K	Lacombe County - DA#2, Tier 1, HDN
5L	5L-1, 5L-2, 5L-3, 5L-4, 5L-5, 5L-6 Lacombe County - DA#2, Tier 1 (portion of 5L-5), LDR
5M	5M-1 & 5M-2: Lacombe County - DA#2, Tier 1, HDN
5R	Red Deer County – Agricultural
5S	Red Deer County – Agricultural
5T	5T-1: Red Deer County – Public Service District 5T-2: Red Deer County – Agricultural
5U	Red Deer County – Agricultural
5V	Red Deer County – Agricultural

KEYPLAN



GENERAL LEGEND

- Municipal District and County
- Summer Village
- Waterbody
- Protective Notation Area
- Wildlife Sensitivity Area
- Roads
- Stream and Flow
- Railways

0 0.5 >1 km

N

3TM Projection

Figure: 2-1

ASSESSMENT MAP
(DRAFT)

SYLVAN LAKE STRATEGY & ACTION PLAN

JUNE, 2015

3 Recreational Site Evaluations

A recreational site evaluation of the existing public lands and private lands around Sylvan Lake was completed as part this of the study.

The site assessments included the following:

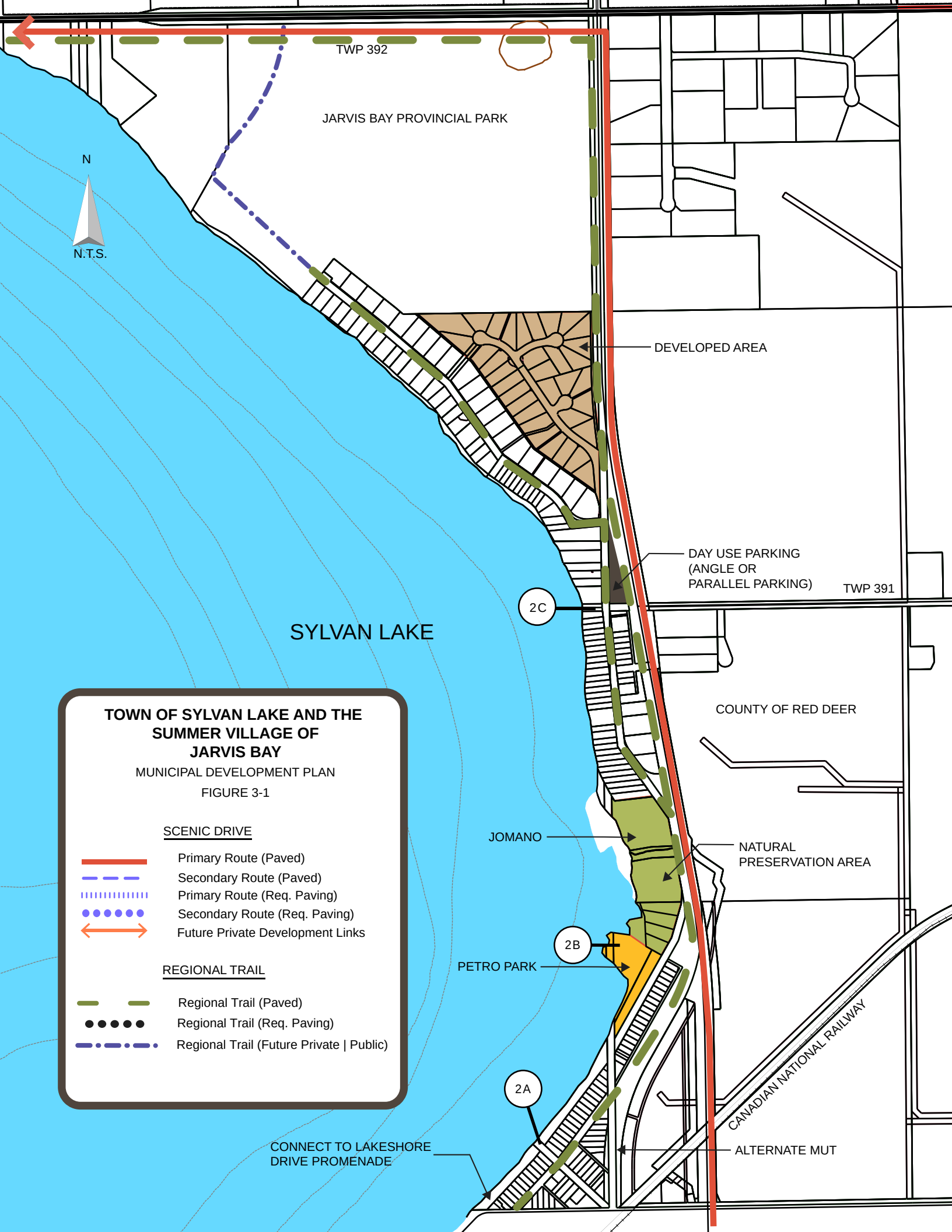
- Review of historical background documents (outlined in Section 2);
- A site assessment of potential recreational areas on the Lake;
- Review of aerial photography and available GIS inventory data; and
- Review of the Lacombe County, Red Deer County. Sylvan Lake and Summer Villages' municipal planning documents.

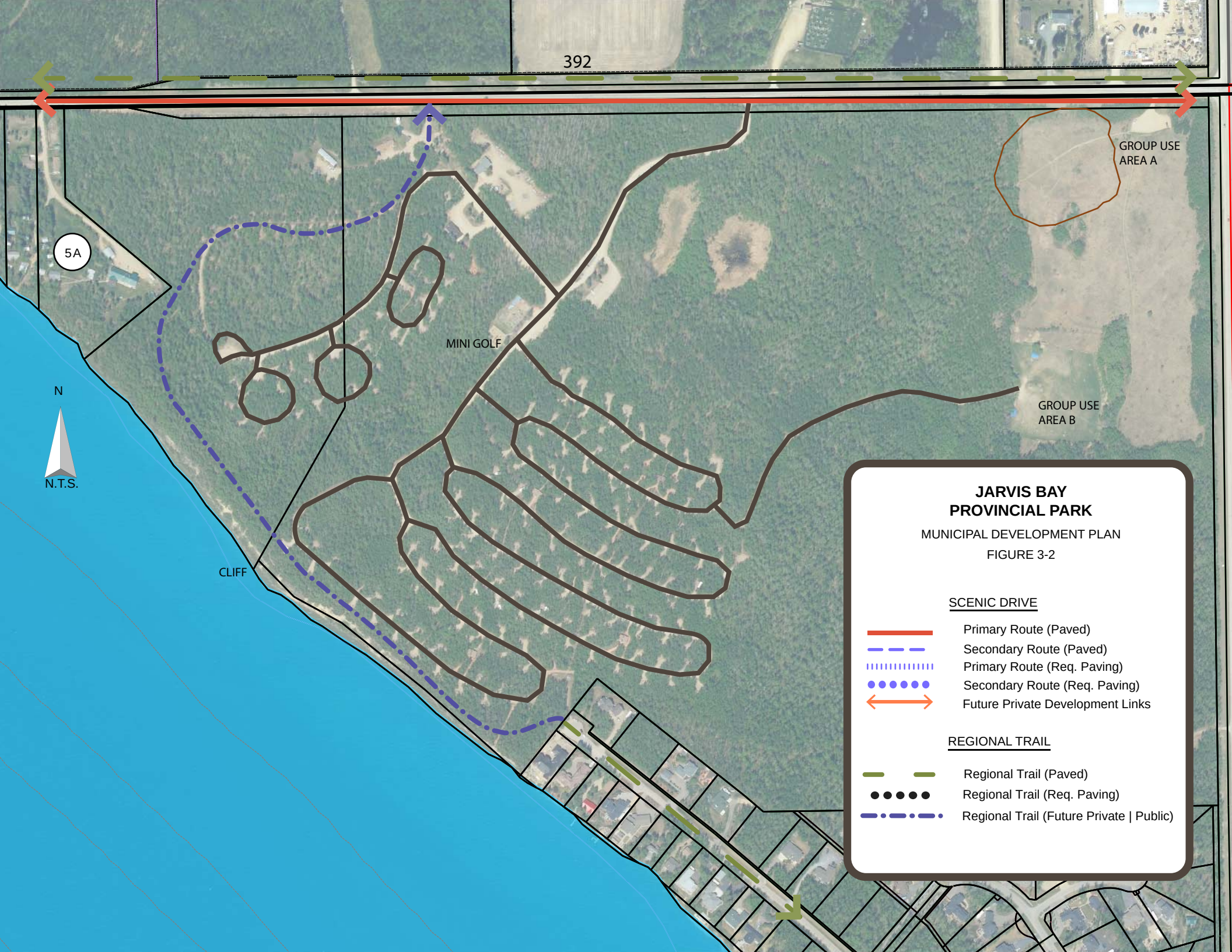
On July 7, 2014, the project team toured of the Lake to gather information on the recreational potential of the identified properties along the Lake. On this visit, the team found:

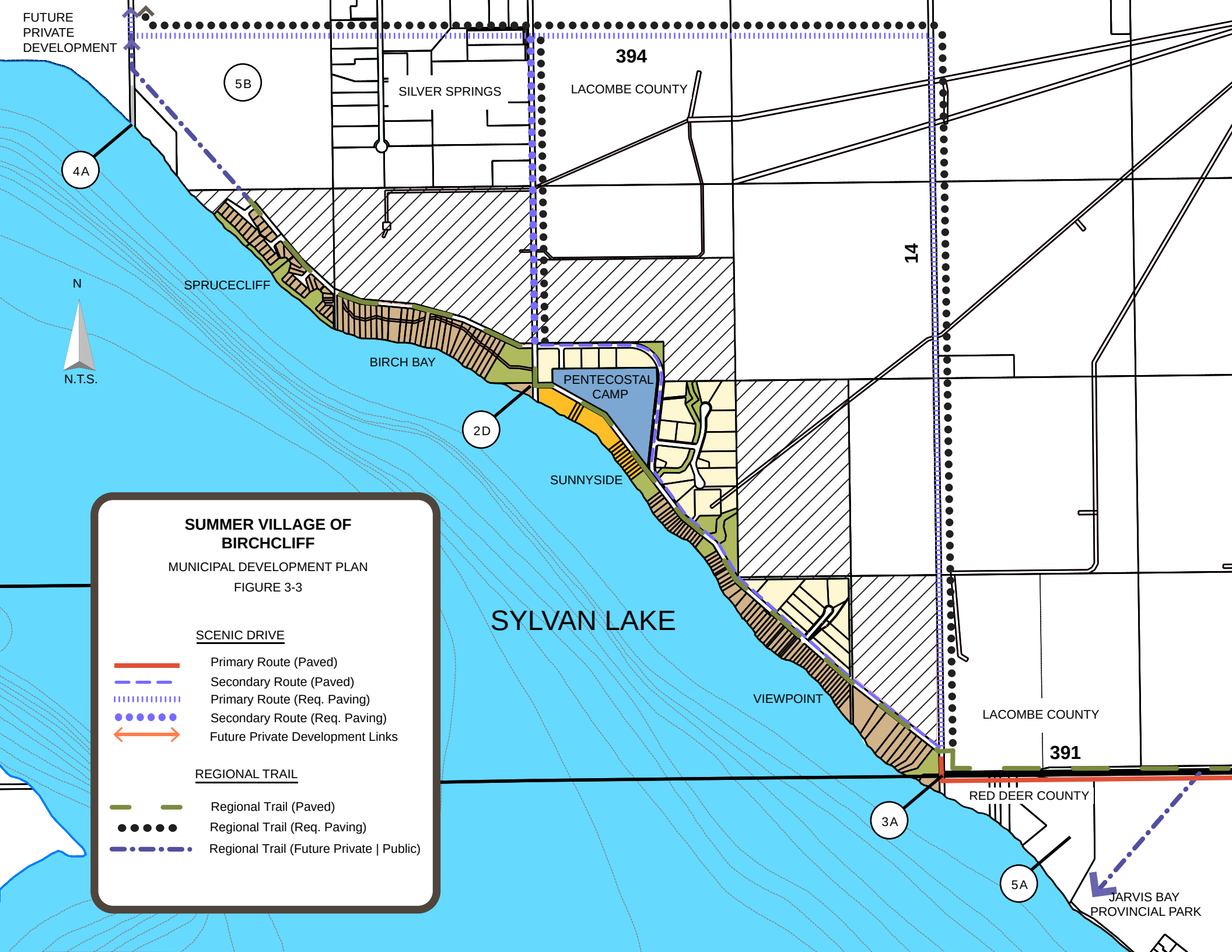
- three existing boat launches including Sunbreaker Cove (public); Marina Bay (private); and Sylvan Lake Marina (private);
- 25 potential public lands, which are publically owned parcel of land that have access to the Sylvan Lake Shore line, but do not include Jarvis Bay Provincial Park and Sylvan Lake Provincial Park on Sylvan Lake; and
- 22 privately owned land parcels that have lake access that could be developed in the future for multi-family lakeshore residential living.

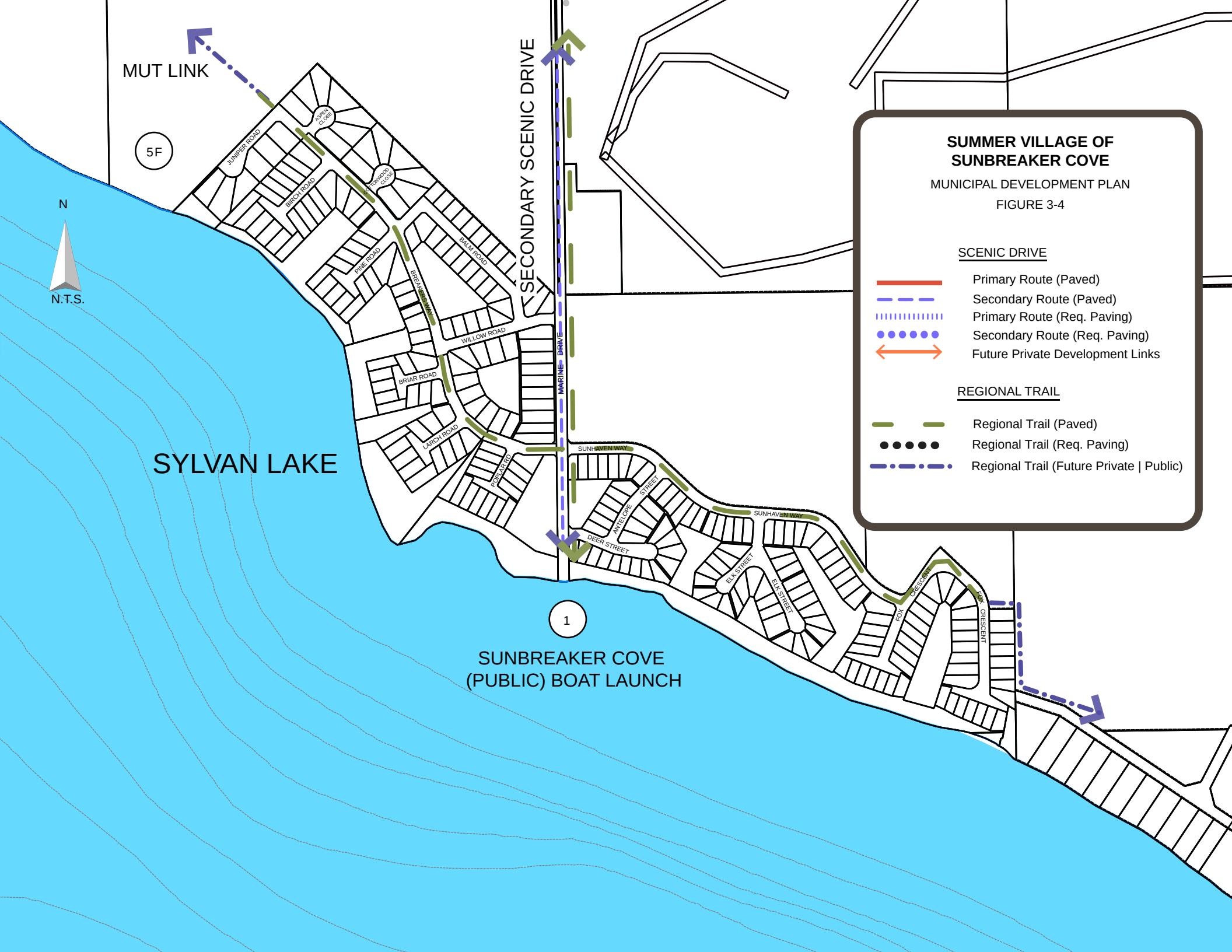
Figure 2-1, illustrates the location of each public site and private land area identified with access to Sylvan Lake. Figures 3-1 to 3-6 provide an expanded view of Jarvis Bay, Jarvis Bay Provincial park, Birchcliff, Sunbreaker Cove, Half Moon Bay and Norglenwold.

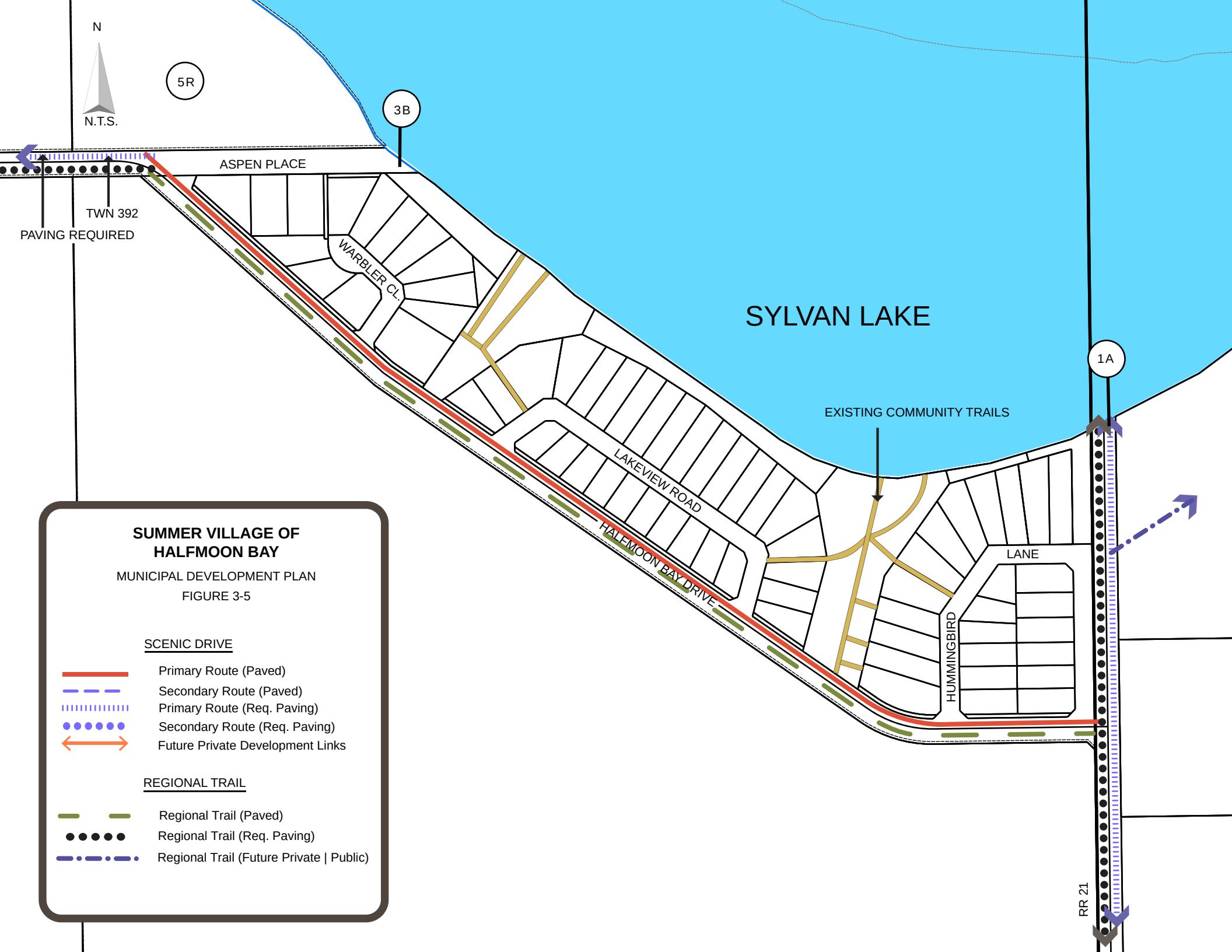
As part of the review of the planning documents, the classifications described in the Sylvan Lake Area Structure Plan (Lacombe County 2010) and the Sylvan Lake Parks, Recreation & Open Space Plan (ROSP 2012), have been reviewed and used in the Assessment Matrix (Appendix C) to provide a consistent basis for determining future potential lake access and/or mitigation and preservation opportunities. Table 3-1 provides the definitions for classifying public access and recreation for lakefront development areas on Sylvan Lake.


TWP 392
JARVIS BAY PROVINCIAL PARK
N
N.T.S.
DEVELOPED AREA
DAY USE PARKING
(ANGLE OR
PARALLEL PARKING)
TWP 391
2C
SYLVAN LAKE
COUNTY OF RED DEER
JOMANO
NATURAL
PRESERVATION AREA
2B
PETRO PARK
CANADIAN NATIONAL RAILWAY
2A
CONNECT TO LAKESHORE
DRIVE PROMENADE
ALTERNATE MUT
TOWN OF SYLVAN LAKE AND THE
SUMMER VILLAGE OF
JARVIS BAY
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-1
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)


392
GROUP USE
AREA A
5A
MINI GOLF
GROUP USE
AREA B
N
N.T.S.
CLIFF
JARVIS BAY
PROVINCIAL PARK
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-2
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)


FUTURE
PRIVATE
DEVELOPMENT
5B
SILVER SPRINGS
394
LACOMBE COUNTY
4A
14
N
N.T.S.
SPRUCECLIFF
BIRCH BAY
PENTECOSTAL
CAMP
2D
SUNNYSIDE
SYLVAN LAKE
VIEWPOINT
LACOMBE COUNTY
391
RED DEER COUNTY
3A
5A
JARVIS BAY
PROVINCIAL PARK
SUMMER VILLAGE OF
BIRCHCLIFF
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-3
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)


MUT LINK
5F
N
N.T.S.
SECONDARY SCENIC DRIVE
MARINE DRIVE
JUNIPER ROAD
ASPEN CLOSE
BIRCH ROAD
DOGWOOD CLOSE
PINE ROAD
BALM ROAD
BREAKWATER WAY
WILLOW ROAD
BRIAR ROAD
LARCH ROAD
POPLAR RD
SUNHAVEN WAY
ANTELOPE STREET
DEER STREET
ELK STREET
FOX CRESCENT
SYLVAN LAKE
1
SUNBREAKER COVE
(PUBLIC) BOAT LAUNCH
SUMMER VILLAGE OF
SUNBREAKER COVE
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-4
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)


N
N.T.S.
5R
3B
ASPEN PLACE
TWN 392
PAVING REQUIRED
WARBLER CL.
SYLVAN LAKE
1A
EXISTING COMMUNITY TRAILS
LAKEVIEW ROAD
HALFMOON BAY DRIVE
LANE
HUMMINGBIRD
RR 21
SUMMER VILLAGE OF
HALFMOON BAY
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-5
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)

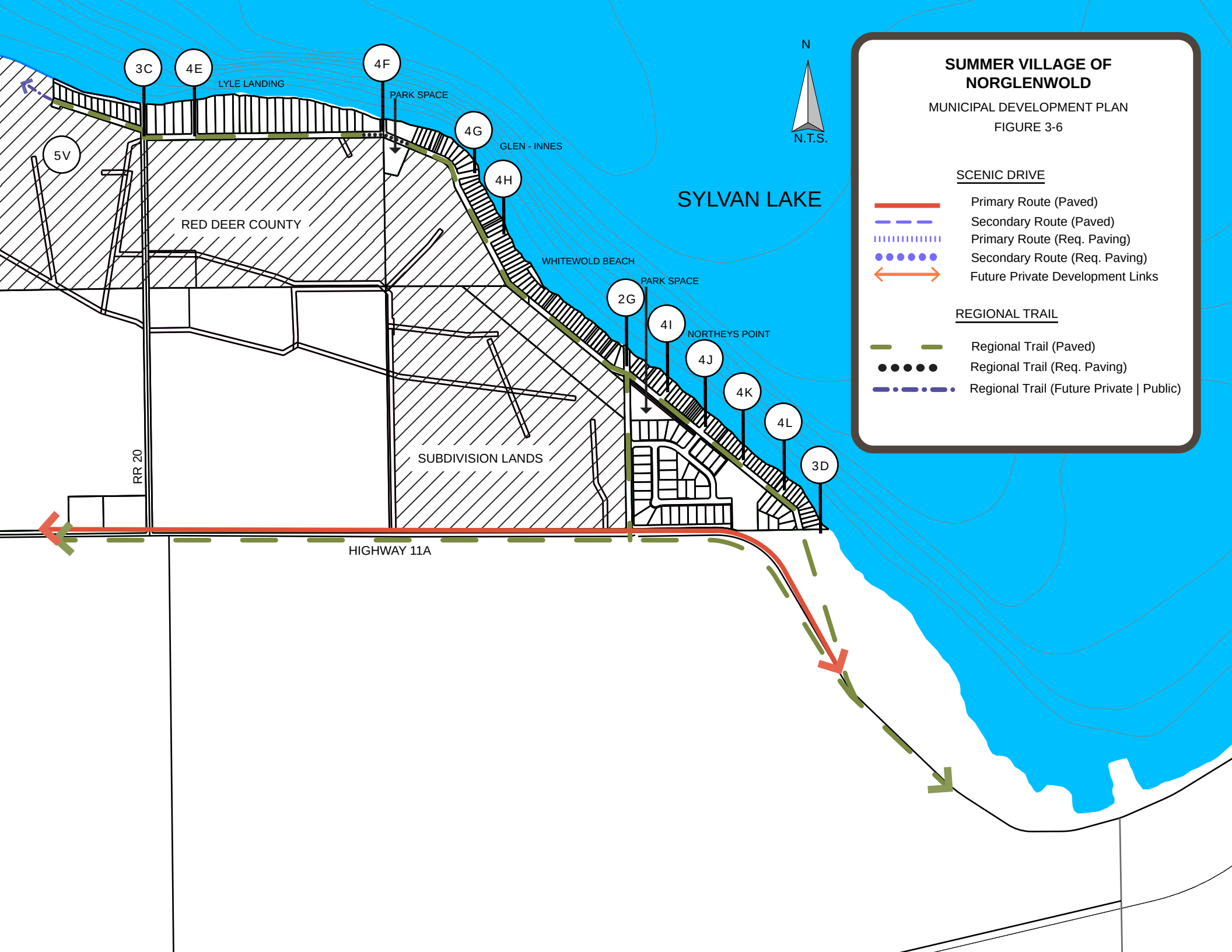

3C
4E
LYLE LANDING
4F
PARK SPACE
4G
GLEN - INNES
4H
5V
SYLVAN LAKE
RED DEER COUNTY
WHITEWOLD BEACH
PARK SPACE
2G
4I
NORTHEYS POINT
4J
4K
4L
3D
SUBDIVISION LANDS
RR 20
HIGHWAY 11A
N
N.T.S.
SUMMER VILLAGE OF NORGLENWOLD
MUNICIPAL DEVELOPMENT PLAN
FIGURE 3-6
SCENIC DRIVE
Primary Route (Paved)
Secondary Route (Paved)
Primary Route (Req. Paving)
Secondary Route (Req. Paving)
Future Private Development Links
REGIONAL TRAIL
Regional Trail (Paved)
Regional Trail (Req. Paving)
Regional Trail (Future Private | Public)

Table 3-1
Classification for Public Access and Recreation for Lakefront Development Areas on Sylvan Lake

Term	Acronym
Lower Density Residential	LDR
High Density Node	HDN
Major Public Access Sites	MaPAS
Minor Public Access Sites 1 (Non ESA)	MiPAS 1
Minor Public Access Sites 2 (Within ESA)	MiPAS 2
Tertiary Public Access Sites	TSAS
Lake Use Trail Nodes	LUTN
Trail Nodes	TN
Public lakeshore access is defined under two (2) development areas:	• Development Area #1 (DA1) • Development Area #2 (DA2)
Land classification and management zones are defined through two (2) tiers:	• Tier 1 (T1) • Tier 2 (T2)

A detailed description of the above classifications is provided in Appendix C.

The information gathered during the site assessment and documentation review was used to classify the sites into one of five recreational use categories:

1. Existing Boat Launches
2. New Boat Launches.
3. Non-Motorized Boat Hand Launches.
4. Environmental/Community Reserve & Lake Access.
5. Natural Preservation & Mitigation Areas.

Each category was established and assessed based on the types of lake access and land use defined in current planning documents for both public and private lands in Lacombe County, Red Deer County, the Town of Sylvan Lake, and the Summer Villages of Birchcliff, Sunbreaker Cove, Half Moon Bay, Jarvis Bay, and Norglenwold.

3.1 ASSESSMENT MATRIX RATIONALE

An Assessment Matrix was used to evaluate the suitability of each location based on the following criteria;

Natural/ Environmental

- Upland and Littoral Gradient
- Level of Disturbance
- Mapped Known Fish Habitat

- Environmentally Protected Areas/Notations
- Mapped Rare Plants
- Riparian Vegetation
- Presence of Aquatic Vegetation
- Proximity to the Sand Stone Aquifer

Regional/ Community

- Location
- Site Access and Egress
- Surrounding Land Use
- Land Acquisition
- Community Impact
- Cultural/Historic Impact

The criteria and weighting factors were determined by the project team and presented to the Committee July 18, 2014. Each criterion was evaluated based on a 1 to 10 scale with 1 indicating a low impact and 10 indicating a high impact. Table 3-2 presents the grading conditions for each item and how the scoring was assigned in the Assessment matrix.

Table 3-2
Assessment Matrix Grading Criteria

Criteria	Evaluation Standards for the Assessment Matrix Criteria		
	1-4: Low Impact	**5-6: Moderate Impact**	**7-10 – High Impact**
Upland and Littoral Gradient • The grading of the site and that of lake bed	Ideal Slope – 12-15%	Slope between 15-17% and 11-10%	Slope less than 10% or more than 17%
Level of Disturbance • The amount of work that must be completed along the shore to make it suitable for use .	No disturbance required	Mid disturbance (less than a hectare of disturbance)	High Disturbance (Over a hectare of disturbance)
Mapped known fish habitat	No mapped habitat	Mapped habitat but Low value	Mapped habitat - High value
Environmentally Protected Areas/Notations	Not an environmentally protect area; no notations	An environmentally protected area – Low value	An environmentally protected area – High value
Mapped rare plants	No mapped plants	Mapped rare plants – Low value	Mapped rare plants – High value
Riparian vegetation • Riparian vegetation (up to 30 m of high water mark)	No Riparian vegetation at the site	50% of site has riparian vegetation	100% of site has riparian vegetation

Criteria	Evaluation Standards for the Assessment Matrix Criteria		
	1-4: Low Impact	**5-6: Moderate Impact**	**7-10 – High Impact**
Presence of Aquatic Vegetation	No Riparian vegetation at the site	50% of site has riparian vegetation	100% of site has riparian vegetation
Proximity to the sand stone aquifer	Site is more than 1km away from aquifer	Site is more than 500m away from aquifer	Site is within the aquifer
Location	Existing services within 500m	Existing services within 1km	Existing services over 1 km away
Site Access and Egress (accessibility to the public)	Easy access to site – good road surface	Poor access to site	No access to site
Surrounding Land Use	No development on either side of the site	Residential/Natural Area on one side of the site	Residential/Natural Area on both sides of the site
Land Acquisition	No land acquisition	0 -1 Hectare required	1 Hectare and up required
Community Impact	No change to proposed usage at the location		More intense recreation use of proposed site
Cultural/Historic Impact	To be assessed at time of development		

Within the matrix different weighting factors from 1 to 5 were applied, to take into account the sensitivity of different criteria, the weighting factors are summarized in the Table 3-3.

Table 3-3
Summary of Weighting Factors

Criteria	Weighting factor
Upland and Littoral Gradient	5x
Level of Disturbance	5x
Mapped known fish habitat	5x
Environmentally Protected Areas/Notations	3x
Mapped rare plants	3x
Riparian vegetation	3x
Presence of Aquatic Vegetation	5x
Proximity to the sand stone aquifer	3x
Location	5x
Site Access and Egress	3x
Surrounding Land Use	1x
Land Acquisition	5x
Community Impact	5x
Cultural/ Historic Impact	1x

To provide a comparative sensitivity for each site, a ranking scale of: least, moderate, high, and very high was attributed to each site. A summary of the Matrix Rating Range is provided in Table 3-4.

Table 3-4
Matrix Rating Range

Rating value	Rating Description
0 – 200	LEAST: Least impact relative to sites assessed (impact score under the 25th percentile)
200 – 260	MODERATE: Moderate impact relative to sites assessed (impact score between the 25th and 50th percentile)
260 – 300	HIGH: High impact relative to sites assessed (impact score between the 50th and 75th percentile)
300+	VERY HIGH: Very high impact relative to sites assessed (impact score above the 75th percentile)

3.2 ASSESSMENT MATRIX RESULTS

The Assessment Matrix is a decision-making tool to aid in the development of the Action and Implementation Plan. The Assessment Matrix provides a relative rank of the reviewed sites from least to very high. This ranking relates to how sensitive each specific site is to development.

Tables 3-5, 3-6, 3-7 and 3-8 summarize the results of the Matrix. The copy Matrix Assessment is provided in Appendix D.

Table 3-5 shows a summary of the matrix results for the sites reviewed as potential new boat launch.

Table 3-5
Summary of the Results for Sites Selected for Potential New Boat Launches (Public and Private Lands)

Site	Location	Rating	Rank
1A	Red Deer County (RR 21 South)	223	MODERATE
5J	Legal: 5-2-39-29 SE Lacombe County - DA#2, Tier 1, HDN	255	MODERATE
5N	5N-1 Legal: 5-2-39-22 SW - Lacombe County - DA#2, Tier 1, HDN 5N-2 Legal: 5-2-39-15 NW, SW -Lacombe County - DA#2, Tier 1, HDN	280	HIGH
5O	Legal: 5-2-39-15 SE - Lacombe County - DA#2, Tier 1, HDN	200	LEAST
5P	5P-1 Legal: 0924467-1-2 -Lacombe County - DA#2, Tier 1, HDN 5P-2 Legal: 0924467-1-1 - Lacombe County - DA#2, Tier 1, HDN	215	MODERATE
5Q	Legal: 5-2-39-14 SW/ 5-2-39-14 SE Lacombe County - DA#2, Tier 1 (residential density not defined)	195	LEAST

Table 3-6
Summary of the Results for Sites Selected as Potential Non-Motorized Boat Hand Launches (Public Sites)

Site	Location	Rating	Rank
2A	Town of Sylvan Lake - 32 Street	177	LEAST
2B	Summer Village of Jarvis Bay - Petro Park	262	HIGH
2C	Summer Village of Jarvis Bay - TWP 391 East	236	MODERATE
2D	Summer Village of Birchcliff - RR 15 North	191	LEAST
2E	Palm Bay - RR 23 North	291	HIGH

2F	Kuusamo Krest - RR 23 South	294	HIGH
2H	Town of Sylvan Lake (Lakeshore Dr & 48/49 St.)	105	LEAST
3C	Summer Village of Norglenwold - RR 20 South	298	HIGH
3D	Summer Village of Norglenwold - Sylvan Lane	237	MODERATE

Table 3-7
Summary of the Results for the Site Identified as Potential Environmental/ Community Reserve & Lake Access locations (Public Sites)

Site	Location	Rating	Rank
2G	Summer Village of Norglenwold - RR 15 South	183	LEAST
3A	Summer Village of Birchcliff - RR 14 North/TWP 392	303	VERY HIGH
3B	Summer Village of Half Moon Bay	279	HIGH

Table 3-8
Summary of the Results for the Site Identified as Potential Natural Preservation & Mitigation Areas Locations (Public Sites)

Site	Location	Rating	Rank
4A	Summer Village of Birchcliff - RR 20 North	214	MODERATE
4B	TWP 394 North - Lakefront Terminus	214	MODERATE
4C	RR21 North - Lakefront Terminus	214	MODERATE
4D	Yuill	131	LEAST
4E-4L	Sites 4E TO 4L	149	LEAST

Table 3-9
Summary of the Results for Remaining Private Sites

Site	Location	Rating	Rank
5A (5A-1/5A-2/5A-3/5A-4)	5-1-39-9 NW, 9220154-1-1, 9220154-1-2, 3814ET-OT	265	HIGH
5B (5B-1/5B-2)	6260 MC – A, 5-1-39-19 NW	241	MODERATE
5C (5C-1/5C-2)	5-2-39-24 NE, 9622893-1	214	LEAST
5D	5-2-39-25 SW	214	LEAST
5E	5-2-39-34 SE	283	HIGH
5F	5-2-39-34 NW, 5-2-39-34 SW	348	VERY HIGH
5G	5-2-39-33 NE	373	VERY HIGH
5H	5-2-39-33-5-6	388	VERY HIGH
5I	5-2-39-29 NE	388	VERY HIGH
5K	5-2-39-21 NW	363	VERY HIGH
5L (5L-1/ 5L-2/ 5L-3/ 5L-4/ 5L-5/ 5L-6)	5-2-39-21 NW 9421037-1-1 5-2-39-21 SW 5-2-39-21 SW 5-2-39-21 SW 5-2-39-21 SW (portion of 5M-5)	288	HIGH
5M (5M-1/ 5M-2)	567TR-1-R1 5-2-39-21 SE	309	VERY HIGH
5R	5-2-39-13 SW	339	VERY HIGH
5S	5-2-39-12 NE	348	VERY HIGH
5T (5T-1/ 5T-2)	849HW-A 5-2-39-12 NW	348	VERY HIGH
5U	5-2-39-12 SW	348	VERY HIGH
5V	Legal: 5-2-39-1 NE	268	HIGH

The results of the Assessment Matrix have been reviewed with the Committee and have been used to develop the Action and Implementation plan.

4 Action and Implementation Plan

The Action and Implementation Plan is intended to be a "living document" and a guide for future implementation. The document discusses the following;

- future policy changes,
- strategic investment of public dollars,
- key regulations and stakeholders,
- public lake access enhancements and/or preservation and restoration of locations; and
- Future private development requirements for lake access and recreation/open space integration.

The intent of the Action and Implementation plan is to be used as a management tool for the development of recreational sites on the Lake. In the Action and Implementation Plan the ranking from the Assessment matrix are provided to identify the level of impact should the municipality choose to move forward with development at a specific site.

Based on the Assessment Matrix in Section 3.0, each public site and private land parcel was further assessed and reviewed by providing:

- a lake access category, complete with a proposed action and implementation direction and description;
- identified mitigation and management requirements;
- Targets of Opportunity (i.e., key stakeholders and decision-makers);
- the identification of specific roles and responsibilities in implementing the proposed actions;
- a proposed timeframe for implementing the proposed action;
- estimated capital costs (where applicable) for either development or mitigation.

Sites identified as having a ranking of least to moderate tend to have a lower economic, environmental, and social impact associated with their development. Sites ranking high to very high do not mean that the site is undevelopable, but rather, that there are potentially higher economic, environmental, or social costs associated with development in those locations.

The Action and Implementation Plan also provides the user with information on mitigation and management strategies for the site and which stakeholders, decision-makers, municipalities or land owners are responsible for the site.

The Action and Implementation Plan matrix is included in Appendix D of this report.

4.1 ASSESSMENT OF LAKE ACCESS SITES AND PARCELS

Based on the review of individual sites within the Assessment Matrix and its respective rating, proposed or/ current recreational use, several of the public and private land areas were redefined in the Action & Implementation Plan. The purpose of redefining certain sites was to suggest a more appropriate recreational use of the site, should the municipality decide to develop the site. For example, Site 2E was

initially assessed as a potential Non-Motorized Boat Hand Launch area. Based on the results of the matrix, the site was ranked as High. Based on this ranking, the area was recommended for Environmental/ Community Reserve & Lake Access, to reduce the impact to the Lake and surrounding shoreline area.

Table 4-1 provides a summary of the assessment for both public sites and private land areas, and presents how those sites and land areas are redefined in the Action & Implementation Plan. All sites have been reviewed and approved by the County as they are classified in the Action and Implementation Plan.

Table 4-1
Identifies the Sites Refined within the Assessment Matrix

Site #	Location	Description
Site 1A	Red Deer County (RR 21)	• Assessed for a future new motorized boat launch, see RR21 Technical memo in Appendix E. • Based on the findings of the technical memo, it was found that this site cannot meet the boat launch requirements for the Committee. • Recommended to be used as a non-motorized boat launch and day use area.
Site 2E	Palm Bay - RR 23 North	• Assessed for future non-motorized hand launch development. • Based on a HIGH rating, it is recommended that development be limited to lane closure, trail and day use development. • Recommended for Environmental /Community Reserve & Lake Access use.
Site 3A	Summer Village of Birchcliff - RR 14 North/TWP 392	• Assessed as an environmental/community reserve and lake access site. • Based on a VERY HIGH rating, it is recommended that lake access not be allowed and that development be limited to trail node development. • Recommended for Natural Preservation & Mitigation Area use.
Site 3B	Summer Village of Half Moon Bay	• Assessed as an environmental/community reserve and lake access site. • Based on a HIGH rating, it is recommended that lake access not be allowed and that development be limited to trail node development. • Recommended to for Natural Preservation & Mitigation Area use.

Site #	Location	Description
Site 3C	Summer Village of Norglenwold - RR 20 South	• Assessed as a non-motorized boat hand launch and lake access site. • Based on a HIGH rating, it is recommended that lake access not be allowed and that development be limited to trail node development. • Recommended for Natural Preservation & Mitigation Area use. • Note: this site is identified as a non-motorized hand launch site in the Summer Village of Norglenwold – Municipal Development Plan. The report recommendation will require further community review. If maintained, the launch site should assess and mitigate identified impacts and incorporate better defined short-term parking turn-around, gravel trail access and day use/picnic sites.
Site 5N	RR 20 South	• Assessed as a new boat launch site • Based on a HIGH rating, associated with the existing habitat and PNT's, it is recommended that lake access be limited.
Site 5S	Red Deer County Legal: 5-2-39-12 NE	• Assessed as a private development site. • As requested by the Committee, the site is being reviewed as a potential boat launch facility with day use.
Site 5V	Red Deer County Legal: 5-2-39-1 NE	• Assessed as a private development site. • As requested by the Committee the site is being reviewed as a potential boat launch facility with day use.

An estimated capital cost has been developed for each site based on the proposed development. These are shown in the Action and Implementation Plan.

Other Action and Implementation Plan recommendations include:

1. Website and/or independent presentation of the Action & Implementation Plan with Sylvan Lake communities and visitors to communicate: the development and mitigation approaches for each public site, the public land parcel, and the lake management benefits from implementing each action.
2. Design development plans complete with detailed costing for all short term development or mitigation activities on public lands.

4.2 PRIVATE LAKE ACCESS PARCELS

There are twenty-two (22) privately owned land parcels on Sylvan Lake (Figure 4-1) having shoreline and lake access that could be developed for multi-family lakeshore residential living. The private sites were evaluated for opportunities to increase public access to the shoreline and the Lake should a private developer choose to develop lakefront properties.

Depending on the type of development proposed, there are variations in Municipal Reserves, Environmental Reserves and dedicated Open Space requirements to be applied to preserve natural areas and maintain public open space and access to the Lake (Appendix B).

Upon review of the noted planning documents and future development classifications, each parcel (and sub-parcel) was identified and assessed (Assessment Matrix) to confirm the type of potential open space, recreational use or lake access that each site could support in the future. Table 4-2 summarizes the findings of the Private Lake Access Points.

Table 4-2
Summary of Private Lake Access Points (Refer to Table 3-1 for Classification Descriptions)

Parcel	Description
5A (5A-1/ 5A-2/ 5A-3/ 5A-4)	• Lacombe County - DA#1, Tier 1, LDR. • HIGH rating. • Tier 1 classification and type of use: TSAS
5B (5B-1/ 5B-2)	• Lacombe County - DA#1, Tier 1, HDN. • MODERATE rating. • Tier 1 classification and type of use: MiPAS 2
5C (5C-1/ 5C-2)	• Lacombe County - DA#1, Tier 1, HDN. • LEAST rating (however located on the sandstone aquifer with steep embankments to the Lake). • Tier 1 classification and type of use: MiPAS 2
5D	• Lacombe County - DA#1, Tier 1, HDN • LEAST rating (however located on the sandstone aquifer with steep embankments to the Lake). • Tier 1 classification and type of use: MiPAS 2
5E	• Lacombe County - DA#1, Tier 1, LDR. • HIGH rating. • Tier 1 classification and type of use: TSAS
5F	• Lacombe County - DA#1, Tier 1, HDN. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS
5G	• Lacombe County - DA#2, Tier 1, HDN. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS

Parcel	Description
5H	• Lacombe County - DA#2, Tier 1, LDR. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS
5I	• Lacombe County - DA#2, Tier 1, LDR. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS
5J	• Lacombe County - DA#2, Tier 1, HDN. • MODERATE rating. • Tier 1 classification and type of use: identified as a potential new boat launch in the assessment. Potential MaPAS or MiPAS 1 development based on further assessment of current gradients, sensitive habitat and PNT notations.
5K	• Lacombe County - DA#2, Tier 1, HDN. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS
5L (5L-1/ 5L-2/ 5L-3/ 5L-4/ 5L-5/ 5L-6)	• Lacombe County - DA#2, Tier 1, LDR. • HIGH rating. • Tier 1 classification and type of use: TSAS
5M (5M-1/ 5M-2)	• Lacombe County - DA#2, Tier 1, HDN. • VERY HIGH rating. • Tier 1 classification and type of use: TSAS
5N (5N-1/ 5N-2)	• Lacombe County - DA#2, Tier 1, HDN. • HIGH rating. • Tier 1 classification and type of use: identified as a potential new boat launch in the assessment. Based on HIGH rating, TSAS development recommended
5O	• Lacombe County - DA#2, Tier 1, HDN. • LEAST rating. • Tier 1 classification and type of use: identified as a potential new boat launch in the assessment. MaPAS or MiPAS1 development recommended
5P (5P-1/ 5P-2)	• Lacombe County - DA#2, Tier 1, HDN. • MODERATE rating. • Tier 1 classification and type of use: identified as a potential new boat launch in the assessment. MiPAS1 or 2 development recommended
5Q	• Lacombe County - DA#2, Tier 1, (residential density not defined). • LEAST rating. • Tier 1 classification and type of use: identified as a potential new boat launch in the assessment. MaPAS or MiPAS1 development recommended
5R	• Red Deer County – Agricultural • VERY HIGH rating.

Parcel	Description
	• Recommended type of use: Potential Regional Trail and Node development
5S	• Red Deer County – Agricultural • VERY HIGH rating. • Recommended type of use: Potential Launch/day use site
5T (5T-1/ 5T-2)	• Red Deer County – Public Service and Agricultural District • VERY HIGH rating. • Recommended type of use: Support new boat launch development a site 5S and provide Regional Trail and Node development
5U	• Red Deer County – Agricultural District • VERY HIGH rating. • As requested by the Committee the site is being reviewed as a potential boat launch facility with day use.
5V	• Red Deer County – Agricultural District • HIGH rating. • As requested by the Committee the site is being reviewed as a potential boat launch facility with day use.

Note: Refer to the Action and Implementation Plan

In moving forward with the plan, it is recommended that the Sylvan Lake Steering Committee review and work with these private landowners to assess opportunities for increased public access to the shoreline and Lake.

4.3 SCENIC DRIVE AND REGIONAL TRAIL SYSTEM

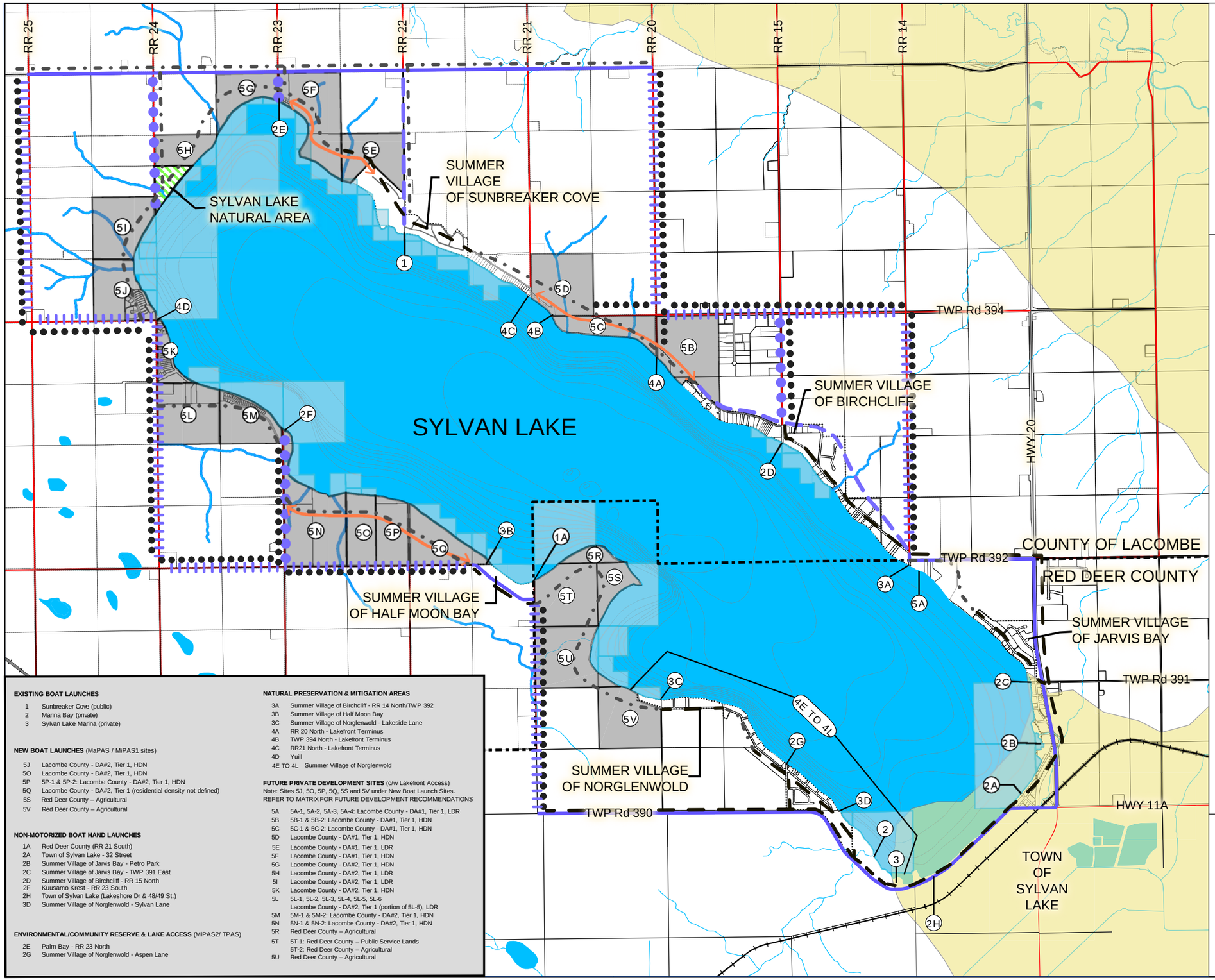
In addition to public sites and private land parcels, the Action and Implementation Plan identified the development of a “Sylvan Lake Scenic Drive and Regional Trail” system designed to provide linkages between: communities; existing and future public sites and private land parcels; and existing points of interest around the Lake (Figure 4-1).

As noted in the Assessment Matrix and Action and Implementation Plan, the Scenic Drive development includes both primary and secondary alignments around the Lake, using Township and Range Roads as primary routes and the existing Summer Village main roads as secondary routes. It is recommended that all primary and secondary Scenic Drive routes are paved, complete with a dedicated Regional Trail lane (approximately 2.5 meters wide).

The Action & Implementation Plan identifies routes that require paving and the development of the dedicated trail lane, existing paved routes that require widening. Secondary Scenic Drive and Regional Trail extensions have also been identified in the Action & Implementation Plan through future private land parcel development.

As part of the development of the regional trail system the following should be developed to assist users:

- Way-finding & Directory development should be incorporated along all Scenic Drive and Regional Trail alignments.
- Way-finder markers should be developed for Scenic Drive (primary & secondary) and Regional Trail alignments, and located at key intersections and/or at intervals of 500m.
- Regional Trail maps should be included on trail markers, especially at key intersections.
- Directories should be developed at all key public (and future private parcel) lake access locations.
- Directories should provide the opportunity to communicate lake management; public education/interpretation; lake/community events; and any other marketing initiatives.



EXISTING BOAT LAUNCHES

1	Sunbreaker Cove (public)
2	Marina Bay (private)
3	Sylvan Lake Marina (private)

NEW BOAT LAUNCHES (MaPAS / MiPAS1 sites)

5J	Lacombe County - DA#2, Tier 1, HDN
5O	Lacombe County - DA#2, Tier 1, HDN
5P	5P-1 & 5P-2: Lacombe County - DA#2, Tier 1, HDN
5Q	Lacombe County - DA#2, Tier 1 (residential density not defined)
5S	Red Deer County – Agricultural
5V	Red Deer County – Agricultural

NON-MOTORIZED BOAT HAND LAUNCHES

1A	Red Deer County (RR 21 South)
2A	Town of Sylvan Lake - 32 Street
2B	Summer Village of Jarvis Bay - Petro Park
2C	Summer Village of Jarvis Bay - TWP 391 East
2D	Summer Village of Birchcliff - RR 15 North
2F	Kuusamo Krest - RR 23 South
2H	Town of Sylvan Lake (Lakeshore Dr & 48/49 St.)
3D	Summer Village of Norglenwold - Sylvan Lane

ENVIRONMENTAL/COMMUNITY RESERVE & LAKE ACCESS (MiPAS2/ TPAS)

2E	Palm Bay - RR 23 North
2G	Summer Village of Norglenwold - Aspen Lane

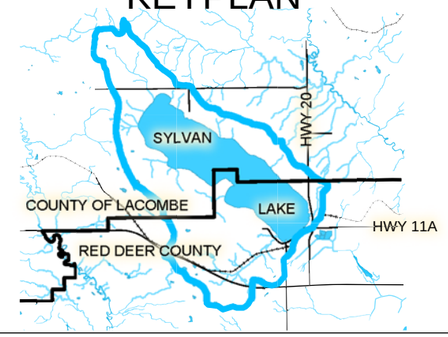
NATURAL PRESERVATION & MITIGATION AREAS

3A	Summer Village of Birchcliff - RR 14 North/TWP 392
3B	Summer Village of Half Moon Bay
3C	Summer Village of Norglenwold - Lakeside Lane
4A	RR 20 North - Lakefront Terminus
4B	TWP 394 North - Lakefront Terminus
4C	RR21 North - Lakefront Terminus
4D	Yuill
4E TO 4L	Summer Village of Norglenwold

FUTURE PRIVATE DEVELOPMENT SITES (c/w Lakefront Access)
Note: Sites 5J, 5O, 5P, 5Q, 5S and 5V under New Boat Launch Sites.
REFER TO MATRIX FOR FUTURE DEVELOPMENT RECOMMENDATIONS

5A	5A-1, 5A-2, 5A-3, 5A-4: Lacombe County - DA#1, Tier 1, LDR
5B	5B-1 & 5B-2: Lacombe County - DA#1, Tier 1, HDN
5C	5C-1 & 5C-2: Lacombe County - DA#1, Tier 1, HDN
5D	Lacombe County - DA#1, Tier 1, HDN
5E	Lacombe County - DA#1, Tier 1, LDR
5F	Lacombe County - DA#1, Tier 1, HDN
5G	Lacombe County - DA#1, Tier 1, HDN
5H	Lacombe County - DA#2, Tier 1, LDR
5I	Lacombe County - DA#2, Tier 1, LDR
5K	Lacombe County - DA#2, Tier 1, HDN
5L	5L-1, 5L-2, 5L-3, 5L-4, 5L-5, 5L-6 Lacombe County - DA#2, Tier 1 (portion of 5L-5), LDR
5M	5M-1 & 5M-2: Lacombe County - DA#2, Tier 1, HDN
5N	5N-1 & 5N-2: Lacombe County - DA#2, Tier 1, HDN
5R	Red Deer County – Agricultural
5T	5T-1: Red Deer County – Public Service Lands 5T-2: Red Deer County – Agricultural
5U	Red Deer County – Agricultural

KEYPLAN



GENERAL LEGEND

- Municipal District and County
- Summer Village
- Waterbody
- Protective Notation Area
- Wildlife Sensitivity Area
- Roads
- Stream and Flow
- Railways

SCENIC DRIVE

- Primary Route (Paved)
- Secondary Route (Paved)
- Primary Route (Req. Paving)
- Secondary Route (Req. Paving)
- Future Private Development Links

REGIONAL TRAIL

- Scenic Drive Integration (Paved)
- Scenic Drive Integration (Req. Paving)
- Regional Trail (Future Private | Public)

NOTE: Refer to Figures 3 to 9 for detailed Scenic Drive & Regional Trail Development & Implementation

0 0.5 >1 km

N

3TM Projection

Figure: 4-1

ACTION PLAN MAP
(DRAFT)

SYLVAN LAKE STRATEGY & ACTION PLAN

JUNE, 2015

5 Project Development Timelines and Initiatives

5.1 TIMELINES

In discussion with the Committee, it was indicated that each individual member will be responsible for the proposed development within their respective jurisdiction. The timeline for each proposed development will be based on the requirements of each Committee member.

5.2 PUBLIC EDUCATION AND MARKETING INITIATIVES

Lake management, public education, and/or marketing initiatives that would support future development or mitigation of each site of land parcel were provided by Lacombe County for the purposes of this study.

Table 5-1 summarizes the current initiatives in the local area.

Table 5-1
Current Lake Management and Marketing Initiatives

Initiative' Lake Management Committee	Lead by	Summary
Aquatic Invasive Species Education campaign	Lacombe County	• Provide basic education on invasive species to help combat aquatic invasive species in the County. • Designed and erected signage at boat access locations on the Lake.
Sylvan Lake Management Committee (SLMC)	SLMC	• Existing Lake Management Committee to help facilitate coordinated land use decision making amongst the eight municipalities of Sylvan Lake Watershed.
Cumulative Effect Management System (CEMS)	SLMC	• The CEMS Phase I report developed in 2014 provided a vision with objectives and outcomes for the Sylvan Lake watershed. • The CEMS Phase ll Implementation Plan consists of three parts: 1) an overview of the current conditions in the watershed; 2) a gap analysis of existing watershed initiatives currently being undertaken by each municipality in the watershed; and 3) implementation actions for cumulative effects management.

Initiative' Lake Management Committee	Lead by	Summary
Take It Off campaign	SLMC	• Program where Fishermen can voluntarily register their huts. This provided the RCMP with contact information of the hut owner in case of vandalism or if a hut is left after close. • "Take It Off" brochure educates the public of the impacts of leaving fishing huts.
The Sylvan Lake Watershed Stewardship Society (SLWSS)	SLWSS	• Lake Management committee that acts as an advocate for the protection of Sylvan Lake and its watershed.
The Alberta Lake Management Society (ALMS)	ALMS	• Lake Management Society that promotes understanding and comprehensive management of lakes and reservoirs and their watersheds.

Additional Lake Management/Public Education initiatives that can be reviewed and implemented either by the Committee or its individual members includes, but is not limited to:

- Forming and maintaining an "Ambassadors" group to oversee the development and implementation of a program.
- Instituting shoreline signing program to identify (action plan) public and private uses and relative support information (i.e., environmental sensitivity).
- Establishing public education and interpretive signing kiosks at all public access locations, complete with the opportunity of recording any monitoring items and potential historical/cultural information. This could be expanded to proposed Scenic Drives and trails/trail nodes once implemented.
- Forming a "Sylvan Lake Ambassadors" website where people can provide their comments and any monitoring information.
- Identifying environmentally sensitive lake areas with special buoy demarcation that mitigate motorized boat use.
- Creating a Responsible Boating Guide, outlining key lake access locations, code of conduct, areas for mooring, preferred areas for tubing/surfing, fueling, noise mitigation, emergency procedures, etc.
- Developing a Responsible Winter Use Guide, outlining key lake access locations, code of conduct, fish hut locations, motorized use/routes, safety/clean-up, noise mitigation, emergency procedures, etc.
- Developing a Responsible Lakefront Owners Guide, outlining key lake and riparian zone management, etc.
- Instituting a lakefront bylaw that bans harmful product use on private/public property.

- Consolidating Assessment and Action Plan & Implementation mapping and matrices into an easy to read Public Education Guide. This would be provided in both hard and electronic format.
- Applying Assessment and Action Plan & Implementation mapping and matrices into future municipal land use and open space documents.
- Providing yearly lake community updates on the progress of the Action Plan & Implementation, through newsletter, special public events and/or information sessions, website, etc.

5.3 GOVERNANCE MODEL

The Action and Implementation Plan (Appendix D), provides a clear vision with appropriate development goals and objectives with respect to public shoreline recreational areas and lake access. It also outlines future and existing private land development and management requirements. The Plan is further supplemented by a lake-wide emergency response plan; invasive species management strategies; and a lake management, public education and marketing initiative outline.

In reference to the Action and Implementation Plan, each site has been identified with specific Targets of Opportunity (key stakeholders) and an estimated capital cost for development or remediation (if feasible). As part of the Action Plan and Implementation Plan, there has to be a strong rationale for implementation actions, potential public / private partnerships, and any other potential funding mechanisms to be identified to leverage the required resources. In moving forward with the Action Plan and Implementation Plan; it is recommended that the SLMC be assigned the role as the 'Keeper of the Plan' both to maintain momentum and resolve problems as they arise. The SLMC would also play a role in establishing a regional agreement with all government groups in the implementation of the Action and Implementation Plan. Figure 5-1, illustrates the proposed governance model and process to support the vision and staged implementation steps for development.

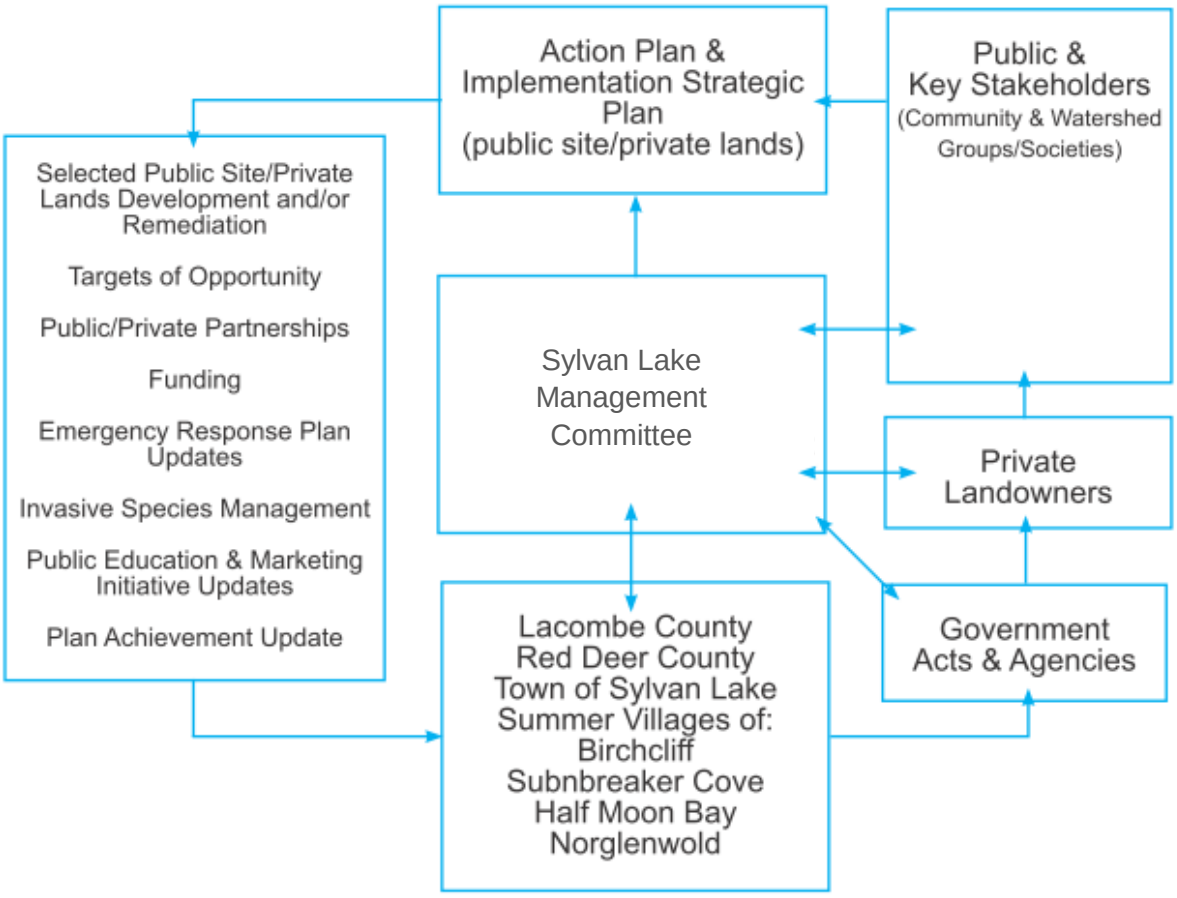


Figure 5-1
Governance Model

The illustrated governance model and process will provide the Committee:

- a clear vision of the proposed development and/or remediation of each public site and private land area;
- the ability to re-visit the vision, goals and objectives for each site on a yearly basis in order to prioritize and justify the next steps. Reassessment will: examine the Targets of Opportunity; identify any potential public / private partnerships; arrange any potential funding mechanisms or financing for development and/or remediation; and analyze, measure and benchmark (i.e. Plan Achievement Recognition System) the progress and success of the Action Plan and Implementation Strategy.

- the opportunity to maintain community, key stakeholder and government consensus for the Action Plan and Implementation Strategy and include yearly updates to the Emergency Response Plan, and other Public Education and Marketing initiatives;
- the ability to establish a process that collectively manages recreational and environmental pressures placed on the Lake by residents and visitors alike.

6 Emergency Response Plan

In communication with the Committee, it has been identified that Sylvan Lake currently has an emergency response plan (ERP) that is enacted for the entire lake. Upon discussion with the Committee, they would like to provide increased public education on emergency response. The purpose of this section is to provide guidance for Lake users on emergency procedures, should an emergency event occur on the Lake, or if adverse weather is encountered and removing a boat from the water is not an option.

6.1 BACKGROUND

In the case of an emergency within the Province of Alberta 911 can be called to obtain emergency assistance. Upon receiving a call, emergency services will coordinate with local resources to provide emergency response. Except for the local RCMP, emergency response is provided by volunteer organizations within the area. Currently within the area, Red Deer County has four to five boats (centrally located within the County) and the RCMP has one boat that can be used in the case of an emergency. In addition to these resources it was relayed that individual emergency volunteer responders may also use their own personal watercraft to assist with an emergency.

In discussion with local emergency responders, it was indicated that once a water emergency call on Sylvan Lake is received, boats are typically launched from the closest location to the emergency call.

In discussion with the Committee and emergency responders, the issue encountered at some of the Lake access points relates to the Lake water level. When the water level is low it becomes difficult to deploy their boat for rescue/recovery. Turnaround at the access points is not a concern for emergency responders.

6.1.1 Local Conditions

Sylvan Lake is approximately 13.6 km long and 2.3 km wide. The prevailing wind direction within the area is northwest, which corresponds to a fetch of approximately 13.6 km. Based on the orientation of the Lake and the prevailing wind direction, large waves can be generated quickly, which can jeopardize the watercraft.

6.1.2 Boater Awareness

Currently the Lake has three formal boat launches, Sunbreaker Cove (public), Marina Bay (private) and Sylvan Lake Marina (private) and several informal launch areas such as Range Road 21. Due to the limited number of launches and their locations on the Lake, it has been identified that it can be a challenge to get watercraft off the Lake during the storm event.

In an effort to mitigate on-lake emergencies, it is important to increase the boater awareness on the Lake. Signage could be used to educate boaters of the following:

- the specific location and address or location name of the launch site.
- basic lake bathometry.

- launch location in relation to the rest of the lake.
- list of Emergency Contact numbers,
    - Emergency Services – 911
    - Environmental Spill Response
    - Report a Poacher – 1-800-642-3800
    - Report a Wild fire – 310-3473

Figure 6-1 shows an example of signage that can be erected at the boat launch locations to increase boater awareness.

RANGE ROAD 21 BOAT LAUNCH
Site and Emergency Information

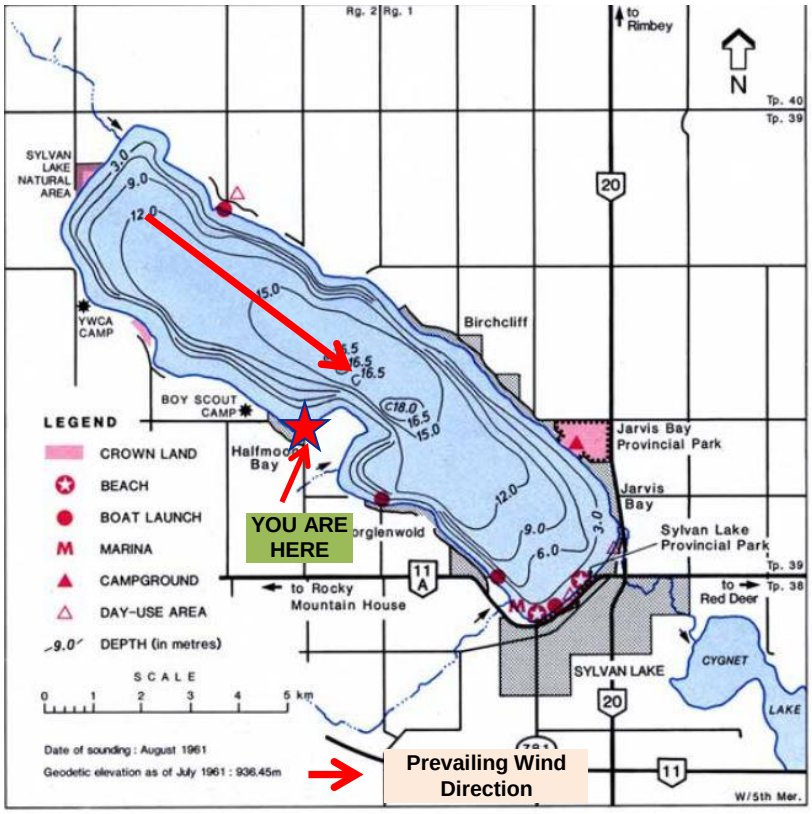


Figure 2. Bathymetry and shoreline features of Sylvan Lake.
BATHYMETRY SOURCE: Alta. Envir. n.d.[c].

EMERGENCY SERVICE – 911
REPORT A POACHER – 1-800-642-3800
REPORT A WILD FIRE - 310-3473

Figure 6-1
Boat Awareness Signage Proposed for the formal Boat Launch Site on Range Road 21

7 Range Road 21 Feasibility Study

For the development of new formal boat launch at Sylvan Lake, the Committee requested a review of the existing (informal) boat launch on Range Road 21 in Red Deer County. The purpose in reviewing this site is to determine whether it is feasible to improve the existing site conditions to provide a more suitable launch location for the public.

AE and Summit completed the following tasks in review of Range Road 21:

- A fisheries assessment of the existing Boat Launch on Range Road 21.
- A Traffic Impact Assessment on Range Road 21.
- Provided design criteria and investigated layout configurations for a new boat launch at Range Road 21.

The findings of the Range Road 21 feasibility study are included in Appendix E of this report.

Based on the findings of the feasibility study, the Range Road 21 boat launch location does not meet the minimum design criteria. Should the Committee want to develop this site they should do so with the understanding that that Range Road 21 would have a reduced level of service as compared to the Sunbreaker Cove facility.

It was recommended that if the Committee is looking to provide a boat launch with similar functionality as Sunbreaker Cove, that an alternative site location be investigated.

8 Additional Site Assessment

Upon completion of the Range Road 21 site review, the Committee requested that two additional sites be reviewed for the potential development of a day use area and boat launch facility. The locations identified for additional review are as follows:

- Site 5S with access through 5T
- Site 5V.

The Committee identified that the future day use area and boat launch facility is to consist of the following elements:

- space for a minimum of 6 to 10 picnic tables and a vault toilet;
- a double boat launch ramp;
- parking capacity to incorporate 80 to 100 trailer parking stalls; and
- site be 2 hectares (5 acres) in size.

For the review of the requested sites, the following was completed:

- A desktop assessment of the primary environmental constraints including;
  - littoral bathymetry and upland gradient;
  - level of disturbance required to construct a proposed boat launch facility; and
  - mapped/known critical fish and wildlife habitat;
- A modified fish habitat assessment (FHA) at and surrounding sites 5S and 5V.
- Develop a potential layout using the identified site requirements to determine the site spatial requirements.
- Review of the access and site improvements that would be required to develop the site.
- Review of the planning and development requirements associated with each site.
- Identify potential barriers or limitations for development of each location.
- Develop a conceptual site plan for each site.
- Develop a conceptual cost estimate for each concept and rank each site based on suitability.
- Provide general considerations for the development of an inland marina within 5S.

In addition to reviewing 5S and 5V for the development of a day use and boat launch facility; the Committee has requested that Range Road 21 (site 1A) and Kuusamo Krest (site 2F) be reviewed for the development of a day use area only.

8.1 DESKTOP STUDY

The following known environmental constraints were considered in more detail for each site pertaining to lake access:

- bathymetry based on the Atlas of Alberta Lakes (University of Alberta 2005),
- mapped known rare plants and animals (Government of Alberta (GoA) 2014a),
- mapped known fish and wildlife habitat (IBI Group 2000, GoA 2014b),
- presence of riparian and upland vegetation (GoA 2014b), and
- proximity to an exposed fractured sandstone formation known to interface with the local groundwater aquifer (Baker 2009).

8.1.1 Bathymetry

Bathymetry was assessed at a desktop level using low-resolution bathymetry maps available from the Atlas of Alberta Lakes (University of Alberta 2005). Extrapolating from the contour intervals available in the Atlas of Alberta Lakes, lake gradient appears to be steeper at Site 5V, indicating that disturbance of the lake substrate at Site 5V would be less to achieve sufficient depths for a boat launch compared to Site 5S (University of Alberta 2005).

Despite the steeper gradient of Site 5V compared to Site 5S, neither site appears to meet the design criteria for a boat launch. As such, disruption of the lake substrate may be required to construct a boat launch at either location. Field measurements are required to determine the exact bathymetric profile of each site.

8.1.2 Rare Plants and Animals

A search of the Alberta Conservation Information Management System (ACIMS) database revealed no rare plants or animals within either the 5S or 5V parcels (GoA 2014). One non-sensitive species was documented in both areas; the variegated meadowhawk (*Sympetrum corruptum*) is listed as “Secure” in the General Status of Alberta Wild Species 2010 and the site areas likely contain suitable habitat to maintain populations of this species (GoA 2014a).

A search of the Fish and Wildlife Management Information System (FWMIS) database showed that no fish inventories had been conducted within the immediate areas of sites 5V or 5S. Fish inventories nearby at the east land-point in NE-12-39-2-W5M documented six fish species; these species are included in the following list and all are considered “Secure” in the General Status of Alberta Wild Species 2010:

- burbot (*Lota lota*),
- emerald shiner (*Notropis atherinoides*),
- lake whitefish (*Coregonus clupeaformis*),
- northern pike (*Esox lucius*),
- walleye (*Stizostedion vitreum*),
- white sucker (*Catostomus commersoni*), and
- yellow perch (*Perca flavescens*, GoA 2014b).

Preliminary investigation suggests that the shoreline of either site may contain habitat for all above species, at various times during the year. The shallow gradient of the Lake, sand/gravel/cobble substrate complexes, and emergent vegetation present at Sites 5S and 5V and the areas surrounding these sites may prove suitable for various life cycle phases including spawning, rearing, and foraging.

8.1.3 Fish and Wildlife Habitat

In the Sylvan Lake Management Plan 2000 update, IBI Group (2000) identified key fisheries habitat in several areas that were sheltered from strong currents, shallow enough to support significant emergent vegetation, and provide suitable foraging and rearing habitat for fish. IBI Group also identified key ungulate and waterfowl habitat in their report. Both parcels 5S and 5V are adjacent to key fisheries habitat identified by IBI Group. Key ungulate habitat was also identified where Site 5S is located; site 5V is not located in key ungulate habitat. Neither site is located near key waterfowl habitat (IBI Group 2000).

A search of FWMIS database identified protective notations (PNTs) along the shore at both Site 5V and 5S. Specifically, PNT020153 occupies the shoreline at Site 5V, and PNT020140 occupies the shoreline at Site 5S (GoA 2014). Both PNTs are held by AEP and protect emergent vegetation. Emergent vegetation is important for foraging and rearing fish but is in decline due to rising water levels (J. Reilly, personal communication, 2014). The operation of motorized watercraft in or near areas with emergent vegetation could contribute to the loss or reduction of this important habitat feature. AEP provide input and place restrictions on the type of development proposed within these areas where PNTs exist.

8.1.4 Proximity of Groundwater Aquifer

An exposed fractured sandstone formation known to interface with the local groundwater aquifer has been mapped along the north-east shore of Sylvan Lake (Baker 2009). Baker (2009) recommends limiting development in close proximity to the exposed fractured sandstone formation to prevent impacting or contaminating the local groundwater aquifer. Both sites 5V and 5S are located along the south-western shores of the Lake and are therefore not in proximity of the fractured sandstone formation. *No impacts to the groundwater aquifer are expected to occur at the sites 5V and 5S based on known information.*

8.2 PLANNING AND DEVELOPMENT

Both potential boat launch and day use sites, site 5S and 5V, are within Red Deer County and are currently zoned as Agricultural district.

As per an email from Mr. Moje, a Planner with Red Deer County, Site 5S is within the Red Deer County Environmentally Significant Areas Inventory (Golder Associates 2011). Site 5V is not within the environmentally sensitive areas (ESAs) as they only cover the northern portion adjacent to the Lake.

Based on the zoning requirements, development within an ESA is not prohibited if mitigation is employed to protect any sensitive areas from development to leave its environmental significance intact. An environmental assessment must be conducted with accompanying recommendations to justify any

proposed development and how to mitigate any environmental impact that may result. The Red Deer County Municipal Development Plan (MDP) Policy for an ESA also states that an ESA will be protected from inappropriate development if necessary (this may arise if the area is highly ecologically sensitive).

8.3 FISH HABITAT ASSESSMENT (FHA)

Summit completed a fish habitat assessment (FHA) at and surrounding sites 5S and 5V in Sylvan Lake, Alberta in July 2015. The purpose of the FHA was to assess the available fish habitat and potential habitat usage in the lake along the shoreline of Kasota Bay.

Summit assessed sites 5V and 5S as well as 3 additional "alternate" locations within Kasota Bay. The alternate sites assessed are described as follows:

- **Alternate: 3C (RR20)**, located within the Summer Village of Norglenwold adjacent to 5V;
- **Alternate: 5R (Pt140)**, northern most tip on Kasota Point; and
- **Alternate: 5R (Pt137)**, north of site 5S and around the point.

Specific habitat structures that were noted for each site during the FHA are as follows:

- emergent vegetation;
- submerged vegetation;
- substrates comprised of gravels and cobbles;
- substrates comprised of sands and fines;
- features providing cover (such as woody debris, boulders and fractured bedrock);
- streams and ephemeral draws; and
- Bathymetry.

The detailed report for the FHA is attached in Appendix F.

8.3.1 Summary of Findings

Several general observations were made to the entire Kasota Bay area.

1. Much of the shoreline of Kasota Bay (excluding shoreline containing residential development) contains emergent vegetation.
2. Areas along the shoreline without emergent vegetation were generally shallower than 0.3 m, or between patches of emergent vegetation, and contained a variety of submerged macrophytes. These macrophytes were present in patches which were evenly distributed with a medium density (10-15 patches per 100 m of shoreline). Each patch of macrophytes contained a variety of species dominated by:
    - Canada waterweed (*Elodea canadensis*);
    - northern water-milfoil (*Myriophyllum sibiricum*);
    - Richardson's pondweed (*Potamogeton richardsonii*); and
    - slender pondweed (*Potamogeton pusillus*);
3. Areas containing emergent vegetation were noted to provide excellent rearing habitat for yellow perch. Large schools of yellow perch were observed using this habitat. The shoreline of Kasota Bay also provides excellent rearing and moderate spawning habitat for northern pike.

4. Kasota Bay is sheltered from the prevailing northwesterly winds and storms.
5. Although limited areas of deeper water are present towards the extreme north and south edges of Kasota Bay, the bay has a shallow gradient from the shore and some of the bay does not reach 1.2 m of depth (engineering requirement for a boat launch) until beyond 100 m from the shore.
6. Terrestrial vegetation at all sites includes a forest floor community of grasses and forbs with minimal shrubs and dense canopy cover of trees.

Site specific observations are summarized in Table 8-1 below.

Table 8-1
Summary of Findings

	Distance to 1.2m depth	Upland rise and gradient	Presence of emergent vegetation	Provincial protection (PNT)	Quality / status of fish habitat
Site 5S	120 m	~1.5 m above lake level @ 10% grade	Yes	PNT020140	Moderate / unique
Site 5V	45 m	~4.0 m above lake level @ 20% grade	Yes	PNT020153	High / unique
Alternate: 3C (RR20)	25 m	~2.0 m above lake level @ 10% grade	No	None	Low / common
Alternate: 5R (Pt137)	60 m	~3.0 m above lake level at 15% grade	Minimal	None	Moderate / common
Alternate: 5R (Pt140)	15 m	~3.0 m above lake level at 15% grade	No	None	Moderate / common

Sites 3C (RR20) and 5R (Pt140) provide the most favorable site features for the development of a boat launch.

8.4 POTENTIAL SITE LAYOUT AND ACCESS

8.4.1 Potential Boat Launch Areas (Sites 5S and 5V)

Figures 8-1, 8-2, and 8-3 attached are concepts for the development of a boat launch and day use areas at sites 5V and 5S.

Two options were developed for site 5S, providing two different locations for the boat launch. Table 8-2 provides a description of what is included in each concept.

Table 8-2
Description of Conceptual Site Layout and Access

Site No.	Description of Layout	Site Access

Site 5S	• **Option 1** boat launch is located on the east portion of the parcel and has little protection from surrounding shore. This exposure leaves the site vulnerable to wave action produced during storms.
	• **Option 2** boat launch is located on the south side of the parcel and protected by the bay. However, this location is shallow and within an ESA.
	
	Each option includes:
	• Double boat launch with turnaround
	• Vehicle/Trailer Parking for 100 (4 x 20m) stall size;
	• Day use area with waterfront access;
	• Washroom Facility,
	• 10 day use sites and parking.
		• Two access routes provided see attached conceptual plan layouts.
		  • Option 1 roadway will require the construction of a new roadway. This option will provide a more direct route to the launch site.
		  • Option 2 utilizes an existing roadway that has a number of bends. A review of the legal plan for the parcel indicates that this access road is a privately owned, and permission from the landowner would be required to use it.

Site 5V	Site includes: • Double boat launch with turnaround • Vehicle/Trailer Parking for 100 (4 x 20m) stall size; • Day use area with waterfront access; • Washroom Facility, • 10 day use sites and parking.	This access route was arranged to retain as much open land to the east (and possibly west) of the access road for future residential development. The launch location was selected to mitigate disturbance to adjacent residential property.

8.4.2 Potential Day Use Area (Sites 1A and 2F)

Figures 8-4 and 8-5 attached are concepts for the development of day use areas at Sites 1A and 2F.

Table 8-3 provides a description of what is included in each boat launch concept and site access at Sites 1A and 2F.

Table 8-3
Description of Conceptual Site Layout and Access for Day Use Areas Development

Site No.	Description of Layout	Site Access
Site 1A	Site includes: • a single launch c/w 4 m wide portage path and turnaround; • parallel vehicle/trailer parking for 10 (with option to expand) • day use area (5 to 6 sites) c/w waterfront access and parking.	Turnaround south along RR21 provides access back to the parallel parking. The number and location of these turnarounds can be better defined once the number of trailer stalls has been identified.
Site 2F	Site includes: • a single launch c/w 4 m wide portage path and turnaround; • parallel vehicle/trailer parking for 10 (with option to expand); • day use area (8 sites) c/w waterfront access and parking.	A turnaround south along RR24 is recommended to provide access back to the parallel parking. The location of this turnaround can be better defined once the number of trailer stalls has been identified.

8.5 CONCEPTUAL COST ESTIMATE

8.5.1 Conceptual Cost Estimate for Sites 5S and 5V

A conceptual cost estimate was developed for Site 5S and 5V based on the conceptual layout for each site. The following assumptions were made for the purposes of this conceptual cost estimate:

- Roadways and parking lot will be gravel;
- Double boat launch with concrete pad;
- Floating dock beside launch area;
- The day use areas will be cleared and seeded;
- One washroom with pump put toilet will be provided for each site;
- 10 benches will be provided for each site;
- Lighting will be provided for each site;

- Costs do not include purchase of any land;
- Construction contingency of 30%;
- Design contingency of 10% is included for engineering design and landscaping design services.

Table 8-4 provides the conceptual cost estimates for the reviewed sites.

Table 8-4
Site 5S and 5V Conceptual Cost Estimate

Description	Site 5S				Site 5V
	Option 1 – Boat Launch (East Side of Parcel)		Option 2 – Boat Launch (South Side of Parcel)		
	A – New Roadway	B – Existing Roadway	C – New Roadway	D – Existing Roadway	
Site Development, includes: • Clearing, • Topsoil Stripping, • Access Road Improvements/ Construction • Parking • Washrooms • Boat Launch with dock • Electrical Lighting	$3,450,000	$1,627,000	$2,463,000	$1,328,000	$2,148,000
Contingency (30%)	$1,035,000	$488,000	$739,000	$398,000	$644,000
Design Services (10%)	$449,000	$212,000	$320,000	$173,000	$279,000
Anticipated Project Cost	**$4,934,000**	**$2,327,000**	**$3,522,000**	**$1,899,000**	**$3,071,000**

As shown in Table 8-3, Site 5S Option 1 and Option 2 that use the existing roadway have the lowest cost. Permission to use the existing roadway to site 5S is required as this roadway is privately owned. If a new access road is required for site 5S, then site 5V is the least cost option.

8.5.2 Conceptual Cost Estimate for Day Use sites 1A and 2F

A conceptual cost estimate was developed for Site 1A and 2F based on the conceptual layout for each site. The following assumptions were made for the purposes of this conceptual cost estimate:

- Roadways and parking lot will be gravel;
- The day use areas will be cleared and seeded;
- 10 parking stalls provided;
- One small hand launch for each site;
- Costs do not include purchase of any land;
- Construction contingency of 30%;
- Design contingency of 10% is included for engineering and landscaping design services.

Table 8-4 provides the conceptual cost estimates for the reviewed sites.

Table 8-5
Site 1A and 2F Conceptual Cost Estimate

Description	Site 1A	Site 2F
Site Development, includes: • Clearing, • Topsoil Stripping, • Access Road Improvements/ Construction • Parking • Small Hand Launch • Small dock	$365,000	$413,000
Contingency (30%)	$110,000	$124,000
Design Services (10%)	$48,000	$54,000
Anticipated Project Cost	**$523,000**	**$591,000**

8.6 BARRIERS AND LIMITATIONS

Both sites were included in the Assessment Matrix discussed in Section 3.0 of this report. The Assessment Matrix ranked sites 5S and 5V as very high and high, respectively for environmental impacts when compared to all the sites at Sylvan Lake. Table 8-6 below summarizes the barriers and limitations of each site.

Table 8-6
Site Barriers and Limitations

Barriers and Limitations for Each Site	
Site 5S	**Site 5V**
• Shallowest grade between the two sites, therefore increased likelihood of having to dredge for accommodate the required boat launch depths/grade.	• Steeper gradient that 5S, however, still may require dredging to accommodate a boat launch.
• May contain habitat for “Secure” fish species.	• May contain habitat for “Secure” fish species.
• Adjacent to Key Fisheries Habitat	• Adjacent to Key Fisheries Habitat
• Located in Key undulate habitat	• PNT from AEP along the shoreline in this location.
• PNT from AEP along the shoreline in this location.	
• Located in a Red Deer County ESA.	.

The FHA of the sites confirmed the constraints identified through the desktop study. Mitigation efforts to reduce these impacts through design may be applied to address these impacts. Some of the mitigation that will be reviewed through design includes limiting tree clearing through sensitive areas, minimizing disturbance through the PNT areas and minimizing impact to undulate habitat providing habitat compensation as required.

8.7 INLAND MARINA FEASIBILITY

The Committee requested that AE comment on the feasibility of developing an inland marina at site 5S. In a review of the site, it is feasible to develop an inland marina at this location with consideration to the following:

- The configuration, the site provides several potential locations for accessing the lake.
- The upland area is large enough for a marina and the supporting infrastructure depending on the size of marina and service requirements.

Some of the potential draw backs of the site are;

- Based on site observations the majority of the site is approximately 1.5 m higher than the current lake level. To develop an inland marina at this location would require a large volume of earth to be excavated.
- Depending on the location of the marina access, a channel may be required to be dredged to maintain access during low lake levels.
- Most of the water front of site 5S has a registered protection notion on it, so it can be anticipated that a higher level of environmental compensation might be required. The development of the marina might compensate some of these environmental compensation requirements as the inland marina does add habit area to the lake.
- The subject site and the adjacent properties are currently privately owned.
- The site is a long distance from municipal services, such as road access, water, sanitary, electrical etc. which would increase the cost of development.

8.8 SUMMARY

Based on the desktop study and FHA of Sites 5S and 5V, neither site appears to be able to meet the criteria identified by the committee for a boat launch without additional exception of the lake bed. This is primarily due to the shallow gradient of the land in these locations. Due to presence of key fisheries habitat, it is likely that may development would require a comprehensive compensation plan.

Observation from adjacent sites 5R and 3C, from the FHA, indicate that these sites might be more suitable locations for a boat launch due to their observed depths and the moderate quality of their fish habitat.

- 5R is very exposed to wind and wave action, and additional protection measures would likely be required to develop a launch at this location.

- 3C might be a potential boat launch location, but it is currently identified within the Summer Village of Norglenwold, Municipal Development Plan (MDP) as a non-motorized boat hand launch location. To develop a motorized boat launch at this location, would require that the MDP be revised.

SYLVAN LAKE - STRATEGY AND ACTION PLAN - SITE 5S (OPTION 1)

SCALE : 1:5000

FIGURE 8-1

NORTH

REGIONAL TRAIL

DOUBLE BOAT LAUNCH

20m DIA. VEHICLE / TRAILER TURNAROUND

10m DIA, DAY USE AREA - 10m BETWEEN EACH AREA (APPROX.) - c/w WASH ROOM / CHANGE ROOM FACILITY

100 - 4 x15m VEHICLE PARKING c/w 7m ONE WAY LANE

10 - 3 X 6m DAY USE VEHICLE PARKING

ROAD ACCESS - OPTION C

WATER FRONT ACCESS

REGIONAL TRAIL

ROAD ACCESS - OPTION D

POTENTIAL LAND DEVELOPMENT

REGIONAL TRAIL

SYLVAN LAKE - STRATEGY AND ACTION PLAN - SITE 5S (OPTION - 2)

FIGURE 8-2

SCALE : 1:5000

NORTH

SYLVAN LAKE

20m DIA. VEHICLE / TRAILER TURNAROUND

DOUBLE BOAT LAUNCH

10 - 5m DIA. DAY USE AREA - 10m BETWEEN EACH (APPROX.) - c/w WASH ROOM/ CHANGE ROOM FAC

WATER FRONT ACCESS

10 - 3 X 6 DAY USE PARKING

100 - 4 X 15 VEHICLE / TRAILER PARKING

REGIONAL TRAIL

ROAD ACCESS

REGIONAL TRAIL

SYLVAN LAKE - STRATEGY AND ACTION PLAN - SITE 5V

FIGURE 8-3

SCALE : 1:4000

NORTH

HAND LAUNCH - BOAT RAMP

20 m DIA. VEHICLE/ TRAILER TURNAROUND

10 - 5m DIA. DAY USE AREA - 10m BETWEEN EACH AREA (APPROX.)

10 - 4m X 6m VEHICLE PARKING

3 - 4m X 15m VEHICLE / TRAILER PARALLEL PARKING

20 m DIA. VEHICLE/ TRAILER TURNAROUND

10 - 4m X 15m VEHICLE / TRAILER PARALLEL PARKING

REGIONAL TRAIL

20 m DIA. VEHICLE/ TRAILER TURNAROUND

REGIONAL TRAIL

PARCEL

RESERVE

R5

R6

R10

R11

11A

12A

CRESCENT

AVE

15.24

20.12

35.36

3.05

FIGURE 8-4

SYLVAN LAKE - STRATEGY AND ACTION PLAN - SITE 1A

SCALE : 1:1500

FIGURE 8-5

SYLVAN LAKE - STRATEGY AND ACTION PLAN - SITE 2F

SCALE : 1:1000

9 Received Comments

The Committee received comments on the draft version of this report from the following:

- Summer Village of Half Moon Lake,
- Sylvan Lake Watershed Stewardship Society, and the
- Sylvan Lake Quiet Enjoyment Initiative.

The comments were reviewed, but not incorporated into the final report. A copy of the received comments is provided in Appendix G.

10 Conclusions and Recommendations

10.1 CONCLUSION

The following is a summary of the conclusions made in this report:

- Due to increased demand from lake users, the current formal and informal boat launches are not able to meet demand. Many of the informal lake access points, which are environmentally sensitive are being negatively impacted.
- The literature review revealed that the formal boat launches on the Lake currently do not meet the user demand, however, there are limited locations on the Lake that are suitable to serve as formal boat launch locations.
- Federal and provincial regulations for the development of a new boat launch have been identified and these regulators will need to be contacted during preliminary design stages.
- The Action and Implementation Plan is a flexible planning tool and is intended to be a living document. It is structured to assist the Committee in the execution of development upgrades and/or mitigation to public lake access locations. It also defines future planning and land use requirements for development involving shoreline and lake access.
- Based on the findings of the feasibility study, the Range Road 21 boat launch location does not meet the minimum design criteria.
- Sites 5S and 5V in Red Deer County ranked very high and high, respectively for environmental impacts in the Assessment Matrix. Site 5S is the least expensive to develop if the use of the existing roadway is permitted. If a new roadway is required for Site 5S, then Site 5V is the least expensive option for development.
- 5R was identified within the FHA as a potential boat launch due to the observed water depth and quality of its fish habitat. If a boat launch was considered at this location, measures would likely be required to protect the launch from wind and wave action.
- 3C was also identified within the FHA as a potential launch location. As indicated in the Action and Implementation Plan, 3C is identified as a non-motorized boat hand launch within the Summer Village of Norglenwold, Municipal Development Plan.
- Sites 5P and 2F were previously assessed for new boat launch sites and were ranked by the A&IP as moderate and high, respectively. Site 5P could potentially be developed into a boat launch site if land was available.

10.2 RECOMMENDATIONS

The following is a summary of the recommendations made in this report:

- Individual members in the Committee and project team should meet to develop timelines for short, medium, and long term development and/or mitigation strategies for areas identified in the Action and Implementation Plan.
- New signage should be installed at the existing boat launches and lake access points to improve awareness on the Lake and provide emergency contact information.

- Should the Committee want to further investigate an inland marina at site 5S, a feasibility study for the development of a marina should be completed.
- 5S and 5V are both feasible boat launch locations provided that the environmental constraint can be mitigated. It is anticipated that both sites will require a comprehensive environmental compensation/mitigation plan.
- If the Committee wants to develop a boat launch at either 5S or 5V, then it is recommended to develop 5S as it is the lowest cost alternative provided; an agreement to use the existing road can be obtained, otherwise it is recommended that 5V be developed.
- As private parcels come up for development, the Committee should review the A&IP to assess lake access requirements.

Closure

This report was prepared for the Lacombe & Red Deer Counties, Town of Sylvan Lake & Summer Villages of Sylvan Lake (Committee) to provide a strategy and action plan for recreational lake access for Sylvan Lake and specific design and construction drawings for boat launch access.

The services provided by Associated Engineering Alberta Ltd., Summit Environmental Consultants and EIDOS Consultants Incorporated in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
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APEGA Permit to Practice P 3979

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Appendix A - Literature Review

Sylvan Lake Boat Launch Assessment

Literature Review

Report titles

1.0 Sylvan Lake Parks and Recreation & Open Space Plan, Lacombe County, 2012.
2.0 Highland Park Concept Plan, Cu-Consulting Ltd., 2012
3.0 Sylvan Lake/Red Deer County Inter-municipal Development Plan, Town of Sylvan Lake/Red Deer County and Park Land Community Planning Services, 2011.
4.0 Birchcliff - The Slopes Concept Plan, Longview Planning and Design and MPE Engineering Ltd., 2011.
5.0 Palm Bay Resort - Biophysical Assessment, Stantec, 2010.
6.0 Lacombe County/Sylvan lake Area Structure Plan, AECOM, 2010 (draft).
7.0 Palm Cove Concept Plan, MH Project Planning, 2010.
8.0 Selection of a New Boat Launch Site on Sylvan Lake, MPE Engineering Ltd., 2010 (draft).
9.0 Fisheries Assessment of Proposed Boat Launches at Sylvan Lake, Palliser Environmental, 2010.
10.0 Lacombe County - Sylvan Lake Boat Launch Study Policies, Standards and Practices, Armstrong Consulting Services, 2010.
11.0 Red Deer County Municipal Development Plan, Red Deer County - Planning and Development Services, 2010.
12.0 SKYY Country Golf and R.V. Plan, Bemoco Land Surveying ltd., 2009.
13.0 Historical Resources Clearance Letter, Government of Alberta, 2009.
14.0 Historical Resource Impact Assessment - Kuusamo Krest & Boy Scout Camp, Bison Historical Services Ltd., 2009.
15.0 Baker Thesis Groundwater Contribution to Sylvan Lake, Jennette Baker - University of Calgary, 2009.
16.0 Red Deer County Open Space Master Plan, Dillon & evds urban lab, 2009.
17.0 Red Deer River State of the Watershed Report, Red Deer Watershed Alliance, 2009.
18.0 Handbook for state of the Watershed Reporting, Alberta, 2008.
19.0 Municipal Guide - Planning for a Healthy and Sustainable North Saskatchewan Watershed, NSWA, 2008.
20.0 MDP Lacombe County, Armin A. Preiksaitis & Associates, 2007 (updated 2010).
21.0 Association of Summer Villages of Alberta Lake Stewardship Reference Guide, ASVA Lake Stewardship, 2006 edition.
22.0 Review and Analysis of the Science Based documents and Associated Governing and Management Documents for the Sylvan Lake Watershed, Planned Environmental Associates, 2006.
23.0 Sylvan Lake Water Quality Assessment and Watershed Management Considerations, AXYS Environmental Consultants Ltd., 2005.
24.0 Administration Report, Red Deer County, Planning and Development, 2004.
25.0 MDP Birchcliff, Parkland Community Planning Services, 2003.
26.0 MDP Sunbreaker Cove, Parkland Community Planning Services, 2003.
27.0 MDP Town of Sylvan Lake, 2003.
28.0 A Review of Three Development Proposals in Vicinity of Sylvan Lake, Komex International Ltd., 2003.

29.0 Cumulative Effects of Lake Side Development on the Sylvan Lake Natural Area, Golder Associates, 2003.
30.0 Sylvan lake Public Access Study, ISL/Westworth & Associates Environmental Ltd./Lovatt Planning Consultants, 2003.
31.0 Fisheries Resource and Effects Assessment & Mitigation for the proposed WestEnd Landing Development on Sylvan Lake, Richard Carson & J.H. Allan, 2002.
32.0 MDP Norglenwold, Parkland Community Planning Services, 2001.
33.0 MDP Half Moon Bay, Parkland Community Planning Services, 2000.
34.0 Sylvan Lake Management Plan - 2000 Update, 2000.
35.0 Assessment of Water Quality in Sylva Lake, Patricia Mitchell, Alberta Environment, 1999.
36.0 MDP Jarvis Bay, Parkland Community Planning Services, 1998.
37.0 Alberta Invasive Species Council, Alberta Invasive Species Council.
38.0 Draft Report to Sylvan Lake Management Committee, Amanda-Brea Watson, Kim Staryzk, Craig Teal.

Environmental Literature Review

Report titles

39.0 Invasive Species: Purple Loosestrife, Alberta Invasive Species Council, 2014.
40.0 Invasive Species: Eurasian Water Milfoil, Alberta Invasive Species Council, 2014.
41.0 Invasive Species: Flowering Rush, Alberta Invasive Species Council, 2014.
42.0 Invasive Species: Zebra and Quagga Mussels, USGS, 2014.
43.0 Invasive Species: Prussian Carp, Wilson, Kate (AESRD), 2014.
44.0 Invasive Species: Didymo Algae, Schweiger, William E., Ashton, Isabel W., Muhlfeld, Clint C., Jones, Leslie A., Bahls, Loren L.
45.0 LakeWatch 2000, 2002, 2003, 2006, 2009, 2010 Reports, Alberta Lake Management Society, 2000-2010.

+Sylvan Lake Boat Launch Assessment
Literature Review

Ref #	Year	Title	Author
1.0	March 2012	Sylvan Lake Parks and Recreation & Open Space Plan	Lacombe County

Summary

- Public consultation process conducted.
- Specific Plan Area and development zones identified in mapping.
- Policies identified for multi-lot developments and amenity requirements that take into consideration of topography, proximity to the lake, environmentally sensitive areas and anticipated demographics.
- Development and public amenity (passive & active recreation, parking, etc) requirements (based on tiered listing) for properties with lake access.
- Tier 1 (1/2 mile of lake) to include beach, marina, boat launch, regional park, water park, nature park/reserve, boardwalks, change house and swimming area, lake look-outs, picnic areas (c/w cooking areas), multi-purpose sports area, mini-golf/ pitch & putt, outdoor exercise park, informal ice rink, pavilions, spray parks, playground equipment, and light aquatic craft launch.
- Trail corridors – regional and internal trails required – incorporating points of interest, amenity areas, natural vistas, historic areas, areas of ecological interest, geological features, and hydrological features. Trails to preserve and protect all existing R.O.W.'s and provide for a diversity of users. Corridors shall delineate lot boundaries from Environmental Reserves. Trail heads to be easily accessible to the public and to accommodate parking. Specific trail design (where feasible) is identified in 4.1.11. **Figure 5 provides a proposed regional trail alignment; however no indication of how the trail alignment was established based on requirements identified above.**
- Multi-lot development to provide 40% Open Space and 10% Municipal Reserve. An update and inventory of Open Space and Reserves are identified in Figure 6. **Figure 6 or further updates required for mapping.**
- Plan identified as a *"living document"* to be amended over time to address changing needs of the County.

Ref #	Year	Title	Author
2.0	February 2012	Highland Park Concept Plan	Cu-Consulting Ltd

Summary

No direct impact on Action Plan

Ref #	Year	Title	Author
3.0	October 18, 2011	Sylvan Lake/Red Deer County Inter-municipal Development Plan	Town of Sylvan Lake/ Red Deer County Parkland Community Planning Services

Summary

- The natural area located in the Northwest and the lands in the Northeast portion of the Plan Boundary, fronting the lakeshore shall be considered within the Sylvan Lake growth area to ensure continuity of administration of lakeshore environmental policies, relative to the efficient provision of services.
- A regional trail network connecting points of interest within the Town and County to major concentrations of residential development shall be addressed as part of any new area structure plan and is encouraged for any existing development areas.
- Environmentally significant areas and features shall be inventoried and identified for preservation, where warranted, through the process of preparing area structure plans.
- Environmentally significant areas and features of the lake shall be inventoried and identified for preservation, where warranted, through the process of preparing area structure plans.
- Where possible, municipal and/or environmental reserve having a width of 30m shall be dedicated through subdivision along those portions of the Sylvan Lake shoreline lying outside the Town boundary as of the date this plan is adopted.
- Map 1 illustrates current Land Use Concept classifications.
- Key classifications pertaining to Public Access include:
    - Residential areas shown on Map 1 illustrate the location of existing and future neighbourhoods. While residential uses such as detached homes and multi-attached dwellings will be the main types of use, small scale neighbourhood commercial and institutional uses typically found in residential neighbourhoods, such as schools and religious assemblies, may also be located in these areas. More detailed plans are expected to provide more direction on the design of future neighbourhoods.
    - The natural areas and recreation areas both represent the major areas that make up some of the elements of a long term open space, park and trail system. The natural areas are those where activities should be limited to ones that do not harm the local environmental features. The recreation areas represent major private and public recreation facilities such as golf courses and campgrounds. Local parks and trail connections are not shown on Map 1 as these facilities are expected to be identified in more detailed plans.

Ref #	Year	Title	Author
4.0	April 15, 2011	Birchcliff – The Slopes Concept Plan	Longview Planning + Design & MPE Engineering Ltd.

Summary

No direct impact on Action Plan

Ref #	Year	Title	Author
5.0	August 2010	Palm Bay Resort – Biophysical Assessment	Stantec

Summary

Notes Stantec Fisheries assessment complete in 2007 and the identification of valuable fish spawning habitat within development shoreline. Further review with Provincial, Federal and Municipal government agencies with respect to compensation is identified.

Ref #	Year	Title	Author
6.0	August 26, 2010 (draft)	Lacombe County Sylvan Lake Area Structure Plan	AECOM

Summary

- Establishes clear and comprehensive set of policies to guide land use and manage growth, health and sustainability of the lake.
- Specified mapping (Figure 2) for Lake Development Area, complete with 4 specific development areas (Figure 3).
- Conservation Cluster Development presented to incorporate and preserve natural areas and features in multi-lot developments. Open space areas to incorporate passive uses (trails/pathways, gathering/rest nodes, etc). Larger reserve areas to incorporate more active recreational uses.
- Municipal Reserve requirements - 10% - with access for regional trail and lakefront park space. Integrated physical connections (20% of total shoreline at 30 meter width) for public day use access. 5 meter width connection to reserve required.
- Figure 4 identifies Higher Density Development nodes around the lake; a regional trail network; possible public access sites; possible boat launch sites; and possible future road upgrades.
- Any development proposal must be capable of providing public access to the lake.
- References ISL (Jan 2002) report regarding "public access" - boat launches, public beach, day use, pier/dock, shoreline access. Identifies Major Public Access Sites vs. Minor Public Access Sites (Types 1 & 2) vs. Tertiary Public Access Sites and guideline components. We will use this information is the Private Property mapping & matrix review.
- References policies with respect to Lake Use Trail Nodes; Trails; Communal Access & Docking Facilities (of Lakeshore Subdivisions)
- Figure 5 illustrates all key Environmental Features.

Section 3.0 provides and overview of Transportation & Access and policies.

Ref #	Year	Title	Author
7.0	July 2010	Palm Cove Concept Plan	MH Project Planning
Summary			
Proposed Public Beach; Public Boat Launch c/w parking; trails and interpretive areas. Status: unknown?			

Ref #	Year	Title	Author
8.0	Draft Report February 2010	Selection of a New Boat Launch Site on Sylvan Lake	MPE Engineering Ltd
Summary			

- Study of two preselected boat launch sites identified by Lacombe County, and land and water requirements. Two sites studies were:
  - SW site – Kuusamo Krest (RR23)
  - SE site – Undeveloped Extension of RR22
- SE site identified as the preferred boat launch site based on comparison ranking.
- **Further County input regarding report discussions and decisions should be included in Action Plan.**

Ref #	Year	Title	Author
9.0	February 2010	Fisheries Assessment of Proposed Boat Launches at Sylvan Lake	Palliser Environmental
Summary			

- Fisheries assessment for the Kuusamo Krest (SW) and RR22 (SE) proposed boat launch locations.
- SW site identified as important fish habitat.
- SE site identified as preferred boat launch location.

Ref #	Year	Title	Author
10.0	January 2010	Lacombe County – Sylvan Lake Boat Launch Study Policies, Standards and Practices	Armstrong Consulting Services

Summary

- General recommendations on design consideration of boat launches, and parking.
- Boat launch site inspections conducted at Pigeon Lake Provincial Park, Gilwood Subdivision (Pigeon Lake), Mulhurst Bay (Pigeon Lake), Aspen Beach Provincial Park (Gull Lake) and Jubilee Park (Wizard Lake).

Ref #	Year	Title	Author
11.0	December 4, 2010	Red Deer County Municipal Development Plan	Red Deer County – Planning & Development Services

Summary

- Key items include:
- Sylvan Lake classified as an Environmentally Sensitive Area.
- Development will not fragment contiguous natural areas, or have a negative impact on adjacent Environmentally Significant Areas or Important Water-Related Features
- When located in an Environmentally Significant Area, the development retains and conserves a large portion of the site in its natural state provided in the form of common area, Environmental Reserve, Municipal Reserve, or open space and natural areas;
- For subdivisions adjacent to water bodies, Environmental Reserve shall include sufficient shore lands so as to provide adequate protection for waterfowl, fish, and wildlife habitat, and public shoreline access. In these areas, the Environmental Reserve allocation may be supplemented by Municipal Reserve in accordance with Policy 7.2.6 (Municipal Reserve Adjacent to Lakeshores and River or Stream Banks) where the additional lands are required to accommodate parks or playground areas, trail corridors or walkways, or parking areas

Ref #	Year	Title	Author
12.0	October 7, 2009	SKYY Country Golf & R.V. Plan	Bemoco Land Surveying Ltd.

Summary

No direct impact on Action Plan

Ref #	Year	Title	Author
13.0	October 5, 2009	Historical Resources Clearance Letter	Government of Alberta

Summary

- Based on Bison Historical Services Ltd., report on proposed launches at Kuusamo Krest and the Boy Scouts Camp.
- No concerns identified.

Ref #	Year	Title	Author
14.0	September 2009	Historical Resource Impact Assessment – Kuusamo Krest & Boy Scout Camp	Bison Historical Services Ltd.

Summary

Site assessment and recommended clearance for construction.

Ref #	Year	Title	Author
15.0	September 2009	Baker Thesis Groundwater Contribution to Sylvan Lake	Jennette Baker – University of Calgary

Summary

Clear identification of Sandstone Aquifer along north shore + contributions to water quality.

- Fractured, water bearing channel sandstone along NE margin of lake in shale with sandy interbeds,
- Total annual water input from groundwater thought to be 27 to 35%,
- Average lake water residence time of 20-35 years,
- Significant interplay between ground and surface water likely contributes to Sylvan's mesotrophic status.

Thesis suggests that development along north side of lake may have more significant impacts to WQ than elsewhere.

Ref #	Year	Title	Author
16.0	June 2009	Red Deer County Open Space Master Plan	Dillon & evds urban lab

Summary

Key items include:

- Protect sensitive ecological and agricultural areas: ESAs, steep slopes, river valleys and wildlife habitat.
- Capitalize upon assets, such as historical and cultural resources, public land, and deferred reserves, and recognize issues such as private property access, highways and strong edges.
- Establish nodes around population concentrations, linkages between nodes, and comprehensive open space system concepts for each project zone.

- Consider the following trends in the design and planning stages, and offer:
  a) Recreation options that are less time-consuming or offer tranquility through minimizing the intrusion of development on the park space, providing more contact with nature and promoting interpretive opportunities;
  b) more daytime opportunities (so long as there is demand);
  c) more individual, drop-in activities; and
  d) customized services based on disability, occupation, skill level in a leisure activity, lifestyle, level of knowledge, special interest, etc.
- An environmental corridor (buffer) shall be enforced along all watercourses, lakes and significant sloughs. Identifying this corridor as environmentally significant will aid in the protection of its ecological integrity while allowing evolution of part of a high quality pathway system.
- Natural area-based open space nodes shall be located where there is a concentration of County-owned open spaces, and based on natural features.
- Places of special historic and/or cultural interest or value shall be encouraged to become concentration points or nodes where appropriate.
- Linkages between nodes are encouraged, to form vital ties between them and population centres. This includes a north-south corridor in west RDC linking together many of the lakes; two east-west corridors to tie together various nodes; and connection to the Waskasoo Trails in Red Deer and Gasoline Alley.
- Part of ACR Project Zone: located in the north-western region of the County, extends from the City of Red Deer west towards the Hamlet of Benalto, and includes the southern portion of Sylvan Lake.
- A trail connection from Benalto in the west, through Sylvan Lake, east to the City of Red Deer and the Waskasoo Park System. This is shown conceptually to follow the abandoned ACR ROW. It also includes points of interest such as the ACR Railway Bridge and Sylvan Lake.
- Open space priority in the ACR Project Zone falls along this corridor:
  1) Using the acquisition strategies specified in this Plan, the County shall acquire land and develop various open space typologies in these specified areas.
  2) Red Deer County shall inquire with CP Rail as to options to purchase their abandoned ACR ROW for use as open space in this project zone.
  3) In order to minimize trail / highway crossings, land should be purchased where the CPR ROW crosses Highway 11 three times in a short distance (between Sylvan Lake and Benalto).
  4) Utilizing the ACR ROW as a trail will require negotiation with regards to the ACR Bridge crossing the Red Deer River.
  5) When detailed planning for trails into the Town of Sylvan Lake and City of Red Deer, Red Deer County shall continue to liaise with each municipality to ensure that intermunicipal trail linkages are completed in the best way possible

Ref #	Year	Title	Author
17.0	April 1, 2009	Red Deer River State of the Watershed Report	Red Deer Watershed Alliance

Summary

- An outline on the current knowledge, environmental integrity of the Red Deer River watershed, and a basis for a future Integrated Watershed Management Plan.
- Provide a series of indicators and background information for improved watershed management.

Ref #	Year	Title	Author
18.0	November 2008	Handbook for State of the Watershed Reporting	Alberta

Summary

- *Water for Life* program.
- A guide for watershed planning and a components outline that identifies watershed health indicators and approaches to compiling and evaluating the broad physical features, resources and conditions of watersheds.

Ref #	Year	Title	Author
19.0	November 2008	Municipal Guide – Planning for a Healthy and Sustainable North Saskatchewan Watershed	NSWA

Summary

A municipal resource guide providing educational and planning tools for municipalities to assess and manage healthy and sustainable watersheds.

Ref #	Year	Title	Author
20.0	August 28, 2007 (Updated January 14, 2010)	MDP Lacombe County	Armin A. Preiksaitis & Associates

Summary

- Protection of rural landscape and environmentally sensitive areas. Environmental stewardship.
- Developers to provide publicly accessible lakeshore park space in excess of what would normally be required through municipal and environmental reserve dedication – implemented through MDP and regulations in the Land Use Bylaw and guided through ASP's.
- Density transfer/bonus system to be used in dedicating publicly accessible open space.
- Reserve areas to be defined to protect environmentally sensitive lands (i.e., riparian areas) and to provide interconnected green spaces for trail development and other public recreational facilities.
- 20% of lakeshore frontage to be allocated to Municipal Reserve.
- 30m setback required from high water mark of lake (may require additional setback based on geotechnical analysis).

- Conservation easements to be developed to protect significant natural features & areas.
- No permanent structures permitted in floodplain areas unless proper flood-proofing is provided.
- "Water for Life" initiative – protect all watersheds and water quality (surface and groundwater).
- Historic Impact Assessment and Environmental Impact Assessment required with any new development.
- Parks, Recreation and Open Space Master Plan required. Need for County-wide trail system.

Ref #	Year	Title	Author
21.0	2006 Edition	Assoc. of Summer Villages of Alberta Lake Stewardship Reference Guide	ASVA Lake Stewardship
Summary			
Provides a guide for establishing a better understanding of lake stewardship issues and participation by all in making better decisions regarding land use practices that support healthy lakes and communities.			

Ref #	Year	Title	Author
22.0	December 1, 2006	Review and Analysis of the Science Based Documents and Associated Governing and Management Documents for the Sylvan Lake Watershed	Planned Environmental Associates
Summary			
A review of recent science documents and the concern for long-term impacts and cumulative effects on lake health.			

Ref #	Year	Title	Author
23.0	July, 2005	Sylvan Lake Water Quality Assessment and Watershed Management Considerations	AXYS Environmental Consultants Ltd.
Summary			

- Provides a baseline overview of water quality and the implications for watershed planning and development.
- **Mapping Data to be obtained from the Committee for application into the Action Plan.**

Ref #	Year	Title	Author
24.0	June 14, 2004	Administration Report	Red Deer County Planning & Development

Summary

Sylvan Lake Management Plan – 2000 Update. Update on new policy directions for growth management; environmentally sensitive areas; shoreline development; water access; open space; road access; boating/lake use conflicts; and water quality/sewage disposal.

Ref #	Year	Title	Author
25.0	October 21, 2003	MDP Birchcliff	Parkland Community Planning Services

Summary

- No boat launch development.
- Series of road closures/access to lake mapped and identified as Environmental Open Spaces.
- Maintain “Country Lane” appearance along roadways.
- Several park & open space areas identified in Sprucecliff, Birch Bay, Sunnyside and Viewpoint.

Ref #	Year	Title	Author
26.0	August 11, 2003	MDP Sunbreaker Cove	Parkland Community Planning Services

Summary

- RR 22 provides access to existing public boat launch (Refer to matrix for existing launch components). No other R.O.W. access points to the lake within the community.
- Encourage preservation and protection of public walkways, environmental open spaces and green areas.
- Shoreline conservation areas with extension into Community Open Space areas. Two Open Spaces internal within the community

Ref #	Year	Title	Author
27.0	March 2003	MDP Town of Sylvan Lake	Not recorded

Summary

- Development restriction for any lands below the 938.0m contour on all lots abutting the lake, unless the site is filled to a level sufficient to avoid flooding and ice damage.
- Environmental Preserves (no less than 22.5m in width) for any land/subdivision adjacent to the lake.

Ref #	Year	Title	Author
28.0	March 2003	A Review of Three Development Proposals in Vicinity of Sylvan Lake	Komex International Ltd

Summary

Part of watershed review requirements. No direct impact on Sylvan Lake or study.

Ref #	Year	Title	Author
29.0	January 2003	Cumulative Effects of Lake Side Development on the Sylvan Lake Natural Area	Golder Associates

Summary

Boehm Development; WestEnd Landing; and DeGroot Development review

- Golder noted several cumulative impacts on the natural area:
  - increased activity in the natural area,
  - wildlife habitat loss in surrounding area,
  - mitigation options are provided and briefly discussed.
- Letter recommends that residents of the proposed surrounding developments form a not-for-profit stewardship society.

Ref #	Year	Title	Author
30.0	January, 20 2003	Sylvan Lake Public Access Study	ISL / Westworth & Associates Environmental Ltd. / Lovatt Planning Consultants

Summary

Sylvan Lake assessment for recreational capacity and the identification of improved public access to the lake.

Characteristic of Sylvan Lake:

- 102 km^2 drainage basin,
- Relatively large and deep lake,
- Water levels fluctuate 1.0m
- Water quality monitored since 1983; no indication of deterioration,
- Fish populations are in relatively poor condition,
- Whitefish is an important winter fishery,
- Shoreline is mostly cleared and altered for development

Collapsed northern pike and walleye communities, yellow perch also in decline

Ref #	Year	Title	Author
31.0	November 2002	Fisheries Resource and Effects Assessment & Mitigation for the proposed WestEnd Landing Development on Sylvan Lake	Richard Carson & J.H. Allan

Summary

- Presents the results of fisheries resource investigations conducted in the West End Landing development area.
- Boat launch and ramp access channel; a beach area; and sewage disposal were all identified as having potential effects on fisheries resources. Through review the following was identified:
- Boat Launch – no loss of habitat; however there would be habitat adjustments. Mitigation or compensation maybe required.
- Beach Development – no loss of habitat; however habitat alteration will occur.

Ref #	Year	Title	Author
32.0	July 25, 2001	MDP Norglenwold	Parkland Community Planning Services

Summary

- No boat launch development.
- Series (9) of road closures/access to lake mapped (owned by Alberta Infrastructure)– action to dedicate as environmental reserve easements or conservation easements (c/w provision for storm water drainage where necessary).
- **Sylvan Lane** – maintain hand launch – parking restricted.
- **Aspen Lane** – escarpment to be left undeveloped as conservation area.
- **Lakeside Lane** – no parking, hand launch (restricted), year-round pedestrian lake access, and winter vehicle access.
- **Honeymoon Drive & Grand Avenue** (undeveloped sections to be left as habitat conservation areas).
- Provide recreational opportunities for residents while ensuring balance with environment.
- Open space or reserves to be accessible and linked to other reserves via trail system. Trails not to infringe on property rights and quality of life.
- Open space to support passive recreation.
- Maintain “Country-like” setting.

Ref #	Year	Title	Author
33.0	November 20, 2000	MDP Half Moon Bay	Parkland Community Planning Services

Summary

- **Aspen Place** - existing lake access (stairs); however steep embankment, undeveloped/natural shoreline and no parking.
- Two major Reserves between Hummingbird Lane and Lakeview Road and between Lakeview Road and Warbler Close. Passive recreation use and existing trails provided.
- Reserve Area – between all residential lots and lakefront.
- “Country Lane” atmosphere.

- Maintain natural shoreline and existing native plants.
- Potential for annexation and the assessment of pedestrian and boat access to the lake.

Ref #	Year	Title	Author
34.0	2000	Sylvan Lake Management Plan – 2000 Update	IBI Group

Summary

- A comprehensive plan that provides specific land use and management policies with respect to responsible land use and development around the lake.
- Includes an assessment of past reports and studies and identifies:
  - Land-based limiting factors for development.
  - Water-based limiting factors for development
  - Water quality and long-term impacts on shoreline management and use.
  - Water levels.
  - Environmentally Sensitive Areas.
  - Bathymetry/Morphology.
  - Social Limiting Factors with respect to land use/future development; the environment; and recreation.

Ref #	Year	Title	Author
35.0	July 1999	Assessment of Water Quality in Sylvan Lake	Patricia Mitchell, Alberta Environment

Summary

- Lake monitoring for water quality.
- General information re: physical characteristics of Sylvan Lake and water monitoring program and results.

Ref #	Year	Title	Author
36.0	April 20, 1998	MDP Jarvis Bay	Parkland Community Planning Services

Summary

- No boat launch development.
- Two (2) road allowances providing lake access – requiring upgrading.
- Two main open space areas – Jomano (environmental reserve) & Petro Park (existing hand launch & beach area).
- Undefined trail access to Jarvis Bay P.P. to the north.
- Defined trail development requirement identified.

Ref #	Year	Title	Author
37.0	Unknown	Alberta Invasive Species Council	Alberta Invasive Species Council

Summary

- Eurasian watermilfoil, flowering rush, purple loosestrife, didymo, zebra mussels
- Zebra mussels have the potential to incur significant monetary costs for maintenance of infrastructure, and can deplete the Sylvan Lake fishery. Trailered boats would be most likely vector of transmission. Clean and dry boats thoroughly

Ref #	Year	Title	Author
38.0	Not dated	Draft Report to Sylvan Lake Management Committee	Amanda-Brea Watson Kim Staryzk Craig Teal

Summary

This report provides a recommendation to the Sylvan Lake Management Committee on how to proceed with the establishment of an action plan that would guide the Committee's efforts over the next 3-5 years.

Environmental Literature Review

Ref #	Year	Title	Author
39.0	2014	Invasive Species: Purple Loosestrife	Alberta Invasive Species Council
Summary			
Alberta *Weed Act*: Schedule 1 Prohibited Noxious (must be destroyed) - Hardy plant, - Highly vigorous, - Single plant can produce > 1,000,000 seeds per year - Outcompetes native species - Takes over wetlands, moist areas			

Ref #	Year	Title	Author
40.0	2014	Invasive Species: Eurasian Water Milfoil	Alberta Invasive Species Council
Summary			
Alberta *Weed Act*: Schedule 1 Prohibited Noxious (must be destroyed) - Creates large floating mats that prevent light from penetrating the water column; shades and kills native plants. - Reproduces primarily from segments. - One piece of this weed cut by a boat propeller can establish an entire colony			

Ref #	Year	Title	Author
41.0	2014	Invasive Species: Flowering Rush	Alberta Invasive Species Council
Summary			
Alberta *Weed Act*: Schedule 1 Prohibited Noxious (must be destroyed) - Until recently this plant was sold at garden centers as a decorative pond plant; it can still be found in some garden centers despite being illegal to be in possession of. - Reproduces both by seed and rhizome. - Displaces native vegetation, - Clogs boat propellers, - Reduces water quality, - Results in fish kill when it takes over lakes to lakes			

Ref #	Year	Title	Author
42.0	2014	Invasive Species: Zebra and Quagga Mussels	USGS

Summary

***Fisheries (Alberta) Act* – prohibits the possession of zebra mussels**

- Are easily introduced by attachment to boats and in ballast water or any other water being carried by a boat.
- Larval form is very small and easy to bring aboard in ballast tanks.
- Attach to boats, lake substrate, water intakes, everything else in water
- Very costly to maintain equipment once infested with zebra mussels.
- Can live out of water for 30 days
- No feasible control options
- Estimated annual cost of managing an Alberta infestation of mussels: $75.5 million / yr
- Create toxic algal blooms
- Has potential to destroy native fisheries
- 2013: voluntary boat inspection program intercepted mussel contaminated boats destined for:
    - Sylvan Lake
    - Pigeon Lake
    - Gull Lake
    - Wabamun Lake (x2)
    - Lesser Slave Lake
    - Whitefish Lake
    - Hayriver

Ref #	Year	Title	Author
43.0	2014	Invasive Species: Prussian Carp	Wilson, Kate (AESRD)

Summary

- Found in Red Deer River System
- Eggs can be fertilized by other cyprinids
- Few predators in this part of the world
- Outcomes and displaces native fish.

Ref #	Year	Title	Author
44.0	2011	Invasive Species: Didymo Algae	Schweiger, William E., Ashton, Isabel W., Muhlfeld, Clint C., Jones, Leslie A., Bahls, Loren L.

Summary

- Forms massive mats several cm think and up to 20 km long.
- Loss of spawning habitat,
- Changes water chemistry,
- Significantly decrease aesthetic appeal of waterbodies

Ref #	Year	Title	Author
45.0	2000-2010	LakeWatch 2000, 2002, 2003, 2006, 2009, 2010 Reports	Alberta Lake Management Society

Summary – ALL 6 REPORTS

- Lake was monitored four times per summer looking at a number of parameters of lake productivity.
- Lake was dimictic in all years.
- Phosphorous and chlorophyll a concentrations have always been low when compared to Alberta lakes, numbers stated in all reports indicate Sylvan Lake is mestrophic.
- A thermocline develops each summer and dissolved oxygen drops rapidly below the thermocline.
- Phosphorous concentration shows steady increase in last decade and is now approximately double since first measured.

LACOMBE COUNTY

SELECTION OF A NEW BOAT LAUNCH SITE ON SYLVAN LAKE

***DRAFT* Report**

(4210-010-00)

Prepared for:

Lacombe County

Prepared by:

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February, 2010

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RR 3
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February 24, 2010
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Attn: **Mr. Bill Cade**
Public Works Supervisor

Dear Bill:

Re: Lacombe County
Selection of a New Boat Launch Site on Sylvan Lake – DRAFT

We are pleased to submit this draft report, "*Selection of a New Boat Launch Site on Sylvan Lake"*. This study assesses and compares two sites preselected by Lacombe County. The comparison includes both the 'land side' and the 'water side' of the boat launch facility. The 'land side' includes a parking area, day use facilities, and approach to a boat launch; the 'water side' includes a boat ramp and dock.

Relevant information of the site was collected, layout options were considered, and a matrix was produced to compare the upgrade options and the eventual selection of the recommended site.

The work primarily consisted of discussions with Lacombe County staff, field reconnaissance, surveys, aquatic assessment, historical overview, hydrological and hydraulic analyses, layout options consideration, and comparison of the layout options.

We trust this report will be beneficial to the County, and thank you and Phil Lodermeier for your invaluable input to the process. Should you have any questions or comments, please contact the undersigned.

Sincerely,

MPE ENGINEERING LTD.

Peter Stevens, P.Eng.
Project Manager

PS/

EXECUTIVE SUMMARY

Sylvan Lake is popular destination for boating and water related activities, but lacks adequate boat launching capacity. Lacombe County wishes to address this by, among other things, constructing a new boat launch. From previous efforts to identify potential sites, Lacombe County selected two potential sites, the 'SE Site' and the 'SW Site', which warranted further investigation.

The focus of this report is twofold: the investigation of the two identified sites, and the selection of a preferred site. The primary objectives of this report are to provide sufficient information to develop design and selection criteria, to select a potential boat launch configuration including both the 'land side' (parking and day use area) and the 'water side' (boat ramp and dock), and to select a preferred boat launch for County approval, final design, regulatory approval, and construction in 2011.

Boat launching facilities typically used in central Alberta were also investigated. The boat launching facilities used for site comparison purposes is similar to that of the Aspen Beach Brewers Park boat launch facility on Gull Lake.

The investigation revealed that, unlike the SE Site, the SW Site is located within an identified Environmentally Sensitive Area, having significant fisheries habitat value, wetland, and upland riparian vegetation found in limited locations in the area. The SW Site also has design challenges in that the shoreline wetlands force the location of the parking area and day use area away from the boat ramp and the boat ramp would need to be extended into the lake to attain at least the minimum required boat ramp gradient. For these reasons, **the SE Site is recommended for selection and construction**.

Once the preferred site is approved by Lacombe County, the final design and regulatory approvals will proceed, with the goal of constructing the upgraded boat launch facilities in 2011.

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1.0 INTRODUCTION

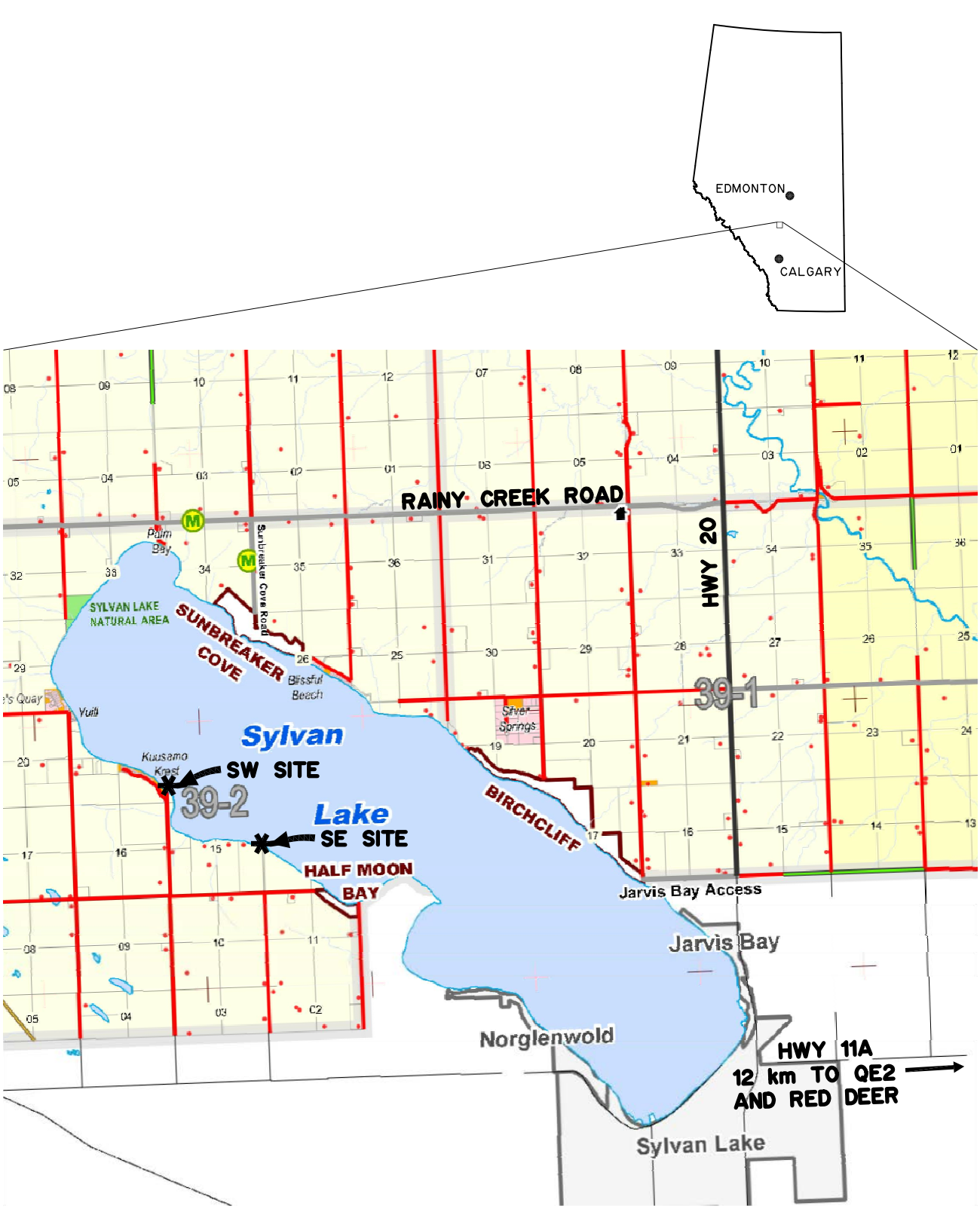
Sylvan Lake is a popular destination for boating and other water related activities. However, there are limited access sites around the lake and these are heavily used, particularly during peak summer weekends. As a result, congestion occurs and boat launchers feel compelled to use informal, undeveloped sites despite the lack of suitable on-site facilities. Not surprisingly, complaints have arisen from users and neighbouring residents related to lack of facilities, use of private property, and deteriorating environment.

To help address these issues, Lacombe County is considering, among other things, the construction of a new boat launching facility on the west side of Sylvan Lake, at one of two potential sites, the 'SW Site' and the 'SE Site'. These are within 2 km of each other and are located as shown in Figure 1. In this regard, Lacombe County has retained MPE Engineering Ltd. to investigate various boat launch configuration options, recommend a preferred option for the County's approval, then design, prepare a tender package, and supervise the construction of the approved boat launch facilities.

1.1 Scope of Work

For this study, MPE was to:

1. Collect and review available relevant information and data
    - Physical and hydrotechnical data
    - Related studies
    - Surveys
2. Investigate and develop alternative boat launch layouts:
    - Optimizing boat launching capacity while considering site constraints, maintenance requirements and environmental issues
3. Evaluate and select a preferred alternative for consideration by Lacombe County.



MPE Engineering Ltd.	COUNTY OF LACOMBE		
	LOCATION MAP		
SCALE: 1:100,000	DATE: FEBRUARY 2010	JOB: 4210-010-00	FIGURE: 1

Once Lacombe County approves this report and selects their preferred option, MPE will complete the scope of work by:

1. Preparing the final design and documents to obtain approvals from regulatory agencies
2. Preparing contract documents
3. Coordinating the tender process
4. Providing construction management and site supervision, and
5. Preparing record drawings.

Lacombe County anticipates construction of the new boat launch facility to occur in 2011.

2.0 SITE ASSESSMENT

The site assessment was comprised of collecting pertinent information and determining the potential implications on a boat launch design. The assessment included site reconnaissance on several occasions under various weather conditions, a review of Sylvan Lake hydrotechnical characteristics, an aquatic environment assessment, and an investigation of existing boat launch ramp and dock systems in central Alberta. These are more fully described in the following sections.

Specifically, MPE:

1. Collected and reviewed available information and data
    - From Lacombe County:
        - Digital imagery
        - Related studies
        - Conceptual boat launch plan
        - Operational issues and constraints
        - Licence of Occupation document
    - From approving agencies:
        - Requirements to obtain approvals
        - Acceptable options
    - Performed:
        - Survey of near-shore lake bed topography and land side boat launch area (by MPE, May and July 2009)
        - Aquatic environment assessment (by Palliser Environmental Services Ltd., June 2009) – see Appendix A
        - Review of federal and provincial policies and design standards (by Armstrong Consulting Services, summer 2009) – see Appendix B
        - Inspection of boat launching facilities in central Alberta (by Armstrong Consulting Services, summer 2009) – see Appendix B

- Historical Resources Overview (by Bison Historical Services Ltd., July, 2009)
- Historical Resource Impact Assessment (by Bison Historical Services Ltd., September, 2009)

- Conducted on-site meeting with approving agencies on June 23, 2009.

2. Investigated layout configurations:
    - Optimized boat launching capacity considering site constraints, maintenance requirements and environmental issues
    - provided conceptual parking and day use layouts
    - Investigated appropriate and available boat launching and dock systems
    - Provided 'ballpark' material and construction costs
    - Recommended a preferred option for County consideration.

Once Lacombe County selects their preferred option, final design will proceed and regulatory approvals will be obtained, with the intention of construction and installation occurring in 2011.

2.1 General Site Description

Sylvan Lake is situated in the Boreal Transition ecoregion, where natural vegetation is dominated by trembling aspen, which is now about 90% cleared primarily for agriculture. The Lake is located in central Alberta, about 15 km west of the City of Red Deer, and is a popular destination regionally and provincially for water related activities.

The drainage basin is 102 km^2, which is small relative to the Lake's 43 km^2 surface area. Inflowing streams are intermittent as is the outlet, Sylvan Creek, located in the southeast corner. The lake itself is about 13.2 km long by 3.2 km wide, at a northwest-southeast orientation. The maximum depth is about 18 m.

The lake is defined to be mesotrophic, which is to say, it contains a moderate amount of nutrients sufficient for healthy diverse aquatic life. Water quality is considered to be good and has been relatively stable for decades.

2.2 Site Existing Conditions

Both sites are situated on the south shore near the west end of Sylvan Lake where rolling hills predominate the terrain.

SW Site

The SW Site is located along the road allowance of Range Road 23, about 300 m east of the Kuusamo Krest subdivision, and immediately west of the Baha'i Centre. There are no boat launching facilities at this site, however, boat launching as well as vehicular access to the lake in winter does occur here.

The road bed of the northern most 200 m is raised less than a metre above the adjacent terrain which is currently inundated with the recent high lake levels. Due to the extended period of inundation, the Crown may claim these areas as part of the 'bed and shore' of Sylvan Lake. The soils in these areas may be unsuitable for supporting structures without significant engineering design and cost. The type and maturity of the vegetation in this area no longer prevalent around Sylvan Lake and support both wildlife and wildfowl, so there is reluctance on the part of the public as well as the provincial government to allow any development at this site.

The undeveloped parcel of land between the road allowance and the Kuusamo Krest subdivision is owned by Lacombe County. West of the inundated area in this parcel is a well vegetated bluff about 5 m high. Above the bluff, the land is moderately sloped and might be suitable for day use facilities, particularly in the cleared area along the access road to Kuusamo Krest.

The land south of the Kuusamo Krest access road and west of the range road is privately owned, much of which is well drained and cultivated.

The NE 16-39-02-W5 quarter section is also privately owned, much of which is well drained and cultivated. A portion of this quarter section along Range Road 23 is not cleared and appears to be subject to periodic inundation due to poor drainage and high water table. However, this area could be large enough for required parking.

Offshore, the lake bed gradually deepens. The lake bed appears to be silty with some gravel and there are significant reed beds. It appears that the boat launching activity and vehicular access to the lake in winter may have caused an opening through the reed bed. This aquatic environment has been identified as environmentally sensitive (important fisheries and wildfowl habitat) and notations as such are registered with Land Titles.

Drawing 1 presents the existing conditions and Appendix E contains photographs of this site.

SE Site

The SE Site is located along the undeveloped road allowance of Range Road 22, due south of the Sunbreaker Cove boat launch. The road allowance at the lake is on a bluff and is naturally vegetated. Boat launching does not occur here and there are no boat launching facilities at this site. On the west side of the road allowance, the SE 15-39-02-W5 quarter section is privately owned. Much of the quarter section is cleared and cultivated, with two residences located on the bluff near the Sylvan Lake shoreline. The bluff along the lake is about 5 m high and almost entirely undisturbed with mature vegetation, except for two access points. Beyond the bluff, the terrain is relatively flat for about 200 m, then rises at a moderate slope. On the east side of the road allowance, the SW 14-39-02-W5 quarter section is privately owned by Scouts Canada. Much of the property is still naturally vegetated, though some clearing and support buildings are present. A primitive road exists for access to each quarter section. However, 800 m of

roadway within the road allowance would have to be constructed to access a new boat launch facility at this site.

Offshore, the lake bed is moderately sloped at 0.075 m/m (4°) for the first 12 m, then flattens out. The lake bed is covered in cobbles, and round and angled rock. No emergent or aquatic vegetation exists in this area and is it not considered to be an environmentally sensitive area.

Drawing 1 presents the existing conditions and Appendix E contains photographs of this site.

2.3 Aquatic Environment Assessment

In June 2009, Palliser Environmental Services Ltd. performed an aquatic environment assessment of the area surrounding the SW Site and the SE Site. The resulting report is found in Appendix A. In summary, their findings were:

- While each site provides fish habitat, the SW site provides important fish habitat that is somewhat limited at Sylvan Lake.
- The large emergent beds of vegetation at the SW site are important fish habitat, the type of which may be in decline around the lake.
- The fish habitat at the SE site consists of cobble/gravel/boulder substrate along a windswept shoreline. This type of habitat has not been previously identified as key habitat and is a common type of habitat along the south shoreline of Sylvan Lake.
- From a fisheries perspective, development of a boat launch at the SE Site is preferred over the SW Site, so the emergent vegetation at the SW Site is not disturbed.
- During construction, standard mitigation measures (timing restrictions, sediment control, good construction practices) can be implemented to reduce impacts to fish and fish habitat.

2.4 Historic Resources Review

In July 2009, Bison Historic Services Ltd. performed a Historical Resources Overview (HRO), as required under the *Alberta Historical Resources Act*, for the area surrounding the SW Site and the SE Site. The resulting report is found in Appendix B. In summary, their findings were:

- No sites of historical resource value were known to occur at the two proposed boat launch locations.
- Known historical sites are located near the SE site, so the potential for encountering intact historical resources is moderate to high.
- A Historical Resource Impact Assessment is recommended.

As such, in July 2009, Bison Historic Services Ltd. then performed a Historical Resource Impact Assessment (HRIA), as required under the *Alberta Historical Resources Act*, for the area surrounding the SW Site and the SE Site. This report is also found in Appendix B. In summary, their findings were:

- No new historical resource sites were recorded.
- Clearance to Lacombe County to proceed with construction was recommended to Alberta Culture and Community Spirit.

As a result, on October 5, 2009, Alberta Culture and Community Spirit granted clearance to proceed with construction of these projects.

2.5 Hydrotechnical Characteristics

Key hydrotechnical characteristics that are important considerations to produce a successful boat launch design in Sylvan Lake include:

- expected range of water levels (for appropriate freeboard and boat launch ramp length),
- wave height (for appropriate freeboard and erosive force estimates),
- ice (for appropriate placement and orientation of structures),
- near-shore lake bed gradient (for appropriate boat launch ramp decline), and

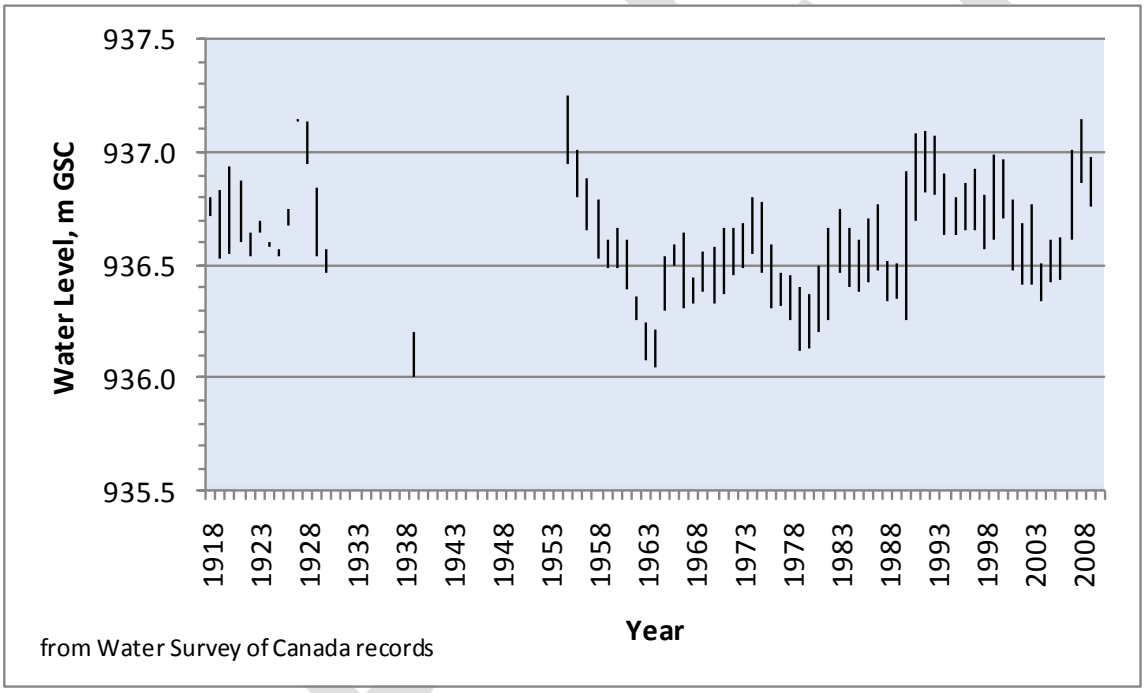
- lake bed substrate.

These are further described below.

Water Levels

Sylvan Lake water levels have been recorded on a regular basis since 1953, and sporadically as early as 1918. Figure 2 presents the annual maximum and minimum water levels for the period of record. As can be seen, the water level has a historical range of about 1.24 m (936.007 in 1939 to 937.248 in 1955). During the past 20 years, the highest recorded water level is 937.142 (in 2008) and the lowest is 936.338 (in 2004), a range of about 0.80 m.

Figure 2: Sylvan Lake Water Levels



The range of water levels to consider has implications on the design, construction, and cost of the boat launch. At this stage in the design process, it was assumed that the water level range of the past 20 years was appropriate. That being the case, the low end of the boat ramp should

be 1 m below the low water level, or to 935.4 m, and the upper end of the boat ramp should be at least to the high water level, or 937.2 m.

Wave Height

Wave heights have not been recorded on Sylvan Lake. However, residents have reportedly observed wave heights up to about 0.9 m near the south shore at the Town of Sylvan Lake. However, due to its relatively sheltered location compared to the Town of Sylvan Lake, it is expected that the SW Site would experience somewhat smaller maximum wave heights, in the order of 0.6 m. The SE Site is more exposed than the SW Site, but less so than at the Town of Sylvan Lake, so design wave heights would be in the order of 0.75 m here. Wave heights are more important in the design of a fixed dock, but is a consideration in selecting a preferred boat dock configuration.

Courtesy Lakeview Contracting

Wave height near Sunbreaker Cove after 2 days of sustained SSE winds, Nov 17, 2009.

Ice

Movement of ice can be caused by thermal expansion and wind effects. These events are common on Sylvan Lake, although not well documented and have rarely cause significant damage. However, because prevailing winds are from the northwest, Sylvan Lake has, on occasion, experienced significant wind-caused ice shove events along the beach of the southern

shoreline (see photo 1), and ice piling up more than 2.5 m was documented at the Summer Village of Norglenwold. Relatively minor ice shoving events, likely due to thermal expansion, have occurred in the vicinity of Sunbreaker Cove, as evidenced by damage to poorly constructed bank protection works (Gabion baskets).

A moving sheet of ice can cause significant damage to barriers protruding into the lake, e.g. vertical structures or banks on the receiving shoreline, and as such, needs to be considered in the design process.

Courtesy Alberta Environment

Sylvan Lake south shoreline, April, 1992. Note: each concrete beam is about 1 tonne and was welded onto the vertical steel sheetpile 'seawall'.

Sunbreaker Cove, February 2008.

It is expected that, while possible, the risk of sustaining damage to any boat launch works at the SW Site and SE Site would be similar to that at Sunbreaker Cove, which is relatively small because:

- strongest recorded winds during the winter season are northwest, which is parallel (not perpendicular) to the shore line at the SW and SE Sites

- lake fetch (distance from shore to opposite shore) perpendicular to these Sites is relatively short
- no signs of ice scars are evident, which suggests damage due to ice at these locations has been relatively minor.

Near-shore lake bed

The near-shore lake bed gradient around the SW Site is generally very mild. The 2009 MPE survey at this Site revealed that beyond the first 3 m which has a gradient of 0.23 m/m (17°), the lake bed has a gradient of only 0.013 m/m (0.7°) for at least the next 80 m. Because of this mild gradient, a boat ramp approach would have to be extended into the lake to achieve a generally accepted boat ramp gradient of 0.14 m/m (8.0°). The natural substrate is composed primarily of organic material, except for the immediate shoreline, which is gravel. Emergent or submergent vegetation was found extensively in the area, except a narrow strip where boats apparently launch.

The near-shore lake bed gradient around the SE Site is generally mild. The 2009 MPE survey at this Site revealed a natural gradient of 0.083 m/m (4.8°) for the first 12 m from shore, and 0.030 m/m (1.7°) beyond. Near shore, the substrate is composed of a mixture of cobbles, boulders, gravel, and sand. About 20 m offshore, the substrate becomes more of a silt/clay with cobbles. No emergent or submergent vegetation was found at the area.

3.0 BOAT LAUNCH OPTIONS

Several boat launch options can be developed by considering site constraints and a list of design criteria.

3.1 Design Considerations

Key site constraints are:

- the 'land side' of the boat launch facilities are to take advantage of the natural setting,
- considering that land purchase may be required, the footprint is to be minimized, and
- boat launch facility is to be acceptable to all pertinent approving agencies.

Key design criteria used to formulate layout options for further consideration are:

- Maximize
    - boat launch capacity
    - public safety
    - ease of use
    - functionality under fluctuating water levels
    - facility longevity
- Minimize
    - boat launch footprint
    - impact to aquatic environment during construction
    - long-term impact to aquatic environment
    - material and construction costs
    - operating and maintenance costs
    - risk of damage to boat launch by natural causes (flooding, ice, waves)

3.2 Selection of Boat Ramp Configurations

The 'water side' of the boat launch facility is basically comprised of two components: a boat ramp and a dock. Several potential ramp and dock configurations are presented schematically in Figure 3.

The dock configurations in Figure 3 are shown as the simple 'I' formation'. Other formations include the 'T' formation and the 'L' formation. For purposes of this stage of the assessment, these alternate formations are considered to be minor revisions and will be addressed at a later stage of the design.

To aid in the selection of preferred boat launch configuration(s), each configuration was rated based on the design criteria noted in 3.1. The results are presented in Table 1 and suggest that the double-ramp configurations should be considered further, namely:

- 2R/centre dock
- 2R/side dock
- 2R/2 side docks

In support of this result, the single ramp configurations would provide about half the boat launching capacity of a double launch, so are not considered further. As well, for the restricted available width on the 'land side', the triple ramp configurations are too wide to function properly, so these are also not considered further.

It should be noted that each of the configurations would require a Licence of Occupation (LOC) from Alberta Sustainable Resource Development (ASRD).

Figure 3: Potential Boat Ramp Configurations

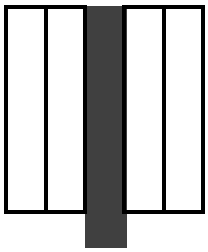
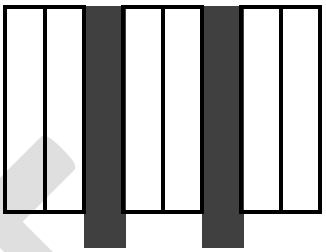
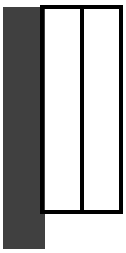
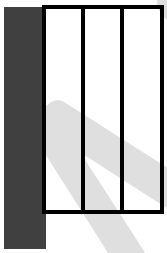
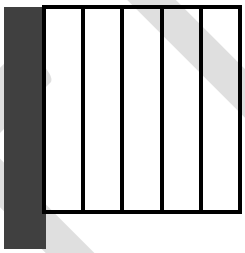
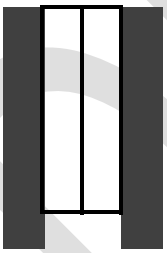
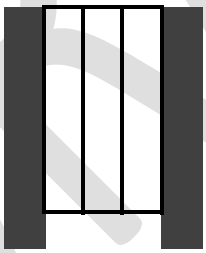
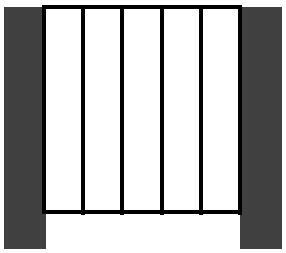
	Single Ramp	Double Ramp	Triple Ramp
Centre Dock		 **2R/centre dock**	 **3R/2 centre docks**
Side Dock	 **1R/side dock**	 **2R/side dock**	 **3R/side dock**
2 Side Docks	 **1R/2 side docks**	 **2R/2 side docks**	 **3R/2 side docks**

Table 1: Rating of Boat Ramp Configurations

Criteria	Relative Rating							
	1R/		2R/			3R/		
	1 side dock	2 side docks	1 centre dock	1 side dock	2 side docks	2 centre docks	1 side dock	2 side docks
Maximize:								
boat launch capacity	2	2	7	7	7	9	9	9
public safety	6	7	9	8	10	9	7	8
ease of use	9	10	9	8	10	9	7	8
functionality under fluctuating water levels	10	10	10	10	10	10	10	10
facility longevity	10	10	10	10	10	10	10	10
Minimize:								
boat launch footprint	10	10	8	9	9	6	7	7
short term impact to aquatic environment	9	9	8	9	8	7	7	7
longterm impact to aquatic environment	8	8	7	8	8	5	6	6
material and construction costs	9	9	8	8	8	7	7	7
operating and maintenance costs	9	9	9	8	8	6	7	7
risk of damage to boat launch by natural causes	9	9	9	9	9	8	8	8
Total:	**91**	**93**	**94**	**94**	**97**	**86**	**85**	**87**

3.3 Selection of Boat Ramp Type

In central Alberta, boat ramps have been constructed of several types of materials, the most common of which are:

1. existing substrate
2. gravel
3. cast in place concrete pad, and
4. precast concrete slabs.

1. Existing substrate

The existing substrate is preferred considering cost and relatively low potential environmental impact, but can be used in limited situations where usage is infrequent or where the substrate is composed of stable materials capable of bearing expected loads. At the SW Site, the predominant substrate material is an organic/sand/silt mix, which is not amenable to withstanding the expected usage levels and load bearing requirements, and so is not considered further. The SE Site has a sand/silt/cobble mix which is not amenable to traffic, and so is not considered further.

2. Gravel

Appropriately graded gravels may be preferable considering cost and relatively ease of construction, but is susceptible to damage by high usage and excess loading, improper construction technique, and natural forces. Any advantages to using this material are offset by greater frequency and cost of maintenance, and associated disturbances to the aquatic environment. For these reasons, gravels as boat ramp material are not considered further.

3. Cast in place concrete pad

Cast-in-place concrete pads have inherent advantages of strength and durability. However, for best results, they must be constructed in dewatered conditions. Maintenance repairs may be difficult. Also, if the slab is shifted (by natural means such as undercutting from erosion or ice

shove), it is likely that it could only be repositioned with specialized equipment. For these reasons, cast-in-place concrete slab is not considered further.

4. Precast concrete slabs

Precast concrete slabs are commonly used for public boat launches in central Alberta and are currently used at the Sunbreaker Cove boat launch. The primary reasons for the popularity of this boat ramp type include: reliable high quality of the product, relative ease of installation, configuration adaptability, flexibility of the structure to minor movement, and good tire traction. For these reasons, the precast concrete slab type is considered further.

3.4 Selection of Dock Type

There are two basic categories of dock type: permanent or portable.

A permanent dock is constructed to remain in the waterbody. Consequently, this type of structure has relatively high material and construction costs and is inflexible to changing water levels. While a permanent dock should be designed to withstand expected natural forces, there is no guarantee of eliminating all risks of damage. A permanent dock can also have a larger footprint than a portable dock, so may require additional mitigation for impacted aquatic habitat.

A portable dock is expected to be removed from the waterbody during non-boating season, and can be either on rollers, skids, or floating. In the past, docks on rollers or skids had been commonly used, particularly as private docks. Cost was a major factor for their popularity but these dock types had inherent maintenance problems (e.g. failure of components due to rust) and functionality issues (e.g. getting stuck in the lake bed). More recently, floating docks have become more common for both private and public applications. Plastic floating dock systems have already been in use for thirty years (Aspen Beach Provincial Park floating dock has been in operation for at least two decades and the materials have proved to be durable), and recently, Lacombe County has approved the use of this system for the Sunbreaker Cove boat launch

upgrade. In addition, the floating systems are modular, therefore adaptable to any required dock configuration, and can easily be repaired if required.

For the reasons described above, the plastic floating dock is considered further.

3.5 Selection of Parking Facility

Based on previous studies and observation of regional boat launches in central Alberta during peak periods (see Appendix C), it is recommended that a parking facility with 100 to 150 parking stalls would ultimately be required. It is assumed that a majority of the stalls would be of the 'pull-through' type, which would eliminate the safety hazard of vehicles with trailers having to back out.

For ease of comparison between sites, similar parking configuration and size are assumed for each site. The parking facility configuration is dependent on site-specific environmental and topographic features. However, efficient traffic flow and traffic safety are considered, while minimizing footprint and earthwork. Aesthetics and environmental concerns will be more fully considered for the preferred site.

Discussions with Lacombe County suggested that access roads to the preferred site would be paved. It is assumed that the parking facility would also be paved. Considering the area involved, stormwater management facilities will need to be considered in final design.

3.6 Selection of Day Use Facility

As with the parking facility, the configuration of a day use facility is dependent upon the site-specific environmental and topographic features, as well as the availability of land. For the purposes of this report, it is assumed that the day use facilities will be similar at each site, although the configuration of trails, locations of tables and benches, and so on, are not yet defined. These details will be determined once the preferred site is selected.

3.7 Conceptual Boat Launch Facilities Configuration

Considering the boat launch components discussed above, a conceptual configuration of boat launch facilities was derived. Drawing 1 presents the overall area required for each site adjusted for local site constraints and also shows the relative proximity of the sites to each other.

Drawings 2 and 3 present the details of the boat launch facilities for the SW Site and SE Site, respectively.

4.0 COST ESTIMATES

To produce 'ballpark' cost estimates, the dimensions and quantities of the selected components presented in Table 2 were assumed. These dimensions and quantities will be refined once the preferred site is selected.

Table 3 presents the costs which were estimated for the sites, to aid in the selection of the preferred site. Note that land costs are not included and may be significant.

Based on cost alone, the SE Site would be preferred.

Table 2: Assumed Dimensions and Quantities for Cost Estimates

Item Description	Unit	SW SITE Estimated Quantity	SE SITE Estimated Quantity
Lake Infill:			
Length	m	110	-
Average Width	m	20	-
Average Height	m	2	-
subbase	m^3	3,300	-
base, 150 mm	m^3	330	-
Riprap	m^3	1,500	-
Boat Ramp:			
Length	m	24	24
# rows of concrete slabs	#	3	3
Boat Ramp Slabs	#	210	210
Geotextile Filter Fabric - Supply and Install	m^2	250	250
Base - Crushed Granular	m^3	90	90
Riprap	m^3	15	15
Dock:			
Length	m	30	30
Width	m	1.5	1.5
number of docks	#	2	2
Area	m^2	90	90
Dock Approach	#	2	2
Dock Attachment Ramp	#	2	2
Concrete Dock Anchors	#	4	4
Parking:			
number of stalls	#	126	126
Area	m^2	37,500	37,500
subbase	m^3	18,750	11,250
base, 150 mm	m^3	5,625	5,625
asphalt, 75 mm	m^2	37,500	37,500

Table 3: Cost Estimates for SW Site and SE Site

Item No.	Item Description	Unit	Estimated Unit Price, $	SW Site			SE Site		
				Estimated Quantity	Cost	Subtotal	Estimated Quantity	Cost	Subtotal
1	Mobilization	lump sum	-		10,000	**10,000**		10,000	**10,000**
2	Site dewatering	lump sum	-		100,000	**100,000**		60,000	**60,000**
	Lake infill								
3	- Grading and Preparation	m^3	10	1,100	11,000		-	-	
4	- Subbase	m^3	50	3,300	165,000		-	-	
5	- Base, 300 mm	m^3	75	330	24,750		-	-	
6	- Riprap	m^3	100	1,500	150,000	**351,000**	-	-	-
	Ramp Site								
7	- Grading & Preparation	m^3	10	170	1,700		170	1,700	
8	- Geotextile Fabric - Supply & Install	m^2	5	250	1,250		250	1,250	
9	- Base, 200mm - Supply & Install	m^3	75	90	6,750		90	6,750	
10	- Riprap - Supply & Install	m^3	100	15	1,500		15	1,500	
11	- Boat Ramp Slabs - Supply & Install	Slab	250	210	52,500		210	52,500	
12	- Dock Approach - Supply & Install	lump sum	1,000	2	2,000		2	2,000	
13	- Dock Gangway Ramp - Supply & Install	lump sum	1,000	2	2,000		2	2,000	
14	- Conc Dock Anchors - Supply & Install	Each	500	4	2,000		4	2,000	
15	- Dock - Supply, Assemble & Install	m^2	900	90	81,000	**151,000**	90	81,000	**151,000**
16	Aquatic Habitat Mitigation	lump sum	-		100,000	**100,000**		10,000	**10,000**
	Ramp Approach								
17	- Grading & Preparation	m^3	10	2,000	20,000		36,000	360,000	
18	- Silt Fence - Supply & Install	m^2	25	250	6,250		100	2,500	
19	- Subbase	m^3	50	1,000	50,000		1,000	50,000	
20	- Base, 300 mm	m^3	75	900	67,500		900	67,500	
21	- Asphalt, 75 mm	m^2	30	3,000	90,000	**234,000**	3,000	90,000	**570,000**
	Parking								
22	- Grading & Preparation	m^3	10	37,500	375,000		37,500	375,000	
23	- Subbase	m^3	50	18,750	937,500		11,250	562,500	
24	- Base, 150 mm	m^3	75	5,625	421,875		5,625	421,875	
25	- Asphalt, 75 mm	m^2	30	37,500	1,125,000	**2,859,000**	37,500	1,125,000	**2,484,000**
	Day Use Facilities								
26	- Double Vault Toilet - Supply & Install	each	20,000	1	20,000		1	20,000	
27	- Picnic Tables & Benches - Supply & Install	each	1,500	8	12,000		8	12,000	
28	- Primitive Trail - Supply & Install	m	50	300	15,000		300	15,000	
29	- Wetland Boardwalk - Supply & Install	m	50	200	10,000	**57,000**	-	-	**47,000**
30	Landscaping	lump sum	-	-	100,000	**100,000**	-	100,000	**100,000**
31	Roadway Markings Paint - Supply and Install	lump sum	-		5,000	**5,000**		5,000	**5,000**
32	Information Signs - Supply and Install	lump sum	1,000	2	2,000	**2,000**	2	2,000	**2,000**

TOTAL ESTIMATED EXPENDITURE:	4,000,000	3,400,000
CONTINGENCIES @20%:	800,000	680,000
UTILITIES:	-	-
RIGHT OF WAY:	-	-
ESTIMATED TOTAL:	**$4,800,000**	**$4,100,000**

5.0 COMPARISON OF SITES

To aid in selecting a preferred site, each site was rated on selected criteria, the results of which are presented in Table 4. As can be seen, the SE Site has a better overall rating, primarily due to the environmental and cost criteria.

Table 4: Comparison of Sites

	SW Site		SE Site	
Selection Criteria	**Rating**	**Comment**	**Rating**	**Comment**
Fisheries Habitat	3	identified environmentally sensitive area	9	minor impact to common fish habitat type
Riparian Vegetation	8	important upland cover	8	important upland cover
Historical Resources	10	none identified, none suspected	10	none identified, none suspected
Perceived Public Acceptance, Local	3	environmental, traffic, quality of life	3	safety, traffic, quality of life
Perceived Public Acceptance, non-Local	7	added distance compared to existing launches	7	added distance compared to existing launches
Accessibility and Convenience	8	24 km from Sunbreaker Cove; 11 km from Sylvan Lake.	8	25 km from Sunbreaker Cove; 9 km from Sylvan Lake.
Boat Launching	7	adequate to accommmodate most days	7	adequate to accommmodate most days
Parking Capacity	9	adequate to accommmodate most days	9	adequate to accommmodate most days
Ease of Use	7	walking distance to parking	8	elevation difference from boat launch to parking
Public Safety	8	extended distance in lake to reach boat ramp	8	wind exposure at boat ramp
Construction Cost	7	about 20% more than SE Site	9	
Land Cost	-	unknown; to be negotiated by County.	-	unknown; to be negotiated by County.
Rating Total:	**77**		**86**	

6.0 CONCLUSIONS

To alleviate the demand for boat launching capacity on Sylvan Lake, Lacombe County intends, among other things, to construct a new boat launch facility. The selection of a preferred boat launch site was predicated on the collection and assessment of various data and relevant information and the comparison of two preselected sites. As a result, the following conclusions were derived.

- Considering the site constraints, a double boat ramp / two dock configuration was selected.
- Considering the estimated volume of traffic and for comparison purposes, the parking area is to accommodate 126 stalls.
- From the selection criteria, the SE Site is the preferred site over the SW Site, primarily due to the environmental and cost criteria.
- The 'ball park' construction cost of SE Site is $ 4.1 million, about 17% less than the SW Site.

7.0 RECOMMENDATIONS

It is recommended that Lacombe County select the SE Site as the preferred boat launch site for final design, approvals, tendering and construction.

It is recommended that the preferred site proceed to final design, regulatory approvals be obtained, and contract documents be prepared for construction in 2011.

8.0 REFERENCES

- "*Atlas of Alberta Lakes*", http://sunsite.ualberta.ca/Projects/Alberta-Lakes/view/?region=South Saskatchewan Region&basin=Red Deer River Basin&lake=Sylvan Lake&number=105&page=Introduction
- "*Best Management Practices for Boat Launch Construction & Maintenance on Lakes*" (BC Ministry of Environment, 2006)
- "*Best Management Practices for Environmental and Habitat Protection in Design and Construction of Recreational Boating Facilities*" (Oregon State Marine Board, 2002)
- "*Lake Access: Issues and Challenges*" Notes for Council Workshop – December 16, 2008 (Lacombe County, 2008)
- "*Landscape Architecture Guidelines Section 300 Boating and Fishing*" (Alberta Recreation and Parks, circa 1980)
- "*Presentation to Lacombe County Council March 31, 2009*" (Kuusamo Krest, 2009)
- "*Sunbreaker Cove Boat Launch Upgrade*" (MPE Engineering Ltd., 2010)
- "*Sylvan Lake Public Access Study*", for Lacombe County etal (ISL Infrastructure Systems Ltd., 2003)
- "*Sylvan Lake Management Plan: 2000 Update*" (Lacombe County etal, 2000)

APPENDIX A

Fisheries Assessment of Proposed Boat Launches at Sylvan Lake, Alberta

by Palliser Environmental Services Ltd.

Palliser Environmental Services Ltd.

FISHERIES ASSESSMENT OF PROPOSED BOAT LAUNCHES AT SYLVAN LAKE, ALBERTA

February 2010

BOX 94, MOSSLEIGH
ALBERTA, T0L 1P0

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INTRODUCTION

Lacombe County (the County) had identified the need to provide additional access for boaters (e.g., angling, pleasure, and sport boats) to Sylvan Lake. Existing boat launches (e.g., Sunbreaker Cove) can become congested on busy summer week-ends and the addition of a new boat launch at Sylvan Lake would alleviate some of this congestion. Lacombe County has identified two locations on the south shore where a boat launch could be built to provide additional boat access to Sylvan Lake. The SW Site is located within the Kuusamo Krest area at SW 22-39-02-W5 and the SE Site is located at SW 14-39-02-W5 adjacent to the Boy Scout Camp (Figure 1). The County has retained MPE Engineering Ltd. and Armstrong Consulting Services to provide options for a boat launch at the SW Site or the SE Site. The study will involve a design and aquatic assessment at each site; however, Lacombe County only intends to build one boat launch based on the most suitable site (i.e., land availability, design limitations, environmental sensitivities).

Palliser Environmental Services Ltd. was retained by MPE Engineering Ltd. to conduct a fisheries assessment of proposed boat launches at the SW Site and the SE Site with regards to fisheries and aquatic habitat. Field data (e.g., fish sampling, habitat mapping) will be used to support regulatory submissions to Fisheries and Oceans Canada and Alberta Environment.

METHODS

A fisheries assessment was completed at the SW Site and the SE Site on June 24th and 25th, 2009. The study area encompassed a shoreline area of approximately 1500 m at the SW Site and 300 m at the SE Site. Photographs were taken of representative sections of the study area.

The study area was mapped to show features such as substrate, depth, aquatic vegetation and instream cover. Water quality was measured for pH (Oakton meter - pH 10 series), turbidity (Hanna turbidimeter- Model HI 93703C), conductivity and total dissolved solids (Hanna meter - Model HI 98311) and oxygen (YSI model 55 meter). Water clarity was determined with a Secchi disc measured at the shady side of the boat.

Fish sampling along the shoreline was completed using a Smith-Root LR20 backpack electrofisher operated in shallow water from a small inflatable boat. Four minnow traps baited with hard dog food pellets were set in shallow water overnight.

A review of historical literature and data was completed to supplement the information and data collected during this study. Sources included the online FWMIS (Fisheries and Wildlife Management Information System) (http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub), the Atlas of Alberta Lakes (Crosby 1990), various consulting reports (ISL 2002), and shoreline assessments (ASRD 2008).

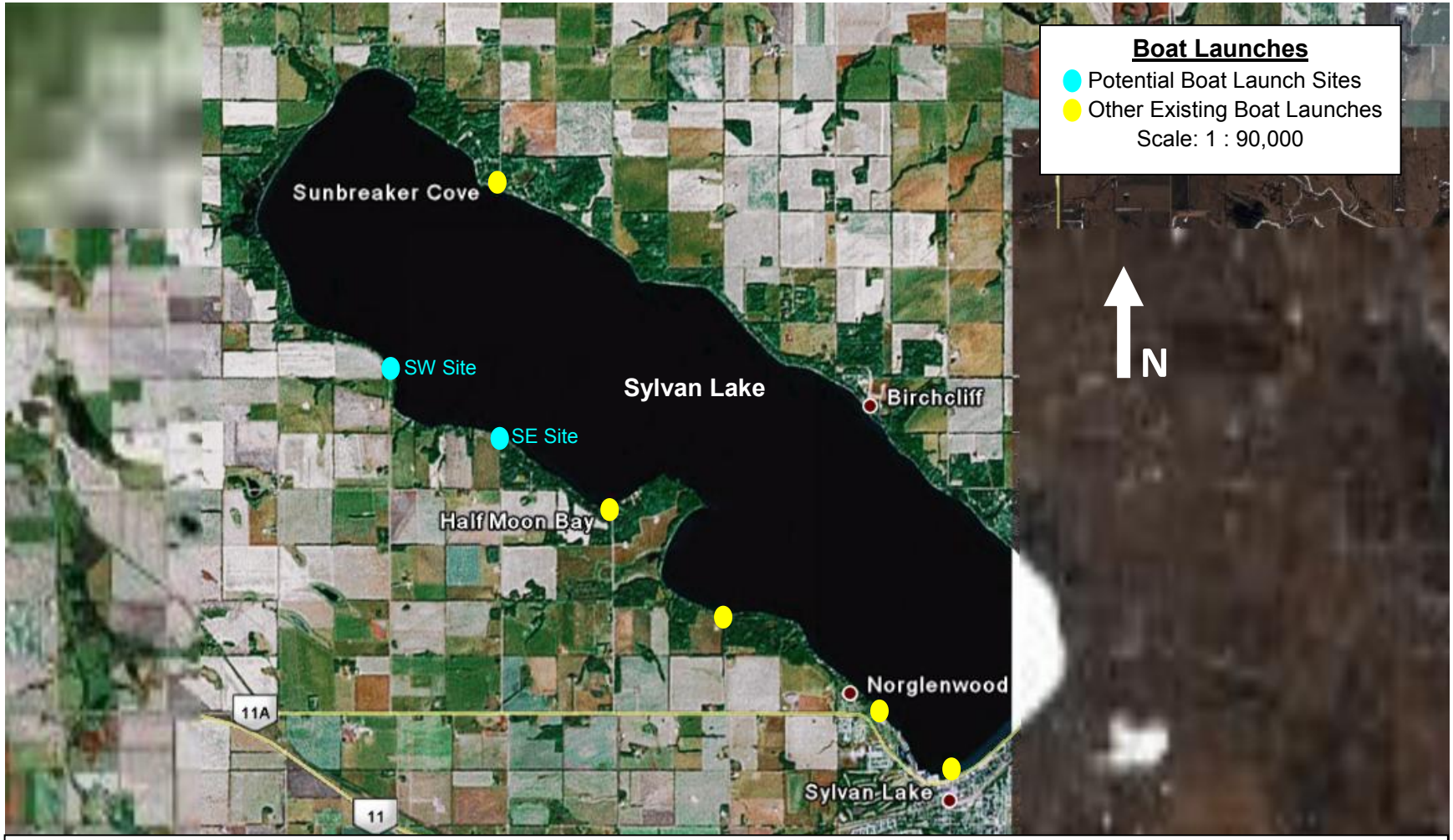

Figure 1 – Location of Proposed Boat Launches at SW Site (Kuusamo Krest) and SE Site (Scout Camp), Sylvan Lake, Alberta

SYLVAN LAKE

General Setting

Sylvan Lake is a rectangular-shaped lake 13.2 km long x 3.2 km wide with a small drainage basin that is only 2.5 times the size of the lake. The land use in the drainage basin is predominantly cereal grains, canola and mixed farming. The lake has a maximum depth of 18.3 m with a mean depth of 9.6 m. Approximately 20% of the lake is considered littoral zone (areas less than 3.5 m deep) (Crosby 1990).

The shoreline of Sylvan Lake is intensely developed with the town of Sylvan Lake, four summer villages and several subdivisions. In 1977, the cottage density was estimated at 33 cottages per km of shoreline. Approximately 73% of the shoreline is private land (41% residential, 32% agricultural), 15% Crown land (parks, municipal reserve, natural areas, road allowances), 11% camps and 1% commercial (marina, watercraft rentals, waterslide) (ISL 2002).

Lake Levels

The small catchment area of Sylvan Lake (only 2.5 times the lake's surface area) results in little incoming water from the drainage basin that could potentially contribute to changes in water level. Inflowing streams are intermittent and there are numerous submerged springs. Evaporation from the large surface area of Sylvan Lake is the primary outlet for water since very little water flows out of the lake. Between 1955 and 1976, the outlet stream flowed only during part of three years. Thus Sylvan Lake's water balance is controlled by direct evaporation and precipitation at the lake's surface (ALMS 2006). Since 1918, the peak water level was 937.2 m above sea level (m a.s.l.) in 1955 to a low of 936.05 m a.s.l. in 1964. Particularly low levels of water occurred from 1961 to 1964 (936.05 to 936.35 m a.s.l.) and 1976 to 1981 (936.10 to 936.50 m a.s.l.) (Crosby 1990).

There has been a general trend of water level decline in Sylvan Lake from 1990 to 2006. During this period the maximum lake elevation occurred in 1992, measuring 937.08 m a.s.l. while the lowest lake level was experienced in 2004 at 936.36 m a.s.l. (ALMS 2006). The water level in Sylvan Lake showed some recovery in 2005, but again declined in 2006. The lake over 16 years has declined on average about 0.5 m which is a longer but less severe decline than between 1955 to 1964 where lake levels dropped 1.15 m before recovering over a 12 year period.

Water Quality

Table 1 summarizes the water quality data collected from a station approximately 210 m offshore from the SW Site and 160 m offshore of the SE Site on June 24, 2009. Table 1 indicates good water quality at these sits. Water quality at both sites was quite similar; therefore, they are discussed together. At the station depths of 7.3 m and 4.5 m, the lake was not stratified as the temperature from surface to bottom did not vary by more than 2.2^{o}C at either site. Dissolved oxygen concentrations were high (9.05 to 10.24 mg/L and 82.0 to 96.2 percent saturation) and well above the guidelines of Alberta Environment (1999) which recommends that the seven day mean for oxygen exceed 6.5 mg/L and the one day minimum exceed 5.0 mg/L to protect aquatic life. The recorded pH values ranged from 8.36 to 8.39 and were within

the guidelines of Alberta Environment (1999) which recommends a pH between 6.5 and 9.0 to protect aquatic life. The conductivity and total dissolved solids averaged 591 uS/cm and 384 mg/L, respectively. Total dissolved solids between 100 and 500 mg/L is considered a moderate concentration (Bain 1999). Water clarity was quite high with a Secchi depth of 4.5 to 4.7 m and turbidity was very low ranging between 0.00 to 0.22 NTU (Table 1).

Table 1 – Summary of *in situ* water quality data collected from offshore areas at SW Site and SE Site, June 24, 2009.

Water Depth (m)	Water Quality Parameter						
	Oxygen (mg/L)	% Oxygen Saturation	Water Temperature (^{o}C)	pH	Conductivity (uS/cm)	Total Dissolved Solids (mg/L)	Turbidity (NTU)
SW Site							
0	9.21	92.2	15.4				
1	9.27	92.0	15.1	8.36	592	384	0.22
2	9.32	90.7	14.7				
3	9.32	90.5	14.4				
4	9.33	89.7	14.0				
5	9.33	89.5	13.9				
6	9.35	89.3	13.8				
7	9.34	88.9	13.8				
7.3	9.05	82.0	13.6				
SE Site							
0	9.25	92.1	15.6				
1	9.23	90.6	15.2	8.39	590	384	0.0
2	9.38	92.2	14.7				
3	9.36	90.2	13.9				
4	9.52	91.4	13.4				
4.5	10.24	96.2	13.4				

SW Site Notes:
Total water depth at station: 7.3 m
Secchi depth at station: 4.9 m
Station Location:11U 689653 5805347

SE Site Notes:
Total water depth at station: 4.5 m
Secchi depth at station: 4.5 m (lake bottom visible)
Station Location:11U 691161 5804497

Historically, the water quality of Sylvan Lake has been considered good. The lake is considered mesotrophic (i.e., moderately enriched with nutrients and moderate productivity), with peak phosphorus concentrations in July and peak chlorophyll ***a*** concentrations in August or September (Crosby 1990; ALMS 2006). Total phosphorus and chlorophyll ***a*** concentrations are generally low (14 to 24.5 ug/L and 3.7 to 9 ug/L, respectively) and hence the Secchi depths are typically greater than 4 m (mean range = 4.1 to 5.0 m) (ALMS 2006). The lake is exposed to the prevailing wind; hence, the lake does not typically thermally stratify (i.e., there is usually a similar water temperature from surface to bottom); although, in July 2006 a thermocline formed at 8 m and reached 17 m by August. By September 2006, there was no thermocline and the temperature was 14^{o}C from surface to bottom (Crosby 1990; ALMS 2006). Oxygen concentrations are usually high. In July 1974, oxygen concentrations were greater than 8 mg/L from surface to 12 m deep, and 1.5 mg/L at 15 m (bottom). During the summer of 2006, oxygen was typically 8 to 9.5 mg/L from 0 to 17 m deep, with the exception of July and August when concentrations below the thermocline ranged from 1 to 4 mg/L (ALMS 2006). During winter,

oxygen concentrations can become low below 8 m with anoxia occurring within a metre of the substrate at 16 m depth (Crosby 1990).

Fish Community

The fish community of Sylvan Lake is summarized in Table 2. The fish community consists of five sport fish species, one large-bodied forage fish species (white sucker) and five small-bodied forage fish species. Sylvan Lake is a popular lake for fishing, particularly winter ice fishing which is focussed on lake whitefish and yellow perch (Table 2).

The current angling regulations (2009) for Sylvan Lake (including tributaries and outlet) are:

- April 1 to May 17 and November 1 to December 10 – Closed to Angling
- May 18 to October 31 and December 11 to March 31 – Walleye limit 0, Pike limit 3 over 63 cm, Perch limit 5, Lake Whitefish limit 5, Burbot limit 5

Table 2 – Fish community of Sylvan Lake, Alberta.

Common Name	Scientific Name	Status and Notes
SPORT FISH		
northern pike	*Esox lucius*	Sport fish indigenous to Sylvan L. Popular year-round fishery.
walleye	*Sander vitreus*	Sport fish introduced to Sylvan L. from 1926 - 1963. Self-sustaining population is popular with anglers.
yellow perch	*Perca flavescens*	Sport fish introduced to Sylvan L. from 1940 - 1945. Self-sustaining population is popular with anglers particularly during winter.
lake whitefish	*Coregonus clupeaformis*	Sport fish introduced to Sylvan L. from 1987 - 1988 to provide additional forage for walleye and pike. Self-sustaining population is popular with anglers particularly during winter.
burbot	*Lota lota*	Sport fish indigenous to Sylvan L.
LARGE-BODIED FORAGE FISH		
white sucker	*Catostomus commersoni*	Large-bodied forage fish.
SMALL-BODIED FORAGE FISH		
spottail shiner	*Notropis hudsonius*	Small-bodied forage fish introduced to Sylvan L. from 1942 - 1945 to provide forage for sport fish.
emerald shiner	*Notropis atherinoides*	Small-bodied forage fish that occurs in Sylvan L.
brook stickleback	*Culaea inconstans*	Small-bodied forage fish that probably occurs in Sylvan L.
fathead minnow	*Pimephales promelas*	Small-bodied forage fish that probably occurs in Sylvan L.
Iowa darter	*Etheostoma exile*	Small-bodied forage fish that occurs in Sylvan L.

References: Crosby 1990; FWMIS online http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub; Mitchell 2009

Fish sampling at the SW Site and the SE Site during this study did not capture any fish using overnight baited minnow traps or shoreline backpack electrofishing from a boat (Table 3). Anglers fishing at the SW Site on June 24th reported catching walleye and yellow perch in deeper water off of the bulrush beds. During the water quality assessment on June 24th at the SE Site a single walleye (approximately 30 cm long) was observed cruising in about 2 m depth of water approximately 100 m offshore. This walleye was probably searching for forage fish.

Historical fish sampling has occurred at the SW Site along the shoreline and fish sampling has occurred near the SE Site (Table 4). At the SW Site, fish sampling in 1993 using gill nets and electrofishing captured lake whitefish (70), walleye (14), northern pike (6), yellow perch (3), burbot (11) and white sucker (16) (Table 4).

Table 3 – Summary of fish sampling at SW Site and SE Site, Sylvan Lake, June 24th and 25th, 2009

Method	Effort	Fish Species	No. Captured	Length (mm)
SW Site				
backpack electrofisher	1182 seconds	--	0	--
minnow trap (4)	14 hours	--	0	--
SE Site				
backpack electrofisher	1306 seconds	--	0	--
minnow trap (4)	22 hours	--	0	--

Fish sampling near the SE Site in 1993 and 1994 using gill nets and electrofishing captured or observed lake whitefish (206), walleye (22), northern pike (17), burbot (9) and white sucker (155) (Table 4). The large number of white sucker captured/observed in late-April suggests pre-spawning or spawning aggregations along the sand/gravel shoreline.

Table 4 – Summary of historical fish sampling at SW Site and near SE Site, Sylvan Lake

Location	Date	Method	Fish Species	No. Captured
SW Site	May 9, 1993	electrofishing	walleye	2
	June 18, 1993	gill net	lake whitefish	70
			walleye	12
			yellow perch	3
			northern pike	6
			burbot	11
			white sucker	16
Half Moon Bay (2.1 km east of SE Site)	June 17, 1993	gill net	lake whitefish	56
			walleye	22
			northern pike	17
			burbot	1
			white sucker	5
	April 29, 1994	electrofishing	lake whitefish	150
			burbot	8
			white sucker	150

Fish Habitat at Sylvan Lake

The abundance and distribution of aquatic vegetation (macrophytes) in Sylvan Lake is generally considered low. Macrophytes are typically found in patches within sheltered areas around the lake and occur predominantly in the northwest end. The most common emergent species are bulrush (*Scirpus* spp.) and common cattail (*Typha latifolia*). Submergent macrophytes include pondweeds (*Potamogeton* spp.), water buttercup (*Ranunculus circinatus*), Canada waterweed (*Elodea canadensis*), and the macroalga stonewort (*Chara* sp.) (Crosby 1990). The limited distribution of aquatic vegetation at Sylvan Lake has previously been thought to limit the abundance of fish especially northern pike and yellow perch as it provides spawning substrate for these two species, and cover and feeding areas for the fry and juveniles of northern pike, yellow perch, walleye and lake whitefish. Dense aquatic vegetation is also important as spawning substrate and cover for small-bodied forage fish.

A shoreline assessment of Sylvan Lake was completed to identify 'key fisheries habitat' areas in 1990 (EMA 1990; ISL 2002). Key spawning areas for yellow perch were generally identified as areas with emergent vegetation whereas key spawning habitat for northern pike were identified as inflowing and outflowing tributaries. Key spawning areas for walleye and lake whitefish were identified as areas of rock and cobble shoreline and occurred predominantly along the south, southeast and northeast shoreline. Rearing habitat for all sport fish species was identified as areas of emergent aquatic vegetation (Table 5; Figure 2). The location of the SW Site boat launch would occur within an area that has been designated as key fish habitat for yellow perch spawning and key rearing habitat for yellow perch, walleye, northern pike and lake whitefish. The location of the SE Site boat launch would not occur within an area that has been designated as key fish habitat, with the closest key fish habitat located 600 m to the southeast at an area identified as key walleye and lake whitefish spawning (Figure 2).

Table 5 – Spawning and rearing habitat preferences and locations for sport fish species at Sylvan Lake, Alberta.

Fish Species	Spawning Habitat	Location of Key Spawning Areas	Rearing Habitat	Location of Key Rearing Areas
yellow perch	Shallow weedy areas.	Northwest corner of lake, Kussamo Krest, and bay near Norglenwold (Figure 3).	shallow weedy areas, woody debris	Northwest corner of lake, Kuusamo Krest, and bay near Norglenwold (Figure 3).
northern pike	Shallow flooded weedy areas such as floodplains of rivers and creeks, marshes and bays.	Creeks flowing into and out of Sylvan Lake (Figure 3).	shallow weedy areas particularly edges of weed beds	
walleye	Shallow rocky shorelines or shoals.	Sections of the south, southeast and northeast shoreline (Figure 3).	shallow vegetated areas	
lake whitefish	Shallow water (2-4 m deep) over rocky shoals and sand substrate.	Sections of the south, southeast and northeast shoreline (Figure 3).	shallow vegetated areas	

References: Scott and Crossman 1973; EMA 1990; ISL 2002; Joynt and Sullivan 2003

SW Site Fish Habitat

The shoreline area at the SW Site has experienced some shoreline disturbances including a boat launch and cottage developments. Although a boat launch has not been built or maintained at the SW Site, an unmaintained, informal boat launch has developed at the end of Range Road 23 where boats are launched into the shallow water of a small cove (Photo 1). Shoreline disturbances at this launch include shrub removal, a gravel road to the water's edge and vehicular traffic. Similarly, the western portion of the SW Site has undergone intensive cottage development along the shoreline and is experiencing disturbances from docks, boat houses, tree and shrub removal, buoy lines and shoreline alteration (e.g., rip rap) (Photo 2). During August 2007, Alberta Sustainable Resource Development completed an aerial assessment of the riparian health along the shoreline of Sylvan Lake (ASRD 2008). Shoreline sections were categorized as *healthy*, *moderately impaired* or *highly impaired*. The riparian health categories

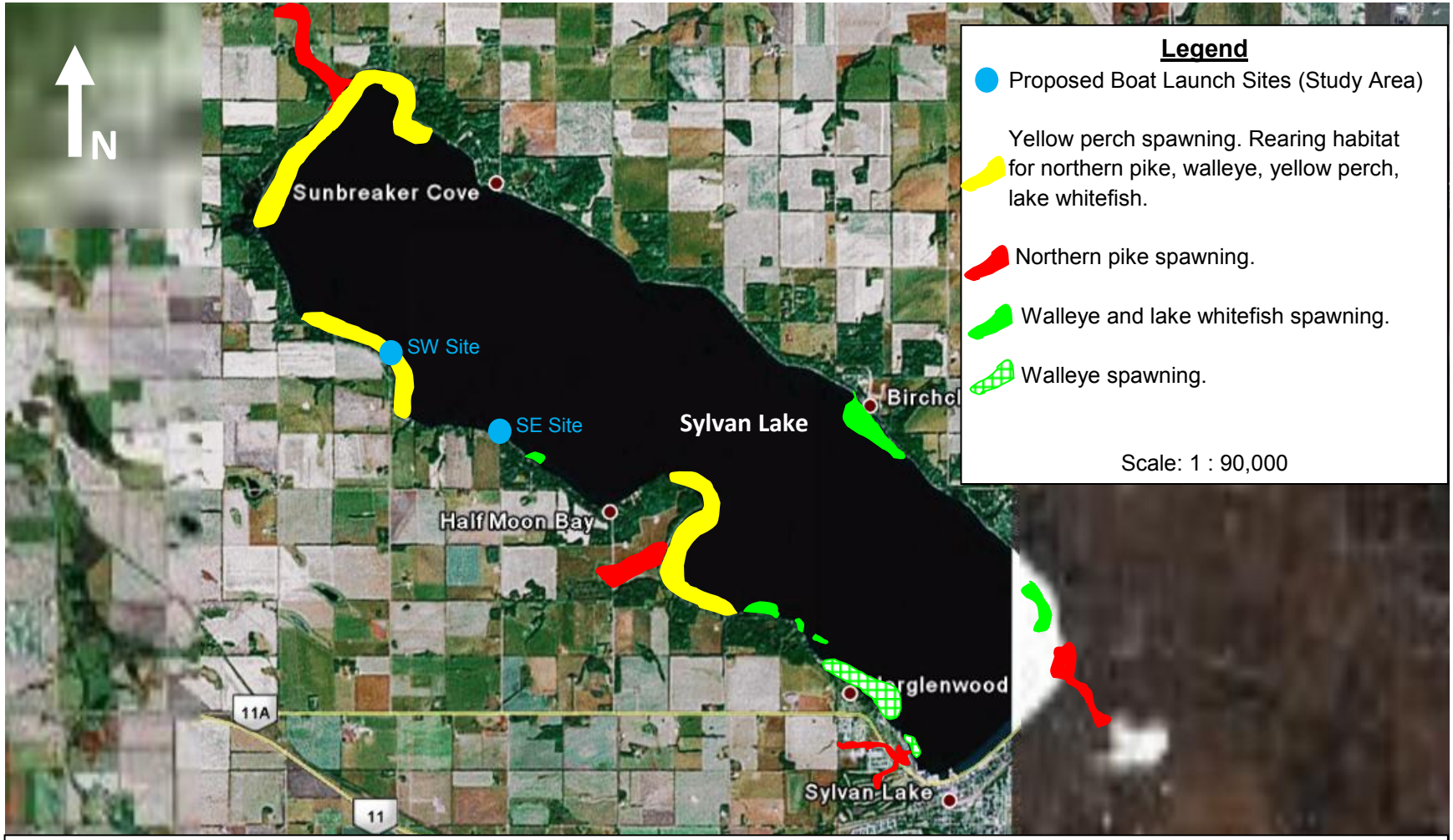

Figure 2 – Location of Key Fish Habitat (Spawning and Rearing) at Sylvan Lake, Alberta
Adapted from EMA (1990) and ISL (2002)

were determined by assessing the proportion of area covered by natural vegetation, presence of cattails and bulrushes, abundance of trees and shrubs, amount of human-caused disturbance or vegetation removal, and amount of human-caused alteration (e.g., retaining walls, ATV trails, boat houses, docks, adding/removing sand or rock, livestock grazing/watering). The unmaintained boat launch at the SW Site was considered *highly impaired*, probably due to the aforementioned disturbances as well as an absence of cattails and bulrushes where the boats leave and enter the launch (Figure 3). Similarly, the western portion of the SW Site was considered *highly impaired* due to the cottage development and an absence of cattails and bulrushes (Figure 3). All other shoreline riparian areas within the SW Site area were considered *healthy* (ASRD 2008)

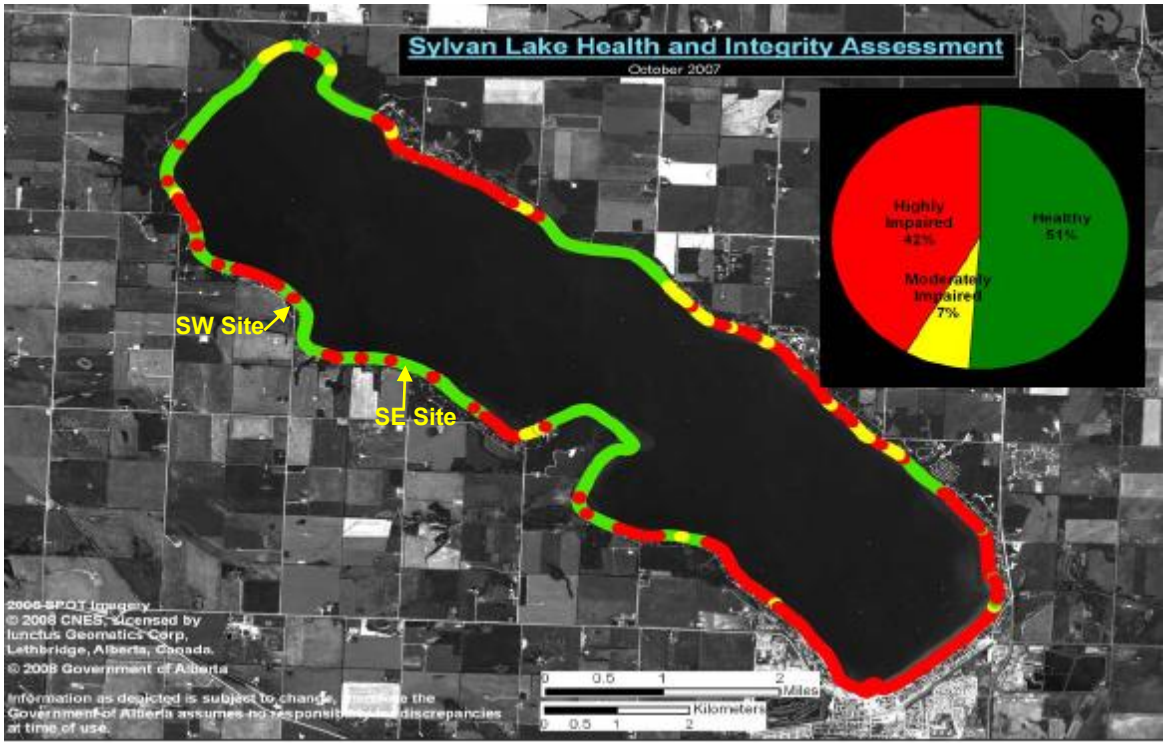

Figure 3 – Sylvan Lake shoreline health (from ASRD 2008)

The eastern portion of the SW Site in the cove area, immediately southeast of the boat launch is a relatively undisturbed area 1200 m long. The riparian vegetation was comprised primarily of grasses, sedge and shrubs. The shoreline was stable and composed primarily of organics and fines. A transect (Lake Habitat Transect No. 1) perpendicular to the shoreline was completed to typify the habitat in this area (Figure 4). From a distance of **0 to 5 m** offshore (maximum depth = 0.5 m) the substrate was composed of soft, deep organics with 75% coverage by common cattail (Photo 3). This band of cattail extended along the entire shoreline (Photo 4). From **5 to 70 m** offshore (maximum depth 1.0 m) the substrate was 100% silt/organic (fines) with 75% coverage by aquatic plants (95% *Chara* and 5% bulrush). From **70 to 240 m** offshore (maximum depth 3.0 m), the substrate was 100% silt/organic with 40% coverage by *Chara* (Figure 4).

A second transect (Lake Habitat Transect No. 2) perpendicular to the shoreline was completed to typify a large stand of dense bulrush (100 m wide x 500 m long) located northeast and east of the boat launch (Photos 5 and 6; Figure 4). From a distance of **0 to 5 m** offshore (maximum depth = 0.5 m) the substrate was composed of soft, deep organics with 75% coverage by common cattail. From **5 to 110 m** offshore (maximum depth 1.0 m) the substrate was 100% silt/organic (fines) with 75% coverage by aquatic plants (60% *Chara* and 40% bulrush). From **110 to 140 m** offshore (maximum depth 3.0 m), the substrate was 100% silt/organic with 40% coverage by *Chara* (Figure 4). Bulrush was observed to grow in 0.5 to 1.5 m depth of water.

In the area of the informal boat launch, the substrate was coarser (sand, gravel, cobble) and bulrush did not grow as dense, although *Chara* was dense in some areas along the bottom substrate. Bulrush was absent from a 10 x 40 m area where boats access the launch (Photo 7; Figure 4). Boat wake action and direct damage from outboard propellers is probably limiting bulrush survival in this area. The area of the boat launch contained some instream logs and woody debris along the shoreline (Figure 4).

The area adjacent to the cottage developments along the western portion of Kuusamo Krest did not contain bulrush but some *Chara* was observed along the bottom. The 1990 survey by EMA indicated that this area contained bulrush; hence its importance for yellow perch spawning and sport fish rearing. In 2001, (Bjorge et al. 2001) conducted a shoreline assessment of Sylvan Lake and re-assessed emergent vegetation areas assessed in 1990. They found that 14 of 35 areas assessed in 1990 as containing emergent vegetation no longer contained emergent vegetation in 2001. This suggest that emergent vegetation stands at Sylvan Lake may be declining and that shoreline development, wave action from boats and perhaps declining water levels may be contributing to the decline. The reason for the absence of emergent vegetation along the western portion of the SW Site is not known but it is the only portion Kuusamo Krest that has cottage development along the shoreline.

There is excellent quality fish habitat at the SW Site and the adjacent Kuusamo Krest mainly due to the presence of a large dense stand of emergent aquatic vegetation. Based on habitat observations during this study and historical fish sampling, the nearshore fish community at the SW Site is likely to consist of the five sport fish species found at Sylvan Lake with lake whitefish, walleye and yellow perch as the dominant adult species. This area has previously been identified as key habitat for yellow perch spawning and key rearing habitat for young yellow perch, northern pike, walleye and lake whitefish. The young (fry and juvenile) of all five sport fish species would utilize the SW Site as these species and life stage are typically associated with aquatic vegetation. Small-bodied forage fish likely to occur at the SW Site are spottail shiner, Iowa darter, fathead minnow and brook stickleback due to their affinity for aquatic vegetation; whereas emerald shiner is typically a more open water pelagic species (Scott and Crossman; Stewart and Watkinson 2004). The presence of aquatic vegetation and nearshore cover (woody debris, coarse organic matter) would provide spawning habitat and rearing/feeding habitat for brook stickleback, fathead minnow and Iowa darter; therefore, foraging by adult northern pike, walleye and burbot (primarily prey on fish) probably occurs in this area. Adult lake whitefish

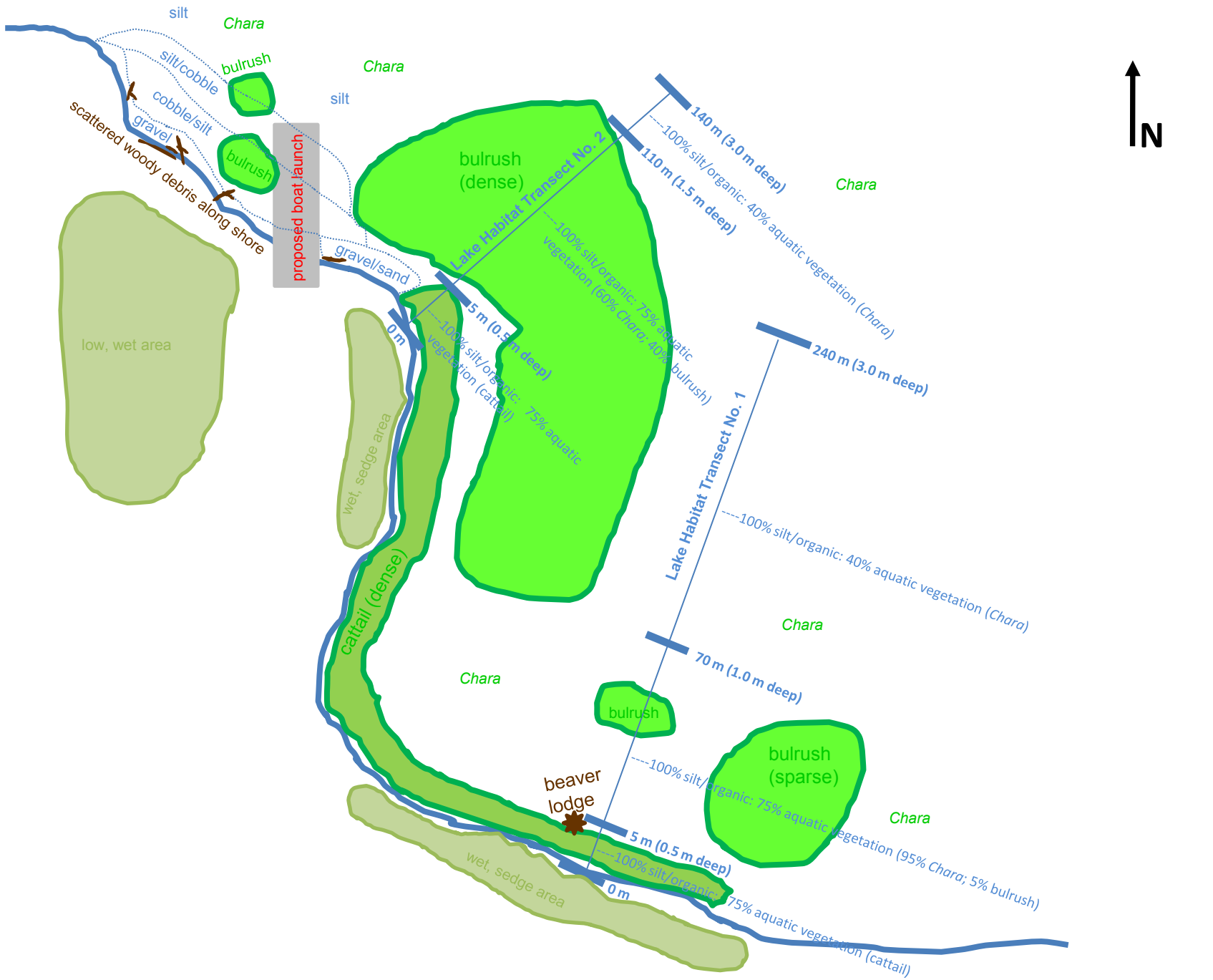

Figure 4 – Habitat Map of SW Site at Proposed Boat Launch, Sylvan Lake, June 2009.

(primarily feed on benthic invertebrates) and yellow perch (feeds on both fish and benthic invertebrates) are also likely to feed in this area.

SE Site Fish Habitat

The shoreline area at the SE Site is a relatively undisturbed section of Sylvan Lake (Photo 8) with a nearshore riparian zone of red-osier dogwood and alder. The upland area has a slope of approximately 20^{o} and is densely covered with poplars (Photo 9). The bank along the shoreline was stable due to the stability provided by the shrubs and boulders (Photo 10). The shoreline area for approximately 250 m on each side of the proposed boat launch was rated as *healthy* by ASRD (2008) presumably due to the undisturbed forest area.

The shoreline and nearshore areas of the SE Site area were relatively homogenous. A linear habitat transect perpendicular to the shoreline was completed to typify the habitat (Figure 5). From a distance of **0 to 3 m** offshore (maximum depth = 0.5 m) the substrate was 50% gravel, 30% boulder, 20% sand with a low amount of fines due to wave action (Photo 11). There were dense shrubs and some trees along the shoreline which overhung the banks providing some overhead cover (shade) and instream cover from woody debris (Photo 12). From **3 to 8 m** offshore (maximum depth 1.2 m) the substrate was 70% cobble, 20% silt/clay and 10% boulder with a low amount of fines covering the substrate (Photo 13). From **8 to 170 m** offshore (maximum depth 4.5 m), the substrate was 80% silt/fines and 20% cobble with a high amount of fines covering the substrate (Figure 5). No emergent or submergent aquatic vegetation was noted within the study area of the SE Site.

Based on observations during this study and historical fish sampling, the nearshore fish community at the SE Site is likely to consist of lake whitefish as the dominant adult species; although other sport fish species may use the area for feeding, particularly as prey species such as spottail shiner move inshore into shallower areas at night (McPhail 2007). Rearing habitat for sport fish is probably limited as the fry and juveniles of the sport fish found at Sylvan Lake are often associated with aquatic vegetation (Scott and Crossman 1973; McPhail 2007). Although the SE Site has not been identified as having sport fish spawning habitat, the shallow shoreline area may provide some spawning for lake whitefish. Lake whitefish spawn over a variety of substrates (sand, gravel, cobble and boulder) in 0.3 to 30 m deep water (Scott and Crossman 1973; McPhail 2007). Yellow perch or northern pike would not spawn at the SE Site due to the lack of aquatic vegetation.

Utilization by small-bodied forage fish is likely limited as Iowa darter, fathead minnow and brook stickleback typically use aquatic vegetation and/or organic debris for spawning and cover (Scott and Crossman; Stewart and Watkinson 2004). There may be some spawning habitat along the shoreline for emerald shiner and spottail shiner. Emerald shiners are mid-water spawners, spawning 30 to 60 cm below the water surface, consequently substrate is not important, as they typically spawn in 2 to 6 m of water over sand, but mud, gravel, cobble and rubble is also used. Spottail shiners spawn in shallow water over sand and gravel but aquatic vegetation is also utilized (McPhail 2007).

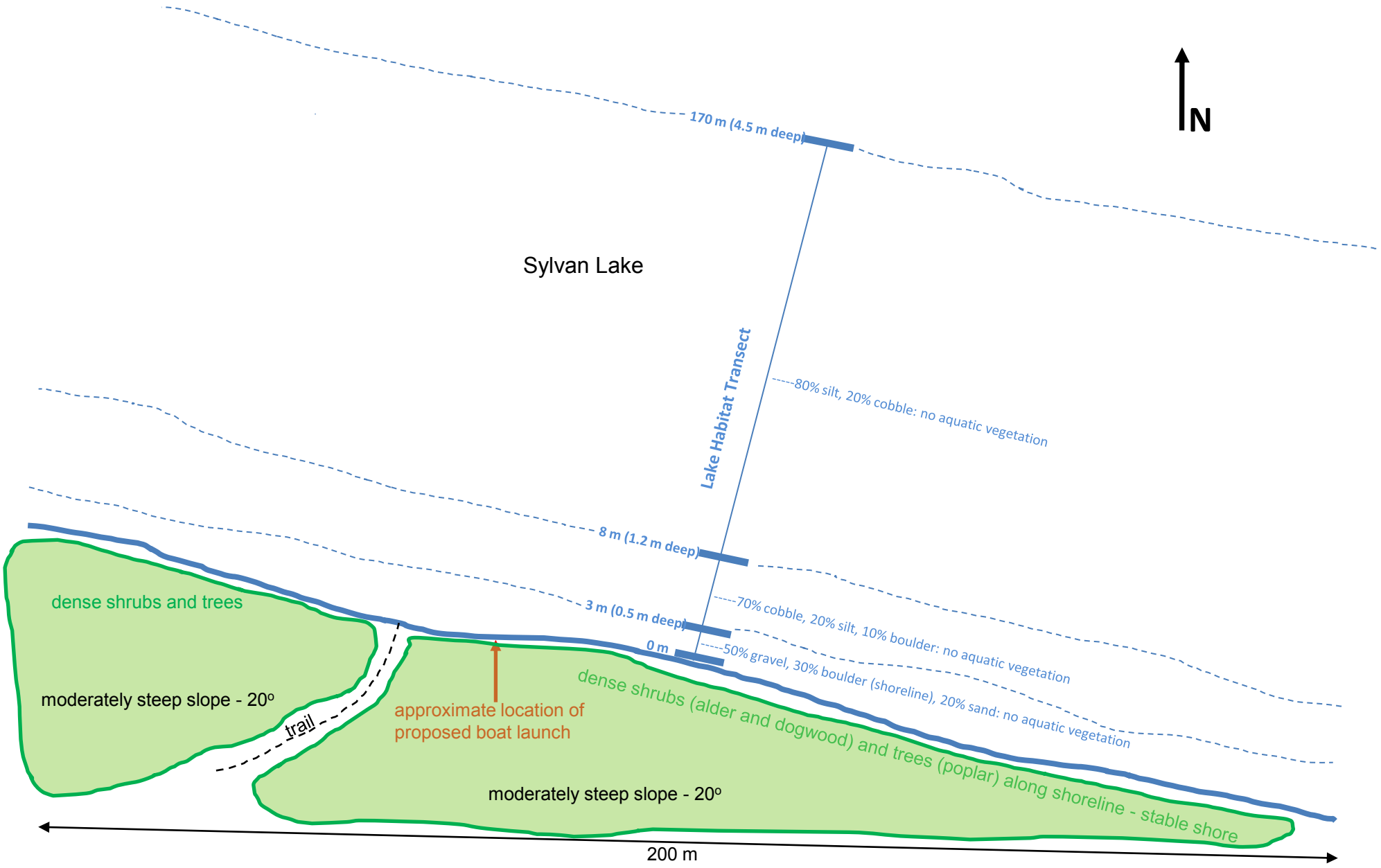

Figure 5 – Habitat Map of SE Site at Proposed Boat Launch, Sylvan Lake, June 2009.

Spawning by white sucker may also occur in the shallow portions of the SE Site area. The capture of large numbers of white suckers in shoreline areas in late-April suggests pre-spawning or spawning aggregations (Table 4). White suckers spawn over gravel and sand in shallow water of lakes (Nelson and Paetz 1992; McPhail 2007).

BOAT LAUNCH DESIGN

Proposed Boat Launch Designs

The proposed boat launch design for the SW Site or SE Site is a two ramp boat launch with two side docks (Appendix ?? - Drawings ? and ?). The two ramp/2 side dock design is preferred over a 2 ramp/centre dock design as it requires less area for the ramp (i.e., a reduced footprint). The proposed material for the ramp is pre-cast concrete boat ramp slabs. Pre-cast concrete ramp slabs are preferred over natural substrate and graded gravel. Both natural substrate and gravel tend to rut under heavy usage, require frequent maintenance (requiring instream disturbances) and continuously re-suspend sediments as boat are launched and loaded. Concrete slabs are durable, require very little maintenance and provide good tire traction without re-suspending sediment. Each concrete slab is secured to the next with a bolt and chain, and a 7.5 cm gap between each slab will be filled with small gravel.

The proposed dock type is a portable, floating plastic type (Jetfloat® or equivalent). This design is preferred as it does not rest on the lake bottom (i.e., no loss of lake bottom habitat), is made of very durable plastic (up to 30 year lifespan) and is non-toxic (as opposed to wood-preservative). The two plastic docks will only require four small concrete anchor points to secure them to the lake bottom. The docks will be installed in the spring and removed in late fall, after the boating season is over. Each floating dock will be 30 m long and 1.5 m wide and placed along the edge of the boat ramp.

SW Site

The proposed boat ramp (25 m long x 10.25 m wide) at the SW Site is offshore due to the gentle lake bottom slope at the site. Therefore, the lake area between the boat ramp and shore will be filled in with an approach ramp (56 m long x 13.25 m wide) with a gravel or asphalt top (Appendix ?? - Drawing ?). In total, the boat ramp and approach ramp would occupy 988 m^2 of lake bottom. Approximately 15 m^3 of riprap will be placed around the perimeter of the concrete slabs to reduce the potential for washout and provide a transition from slab to natural substrate.

SE Site

The instream portion of the proposed boat ramp at the SE Site will be 23 m long and 10.25 m wide (i.e., 236 m^2 in total). Approximately 15 m^3 of riprap will be placed around the perimeter of the concrete slabs, to reduce the potential for washout and provide a transition from slab to natural substrate (Appendix ?? - Drawing ?).

Assessment of Potential Impacts to Aquatic Environment

The impacts to fish habitat from a proposed boat launch at the SW Site are predicted to be moderate. Currently, the site has been a functioning as an *ad hoc* boat launch for many years,

and as a result there are existing impacts to the riparian area and the aquatic vegetation at the site. However, the boat launch design at the SW Site will require a large footprint of 998 m^2.

The impacts to fish habitat of a proposed boat launch at the SE Site are predicted to be minor. Currently, there are no existing disturbances at the SE Site; however, the boat launch design will require a smaller footprint of 236 m^2.

The following provides as assessment of the impacts of the two boat launch sites on the major types of fish habitat:

Spawning Habitat

The extensive emergent bulrush beds at the SW Site have previously been identified to provide important spawning habitat for yellow perch (Figure 4). Spawning by other sport fish has not been identified at the SW Site. Therefore, the construction of the approach ramp and boat launch in conjunction with increased boat traffic (wave action, propeller damage) at the SW Site will impact yellow perch spawning habitat; although, quantification of the impact is difficult.

No spawning habitat for any of the sport fish that occur in Sylvan Lake has been previously identified to occur at or near the SE Site (Figure 4). Northern pike and yellow perch spawn in association with aquatic vegetation, which does not occur at the SE Site. Walleye prefer to spawn over rock and rubble along shoreline and shoals, which does not occur at the SE Site. Lake whitefish spawn over a variety of substrates from sand to rubble; therefore, some spawning habitat may be available at the SE Site. If lake whitefish spawning does occur at the SE Site (unknown) impacts to spawning habitat would be minor as the south shoreline has several kilometres of gravel/sand substrate.

Rearing Habitat

The young of the four main sport fish occurring in Sylvan Lake (yellow perch, northern pike, walleye and lake whitefish) are typically found in association with aquatic vegetation. The extensive bulrush beds at the SW Site have previously been identified as important rearing areas for yellow perch, northern pike, walleye and lake whitefish (Figure 4). Therefore, the construction of the access ramp and boat launch in conjunction with increased boat traffic (wave action, propeller damage) at the SW Site will impact sport fish rearing habitat; although, quantification of the impact is difficult. The addition of rock riprap (instream cover) around the entire perimeter of the concrete slabs in conjunction with overhead cover from the floating docks may result in additional rearing habitat (albeit minor) for small-bodied forage fish and the fry/juveniles of burbot and white sucker.

The construction of a boat launch at the SE Site would not impact sport fish rearing habitat as aquatic vegetation does not occur at the site. The addition of rock riprap (instream cover) around the entire perimeter of the concrete slabs in conjunction with overhead cover from the floating docks may result in additional rearing habitat (albeit minor) for small-bodied forage fish and the fry/juveniles of burbot and white sucker.

Overwintering Habitat

The boat launches at the SW Site or SE Site would not be operational during the winter and the floating docks will be removed before ice over. The construction of an approach ramp at the SW Site would result in the loss of some water column depth; however, this area is currently too shallow for overwintering fish. The boat launch at the SE Site will not alter the water depth; therefore, fish will be able to use the SE Site boat launch area as overwintering habitat.

Riparian Habitat

There is no riparian habitat at the SW Site boat launch due to the already existing disturbances associated with the *ad hoc* boat launch and gravel road. The shoreline riparian health at this site has previously been classified as *highly impaired* (ASRD 2008). Therefore, construction of a boat launch at the SW Site will not impact any riparian habitat. A low, wet area adjacent to the gravel road may be impacted by the construction of the turnaround at the launch.

The construction of a boat launch at the SE Site would impact approximately 15 m of shoreline riparian habitat consisting of trees and shrubs. The shoreline riparian health at this site has previously been classified as *healthy* (ASRD 2008).

Feeding Habitat

Forage fish likely occur in the area of the SW Site boat launch due to the emergent aquatic vegetation, which they use for cover, feeding and escape from predators. Therefore, the SW Site boat launch likely provides forage fish for walleye, northern pike and burbot which feed primarily on fish. The construction of an approach ramp and boat launch at the SW Site is likely to impact feeding by predatory fish on forage fish; although, the impact is difficult to quantify.

Presently, there may be some feeding habitat in the area of the proposed boat ramp at the SW Site for lake whitefish and yellow perch which primarily eat bottom organisms such as insect larvae (including chironomid larvae), amphipods, snails, and clams (Scott and Crossman 1973; Nelson and Paetz 1992; Carlander 1997). Many of these food organisms are found in association with aquatic vegetation which occurs at the SW Site boat launch. The replacement of 236 m^2 of lake bottom with concrete slabs, riprap and gravel may result in the loss of some soft-surface habitat for chironomids, nematodes and oligochaetes. However, the addition of hard surface habitat (concrete slab, gravel and rock) and the interstitial habitat from the riprap may provide additional habitat for amphipods, snails and clams which are common food items for lake whitefish and yellow perch. The construction of the approach ramp would result in the direct loss of 742 m^2 of lake bottom and consequently some feeding habitat. Overall, the construction of the SW boat launch would result in a minor loss of benthic invertebrate habitat.

Forage fish are not likely to occur in the area of the SE Site boat launch in substantial numbers due to the lack of instream cover, particularly aquatic vegetation, which they use for cover, feeding and escape from predators. Therefore, the SE Site boat launch likely provides little feeding habitat for walleye and northern pike which feed primarily on forage fish.

Presently, there may be some feeding habitat in the area of the proposed SE boat launch for lake whitefish which primarily eat bottom organisms such as insect larvae (including chironomid larvae), amphipods, snails, and clams. Many of these food organisms are found in association with aquatic vegetation which was not present at the SE boat launch site. The replacement of a small area of silt/cobble lake bottom with concrete slabs, riprap and gravel may result in the loss of some soft-surface habitat for chironomids, nematodes and oligochaetes. However, the addition of hard surface habitat (concrete slab, gravel and rock) and the interstitial habitat from the riprap may provide additional habitat for amphipods, snails and clams which are common food items for lake whitefish. Overall, the construction of a boat launch at the SE Site would not result in a loss of feeding habitat.

Mitigation

In order to minimize or eliminate disturbances to fish habitat, the following mitigation measures would be implemented:

Sediment Control/Water Quality

The water quality during the construction and operation of a boat launch at either the SW Site or SE Site must be maintained. A water quality review during this study indicates Sylvan Lake has high water clarity, low turbidity and moderate enrichment from nutrients.

During construction, the main water quality concern will be re-suspension of bottom sediments. High concentrations of suspended sediment can reduce feeding success in fish, induce gill trauma, and cause direct mortality (in very high concentrations). Deposited sediment can fill in the interstitial spaces of coarse substrate, suffocate fish eggs and smother benthic invertebrates (Waters 1995). In addition, there can be aesthetic issues with visible sediment plumes. In order to confine suspended sediment to the immediate work area, an isolation berm would be constructed around the perimeter of the work area and the work area would be pumped down to allow work to proceed in the dry. The current option for the isolation berm would be an Aqua Dam® or equivalent which is preferred over a rock/textile berm due to disturbance and sediment caused by the installation and removal of the rock berm.

The proposed boat launch at either site would have bathroom facilities installed with a holding tank. Therefore, nutrient enrichment and bacterial contamination from a bathroom is not a concern as sewage would be pumped and trucked to an offsite facility for proper treatment. Therefore, nutrient enrichment or bacterial contamination of Sylvan Lake will not occur as a result of the construction and operation of the boat launch at the SW Site or SE Site.

Timing of Boat Launch Re-Construction

To protect spring-spawning sport fish (yellow perch, northern pike, walleye), fall-spawning fish (lake whitefish) and winter-spawning fish (burbot) it is important that instream construction at the SW Site or SE Site is scheduled to avoid the sensitive spawning and fry emergence period. The province of Alberta has developed Restricted Activity Periods (RAPs) for each sport fish species in the province by geographic region (Alberta Sustainable Resource Development

2009). The RAPs for the sport fish species occurring in Sylvan Lake (Parkland Prairie – PP2) are:

- walleye: April 16 to June 30
- northern pike: April 16 to June 30
- yellow perch: April 16 to June 30
- lake whitefish: October 1 to May 31
- burbot: January 1 to April 30

Based on these sport fish species, instream construction at Sylvan Lake could occur from July 1 to September 30 to avoid the spawning and fry emergence periods.

General Mitigation Measures

The following general mitigation measures for the boat launch construction at the SW Site or the SE Site would be implemented to maintain the aquatic environment at Sylvan Lake:

- The provincial Restricted Activity Periods for instream construction will be adhered to during construction of a boat launch at the SW or SE Site. Therefore, instream construction will not occur from October 1 to June 30 to protect spring-, fall- and winter-spawning fish.
- If necessary, fish will be salvaged from the area within the work area prior to construction and returned to the lake outside of the isolation berm.
- During construction, all equipment will be refuelled and all hazardous materials stored at least 100 m from the lake.
- An emergency hydrocarbon spill kit will be maintained onsite in the unlikely event of a hydraulic fluid or fuel leak.
- Exposed topsoil will be re-seeded at the completion of construction with an appropriate grass seed mix.
- Areas of exposed topsoil will be contained by silt fencing until vegetation has regenerated sufficiently to hold the soil in place.
- The heavy equipment onsite will be free of mud, grease, oil and fluid leaks on the outside surfaces. The washing of mud-covered buckets, tracks, wheels and other equipment in the lake will be prohibited.

SUMMARY

Lacombe County is proposing to construct a new boat launch at either the SW Site (Kuusamo Krest) or at the SE Site (adjacent to Boy Scout Camp) on Sylvan Lake. A fisheries assessment at both sites indicates that while each site provides fish habitat, the SW Site provides important fish habitat that is somewhat limited at Sylvan Lake. Large emergent beds of bulrush at the SW Site provide spawning habitat for yellow perch and important rearing habitat for walleye, yellow perch, northern pike and lake whitefish. Previous studies indicate that stands of bulrush may be declining around Sylvan Lake. Conversely, the fish habitat at the SE Site consists of cobble/gravel/silt substrate along a wind-swept shoreline. This area has not been previously

been identified as key habitat (e.g., spawning or rearing) and is a common habitat type along the southern shoreline of Sylvan Lake. From a fisheries and aquatic perspective, the SE Site provides a more ideal location for a boat launch in order to reduce stressors on the emergent stands of bulrush at the SW Site. In addition, a boat launch at the SE Site would require less than 25% of the footprint area (236 m^2) compared to the footprint required at the SW Site (998 m^2).

CLOSURE

We trust the information provided is sufficient to describe the existing fisheries resources at two proposed boat launch sites at Sylvan Lake and the potential impacts of these launches on the aquatic resources of Sylvan Lake. If you have any questions, please do not hesitate to contact Scott Stoklosar at 403-479-5668.

Yours truly,

Palliser Environmental Services Ltd.

Scott Stoklosar, M.Sc., QAES, P.Biol.
Senior Fisheries Biologist

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↓**Photo 1:** *View to informal boat launch at the SW Site, Sylvan Lake, June 2009.*

↓**Photo 2:** *View to shoreline development along western portion of Kuusamo Krest, Sylvan Lake, June 2009.*

↓**Photo 3** – *View of nearshore and common cattails adjacent to the SW Site, Sylvan Lake, June 2009.*

↓**Photo 4** – *View of band of common cattail along shoreline adjacent to the SW Site, Sylvan Lake, June 2009.*

↓**Photo 5** – *View of large, dense stand of bulrush adjacent to the SW Site at Kuusamo Krest, Sylvan Lake, June 2009.*

↓**Photo 6** – V*iew of bulrush stand near informal boat launch at SW Site, Sylvan Lake, June 2009.*

↓**Photo 7** – *View from informal boat launch at SW Site, showing the absence of bulrush from boating traffic, Sylvan Lake, June 2009.*

↓**Photo 8** – *View to approximate location of proposed boat launch, SE Site, Sylvan Lake, June 2009.*

↓**Photo 9** – *View to nearshore slope and forested area at the SE Site, Sylvan Lake, June 2009.*

↓**Photo 10** – *View to stable shoreline at the SE Site provided by shrubs and boulders, Sylvan Lake, June 2009.*

↓**Photo 11** – *View to clean gravel/boulder/sand substrate adjacent to shoreline at the SE Site, Sylvan Lake, June 2009.*

↓**Photo 12** – *View to typical shoreline at the SE Site with overhanging trees, Sylvan Lake, June 2009.*

↓**Photo 13** – *View to cobble substrate with light covering of fines 3 to 8 m offshore at the SE Site, Sylvan Lake, June 2009.*

APPENDIX B

Historical Resources Review

by Bison Historical Services Ltd.

JUSTIFICATION FOR *HISTORICAL RESOURCES ACT* REQUIREMENTS

Bison Historical Services Ltd.
Archaeological and Historical Consultants
1A, 215-36th Avenue N.E., Calgary, AB T2E 2L4
Phone: 403-283-8974, Fax: 403-270-0575
www.bisonhistorical.com

Project Name or Project Identifier
Lacombe County Sylvan Lake Boat Launches at Kuusamo Krest (SW 22-39-2-W5M) and Boy Scout Camp (N 15-39-2-W5M)

Disposition Type & Number

Consultant Information
Name: Christie Pituch **Company:** Bison Historical Services Ltd. **Phone Number:** 403-283-8974 **Fax Number:** 403-270-0575 **E-Mail Address:** pituch@bisonhistorical.com **File #:** 906-0479, HRO # 09-032

Proponent Information
Corporate Name: Lacombe County **Contact Name:** Bill Cade **Address:** RR3, Lacombe, AB T4L 2N3 **Phone Number:** (403) 782-3567 **Fax Number:** (403) 782-5356 **E-Mail Address:** bcade@lacombecounty.com

Agent Information
Corporate Name: MPE Engineering Ltd. **Contact Name:** Peter Stevens **Address:** #302, 4702-49th Avenue, Red Deer, Alberta T4N 6L5 **Phone Number:** (403) 314-6129 **Fax Number:** (403) 348-8331 **E-Mail Address:** pstevens@mpe.ca

Lands Affected		
Legal Description	**Land Ownership Type**	**HRV notation**
22-39-2-W5M	Freehold	0
15-39-2-W5M	Freehold	0

Activity Type and Anticipated Ground Disturbance

The proposed developments involve the construction of two boat launch sites along the southwest shore of Sylvan Lake. These boat launch sites will involve parking areas and day-use facilities at each location, and will involve development of undisturbed land.

Project Size

currently unavailable

Existing Disturbance

Aerial photographs indicate that the affected land in 22-39-2-W5M (Kuusamo Krest) is undisturbed sandy shore, while the land in 15-39-2-W5M (Boy Scout Camp) is undisturbed vegetated shoreline.

Landscape and Environmental Information

Sylvan Lake occurs in the Low Boreal Mixedwood ecoregion of Alberta. This land is characterized by draped moraine, with till of even thickness, with minor amounts of water-sorted material and local bedrock exposures. The surface is flat to undulating, and reflects the topography of the underlying bedrock and other deposits.

The proposed boat launch sites occur on the shores of Sylvan lake; the Kuusamo Krest launch is located on a broad, relatively flat shore, while the Boy Scout Camp is located at the bottom of a bank.

Archaeological Resources		
Borden #	**Relationship to Activity**	**Anticipated Impacts**
FcPn-8	located more than 2km south west of development	no impact
FcPn-13	located more than 5km from development, on shores of Sylvan Lake	no impact
FcPn-16	located more than 5km from development, on shores of Sylvan Lake	no impact
FcPn-17	located more than 5km from development, on shores of Sylvan Lake	no impact

Historic Structure(s)	Anticipated Impacts
72472	Exact location not indicated, but associated with Boy Scout camp and potential for impact exists
72494	Exact location not indicated, but associated with Issac Lampi Homestead, which is associated with Boy Scout camp; potential for impact exists.

Permit Number(s)	Relationship to current development footprint
83-097	unrelated
Project Arrowhead 1983	unrelated
07-289	unrelated
07-519	unrelated

Illustrative Materials
Project Sketch; NTS Maps

Evaluation

The proposed boat launches occur on the south western shore of Sylvan Lake. The Kuusamo Krest boat launch (SW 22-39-2-W5M) occurs on a broad, flat undisturbed sandy shore, while the Boy Scout Camp launch (NE 15-39-2-W5M occurs on a narrow shore at the bottom of a slope, in undisturbed vegetation. Land-side development associated with these developments will involve the construction of parking and day-use facilities.

According to the Listing of Historic Resources (March 2009 edition), neither of the affected sections have HRV notations. There are no known archaeological sites within these sections, but there are sites in nearby sections and areas with similar depositional potential to the project area. FcPn-8 (HRV=0) is located more than 2km south west of the project area, away from the lakeshore; this site, identified in 1983, consists of a lithic scatter found in a cultivated field. Three known sites are located along the northwestern shore of Sylvan Lake. The Sylvan Lake Wintering Area (FcPn-13, HRV=0) is a reported animal watering area recorded under Project Arrowhead in 1983; FcPn-16 is a stone feature/cairn with an HRV notation of 4 for archaeology; and FcPn-17 is the Palm homestead, which has been assigned an HRV notation of 4 for archaeology given the significance of the site based on several criteria, including the completeness of the site, its association with a discernable ethnic homestead group (Finnish), and the fact that it contains burials. The presence of these known sites along the shores of Sylvan Lake suggests the use of the lake shore in historic and prehistoric times, suggesting that other similar sites may be present at other points along the shore.

Given the location of the proposed developments along the shores of Sylvan Lake and the presence of known archaeological and historic sites in similar depositional environments along the northern lakeshore, the potential for encountering intact historical resources is moderate to high.

Although there are no archaeological sites within the immediate sections of the current development, there are two historic sites, recorded as being somewhere within Township 39, Range 2, W5M, that likely occur within close proximity to the Boy Scout Camp boat launch in NE 15-39-2-W5M. The first site is historic site # 72472, which is recorded as both the Isaac Lampi homestead loghouse and the Boy Scouts of Canada at Camp Woods. According to the historic site form, the structure was originally constructed in 1900 by Rev. Jujelt, a Lutheran Minister from Finland. Isaac Lampi bought the property from Jujelt in 1905, and occupied it until 1912, when both Mr. Lampi and his wife passed away. The estate was taken in trust by the province, and was eventually turned over to Col. Woods who leased it to the Boy Scouts in 1934. Throughout its period of use, the structure acted as a family dwelling and church meeting hall, as well as a camp building. In 1972, the year of the site's recording, a grant was recommended to the Boy

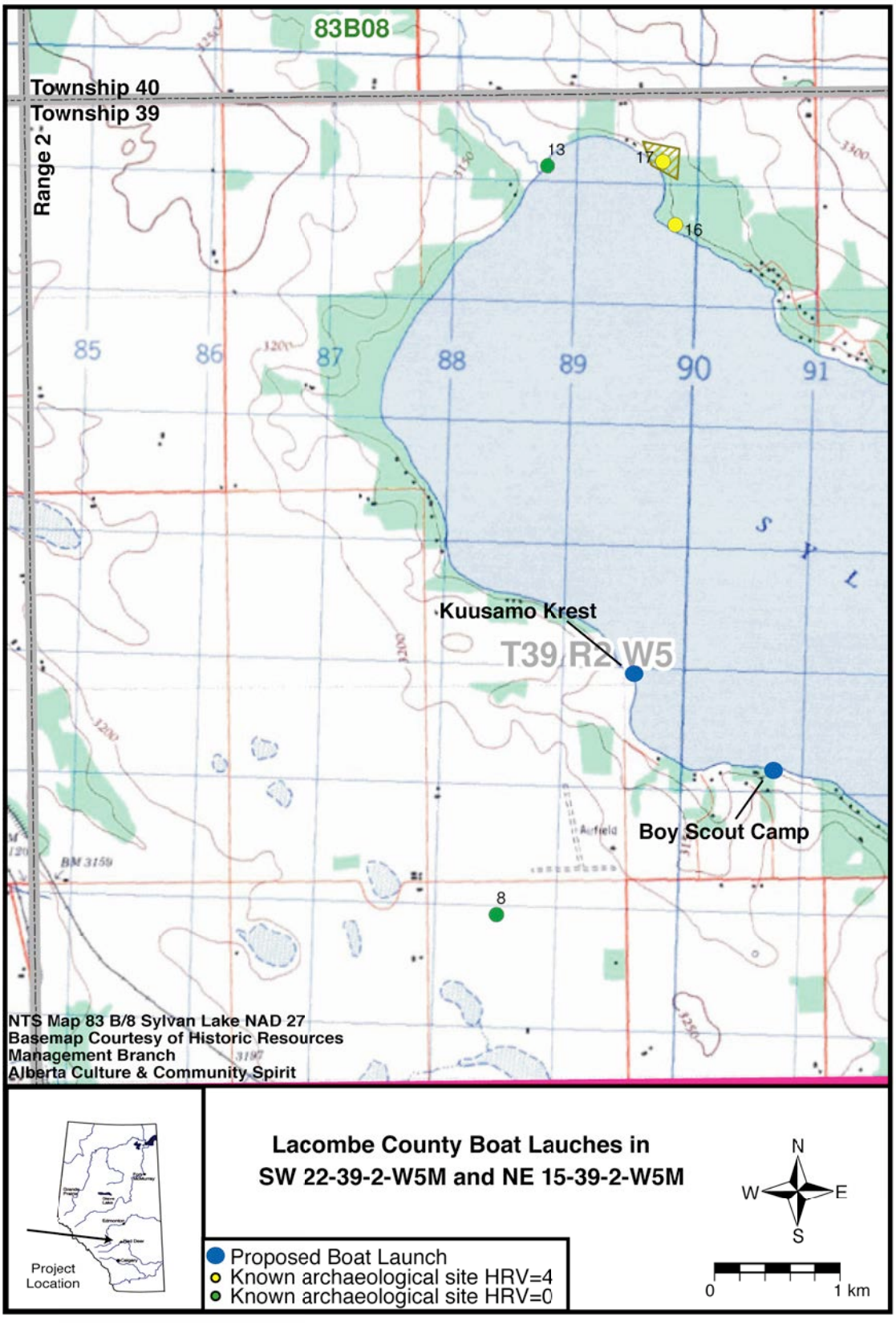
Scouts to restore the homestead. The current condition of the log house is not known.

The other known historic site identified as being located within Township 39 Range 2 W5M is site 72494, the Isaac Lampi Homestead, which is presumably associated with site 72472, above. This site consists of a farm and 102 acre parcel of land, although the historic site form does not contain sufficient information to identify precisely what it contains.

Recommendations ***(Recommendations regarding archaeological resources must be made by a professional archaeologist.)***

Given the location of the proposed developments along the shores of Sylvan Lake and the presence of known archaeological and historic sites in similar depositional environments along the northern lake shore, the potential for encountering intact historical resources is moderate to high. In addition, given the likely presence of two historic sites within close proximity to the proposed boat launch at NE 15-39-2-W5M, an HRIA is recommended for this development.

Recommendation made by: Christie Pituch B.Sc.	**Date:** July 1, 2009


83B08
Township 40
Township 39
Range 2
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87
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Kuusamo Krest
T39 R2 W5
Boy Scout Camp
BM 3159
8
NTS Map 83 B/8 Sylvan Lake NAD 27
Basemap Courtesy of Historic Resources Management Branch
Alberta Culture & Community Spirit
Project Location
Lacombe County Boat Lauches in
SW 22-39-2-W5M and NE 15-39-2-W5M
Proposed Boat Launch
Known archaeological site HRV=4
Known archaeological site HRV=0
N
W
E
S
0
1 km

Government of Alberta
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca

July 30, 2009

Project File: 4820-09-004

Mr. Peter Stevens
MPE Engineering Ltd.
302, 4702 - 49 Avenue
Red Deer, AB T4N 6L5

Dear Mr. Stevens:

SUBJECT: LACOMBE COUNTY
AGENT BEING MPE ENGINEERING LTD.
SYLVAN LAKE BOAT LAUNCHES
WITHIN SECTIONS 14, 15 & 22, TOWNSHIP 39, RANGE 2, W5M
***HISTORICAL RESOURCES ACT* REQUIREMENTS**

Bison Historical Services Ltd. has provided Alberta Culture and Community Spirit with information regarding the proposed Sylvan Lake Boat Launches at Kuusamo Krest and the Boy Scout Camp. Ministry staff have reviewed the potential for this development to impact historic resources and have concluded that **an Historic Resources Impact Assessment is required.**

HISTORIC RESOURCES IMPACT ASSESSMENT

Pursuant to Section 37(2) of the *Historical Resources Act*, an Historic Resources Impact Assessment (HRIA) report is required for the proposed boat launches. The HRIA is to be prepared in accordance with the instructions outlined in the attached Schedule "A". Should you require additional information or have any questions concerning the above, please contact Margret Ingibergsson at 780-431-2374 or by e-mail at margret.ingibergsson@gov.ab.ca.

On behalf of Alberta Culture and Community Spirit, I would like to thank officials of Lacombe County and MPE Engineering Ltd. for their cooperation in our endeavour to conserve Alberta's past.

Sincerely,

David Link, PhD
Executive Director

Attachment

cc: Bill Cade, Lacombe County
Christie Pituch, Bison Historical Services Ltd. (906-0479)

SCHEDULE "A"

HISTORICAL RESOURCES ACT REQUIREMENTS

LACOMBE COUNTY
MPE ENGINEERING LTD.
SYLVAN LAKE BOAT LAUNCHES
WITHIN SECTIONS 14, 15 & 22, TOWNSHIP 39, RANGE 2, W5M

(PROJECT FILE: 4820-09-004)

1. HISTORIC RESOURCES IMPACT ASSESSMENT - ARCHAEOLOGY

An Historic Resources Impact Assessment and any work resulting from this assessment is to be conducted on Lacombe County and MPE Engineering Ltd.'s behalf by an archaeologist qualified to hold an Archaeological Research Permit within the Province of Alberta. In order to conduct the Historic Resources Impact Assessment, the archaeological consultant must submit "An Application for an Archaeological Research Permit - Mitigative Research Project" to the Historic Resources Management Branch. Please allow ten working days for the permit to be processed.

Timing: The Historic Resources Impact Assessment is to be carried out prior to the initiation of any land surface disturbance activities under snow-free, unfrozen ground conditions.

Coverage: The Historic Resources Impact Assessment must include all areas of high archaeological potential within the development areas.

Additional Measures: Depending upon the results of the Historic Resources Impact Assessment, additional salvage, protection or preservative measures may be required.

Assessing Historic Structures within the context of primarily archaeological HRIAs: Archaeological consultants are to comply with the requirements for recording historic structures. For further information, please refer to the annotated October 2008 guidelines entitled *Requirements for recording and reporting historic structures within the context of archaeological HRIAs*. Any interim reports and the final report must stipulate whether or not any historic structures are present in the impact zone.

Submission of Interim Reports: Occasionally, an applicant is unable to delay the development schedule for a period of time sufficient for the consulting archaeologist to complete the submission requirements as stated in the *Historical Resources Act* and its Regulations. Interim reports are only accepted when *Historical Resources Act* clearance is of some urgency to the applicant. The submission of an interim report must be accompanied by a covering letter that clarifies the need for the interim report. It is preferable that interim reports be submitted by courier or mail. Facsimile copies of maps are generally poor quality.

These conditions shall be considered directions of the Minister of Alberta Culture and Community Spirit under the *Historical Resources Act*. Representatives of Lacombe County and MPE Engineering Ltd. are required to become knowledgeable of the conditions attached to this schedule.

FINAL REPORT
HISTORICAL RESOURCE IMPACT ASSESSMENT
Lacombe County Sylvan Lake Boat Launches in Kuusamo Krest (22 and 15-39-2-W5M) Boy Scout Camp (14 and 15-39-2-W5M) (ASA Permit 2009-169)

FINAL REPORT
HISTORICAL RESOURCE IMPACT ASSESSMENT
Lacombe County Sylvan Lake Boat Launches in Kuusamo Krest (22 and 15-39-2-W5M) Boy Scout Camp (14 and 15-39-2-W5M) (ASA Permit 2009-169)

Prepared for

Peter Stevens

MPE Engineering Ltd.
#302, 4702-49th Avenue
Red Deer, Alberta
T4N 6L5

on behalf of

Bill Cade

Lacombe County
RR3
Lacombe, Alberta
T4L 2N3

By

Michelle Wickham, M.A.

Bison Historical Services Ltd.
1A, 215-36th Ave. NE
Calgary, Alberta
T2E 2L4

September 7, 2009

EXECUTIVE SUMMARY

On behalf of MPE Engineering Ltd., acting as agent for Lacombe County, Bison Historical Services Ltd. has conducted an Historical Resources Impact Assessment (HRIA) of the Lacombe County Sylvan Lake Boat Launches. This investigation was initiated by a Bison HRO (09-032), which triggered the issuance of a Schedule 'A' by Alberta Culture and Community Spirit (ACCS) (Schedule A 4820-09-004) on July 30, 2009.

During the HRIA field investigations on September 2, 2009, no new historical resource sites were recorded as a result of visual inspection of the proposed project area. Two previously recorded historic sites are known to lie within the proposed development area and an attempt was made to revisit them as part of these HRIA field investigations. None of the 22 subsurface tests dug within the study area contained evidence of cultural materials.

Relocated historic site # 72472 identified as Isaac Lampi homestead loghouse and the Boy Scouts of Canada at Camp Woods, is no longer standing and is of low significance located within the proposed project area. The site area may be impacted by the proposed development.

In light of the complete lack of cultural material and standing historic structures, no further work is warranted. Therefore, **it is recommended that the Lacombe County Sylvan Lake Boat Launches be given clearance to proceed with construction.** This recommendation is subject to the approval of Alberta Culture and Community Spirit.

CREDITS

Permit Holder:	Michelle Wickham, M.A.
Field Personnel:	Michelle Wickham, M.A.
	Joe Moravetz, M.A.
Report Author:	Michelle Wickham, M.A.

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INTRODUCTION

On behalf of MPE Engineering Ltd., acting as agent for Lacombe County, Bison Historical Services Ltd. has conducted an Historical Resources Impact Assessment (HRIA) of the Lacombe County Sylvan Lake Boat Launches (See Figure 1 through Figure 3). The proposed project consists of the construction of two boat launches (Kussamo Krest and Boy Scout Camp) along the southwest shore of Sylvan Lake, within the Boreal Natural Region of Alberta, north west of the town of Sylvan Lake. The boat launch sites will involve the development of parking areas and day use facilities. The proposed boat launch development at the Boy Scout Camp will primarily impact areas that have been completely disturbed by years of camping activities. The proposed boat launch development project at Kuusamo Krest will impact disturbed and submerged areas of the shoreline.

This investigation was initiated by the issuance of a Schedule 'A' by Alberta Culture and Community Spirit (ACCS) (Schedule A 4820-09-004) on July 30, 2009. Schedule A requirements include:

- An HRIA is to be carried out prior to the initiation of any land surface disturbance activities under snow-free, unfrozen ground conditions,
- The HRIA must include all areas of high archaeological potential within the development areas
- All historic structures are to be recorded in compliance with the annotated October 2008 guidelines for recording historic structures.

There are no archaeological sites within the development areas; there are however two historic structures recorded within township 39-2-W5M in proximity to the Boy Scout Camp. Historic site # 72472 is recorded as both the Isaac Lampi homestead loghouse and the Boy Scouts of Canada at Camp Woods. Historic site # 72494 is recorded as the Isaac Lampi Homestead and is likely associated with Historic site # 72472. One purpose of this assessment was to determine what

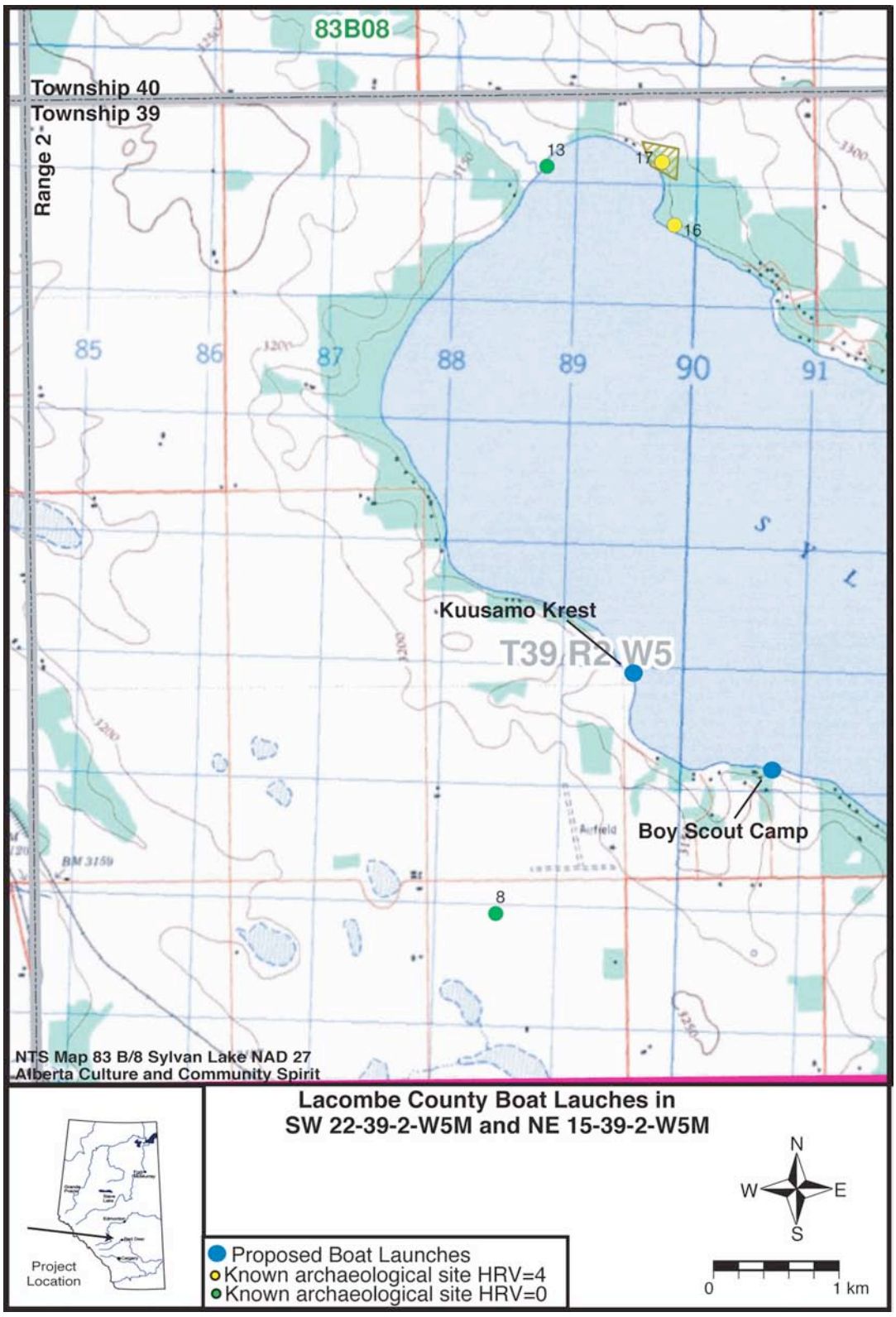


Figure 1: Project location

Figure 2: General location of the proposed development area

Figure 3: Approximate size of proposed development area

impact, if any, the proposed development would have on these two historic structures (#72472 and #72494).

Fieldwork was conducted under the direction of the author on September 2, 2009. Areas of native vegetation were examined by pedestrian survey, while subsurface testing was concentrated in areas thought to have a potential for buried historical resources. A total of 22 subsurface tests were excavated during the course of this study. No previously unrecorded historical resource sites were identified as a result of this survey.

This report will begin with a brief overview of the environmental and culture-historical contexts of the proposed project area. The results of a literature review outlining all previous archaeological work in the vicinity of the proposed project are also included. A summary is presented of the methodology by which the field component of this HRIA was conducted, followed by the results of this investigation.

THE STUDY AREA

An archaeological site represents a collection of features, artifacts and contextual material, the deposition of which is a product of past lifeways. The materials present reflect the environment that surrounded the inhabitants in a number of ways. Patterns of subsistence and settlement reflect the geology, climate, fauna and vegetation of the region. In a similar fashion, the range of materials present, their preservation and the integrity of archaeological sites are conditioned by depositional regimes and the soils present. For this reason, a summary of those facts describing the environmental context associated with this project is presented below. In the following section, a brief description of the historical context is provided.

The proposed project lies within the Boreal Natural Region of Alberta (NRC 2006). Spanning the width of the province from the Northwest Territories border to the aspen parklands of Central Alberta, it is the largest natural region in the province. Blanketed by tree cover, forestry development is a primary economic

activity throughout much of the region; oil and gas development is also extensive in several areas. Hunting and trapping are locally important activities in some communities. As much as 50% of the forest cover in the Dry Mixedwood, the southernmost subregion of the Boreal Natural Region, has been removed for agricultural development.

Short warm summers and long, cold winters characterize the Boreal Region, with a high variation in seasonal temperature averages. Given the size of the region, several climatic trends are notable, including increasingly cooler mean annual temperatures from south to north, coupled with increased continentality, or variation between seasonal highs and lows. The number of growing degree days is highest along the Athabasca River to the north and south of Fort McMurray and along the Peace-Athabasca Delta (*ibid.*).

Most of the Boreal region is characterized by undulating plains with some hummocky areas, with several distinct upland features such as the Caribou and Birch Mountains. The Boreal extends across most of the northern Alberta Plains geological region, but also includes parts of the Northern Plains, the Saskatchewan Plains, the Eastern Alberta Plains, and the Northern Alberta Uplands. Underlying geology consists primarily of Cretaceous deposits, with some Devonian sedimentary structures in the northeast (*ibid.*). As with most of Canada, this region was subjected to a long period of glacial advances and recessions during the Pleistocene Epoch, ending around 11,550 years ago (Lourens *et al*. 2004). Quaternary deposits blanket a majority of this region, particularly the uplands, consisting of a mix that includes glacial till, glaciolacustrine deposits, and glaciofluvial and eolian sands. The remaining land area is covered by unevenly distributed organic deposits, mainly concentrated in flat lacustrine areas, less common in hummocky areas (NRC 2006).

Many lakes are found in the region, most of them south of 57ºN latitude, as well as major watercourses including the Peace, Athabasca, Wabasca and Hay Rivers. Wetlands make up a dominant component of the Boreal Natural Region, including wooded, shrubby fens on organic deposits and major fen and marsh

systems on wet sands and mineral soils (*ibid.*).

Gray Luvisols are dominant, but Dystric and Eutric Brunisols are found with coarse sand deposits in the area. The Luvisols are common mainly to low-relief landforms with imperfect drainage, while Mesisols, Fibrisols and sometimes Cryosols are associated with fens and bogs. Orthic and Peaty Gleysols occur over about 5 percent of the area (*ibid*.).

Typical vegetation in the region varies with latitude, elevation and soil type, but mixtures of aspen, white spruce and jack pine stands are common, as are wet and poorly drained fens and bogs. Patches of grassland, consisting of northern rice grass, Rocky Mountain fescue, dryland sedges and plains wormwood, are very rare, occurring only in jack pine or black spruce forests on dry, coarse, well drained soils. Understory vegetation varies based on soil type, with lichen and bearberry associated with coarse, rapidly drained glaciofluvial deposits. Common blueberry, green alder, prickly rose, wild lily-of-the-valley and hairy wild rye are more common where the water supply is greater. On areas of average moisture and nutrient status, low bush cranberry, Canada buffaloberry, wild sarsaparilla and dewberry also appear, while in the moister, nutrient poor areas, Labrador tea, bog cranberry and feathermosses dominate (*ibid.)*.

A wide range of wildlife is abundant in the Boreal region, with species like beaver, moose and black bear being most characteristic (Strong and Leggat 1992). Elk, woodland caribou, mule deer and, in recent years, white-tailed deer also number among the large ungulates, while less common carnivores include gray wolf, wolverine and Canada lynx. Smaller mammals include snowshoe hare, porcupine, mink, marten, weasel, fisher, muskrat and skunk. Seasonal waterbirds thrive on the larger and smaller water bodies of the region, while upland game birds include a variety of grouse and ptarmigan.

Largely absent today is the wood bison (*Bison bison athabascae*), decimated by hunting at the end of the 19th century. In the Central Mixedwood, remnant herds can now be found in Wood Buffalo National Park and several remote upland areas.

By consuming the grasses and sedges found in small patches of grassland in the Boreal region, bison may have been partially responsible for maintaining these habitats. The disappearance of the bison from much of Alberta has likely been a contributing factor in modern forest encroachment (Mitchell and Gates 2002).

Fire suppression has also likely had an impact on the character of the Boreal Natural Region today. The hunter-gatherer practice of deliberately burning forest cover or grassland, clearly documented in Alberta's historic record, may have helped make the movement of large ungulates more predictable, enabling higher human carrying capacities (Boyd 2002). The prevalence of this traditional practice among native groups in Alberta (Lewis 1978, 1982; Williams 1994) may strongly indicate a potential impact on Boreal ecosystems.

CULTURAL BACKGROUND

The Boreal Natural Region of Alberta encompasses an area of 473,093 km^2, 71.5% of the province's landmass. In spite of its expanse, or perhaps because of it, our knowledge of Northern Alberta prehistory is limited. In an archaeological perspective, the Boreal Archaeological Province can be subdivided into two districts: the Northeast and the Upper Peace River/Grande Prairie. The archaeology of the latter area is distinguished by a strong representation of Plains-like Early Prehistoric projectile point types. The archaeology of the Northeastern District is more poorly known, likely as a result of less agricultural development. Chronologies are particularly difficult to reconstruct in this region, largely due to poor organic preservation and limited sedimentation.

Present chronological information is restricted to small regions including, for example, the Caribou Mountains (Donahue 1976), the Birch Mountains (Donahue 1976; Ives 1983), the Lower Peace River area (Stevenson 1985), the Lake Athabasca area (Wright 1975), the Clearwater-Athabasca River area (Syncrude Canada 1974; Donahue 1976; LeBlanc and Ives 1986; Saxberg et al. 2003), the Lake District between Lesser Slave Lake and Lac La Biche (Gruhn 1981;

McCullough 1982) and the Peace River/Grande Prairie region (Thomson 1973; Bryan et al. 1975; Damkjar 1987; Head 1993).

Local sequences have been compared to sequences developed for surrounding regions in the Yukon and Northwest Territories. Comparative sequences include those for the Canadian Shield (Wright 1972), Fisherman Lake (Millar 1968), the Central District of Mackenzie (Noble 1971), and the Southwest Yukon (Workman 1977). Although this brief culture historical reconstruction is based on limited information and a broad area, this discussion of complexes is intended to encapsulate major regional trends in general fashion (Figure 4). The complex names presented here are preliminary organizational units and are neither formally defined nor widely accepted.

The earliest occupation of Boreal Alberta seems largely restricted to the Peace River/Grand Prairie region. As used here, basally thinned spear points represent the Charlie Lake Complex with some similarities to Clovis. Specimens of this type are known in surface finds throughout the region (Ives 1991) as well as in archaeological contexts at Charlie Lake (HbRf-39: Fladmark et al. 1988) and the Pink Mountain Site (HhRr-01: Wilson 1989) in British Columbia. Four dates on the Clovis occupation at Charlie Lake suggest an age of 10,500 BP. Although Northeastern Alberta was likely ice-free by this time, there is no evidence for human occupation in that area.

In the west, the Saskatoon Complex succeeds the Charlie Lake Complex. Numerous occurrences of large lanceolate and stemmed spear points are reported from surface finds in the Peace River/Grand Prairie region. Although the Saskatoon Mountain site near Grande Prairie does not contain these early diagnostic types, the site has been attributed to this complex. Principal among these point types are large stemmed specimens executed in black cherts that strongly resemble Hell Gap, Scottsbluff and Alberta types. There is no reason to surmise that these are significantly younger than those found on the Plains (9,450-8,950 BP).

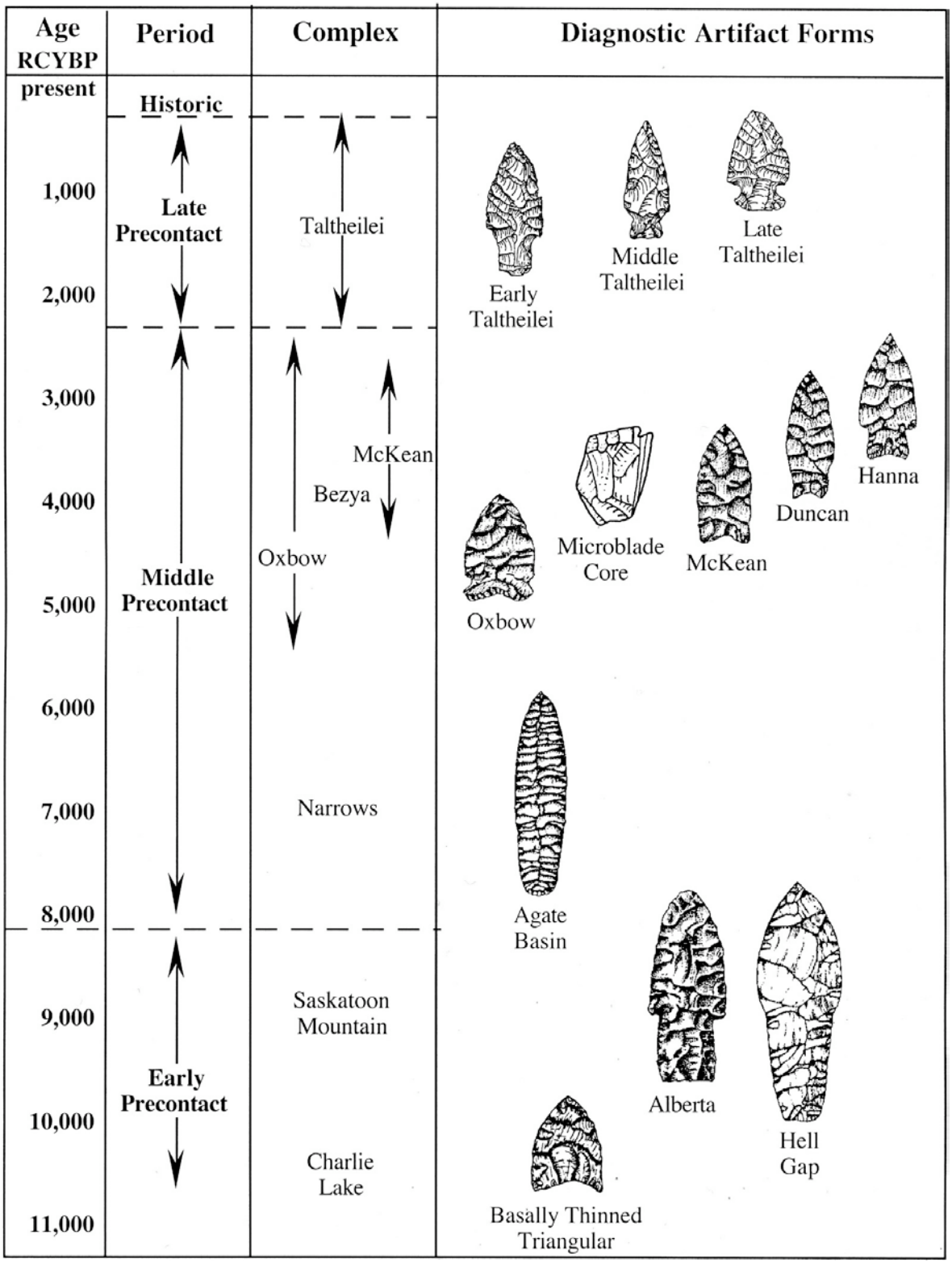


Figure 4: Chronological overview of Precontact Northern Alberta

In the east, large, broad-bladed lanceolate and stemmed spear points have been identified at several sites associated with fossil beach ridges in the oilsands region. Assemblages with broad lanceolate spear points have been assigned to the Fort Creek Fen Complex (9,900 to 9,400 BP), while assemblages with large stemmed projectile points have been assigned to the Nezu Complex (9,400 to 8,500 BP) (Saxberg et al. 2003). These assemblages are dominated by use of locally quarried stone and are interpreted as a colonizing population following the catastrophic Lake Agassiz floods through the Clearwater and Athabasca valleys.

The Narrows Complex in the west and the Cree Burn Lake Complex in the east follow the Saskatoon Mountain Complex. The Narrows Complex is here used to describe the Acasta Lake-like occurrence of Agate Basin points (ca. 7,000 BP), reasonably common finds in the North. Notably, the Agate Basin occupation appears to represent a younger or relic population as compared to similarly defined occupations on the Plains. In the oilsands region, obliquely flaked Agate Basin or Lusk spearpoints in association with finely made endscrapers, burins and blades are assigned to the Cree Burn Lake Complex with an estimated age of 9,400 to 7,750 BP (*ibid*.).

The beginning of the Middle Precontact is a period for which there is little information in Northern Alberta. In the oilsands region it begins with the Beaver River Complex, believed to develop out of the preceding Cree Burn Lake Complex and characterized by large side- and corner-notched dart points estimated to date between 7,750 and 5,000 BP (*ibid*.). However, radiocarbon dates for this period are limited to the Wentzel Lake Site (5,220 ± 140 BP, 4,100 ± 130 BP) and Cormie Ranch Site (4,490 BP) where no definitive diagnostics except for fragmentary side- and corner-notched points are present.

Dating to about 3,900 BP is a widespread but diffuse occurrence of microblades and cores in Northern Alberta. Referred to here as the Bezya Complex, microblades are known to occur in the Grand Cache region (Brink and Dawe 1986), Vermilion (Pyszczyk 1991), Calling Lake (Gruhn 1981), and Fort Mackay (LeBlanc

and Ives 1986). Microblade cores have been reported in the Edmonton area as well (Ronaghan et al. 1983).

During the remainder of the Middle Precontact Period there are few dated sites. However, Oxbow points are widely reported. The Oxbow Complex on the Plains is dated to the period between 5,500 and 2,500 BP, but it has been suggested that its manifestation at the edge of the Boreal Forest falls late in this span (Spurling and Ball 1981). Oxbow points are reported for Lac La Biche (McCullough 1982), Lake Wabasca (Sims 1977; Head 1987), Musreau Lake (Buchner 1977) and elsewhere. Also present at this and more recent times are McKean, Duncan and Hanna style dart points similar to those recovered on the Plains (Buchner 1977; Gruhn 1981; McCullough 1982), possibly representing a diffusion of style into the north (Gruhn 1981). A date of 2,795 BP at the Eaglenest Portage Site may represent this complex.

Beginning about 2,400 BP, there appears evidence for a distinctive tradition elsewhere referred to as Taltheilei (Noble 1971, 1977). In the Boreal Ecoregion of Alberta, this tradition is widely represented by occurrences of small, stemmed lanceolate points, and later by side-notched and corner-removed arrow points (Gruhn 1981). Excavated sites include Peace Point (1,040 ± 75 BP), Eaglenest Portage (1,030 ± 110 BP), the Wentzel Lake Site (1,440 ± 110 BP), the Karpinski Site (1,070 ± 55 BP) and several sites at Calling Lake (Gruhn 1981; Ives 1983).

The close of the Precontact period is difficult to determine with any accuracy. It is likely that European trade goods preceded the actual arrival of European explorers and traders. First contact is reported to have occurred in the extreme northeast in the early 1700s (Swan between 1715 and 1721; see Ives 1983). This was followed by the establishment of fur trade posts in the late 1700s and early 1800s. The fur trade industry was to dominate relations in the North for almost a century. Land surrender in the Boreal Ecoregion occurred in 1899 with Treaty No. 8 and, in Alberta, involved the Cree and Beaver (White 1912).

PREVIOUS RESEARCH

The goals of this summary are threefold. The first objective is to identify any previously recorded historical sites that may be impacted by the proposed development. A second goal is to provide a reasonable assessment of the quantity, type and distribution of known sites in the near vicinity of the proposed development. A final goal is to provide an indication of the nature and scope of previous investigations in the development area.

Details of known historical resource sites are recorded in Archaeological Site Inventory Data forms, Historic Site forms and final project reports, all of which are kept on file with the Historic Resource Management Branch of Alberta Culture and Community Spirit (ACCS). The significance of historical resources is denoted by a ranked Historic Resource Value (HRV), ranging from 5 for potential significance through 1 for the most important known historical sites in the province (HRMB 2008). Individual archaeological sites are identified using the Borden system (Borden 1952).

The Borden system is a Canada-wide, geographically based system for recording historical sites which divides the country into rectangular "blocks". In this part of Canada, each block is ten minutes of latitude by ten minutes of longitude. A Borden block in the vicinity of Calgary encompasses an area somewhat larger than two Townships (ca. 80 miles). Each block is referred to by a four-letter code uniquely describing the location of that block. Sites are sequentially numbered within each block in the order in which they are discovered and reported. The proposed development encompasses Borden block FcPn.

Borden block FcPn encloses the area between 52˚20' and 52˚30' north latitude, and 114˚10' and 114˚20' west longitude. At the time of this HRIA, 17 heritage sites have been recorded in this Borden Block. The majority of these sites are located to the north east in areas of greater relief, surrounding the Medicine Lodge Hills, although a single site is located within a relatively flat area to the south.

The first site (FcPn 1) represents an isolated flake reported in this block during the course of a government-sponsored project during the 1970s. The next campsite (FcPn 2) was recorded by Reeves (1976) during a pipeline survey. Five isolated finds (FcPn 3, 4, 5, 6 and 7), were recorded by Coulton during work in 1977 and 1978. VanDyke (1983a, 1983b) identified two lithic scatters (FcPn 8, 9) in cultivated fields. An additional site (FcPn 10) was first identified by McCullough (1985) by the presence of a biface in a ploughed field. The site was later revisited (McCullough 1988) but no additional historical resources were detected. An additional five sites (FcPn 11, 12, 13, 14 and 15) were identified during government-sponsored collection projects in the 1980s and early 1990s. These sites include a surface scatter, burial, a natural wintering area, and two campsites. The last two and most recently identified sites were recorded by Enns-Kavanagh (2007) and consist of a cairn (FcPn 16) and the John and Eve Palm Homestead (FcPn 17). Of the 17 sites thus far recorded in the FcPn Borden block, none lie within one kilometre of the proposed Lacombe County Sylvan Lake Boat Launches (See Figure 1).

The First Nations heritage resource sites previously recorded in the region surrounding the study area are, for the most part, surface lithic scatters and surface campsites of limited heritage resource significance; one exception is the presence of a burial site represented by a grave in the Sunset Hills. The recorded distribution of such sites is largely the result of judgmental and industry-biased sampling and cannot be considered exhaustive.

METHODOLOGY

Field studies for this HRIA were undertaken on September 2, 2009 under the direction of the author and in accordance with requirements set out by the Government in the Guidelines for Archaeological Permit Holders in Alberta (ASA 1989) and the Archaeological and Palaeontological Research Permit Regulations (Alberta 2002). The work was conducted pursuant to Section 37(2) of the Historical Resources Act.

The objective of this HRIA was to identify, evaluate and develop avoidance or mitigation strategies for historical resource sites that might be impacted by the proposed development. Over time, archaeological materials can be buried through fluvial, aeolian and organic activity, ground slump and other processes; the same factors can play a part in their re-exposure. In consideration of these depositional processes, both surface and subsurface deposits must be investigated.

Surface reconnaissance was conducted on foot across those parts of the proposed development area associated with undisturbed land and/or those parts with notations in the Listing of Historic Resources (HRMB 2008). This survey was conducted under snow free and frost free conditions with clear surface visibility. In all cases, opportunistic observation was made of exposures such as rodent spoils, erosional cuts and blowouts for evidence of buried historical resources.

Subsurface testing served as a further aid to the identification of historical resources. Standard subsurface tests are excavated by shovel, measuring 40 cm x 40 cm, with the back dirt sorted by hand. During this survey, a total of 22 subsurface tests were excavated to a depth of 40 cm – 50 cm.

The results of the HRIA field research for the proposed Lacombe County Sylvan Lake Boat Launches are presented in the following section.

RESULTS

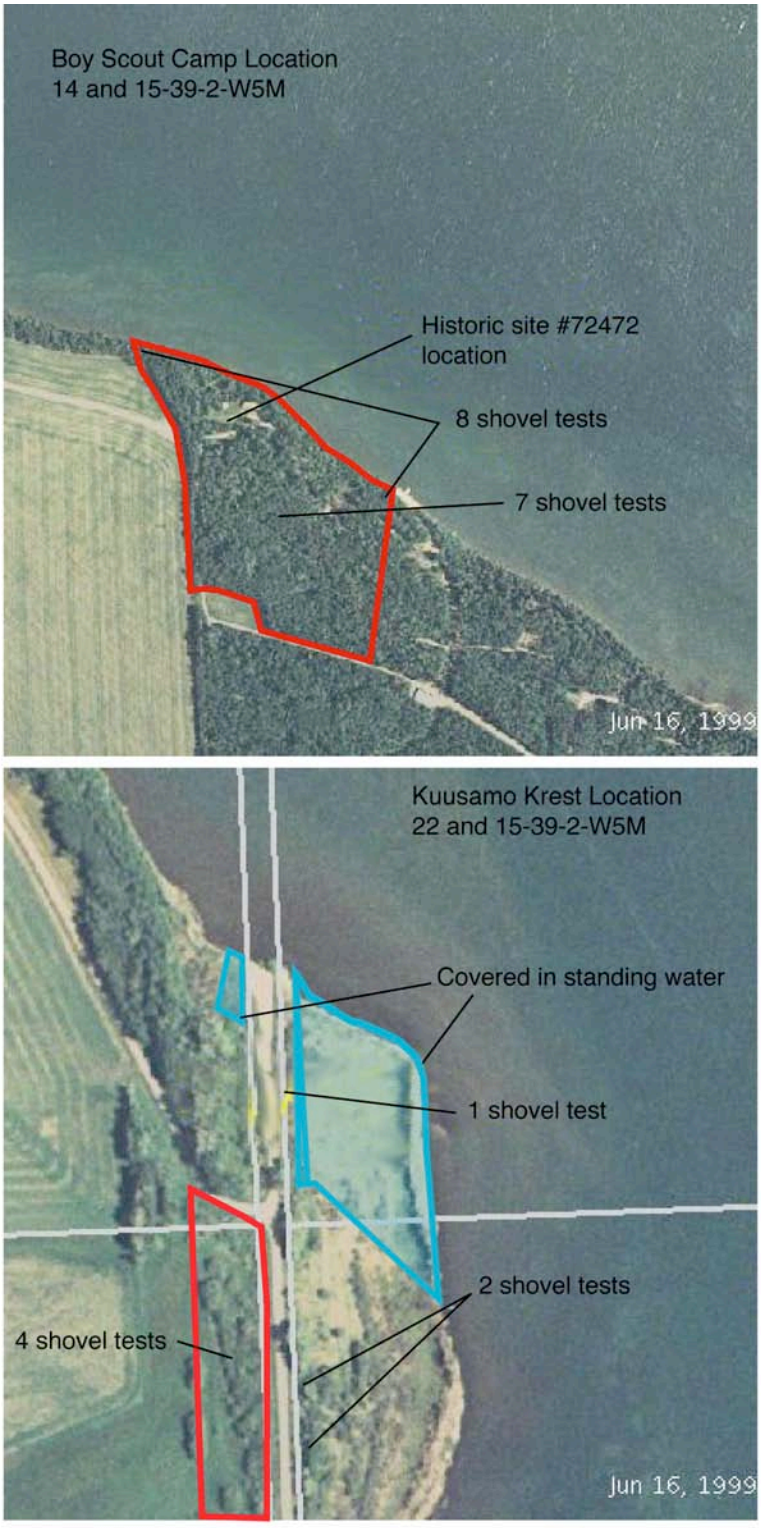
On September 2, 2009, the author, with the assistance of Joe Moravetz, conducted the HRIA for the proposed Lacombe County Sylvan Lake Boat Launches.

The proposed project consists of the construction of two boat launches along the southwest shore of Sylvan Lake, within the Boreal Natural Region of Alberta, north west of the town of Sylvan Lake. The boat launch sites will involve the development of parking areas and day use facilities at both locations. The proposed boat launch development at the Boy Scout Camp will primarily impact areas that have been completely disturbed by years of camping activities. The proposed boat launch development project at Kuusamo Krest will impact disturbed areas of the shoreline. Twenty-two subsurface tests were excavated during this HRIA within the proposed development right-of-way as part of the assessment of historical resource sites and in search of potential new sites (Figure 5). During the fieldwork investigations, no previously unidentified historical resource sites were recorded and a single known Historic site location within the proposed development area was relocated.

The proposed project consists of the construction of two boat launches in two separate locations, Kuusamo Krest (22 and 15-39-2-W5M) and Boy Scout Camp (14 and 15-39-2-W5M) as such, they will be discussed separately below.

Boat Launch at the Boy Scout Camp at Camp Woods (14 and 15-39-2-W5M)

Much of this area has been extensively disturbed through recreational activities and use by the Boy Scouts of Canada. There is very little soil development, three to five cm, and in many areas the top soil and boreal vegetation has been cleared for the development of roads, activity areas and outbuildings. The entire proposed development area, was investigated through pedestrian survey. The only area with moderate potential for undisturbed archaeological resources is the escarpment edge above the south edge of the lake. Eight shovel tests were



Area outlined in red was investigated through pedestrian survey.

Area in blue is under standing water

Figure 5: Areas investigated during the current survey

placed at intervals along this edge, all yielded negative results. An additional seven shovel tests were randomly placed within the proposed development boundaries. Again, all yielded negative results.

A pedestrian survey was conducted within the proposed development boundaries within the south east 1/4 of section 15-39-2-W5M, historic site forms indicate that the Isaac Lampi Homestead (#72494) is likely located in this quarter section. Historic material or depressions were not observed during the survey of this small-undisturbed area along the escarpment. The remainder of the SE1/4 section has been extensively disturbed through modern farming activities. Along the edge of the clearing for Gilwell Hall (at Camp Woods), just north of the know location of the Isaac Lampi homestead loghouse (#72472), 14 sandstone slabs were observed on the surface (some overgrown by sod) (Figure 6). Some sandstone slabs were rectangular and ranged in size between 20 – 40 cm. The slabs were not arranged in any recognizable pattern and covered an area approximately 25 m east / west and five m north / south. These do not appear to be natural as sandstone was not recovered from any of the shovel tests and was not observed elsewhere in the project area, however no information on their antiquity or function is available. They may be related to the Boy Scout buildings, or to the Isaac Lampi homestead loghouse. The historic structure form states that the loghouse had a flagstone foundation; it is possible that these sandstone slabs were once foundation stones that have been dispersed over the years.

Historic site forms also indicate that the Isaac Lampi homestead loghouse (#72472) may also be located in this area. Personnel communication with Wayne Stade, Camp Ranger, provided us with the location of this loghouse. The loghouse has been completely destroyed, the topsoil has been scraped leaving a large mound of soil (Figure 7). The only remaining indication of a historic structure are two pieces of cement adjacent to the pile of dirt (Figure 8). See below for more detail.

Figure 6: Example of (2) sandstone slabs in the foreground of the photo

Figure 7: Location of the Isaac Lampi homestead loghouse (#72472), view south

Figure 8: Photo of concrete, shovel marks one piece

Boat Launch at Kuusamo Krest (22 and 15-39-2-W5M)

Although the proposed development plans indicate that the sandy beach in the north west 1/4 of 15 and the south west 1/4 of 22-39-2-W5M (along the east side of the road) are within the proposed boundaries, while conducting this survey these areas where found to be submerged under water (Figure 9). Personal communication with Peter Stevens, MPE representative on August 31, 2009, indicates that Lacombe County will not be developing lands that are submerged. Given this, the areas within the proposed development boundaries along the west side of the road were the focus of the pedestrian survey and shovel tests. Four shovel tests were placed within the meadow, all yielded negative results (Figure 10). However, three shovel tests were placed along the east side of the road in areas that appeared to hold limited potential for archaeological resources. All three shovel tests yielded negative results and standing water (Figure 11).

Figure 9: Area along east side of road

Figure 10: Meadow along west side of road

Figure 11: Shovel test location along the east side of the road

REVISITED HISTORICAL RESOURCE SITES

Of the 17 historical resource sites in Borden block FcPn, two historic structures have been recorded within or near the project area and an attempt was made to revisit both (#72472 and #72494) during this HRIA.

An attempt was made to relocate historic site #72494, the Isaac Lampi Homestead. An intensive pedestrian survey was conducted within the proposed development boundaries within the southeast 1/4 of section 15-39-2-W5M. However, historic material or depressions were not observed during the survey of this small-undisturbed area along the escarpment. The remainder of the SE1/4 section has been extensively disturbed through modern farming activities.

Historic site #72472

Site Class: **historic structure** Sub Type: **log**
Site Type: **loghouse** Site Condition: **destroyed**

Site Location:

LSD 05, Section 14, Township 39, Range 02, West of 5th Meridian
(NAD 83) 11U 0691210 Easting 5804213 Northing

Impact: **possible** Significance: **low** Recommendations: **none**

From Highway 2 head west on highway 11A. From highway 11A, head north on range road 22 to township road 392. Follow township road 392, .4 km to the entrance to Camp Woods. Once inside Camp Woods, follow trail north, at the intersection head west. Follow trail past the chapel, the obstacle course and the bouldering wall, once past the bouldering wall follow the trail north to Gilwell House. The location of historic site #72472 is directly south and east of Gilwell House (on the south side of the road).

Historic site #72472 is located within a clearing (the top soil has been removed) in the boreal forest, several hundred metres south of Sylvan Lake. Shovel tests were not placed in the clearing. This site visit confirms that the loghouse has been completely destroyed, the topsoil has been scraped leaving a large mound of soil, the only remaining indication of a historic structure are two pieces of cement foundation adjacent to the pile of dirt (See Figure 7 and Figure 8).

Given that the structure has been destroyed this site has very limited archaeological significance, no further work is recommended.

SUMMARY AND RECOMMENDATIONS

On behalf of MPE Engineering Ltd., Bison Historical Services Ltd. has conducted an Historical Resources Impact Assessment (HRIA) of the Lacombe County Sylvan Lake Boat Launches, located along the south west shore of Sylvan Lake.

On September 2, 2009, the author and Joe Moravetz carried out the fieldwork for this HRIA. Work included ground surface survey augmented by judgmental subsurface testing of areas of high potential for buried archaeological resources. Twenty-two subsurface tests were excavated as part of this fieldwork. No newly identified historical resource sites were recorded and a single previously identified site was relocated during the course of this HRIA.

Historic site #72472 is a historic structure recorded in 1972. It was revisited in 1975 and the condition of the structure at that time was recorded as threatened. At present the loghouse has been completely destroyed, the topsoil has been scraped leaving a large mound of soil, the only remaining indication of a historic structure are two pieces of cement foundation adjacent to the pile of dirt. The location of the site occurs within the proposed development Boy Scout Camp boat launch boundaries. Given that the structure has been destroyed, historic site #72472 is deemed to be of low archaeological significance.

In summary, given that cultural material was not recovered, the one known historic structure has been destroyed (#72472), and the other was not relocated (#72494), **no further work is warranted in relation to the Lacombe County Sylvan Lake Boat Launches**. Therefore, **it is recommended that the Lacombe County Sylvan Lake Boat Launches be given clearance to proceed with construction.** These recommendations are subject to the approval of Alberta Culture and Community Spirit.

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APPENDIX 1: Historic Site Form

FINAL REPORT HISTORICAL RESOURCE IMPACT ASSESSMENT
Lacombe County Sylvan Lake Boat Launches
(ASA Permit 2009-169)

Bison No. 906-0479; Permit No. 2009-169

Alberta

SITE FORM

Heritage Survey

[1]Key H S

[2]Site Name

[3]Other Name(s)

[4]Site Type

Legal Description

[5]LSD	[6]Quarter	[7]Section	[8]Township	[9]Range	[10]W-M

[11]Lot

[12]Block

[13]Plan

[14]Metes & Bounds

[15]Address [16]Number

[17]Street [18]Avenue [19]Other

[20]Town [21]Near Town [22]County

NTS [23]Grid / [24]Letter / [25]Number ___ / ___ / ___ [26]Name

UTM

[27]Zone	[28]Easting	[29]Northing	[30]Datum	[31]Coordinate Determination

[32]Latitude	[33]Longitude	[34]Datum	[35]Coordinate Determination

Image 1

[36]Negative

[37]Other

[38]View

[39]Date

[40]Source

Visual Description

[41] Style

[42] Plan Shape

[43] Storeys

[44] Foundation

[45] Superstructure

[46] Superstructure Cover

[47] Roof Structure

[48] Roof Cover

[49] Exterior Codes

[50] Exterior

[51] Interior

[52] Environment

[53] Condition

[54] Alterations

[1]Key H S

	Description	Date (dd/mm/yyyy)	Code
[55]Construction		[56]	[57]
[58]Usage		[59]	[60]
[61]Owner		[62]	

Image 2

[36]Negative

[37]Other

[38]View

[39]Date

[40]Source

Image 3

[36]Negative

[37]Other

[38]View

[39]Date

[40]Source

Text Fields

63 Architect

64 Builder

65 Craftsman

66 History

67 Sources

68 Status

Date (dd/mm/yyyy)

69

70 Form Completed By

71

Office Use

72 Priority

73 Geo Code

74 Borden Number

75 Register

Government of Alberta
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca

October 5, 2009

Project File: 4820-09-004
Permit File: 2009-169
Bison # 906-0479.

Mr. Peter Stevens
MPE Engineering Ltd.
302, 4702 - 49 Avenue
Red Deer, AB
T4N 6L5

Dear Mr. Stevens:

SUBJECT: LACOMBE COUNTY
AGENT BEING MPE ENGINEERING LTD.
SYLVAN LAKE BOAT LAUNCHES
WITHIN SECTIONS 14, 15 & 22, TOWNSHIP 39, RANGE 2, W5M
***HISTORICAL RESOURCES ACT* CLEARANCE**

Alberta Culture and Community Spirit has received a final report from Bison Historical Services Ltd. regarding the results of the Historic Resources Impact Assessment of the proposed Sylvan Lake Boat Launches at Kuusamo Krest and the Boy Scout Camp. One historic resource site was revisited and the Historic Resources Management Branch has no further concerns with this site. Therefore, *Historical Resources Act* clearance is granted for the Sylvan Lake Boat Launches at Kuusamo Krest (15 & 22-39-2-W5M) and the Boy Scout Camp (14 & 15-39-2-W5M).

Should you require additional information or have any questions concerning the above, please contact Margret Ingibergsson at 780-431-2374 or by e-mail at margret.ingibergsson@gov.ab.ca.

On behalf of Alberta Culture and Community Spirit, I would like to thank officials of Lacombe County and MPE Engineering Ltd. for their cooperation in our endeavour to conserve Alberta's past.

Sincerely,

David Link, PhD
Executive Director

cc: Bill Cade, Lacombe County
Michelle Wickham, Bison Historical Services Ltd.

APPENDIX C

Review of Policies, Standards and Practices

by Armstrong Consulting Services

LACOMBE COUNTY
SYLVAN LAKE BOAT LAUNCH STUDY

REVIEW OF POLICIES, STANDARDS AND PRACTICES

JANUARY 2010

ARMSTRONG CONSULTING SERVICES

Lacombe County
Sylvan Lake Boat Launch Study

Policies, Standards and Practices

1. Introduction

Lacombe County has identified the need to address existing crowding and congestion problems at boat launches on Sylvan Lake. Improvements to the existing boat launch at Sun Breaker's Cove and investigations of a new launch site on the northwest shoreline of the lake are under consideration.

Armstrong Consulting Services (ACS), in cooperation with MPE Engineering Ltd, is undertaking the boat launch study for Lacombe County. In order to assist with the design of the Sylvan Lake boat launches, ACS reviewed boat launch policies, standards and practices from municipal, provincial and federal government agencies. The following report presents a synopsis of findings.

2. Policies and Standards

Provincial and federal government staff and references were researched to identify the existing policies and standards for design and construction of boat launches. A web search was conducted to identify relevant policies and standard from other agencies in North America.

Unfortunately, there is very little written information available on specific policies or standards for boat launches. The unique design requirements of each boat launch site makes it difficult to provide specific directions.

The following are a few general guidelines provided verbally by staff from local federal and provincial environmental agencies.

- A licence of occupation is required for placement of boat launches and associated structures on the bed and shore of lakes.
- Public notice (newspaper advertisement) must be provided for an application to proceed.
- Structures that are permanently fixed to the lakebed are discouraged (e.g. removable docks preferred over fixed piers).
- Design should avoid areas of fish or wildlife habitat.
- Compensation for habitat loss may be required.
- Dredging of the lake bottom to provide sufficient water depth is strongly discouraged.
- Shoreline disruptions should be minimized and stabilization/protection measures provided where disturbance occurs.
- The risk of erosion and sedimentation should be minimized and protection measures implemented during construction.

In the early 1980's, Alberta Recreation and Parks (now Alberta Tourism, Parks and Recreation) developed Landscape Architectural Guidelines that address standards and guidelines for boating infrastructure. Although dated, these Landscape Architectural Guidelines provide the best available direction for planning and designing boat launches. The Guidelines address the following:

- Site and Environmental Criteria
- Location and Access
- Parking
- Motorized Boating Facility Standards (e.g. widths, slopes, water depths)

A copy of the Landscape Architectural Guidelines is available from Alberta Tourism, Parks and Recreation.

3. Practices

Site inspections of major boat launches at lakes in Central Alberta were conducted to observe design features, facilities provided, parking capacities, and assess the functionality of the boat launches. When possible, the inspections were scheduled during peak use periods in order to assess the successes and failures of the existing launches.

Boat launch site inspections were conducted at:

- Pigeon Lake Provincial Park,
- Gilwood Subdivision on Pigeon Lake (operated by Leduc County),
- Mulhurst Bay on Pigeon Lake (operated by Wetaskiwin County),
- Aspen Beach Provincial Park on Gull Lake,
- Jubilee Park on Wizard Lake (operated by Leduc County).

A summary of observations, lay out drawings and pictures of each boat launch follow.

Boat Launch Site Inspection
Pigeon Lake Provincial Park

The boat launch at Pigeon Lake Provincial Park (SE 6 T 42 R1 W5M) is the largest and busiest on the lake. The launch and original parking lot were built in the 1970's with a major parking expansion around 2007. The launch is located immediately adjacent to the Park's Day Use Area (concession, beach, picnicking, playground) and the Park campground.

The site is a double boat launch with three rows of concrete pads, with a large diameter turning circle (20 metres +/-) and pull-off area for unfastening/fastening boats before/after launching. A toilet, fish cleaning stand, waste receptacles and picnic tables are associated with the boat launch. Two parking lots are provided for vehicles and trailers with a capacity of approximately 70 vehicle/trailer units.

Pigeon Lake Provincial Park Boat Launch Layout

(Since this air photo was taken, a new parking area has been added north of the existing lot.)

Pigeon Lake Boat Launch June 27, 2009

Double launch

Triple concrete pads

Parking lot #1- 38 units

Parking lot #2- 32 units

Double toilet

Vehicle stacking lane, fish clean stand, waste receptacle

Boat Launch Site Inspection
Gilwood Subdivision on Pigeon Lake

The launch at Gilwood Subdivision (north end of Pigeon Lake NE14 T47 R2 W5M) is located on a road allowance and narrow strip of Municipal Reserve surrounded by cottage residences (similar to Sunbreaker's Cove). Parking is constrained with frequent complaints from subdivision landowners about parking congestion along the subdivision roads. Leduc County reconstructed the site in 2006.

The site is a single boat launch with a gravel surface, a 30-metre metal pier, and portable toilet. A turning circle (outside diameter-10 metres) is provided at the launch, with a parking lot for about a dozen vehicle/trailer units. Camping is not allowed and no picnic tables or waste receptacles are provided. Chain link fencing separates the launch area from adjacent private properties.

Gilwood Subdivision Boat Launch Layout

(Parking lot on municipal reserve added after air photo taken)

Gilwood Subdivision Boat Launch June 27, 2009

Single gravel launch

Metal dock 30-metres

Parking on road allowance (6 units)

Parking on municipal reserve (7 units)

Over-flow parking on road

Portable toilet

Boat Launch Site Inspection
Mulhurst Bay on Pigeon Lake

The launch at Mulhurst Bay is on the northeast shore of Pigeon Lake (SW 14 T47 R28 W4M) and was completely rebuilt by Wetaskiwin County in 2005. The launch is unusual in that it is located on a landfill area that parallels the original shoreline and adjacent roadway. The launch is located within the Hamlet of Mulhurst Bay where space is at a premium. Parking for the launch is provided at a separate location about 300 metres north.

At Mulhurst Bay there is a double launch with triple rows of concrete pads and a metal/wood dock about 12 metres long. No toilet facilities are provided, but there are benches and waste receptacles. Vehicle stacking lanes are located on the landfill with a T-shaped turnaround and back-in lane at the boat launch. Twelve pull-though parking stalls are provided at the separated parking lot. Over-flow parking occurs on nearby streets.

Mulhurst Bay Boat Launch June 27, 2009

Vehicle stacking lanes on landfill parallel to shoreline

Vehicles waiting to launch on landfill

Double launch with triple concrete pads

Metal/wood dock 12-meters

Parking lot about 300 metres from launch

Over-flow parking along roads

North parking lot for 12 units

Boat Launch Site Inspection
Aspen Beach Provincial Park Gull Lake

Aspen Beach Provincial Park has three boat launches. The primary launch is built on the south shore of Gull Lake (NE 21 T40 R28 W4M) between the Brewer's Campground and Ebeling Day Use Area. There are actually two mirror image launches that separately service the campground and day use area.

The launches are located on a narrow peninsula that acts as a stacking lane for waiting vehicles, with turning circles at the end (outside diameter 24 metres). The Day Use side is a double launch with triple rows of concrete pads and a long 30 metre + floating dock (Jetfloat Ltd). Furnishings at the launch include fish cleaning stands, waste receptacles, with multiple toilets located nearby. The Day Use boat launch parking lot will accommodate 20 units in pull-through stalls, plus 12 nose-in angle stalls and 20 nose-in straight stalls.

Aspen Beach Provincial Park Boat Launch Layout

Aspen Beach Provincial Park Day Use Boat Launch July 19, 2009

Double launch with triple rows of concrete pads

Floating dock 30-metres

Dock attachment to allow for fluctuating water levels

Parking lot for 50 vehicles/trailers +/-

Fish cleaning stands and waste receptacles

Boat Launch Site Inspection
Jubilee Park on Wizard Lake

The boat launch at Jubilee Park is located on the north shore of Wizard Lake (SE 2 T48 R27 W4M). The launch and parking lot were built by Leduc County in 2005 as part of the upgrading of the Day Use Area at Jubilee Park.

A turning circle (36 metres outside diameter) acts as a stacking lane and turnaround. This is a single launch with two rows of concrete pad and a wheeled metal dock (12 metres long). A portable toilet and double vault toilet are located near the launch, along with waste receptacles. The parking lot includes 32 nose-in and pull-through stalls for vehicle and boat trailers, plus 40 nose-in stalls for other day use visitors. Over flow parking is accommodated in a separate location about 350 metres north of the boat launch. A day use/parking fee is in effect with fee collection utilizing an electronic pay station.

Jubilee Park Boat Launch July 28, 2009

Large diameter (36 metres) turn around/stacking lane

Single launch with double row of concrete pads. Metal dock 12 metres

Angle parking for 16 units

Pull-through parking for 16 units

Electronic pay station

Parking rules

Sign to speed up launching process

Double toilet

Edge hazard marking

Tire hazard from concrete pad separation

4. Conclusions

The review of government policies and standards, plus inspections of existing boat launches on other Central Alberta lakes identified a number of key features for consideration in the design of the Sylvan Lake boat launches.

- Launch facilities should be designed to accommodate water level fluctuations. Preferred water depth at end of launch pads is 1-1.5 metres.
- Ideal slope on shoreline portion of launch is 2-10 % and 10-15% for the submerged portion of the launch.
- Double launches with triple rows of concrete pads are recommended if space allows.
- Concrete pads are required on the lakebed and shoreline to accommodate larger boats.
- Adjacent docks greatly assist with the launching process. Non-permanent docks (i.e. seasonally removable) are preferred by government agencies.
- Long stacking lanes with turnarounds for vehicles and trailers make launching faster and easier for boaters. Signs can encourage people to prepare their boats while waiting to speed the launching process.
- Space should be provided along the exit road from the launch for people to properly secure their boat to the trailer away from the busy launching area.
- Service roads and parking should be designed for large trailer units driven by inexperienced operators.
- Provide a minimum of 50 to 75 vehicle/trailer parking stalls to accommodate normal loading. If possible, parking should be provided for approximately 125 vehicle/trailer units to meet peak weekend loading.
- Site furnishing typically include a fish cleaning stand, waste receptacles and a toilet. Picnic tables and benches are also desirable.

APPENDIX D

Drawings

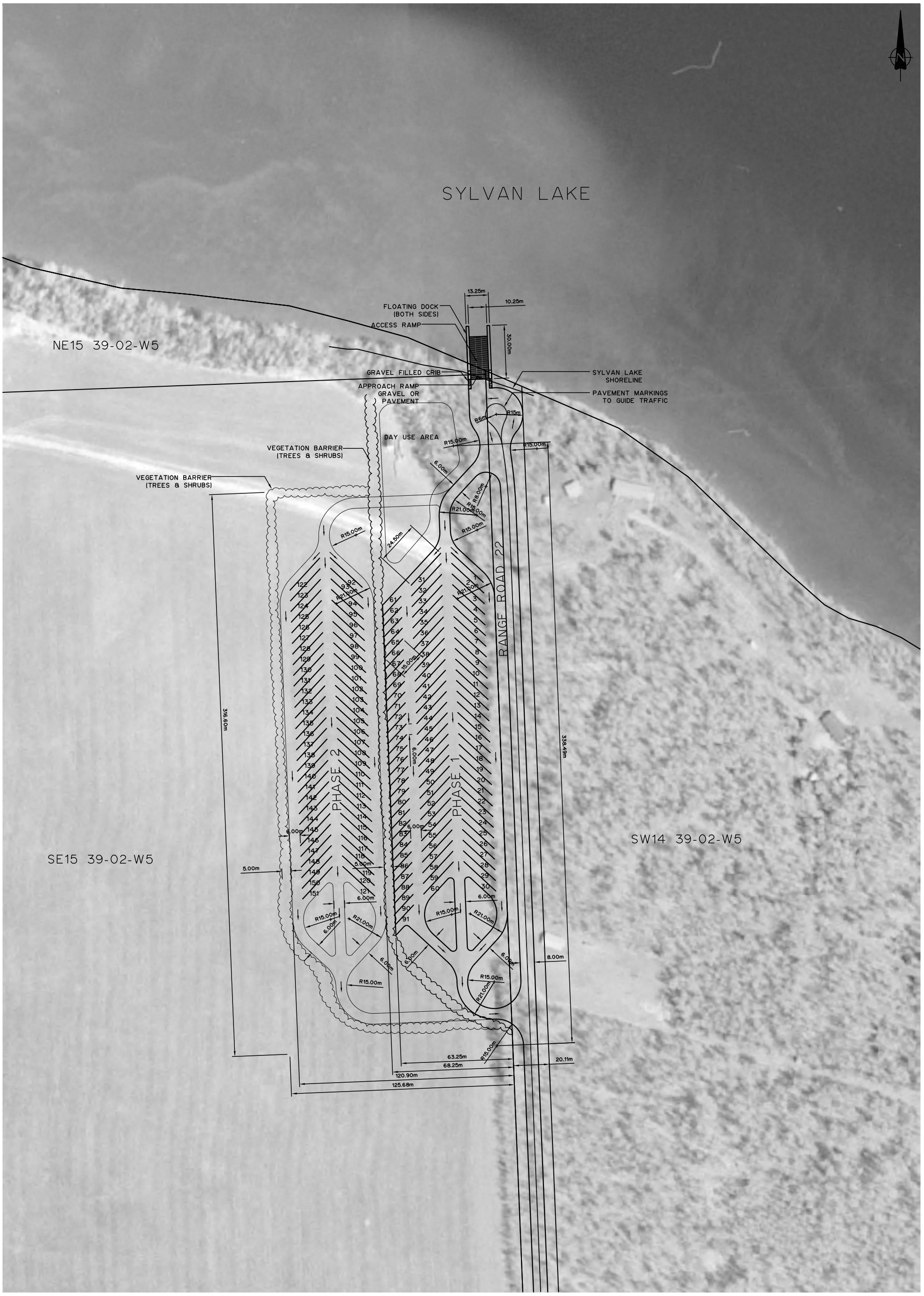
Engineering Ltd.

COUNTY OF LACOMBE

SITE PLAN FOR
SW SITE AND SE SITES

SCALE: 1:10000	DATE: FEBRUARY 2010	JOB: 4210-010-00	DRAWING: 1

MPE Engineering Ltd.		COUNTY OF LACOMBE	
		SW SITE CONCEPTUAL FACILITIES CONFIGURATION	
SCALE: 1:2000	DATE: FEBRUARY 2010	JOB: 4210-010-00	DRAWING: 2



MPE Engineering Ltd.		COUNTY OF LACOMBE	
		SE SITE CONCEPTUAL FACILITIES CONFIGURATION	
SCALE: 1:2000	DATE: FEBRUARY 2010	JOB: 4210-010-00	DRAWING: 3

APPENDIX E

Photographs

SW Site

'Environmentally Sensitive Areas' sign posted at SW Site.

SW Site

Looking N at informal boat launch, winter access to lake, & reed beds at SW Site.

Looking SE from winter access location at reed beds.

Looking N at near shore; lake bed material is organic/silt/sand mixture.

SW Site

Looking S at potential parking area in NE16-39-02-W5; note standing water in foreground.

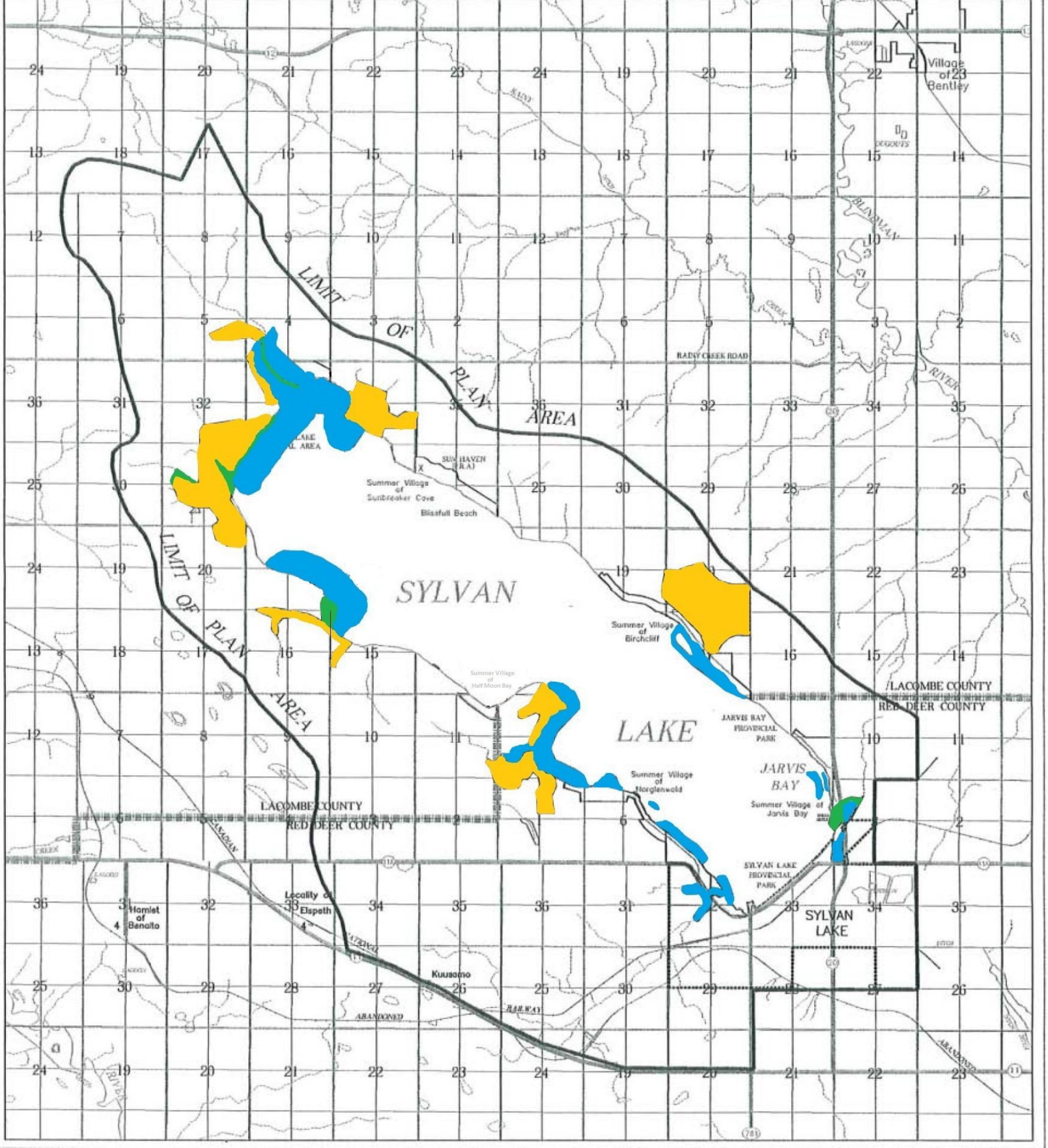
Looking N from NE16-39-02-W5 at access road to Kuusamo Krest
and access road to potential boat launch area.

Looking N at access road towards potential boat ramp area.

SE Site

Looking NE-E-SE at lake shore, natural bank and bluff. Note height and slope of bank and bluff.

Appendix B - Environmentally Sensitive Areas (Sylvan Lake Management Plan 2000 Update)



DRAFT

SYLVAN LAKE MANAGEMENT PLAN
2000 Update

Note:
The purpose of this map is to illustrate environmentally sensitive areas identified in the Sylvan Lake Management Plan: 2000 Update. The base used for this map is contained within the Sylvan Lake Management Plan: 2000 Update.

LEGEND:

- Key Fisheries Habitat
- Key Ungulate Habitat
- Key Waterfowl Habitat

SOURCE: SHORELINE HABITAT ASSESSMENT OF SYLVAN LAKE (EMA, 1990)

ENVIRONMENTALLY SENSITIVE AREAS

Map 4

400m 0 800m 1600m

Appendix C - Assessment Matrix

SYLVAN LAKE - Assessment Matrix

ASSESSMENT MATRIX

Date: June 19, 2015

Rev:13

Level of Impact:

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Medium:	4 to 7
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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS	DESCRIPTION	IMPACT ASSESSMENT/RATING																Weight Total	STAKEHOLDER & GOVERNMENT ENGAGEMENT															
			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY							Federal		Provincial				Municipal										
		Weighting		5	5	5	3	3	3	5	3		5	3	1	5	5	1																		
				Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)		Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact		(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
	EXISTING BOAT LAUNCHES																																			
1	Sunbreaker Cove (public - developed)	Double slip boat launch c/w floating dock system. 16 (approx) vehicle/trailer parking stalls (11 stalls angled/4 to 5 stalls parallel parking. 11 Day Use vehicular parking stalls. Vault Washroom (M/W) Day use area Playground	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	Marina Bay (private)	Single boat launch	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Sylvan Lake Marina (private)	Double slip boat launch	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY							Federal		Provincial				Municipal								
		Weighting		5	5	5	3	3	3	5	3		5	3	1	5	5	1																
				Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)		Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
	NEW BOAT LAUNCHES (MaPAS / MiPAS1 sites)																																
1A	Red Deer County (RR 21 South)	Gravel road access along RR 21 Informal gradual lake front access. Shallow - approx. 30 to 40m - .90m (3ft) depth. Current parking along ROW. Limited turning space. Wooded area west and east of lakefront access. Area (ROW + private property) south of lakefront access for parking + day use development. Sandy shoreline.		10	10	5	5	1	1	2	1		1	1	5	5	5	1	223	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5J	Legal: 5-2-39-29 SE Lacombe County - DA#2, Tier 1, HDN	Area located east of Range Road 25, south of area 5I, and north of Township Road 394. Current property access provided from Township Road 394. Portion of the land has been developed – Eagle's Quay, complete with community dock access, trails, and recreational amenities. Key waterfowl and ungulate habitat identified. Shoreline classified with Protective Notation on Shoreline (PNT).		10	10	5	10	1	10	10	1		1	1	1		1		255	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5N	5N-1 Legal: 5-2-39-22 SW Lacombe County - DA#2, Tier 1, HDN 5N-2 Legal: 5-2-39-15 NW, SW Lacombe County - DA#2, Tier 1, HDN	Area located east of Range Road 23 and west of area 5O. Future access to be provided from Range Road 23 and/or Township Road 392. No direct access to shoreline. Key habitat and protective notation identified. Moderate slopes to lakefront. Shoreline classified with Protective Notation on Shoreline (PNT). Future lake access will require further assessment and resolution of habitat and PNT notations which rate this site HIGH.		10	10	10	10	1	10	10	1		1	1	1		1		280	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5O	Legal: 5-2-39-15 SE Lacombe County - DA#2, Tier 1, HDN	Area located east of area 5N and west of area 5P. Future access to be provided from Township Road 392. No direct access to shoreline. Moderate slopes to lakefront. Shoreline classified with Protective Notation on Shoreline (PNT).		10	10	5	5	1	5	5	1		1	1	1		1		200	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5P	5P-1 Legal: 0924467-1-2 Lacombe County - DA#2, Tier 1, HDN 5P-2 Legal: 0924467-1-1 Lacombe County - DA#2, Tier 1, HDN	Area located east of area 5O and west of area 5Q. Future access to be provided from Township Road 392. No direct access to shoreline. Previously proposed boat launch study site. Key fisheries habitat identified in the northwest corner of the area. Moderate slopes to lakefront. Shoreline classified with Protective Notation on Shoreline (PNT).		10	10	5	10	1	5	5	1		1	1	1		1		215	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5Q	Legal: 5-2-39-14 SW 5-2-39-14 SE Lacombe County - DA#2, Tier 1 (residential density not defined)	Area located east of area 5P and west of the Summer Village of Half Moon Bay. Future access to be provided from Township Road 392. No direct access to shore line. Existing Boy Scouts Camp. Moderate slopes to lakefront. Portions of the shoreline classified with Protective Notation on Shoreline (PNT).		10	10	1	10	1	5	5	1		1	1	1		1		195	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

SYLVAN LAKE - Assessment Matrix
ASSESSMENT MATRIX
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			NATURAL/ ENVIRONMENTAL									REGIONAL/ COMMUNITY							Federal		Provincial				Municipal								
		Weighting	5	5	5	3	3	3	5	3		5	3	1	5	5	1																
			Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)		Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
	NON-MOTORIZED BOAT HAND LAUNCHES (MiPAS 1/ MiPAS2 sites)																																
2A	Town of Sylvan Lake - 32 Street	Open wooded area between cottage lots along 50A Avenue. Existing concrete barriers & signage Park space on corner. Limited parking area. Sandy shoreline. Shallow shoreline 40m out - 0.90m (3ft)		10	5	1	10	1	1	1	1	1	1	10		7		177	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2B	Summer Village of Jarvis Bay - Petro Park	Petro Park - along Jarvis Bay Drive Open area c/w beach with wooded area to the north and tree line along Jarvis Bay Drive. No defined parking for public use along road. Public parking north along Jarvis Bay Drive at Erikson Drive.		10	5	10	10	3	1	10	1	1	1	4		6		262	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2C	Summer Village of Jarvis Bay - TWP 391 East	Extension of TWP 391 at Jarvis Bay Drive Concrete barrier control. Wooded area with clear access to Lake. Cottage properties to south and north. Open grass area along Jarvis Bay Drive (possible short term public parking area) with woodlot separation between grass area and HWY 20.		10	5	10	5	1	5	5	1	1	1	7		7		236	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2D	Summer Village of Birchcliff - RR 15 North	Access from Birchcliff Road. Concrete barrier control. Park area to the west and cottage property to the east. Wooded area with clear footpath access to lakefront. Along sandstone aquifer.		1	3	5	10	1	1	5	10	1	1	7		8		191	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2E	Palm Bay - RR 23 North	Access from Rainy Creek Road along RR 23. Narrow gravel road access with wooded area west & east. Informal gradual lakefront access. 3 informal parking areas. Small cottage development east of road allowance - 6 lots? Future extension east to Palm Cove (Qualico) development. Shallow shoreline c/w sandy beach area. Erosion/rutting identified along shoreline.		10	10	10	10	1	5	5	10	1	1	5		5		291	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2F	Kuusamo Krest - RR 23 South	Gravel road access along RR 23 Informal gradual lake front access. Shoreline depth (30 to 40 m - 1.2m (4 ft). Current parking along ROW. Wetland area west and east of lakefront access. Area (ROW + private property) south of lakefront access for parking + day use development. Identified ungulate and fish habitat area.		10	10	10	10	1	10	10	1	1	1	5		3		294	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

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		Weighting	5	5	5	3	3	3	5	3	5	3	1	5	5	1																		
			Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)	Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
2H	Town of Sylvan Lake (Lakeshore Dr & 48/49 St.)	Existing lake front access along Lakeshore Drive at 48/49 Street. Gate controlled with vehicle access to lake front c/w turning capabilities. In Provincial Park property. Public parking provided within downtown.	1	1	1	5	10	1	5	1	1	1	1		1		105	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3C	Summer Village of Norglenwold - Lakeside Lane	Lakeside Lane at Last Chance Way. Existing boat launch site & winter vehicle access site (Refer to MDP). Concrete barrier control. Wooded area with clear access to Lake. Cottage properties to west and east. Isolated area with current access only from RR 20.	10	10	10	5	5	5	5	1	1	5	5		10		298	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3D	Summer Village of Norglenwold - Sylvan Lane	Extension of Sylvan Lane at Grand Avenue. Existing boat launch site & winter vehicle access site (Refer to MDP). Wooded area with clear access to Lake. Cottage properties to west and east.	10	10	5	1	1	1	5	1	1	5	5		10		237	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

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	ENVIRONMENTAL/COMMUNITY RESERVE & LAKE ACCESS (MiPAS2/ TPAS)																																
3A	Summer Village of Birchcliff - RR 14 North/TWP 392	Access from TWP 392 & RR 14. Concrete barrier control. Cottage property to west and east. Wooded area with clear footpath access to lakefront. Poor sightlines at intersection at RR & TWP roads. No public parking opportunities. Along sandstone aquifer. Slope stability issues. Shallow shoreline depth.		10	10	10	5	1	5	5	10		1	10	5		5		303	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3B	Summer Village of Half Moon Bay	Access from Aspen Place off Halfmoon Bay Drive Cul-de-sac area with cottages to south and southeast. Existing staircase to lake front. Poor terrain along lake front (old wood pole water breaks). Mixed vegetation & steep slopes. No public parking opportunities. Shallow lake depth.		10	10	5	10	5	5	5	1		1	1	8		10		279	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2G	Summer Village of Norglenwold - Aspen Lane	Aspen Lane at Grand Avenue. No existing boat access (Refer to MDP). Concrete barrier control. Wooded area with clear access to Lake. Cottage properties to west and east. Park area on the southeast corner of the T-intersection of RR15 and Grand Avenue.		1	1	10	3	1	5	5	1		1	1	10		10		183	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

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		Weighting	5	5	5	3	3	3	5	3	5	3	1	5	5	1																			
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	NATURAL PRESERVATION & MITIGATION AREAS																																		
4A	RR 20 North - Lakefront Terminus	Access from RR 20 to dead end Wooded area between RR 20 and escarpment/lake front. Limited development in area. Along sandstone aquifer.	5	5	1	1	1	1	5	10	1	10	10		10		214	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
4B	TWP 394 North - Lakefront Terminus	Area located west of 5C and south of 5D. No existing road access provided from Township Road 394. Heavily wooded area. Located on the sandstone aquifer. Steep slopes and shoreline erosion observed.	5	5	1	1	1	1	5	10	1	10	10		10		214	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
4C	RR21 North - Lakefront Terminus	Area located west of 5D and east of the Summer Village of Sunbreaker Cove. Access from RR 21 to dead end Wooded area between RR 21 and escarpment/lake front. Limited development in area. Located on the sandstone aquifer. Steep slopes and shoreline erosion observed.	5	5	1	1	1	1	5	10	1	10	10		10		214	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
4D	Yuill	TWP 394 and RR 24 Relatively steep embankment Shoreline depth (5 m out) 1.3 m (4.5ft). Lake front armored with rip rap. Previously recommended for rehabilitation	1	1	1	7	1	1	5	1	1	10	1		5		131	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
SITES 4E TO 4L - Summer Village of Norglenwold		Sites 4B to 4L are located within the Summer Village of Norglenwold.	5	5	10	1	1	5	5	1							149														
		These sites are all located off Grand Avenue and were previously dedicated roadway/access locations that have been dedicated as Natural Areas.	5	5	10	1	1	5	5	1	1	1	10		10		217	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

SYLVAN LAKE - Assessment Matrix
ASSESSMENT MATRIX
Date: June 19, 2015
Rev:13

Level of Impact:
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Medium: 4 to 7
Low: 1 to 4

Weighting:
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3 - Medium weight
1 - low weight

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS	DESCRIPTION	IMPACT ASSESSMENT/RATING															Weight Total	STAKEHOLDER & GOVERNMENT ENGAGEMENT														
			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY							Federal		Provincial				Municipal								
		Weighting		5	5	5	3	3	3	5	3		5	3	1	5	5	1															
				Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)		Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
	FUTURE PRIVATE DEVELOPMENT SITES (c/w Lakefront Access) Note: Sites 5J, 5N to 5Q above under New Boat Launch Sites)																																
5A	5A-1 Legal: 5-1-39-9 NW Lacombe County - DA#1, Tier 1, LDR 5A-2 Legal: 9220154-1-1 Lacombe County - DA#1, Tier 1, LDR 5A-3 Legal: 9220154-1-2 Lacombe County - DA#1, Tier 1, LDR 5A-4 Legal: 3814ET-OT Lacombe County - DA#1, Tier 1, LDR	Located between Jarvis Bay Provincial Park (to the east) and the boundary of the Summer Village of Birchcliff (to the west). Access provided from Township Road 392. Connected to public access area 3C. Located on the sandstone aquifer. Key fisheries habitat identified.		5	5	10	1	3	1	5	10		1	10	10		10		265	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5B	5B-1 Legal: 6260 MC - A Lacombe County - DA#1, Tier 1, HDN 5B-2 Legal: 5-1-39-19 NW Lacombe County - DA#1, Tier 1, HDN	Area located northwest/west of the Summer Village of Birchcliff. Access provided from Township Road 394 and RR 19 or RR 20. West border is public access area 4A. Located on the sandstone aquifer. Steep slopes and shoreline erosion observed.		5	5	1	10	1	1	5	10		1	10	10		10		241	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5C	5C-1 Legal: 5-2-39-24 NE Lacombe County - DA#1, Tier 1, HDN 5C-2 Legal: 9622893-1 Lacombe County - DA#1, Tier 1, HDN	Area located west of 5B and southeast of 5D. Access provided from Range Road 20 and west extension of Township Road 394. Public access area 4A at terminus of RR20 R.O.W. Located on the sandstone aquifer. Steep slopes and shoreline erosion observed.		5	5	1	1	1	1	5	10		1	10	10		10		214	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5D	Legal: 5-2-39-25 SW Lacombe County - DA#1, Tier 1, HDN	Area located northwest of 5C and east of 5D. Access provided from RR 21 with potential future residential road network connection eastward to Township Road 394 and westward through area 5E to the Summer Village of Sunbreaker Cove. Located on the sandstone aquifer. Steep slopes.		5	5	1	1	1	1	5	10		1	10	10		10		214	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

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ASSESSMENT MATRIX

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS	DESCRIPTION	IMPACT ASSESSMENT/RATING																Weight Total	STAKEHOLDER & GOVERNMENT ENGAGEMENT														
			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY							Federal		Provincial				Municipal									
		Weighting	5	5	5	3	3	3	5	3	5	3	1	5	5	1																			
			Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)	Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
5E	Legal: 5-2-39-34 SE Lacombe County - DA#1, Tier 1, LDR	Area located west and north of the Summer Village of Sunbreaker Cove and east of site 5F. Access provided from RR 22 with potential future residential road network connection to the Summer Village of Sunbreaker Cove and site 5F to the west. Located on the sandstone aquifer. Classified with Protective Notation on Shoreline (PNT). Lake access width of property is approximately 125 meters (410 ft), which limits the amount of future public lakefront access and support development. Shoreline adjustments identified to accommodate lake access from the property.	10	10	1	10	1	5	1	10	1	10	10		10		283	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5F	Legal: 5-2-39-34 NW 5-2-39-34 SW Lacombe County - DA#1, Tier 1, HDN	Area located west of area 5G and east of Range Road 23 (Palm Bay Road). Access provided from RR 23 with potential future residential road network connection to the Summer Village of Sunbreaker Cove and site 5E to the east. Existing lakefront lot development (6 lots) east of Range Road 23 (at the terminus). Palm Cove Estates & Marina development proposed from Rainy Creek Road to lakefront, including Environmental and Municipal Reserves (incorporating identified key ungulate habitat), and public access/waterfront amenities. Historic site components incorporated into the development plan. Proposed beach and marina development within a key fisheries habitat area. Key fisheries and ungulate habitat identified. Classified with Protective Notation on Shoreline (PNT).	10	10	10	10	1	5	5	10	1	10	10		10		348	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5G	Legal: 5-2-39-33 NE Lacombe County - DA#2, Tier 1, HDN	Area located west of Range Road 23 (Palm Bay Road) and areas 2E and 5F and northeast of area 5H. Main access provided from RR 23 with future connection opportunities to Rainy Creek Road. Key fisheries, waterfowl and undulate habitat identified. Classified with Protective Notation on Shoreline (PNT).	10	10	10	10	1	5	10	10	1	10	10		10		373	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5H	Legal: 5-2-39-33-5-6 Lacombe County - DA#2, Tier 1, LDR	Area located east of Range Road 24, southwest of area 5I, and north of the Sylvan Lake Natural Area. Main access provided from RR 24. Residential development underway. Key fisheries, waterfowl and undulate habitat identified. Classified with Protective Notation on Shoreline (PNT).	10	10	10	10	10	10	10	1	1	10	10		10		388	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5I	Legal: 5-2-39-29 NE Lacombe County - DA#2, Tier 1, LDR	Area located east of Range Road 25, southwest of area 5H and the Sylvan Lake Natural Area, and north of area 5J. Current property access provided from RR 25. WestEnd Landing development proposed for the property. Key fisheries, waterfowl and undulate habitat identified. Classified with Protective Notation on Shoreline (PNT).	10	10	10	10	10	10	10	1	1	10	10		10		388	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5J - Refer to assessment above (New Boat Launch Site)																																			

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS	DESCRIPTION	IMPACT ASSESSMENT/RATING																Weight Total	STAKEHOLDER & GOVERNMENT ENGAGEMENT															
			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY							Federal		Provincial				Municipal										
		Weighting	5	5	5	3	3	3	5	3	5	3	1	5	5	1																				
			Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)	Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
5K	Legal: 5-2-39-21 NW Lacombe County - DA#2, Tier 1, HDN	Area located east of Range Road 24, north of area 5L, and south of area 5J. Current property access provided from Range Road 24. Land has been developed – Westside Country Estates, complete with community dock access, trails, and recreational amenities. Key waterfowl and undulate habitat identified. Shoreline classified with Protective Notation on Shoreline (PNT). Land fully developed with residential lots and amenities.	10	10	10	10	10	10	5	1	1	10	10		10		363	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5L	5L-1 Legal: 5-2-39-21 NW Lacombe County - DA#2, Tier 1, LDR 5L-2 Legal: 9421037-1-1 Lacombe County - DA#2, Tier 1, LDR 5L-3 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-4 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-5 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-6 Legal: 5-2-39-21 SW (portion of 5M-5) Lacombe County - DA#2, Tier 1 (portion of 5M-5), LDR	Area located east of Range Road 24 and south of area 5K. Current property access provided from Range Road 24 Key fisheries habitat identified. Steep slopes. Shoreline classified with Protective Notation on Shoreline (PNT).	10	10	10	3	1	1	5	1	1	10	10		10		288	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5M	5M-1 Legal: 567TR-1-R1 Lacombe County - DA#2, Tier 1, HDN 5M-2 Legal: 5-2-39-21 SE Lacombe County - DA#2, Tier 1, HDN	Area located west of Range Road 23 and east of area 5L. Existing residential development along the top of the lake embankment, with access provided from Range Road 23. Adjacent to public access site 2F (end of RR23) Key fisheries habitat identified. Steep slopes. Shoreline classified with Protective Notation on Shoreline (PNT).	10	10	10	10	1	1	5	1	1	10	10		10		309	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5N to 5Q - Refer to assessment above (New Boat Launch Site)																																				
5R	Legal: 5-2-39-13 SW 5-2-39-13 SE Red Deer County –Agricultural	Area located east of Range Road 21 and the Summer Village of Half Moon Bay, and north of area 5S and 5T. Existing access provided through lane located between area 5T and area 5U. Key fisheries, ungulate and waterfowl habitat identified. Portions of the shoreline classified with Protective Notation on Shoreline (PNT).	10	10	10	10	7	5	5	1	1	10	10		10		339	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS	DESCRIPTION	IMPACT ASSESSMENT/RATING															Weight Total	STAKEHOLDER & GOVERNMENT ENGAGEMENT														
			NATURAL/ ENVIRONMENTAL										REGIONAL/ COMMUNITY										Federal		Provincial				Municipal							
		Weighting		5	5	5	3	3	3	5	3		5	3	1	5	5	1																
				Upland and Littoral gradient (bathymetry mapping)	Level of Disturbance	Mapped known fish habitat (FWMIS, Sylvan Lake Management Plan 2000 update)	Environmentally Protected Areas/Notations (i.e. regulated by AESRD) Considers ungulate, waterfowl, rare species, etc	Mapped rare plants (ACIMS)	Riparian Vegetation (up to 30 m of high water mark)	Presence of Aquatic vegetation	Proximity to aquifer (North side of lake)		Location	Access/Egress	Surrounding Land Use	Land Acquisition	Community Impact	Cultural/Historic Impact	(Impact value x weighting value)	Fisheries & Oceans	Transport Canada	AESRD	Alberta Public Lands	Alberta Culture	Alberta Parks	Lacombe County	Red Deer County	Town of Sylvan Lake	SV of Jarvis Bay	SV of Half Moon Bay	SV of Norglenwold	SV of Sunbreaker Cove	SV of Birchcliff
5S	Legal: 5-2-39-12 NE Red Deer County – Agricultural	Area located east of Range Road 22, the Summer Village of Half Moon Bay and area 5T. No access identified – potential access from area 5T or 5U. Key fisheries, ungulate and waterfowl habitat identified. Shoreline classified with Protective Notation on Shoreline (PNT).		10	10	10	10	10	5	5	1		1	10	10		10		348	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5T	5T-1 Legal: 849HW-A Red Deer County – Public Service District 5T-2 Legal: 5-2-39-12 NW Red Deer County – Agricultural	Area located east of Range Road 21 and the Summer Village of Half Moon Bay, west of area 5S, south of area 5R and north of area 5S. Existing access provided from Range Road 21. Existing Summer Camp located on property. Key ungulate and waterfowl habitat identified.		10	10	10	10	10	5	5	1		1	10	10		10		348	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5U	Legal: 5-2-39-12 SW 5-2-39-12 SE Red Deer County – Agricultural	Area located east of Range Road 21 and the Summer Village of Half Moon Bay, south of area 5T and northwest of area 5V. Existing access provided from Range Road 21. Key fisheries, ungulate and waterfowl habitat identified. Shoreline classified with Protective Notation on Shoreline (PNT).		10	10	10	10	10	5	5	1		1	10	10		10		348	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
5V	Legal: 5-2-39-1 NE Red Deer County – Agricultural	Area located southeast of area 5U and west the Summer Village of Norglenwold (Note: portion of the Summer Village of Norglenwold extends into the northeast portion of the areas lakeshore edge). Existing access provided from Range Road 20. Key fisheries and undulate habitat identified. Shoreline classified with Protective Notation on Shoreline (PNT).		5	5	10	5	5	5	5	1		1	10	10		10		268	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Appendix D - Action & Implementation Plan

SYLVAN LAKE - ACTION & IMPLEMENTATION PLAN

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS		PROPOSED ACTION & IMPLEMENTATION			DESCRIPTION	MITIGATION & MANAGEMENT REQUIREMENTS	TARGETS OF OPPORTUNITY	ROLES & RESPONSIBILITIES	ESTIMATED CAPITAL COSTS
										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
	EXISTING BOAT LAUNCHES									
1	Sunbreaker Cove (public - developed)		✔			NA				
2	Marina Bay (private)		✔			NA				
3	Sylvan Lake Marina (private)		✔			NA				
	NEW BOAT LAUNCHES (MaPAS / MiPAS1 sites)									
5J	Legal: 5-2-39-29 SE Lacombe County - DA#2, Tier 1, HDN	255		✔		Private Property - Future possible Land Development site. Boat Launch Development (Low to Medium – based on updated assessment of gradients, habitat and PNT areas - MODERATE rating). ROSP Opportunities: Potential MaPAS or MiPAS 1 development, complete with possible boat launch access (north portion of property dependent on habitat/PNT impact) and Regional Trail and Node development that links with the Sylvan Lake Natural Area to the north and area 5K and Range Road 24 to the south. Scenic Drive development along RR24 and TWP 394, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories).	Mitigation of potential habitat and PNT areas to be assessed as part of private future land development. Emergency Response Plan assessment and requirements.	SLWC Lacombe County Provincial/Federal Government Adjacent Eagle's Quay property owners 5J - Legal: 5-2-39-29 SE	SLWC Lacombe County Property Owners: 5J	$750,000.00
5O	Legal: 5-2-39-15 SE Lacombe County - DA#2, Tier 1, HDN	200		✔		Private Property - Future possible Land Development site. Boat Launch Development (High to medium based on updated confirmation of PNT areas - LEAST rating). ROSP Opportunities: Potential MaPAS or MiPAS 1 development, complete with boat launch access (based on assessment of PNT areas) and Regional Trail and Node development that links to area 5N to the west, area 5P to the east, and Township Road 392 to the south. Scenic Drive development along TWP 392, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories).	Mitigation of potential habitat and PNT areas to be assessed as part of private future land development. Emergency Response Plan assessment and requirements.	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owners (5N and 5P) 5O Legal: 5-2-39-15 SE	SLWC Lacombe County Property Owners: 5O	$750,000.00
5P	5Q-1 Legal: 0924467-1-2 Lacombe County - DA#2, Tier 1, HDN 5Q-2 Legal: 0924467-1-1 Lacombe County - DA#2, Tier 1, HDN	215		✔		Private Property - Future possible Land Development site. Boat Launch Development (Low to Medium – based on updated assessment of gradients, habitat and PNT areas - MODERATE rating). ROSP Opportunities: Potential MiPAS1 or 2 development, complete with boat launch access (dependent on habitat/PNT impact) and Regional Trail and Node development that links to area 5O to the west, area 5Q to the east, and Township Road 392 to the south. Scenic Drive development along TWP 392, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories).	Mitigation of potential habitat and PNT areas to be assessed as part of private future land development. Emergency Response Plan assessment and requirements.	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owners (5O and 5Q) 5P-1 - Legal: 0924467-1-2 5P-2 - Legal: 0924467-1-1	SLWC Lacombe County Property Owners: 5P	$750,000.00

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
5Q	Legal: 5-2-39-14 SW 5-2-39-14 SE Lacombe County - DA#2, Tier 1 (residential density not defined)	195		✔		Private Property - Future possible Land Development site. Boat Launch Development (High to medium based on updated confirmation of PNT areas - LEAST rating). ROSP Opportunities: Potential MaPAS or MiPAS 1 development, complete with boat launch access and Regional Trail and Node development that links to area 5P to the west and the Summer Village of Half Moon Bay to the east. Scenic Drive development along TWP 392, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories).	Mitigation of potential habitat and PNT areas to be assessed as part of private future land development. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owner (5P) 5Q Legal: Legal: 5-2-39-14 SW & 5-2-39-14 SE (Boy Scouts Property)	SLWC Lacombe County Property Owners: 5R	$750,000.00
5S	Legal: 5-2-39-12 NE Red Deer County – Agricultural District	348		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – fisheries, undulate and wildfowl habitat. Identified as Natural Area within the RDC – Inter-municipal Development Plan - VERY HIGH rating). ROSP Opportunities: Potential Regional Trail and Node development that links to area 5R, 5T, 5U and 5V to the north, south and west. Under review as a potential boat launch site.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Red Deer County Provincial/Federal Government Property Owners - 5S	SLWC Red Deer County Property Owners - 5S	To be determined by Developer
5V	Legal: 5-2-39-1 NE Red Deer County – Agricultural District	268		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Low). HIGH rating. ROSP Opportunities: Potential Regional Trail and Node development that links to area 5U to the northwest and the Summer Village of Norglenwold to the northeast. Under review as a potential boat launch site.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Red Deer County Provincial/Federal Government Property Owners - 5V	SLWC Red Deer County Property Owners - 5V	To be determined by Developer

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	LAKE ACCESS & REGIONAL TOURISM PLAN COMPONENTS & LOCATIONS		PROPOSED ACTION & IMPLEMENTATION			DESCRIPTION	MITIGATION & MANAGEMENT REQUIREMENTS	TARGETS OF OPPORTUNITY	ROLES & RESPONSIBILITIES	ESTIMATED CAPITAL COSTS
										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
	NON-MOTORIZED BOAT HAND LAUNCHES (MiPAS 1/ MiPAS2 sites)									
1A	Red Deer County (RR 21 South)	223		✔		Potential public boat launch site. MODERATE rating: Further assessment and mitigation of upland and littoral gradients and level of disturbance required during development. Land acquisition in 5U required for access/egress and parking requirements. Day use development recommended. No specific requirements identified in 5T - Red Deer County. Secondary Scenic Drive development along RR21, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories). Regional Trail links to Halfmoon Bay Drive and 5U.	Mitigate impact to adjacent cottages to the west with respect to boat launch and parking access/egress; day use and general increased public access. Land Use defined as Recreation and/or Recreation Area - specific land use opportunities to be defined in order to assess proposed boat launch support development requirements. Emergency Response Plan assessment and requirements.	SLWC Red Deer County Lacombe County Summer Village of Half Moon Bay Provincial/Federal Government Adjacent Half Moon Bay Property Owners 5T-1 - Legal: 849HW-A 5T-2 - Legal: 5-2-39-12 NW	SLWC Red Deer County Summer Village of Half Moon Bay Property Owners: 5T	$30,000.00
2A	Town of Sylvan Lake - 32 Street	177		✔		Recommended local community use only. Enhance lane access with decorative protection bollards; gravel lane treatment; floating dock; and day use amenities. No public parking opportunities. Regional Trail development proposed along 50A Avenue.	Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Jarvis Bay Provincial/Federal Government Adjacent Jarvis Bay Property Owners	SLWC Summer Village of Jarvis Bay	$30,000.00
2B	Summer Village of Jarvis Bay - Petro Park	262		✔	✔	Existing public and community access. Current use to be assessed with respect to identified habitat and PNT areas - HIGH rating. Additional enhancements to park edge with additional boulders. Upgrade day use amenities. Regional Trail development proposed along Jarvis Bay Drive.	Further assessment of current gradients and habitat required. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements Assessment of roadway drainage into the park and lake.	SLWC Summer Village of Jarvis Bay Provincial/Federal Government Adjacent Jarvis Bay Property Owners	SLWC Summer Village of Jarvis Bay	$30,000.00
2C	Summer Village of Jarvis Bay - TWP 391 East	236		✔	✔	Public and community access. Enhance lane access with decorative protection bollards; gravel lane treatment; and day use amenities. Lake access and floating dock opportunities are to be further assessed based on habitat and PNT areas - MODERATE rating). Public parking opportunity on the east side of Jarvis Bay Drive, adjacent to HWY 20. Regional Trail development proposed along Jarvis Bay Drive.	Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Jarvis Bay Provincial/Federal Government Adjacent Jarvis Bay Property Owners	SLWC Summer Village of Jarvis Bay	$30,000.00

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
2D	Summer Village of Birchcliff - RR 15 North	191		✔		Recommended local community use only. Enhance lane access with decorative protection bollards; gravel lane treatment; floating dock; and day use amenities. No public parking opportunities. Potential motorized access during winter months. Secondary Scenic Drive development along Birchcliff Road and RR15. Regional Trail development proposed along Birchcliff Road and RR15, with future trail development links west along Birchcliff Road to 5B.	Mitigation of potential habitat, sandstone aquifer, and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Birchcliff Provincial/Federal Government Adjacent Jarvis Bay Property Owners	SLWC Summer Village of Birchcliff	$30,000.00
2F	Kuusamo Krest - RR 23 South	294		✔	✔	Public and community access. Enhance road access to peninsula, complete with a defined drop-off/ turn-around and access to formal day use area. Non-motorized boat launch not recommended based on existing habitat and PNT notations (HIGH impact area). Public parking opportunity along the west edge of RR 23. Parallel or angle stall development. Scenic Drive development along TWP 392, with Secondary Scenic Drive development along RR 23 to lake access. Regional Trail development proposed along TWP 392 and RR 23, with future trail development links to 5M and 5N.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owners (5M and 5N)	SLWC Lacombe County	$15,000.00
3D	Summer Village of Norglenwold - Sylvan Lane	237		✔	✔	Public and community access. MODERATE rating - continued non-motorized boat launch use should be further assessed and gradient and disturbance impacts mitigated. If retained, the launch site should be upgraded with defined short-term parking, a turn-around, gravel trail access and day use/picnic sites. Scenic Drive development along TWP 390. Regional Trail development proposed along TWP 390, with links along Grand Avenue and future links to 3C (west) and Town of Sylvan Lake (east).	Mitigation of potential habitat, and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Norglenwold Provincial/Federal Government Adjacent Half Moon Bay Property Owners	SLWC Summer Village of Norglenwold	$30,000.00
2H	Town of Sylvan Lake (Lakeshore Dr & 48/49 St.)	105		✔		Public and community access. Enhance road access to lakefront, complete with a defined drop-off/ turn-around, parking (short-term/ dock users only) and lake access complete with floating dock. Additional existing parking opportunities found within downtown area. Scenic Drive development along Lakeshore Drive. Regional Trail link along existing Promenade.	Emergency Response Plan assessment and requirements	SLWC Town of Sylvan Lake Provincial/Federal Government (Provincial Park lands)	SLWC Town of Sylvan Lake Provincial Park	$30,000.00

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
	ENVIRONMENTAL/COMMUNITY RESERVE & LAKE ACCESS (MiPAS2/ TPAS)									
2E	Palm Bay - RR 23 North	291		✔	✔	Public and community access. Enhance trail access to lakefront with decorative protection bollards; gravel treatment; and day use amenities. Non-motorized boat launch not recommended based on existing habitat and PNT notations (HIGH impact area). Public parking opportunity along the west or east edge of RR 23. Parallel or angle stall development and turn-around required. Scenic Drive development along Rainy Creek Drive, with Secondary Scenic Drive development along RR 23 to lake access. Regional Trail development proposed along Rainy Creek Drive, with future trail development links to 5F and 5G.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owners (5F and 5G)	SLWC Lacombe County	$15,000.00
2G	Summer Village of Norglenwold - Aspen Lane	183		✔		Recommended local community use only. Enhance lane access with decorative protection bollards; gravel lane treatment; floating dock; and day use amenities. No public parking opportunities. Regional Trail development proposed along Grand Avenue, with future links to 5W (west) and the Town of Sylvan Lake (east).	Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Norglenwold Provincial/Federal Government Adjacent Norglenwold Property Owners	SLWC Summer Village of Norglenwold	$15,000.00

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
	NATURAL PRESERVATION & MITIGATION AREAS									
3A	Summer Village of Birchcliff - RR 14 North/TWP 392	303		✔	✔	Recommended local community use only. Enhance trail access with decorative protection bollards, defined gravel trail, trail node development and reclamation plantings. Water access should not be allowed: habitat and PNT notations (VERY HIGH impact area). No public parking opportunities. Scenic Drive development along TWP 392 and RR 14. Regional Trail development proposed along TWP 392, from Jarvis Bay Provincial Park into the Summer Village of Birchcliff.	Mitigation of potential habitat, sandstone aquifer, and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Birchcliff Provincial/Federal Government Adjacent Property Owners (5A) and Jarvis Bay Provincial Park	SLWC Summer Village of Birchcliff	$15,000.00
3B	Summer Village of Half Moon Bay	279		✔	✔	Recommended local community use only. Existing staircase to lakefront to be maintained. Option to enhance lakeshore area with more even terrain for public access and use. Water access should not be allowed: habitat and PNT notations (HIGH impact area). Preserve embankment plantings. No public parking opportunities. Scenic Drive development along Halfmoon Bay Drive and TWP 392. Regional Trail development proposed along TWP 392 and thru the Summer Village of Half Moon Bay, with future links to 1A, 5T (east) and 5Q (west).	Mitigation of potential habitat, and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Half Moon Bay Provincial/Federal Government Adjacent Half Moon Bay Property Owners	SLWC Summer Village of Half Moon Bay	$15,000.00
3C	Summer Village of Norglenwold - Lakeside Lane	298		✔	✔	Public and community access. Existing boat launch and water access should not be allowed: habitat and PNT notations (HIGH impact area). If maintained, launch site should incorporate shoreline protection, defined boat access/egress, better defined short-term parking turn-around, gravel trail access and day use/picnic sites. Scenic Drive development along TWP 390. Regional Trail development proposed along TWP 390, with future links thru 5V (west) and community park space (east) connecting with Grand Avenue.	Re-assess current hand launch access. Mitigation of potential habitat, and PNT areas potentially required. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Summer Village of Norglenwold Provincial/Federal Government Adjacent Norglenwold Property Owners and private property owner - 5V.	SLWC Summer Village of Norglenwold	$15,000.00
4A	RR 20 North - Lakefront Terminus	214		✔	✔	Future Regional Trail link and lakeshore node development in conjunction with future links to 5B (east) and 5C (west). Scenic Drive development along TWP 394 and RR 20, complete with Regional Trail development.		SLWC Lacombe County Provincial/Federal Government Adjacent property owners 5B-1 - Legal: 6260 MC - A 5B-2 - Legal: 5-1-39-19 NW 5C-1 - Legal: 5-2-39-24 NE 5C-2 - Legal: 9622893-1	SLWC Lacombe County Property Owners: 5B & 5C	$15,000.00

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
4B	TWP 394 North - Lakefront Terminus	214			✔	Future Regional Trail link and lakeshore node development in conjunction with future links to 5C (south/east) and 5D (north/west). Scenic Drive development along TWP 394 and RR 20, complete with Regional Trail development.		SLWC Lacombe County Provincial/Federal Government Adjacent property owners 5C-1 - Legal: 5-2-39-24 NE 5C-2 - Legal: 9622893-1 5D - Legal: 5-2-39-25 SW	SLWC Lacombe County Property Owners: 5C & 5D	$15,000.00
4C	RR21 North - Lakefront Terminus	214			✔	Future Regional Trail link and lakeshore node development in conjunction with future links to 5D (east) and Summer Village of Sunbreaker Cove (west).		SLWC Lacombe County Provincial/Federal Government Adjacent property owners 5D - Legal: 5-2-39-25 SW	SLWC Lacombe County Property Owners: 5D	$15,000.00
4D	Yuill	131			✔	Future Regional Trail link and lakeshore node development in conjunction with links to Eagle's Quay/ 5J (north) and 5K (south). Enhance trail access with decorative protection bollards, defined gravel trail, trail node development and reclamation plantings. Scenic Drive development along TWP 394 and RR 24, complete with Regional Trail development.		SLWC Lacombe County Provincial/Federal Government Adjacent property owners 5J - Legal: 5-2-39-29 SE 5K - Legal: 5-2-39-21 NW	SLWC Lacombe County Property Owners: 5J & 5K	$15,000.00
4E to 4L	Summer Village of Norglenwold	217			✔	Local community use only. R.O.W.'s to be reclaimed and maintained as natural areas, as per the MDP.		Summer Village of Norglenwold	Summer Village of Norglenwold	$15,000.00

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										Refer to Appendix Breakdown (+/- 50%)
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	PRIVATE DEVELOPMENT PARCELS (c/w Lakefront Access) Note: Sites 5J, 5O to 5Q, 5S, and 5V above under New Boat Launch Sites)									
5A	5A-1 Legal: 5-1-39-9 NW Lacombe County - DA#1, Tier 1, LDR 5A-2 Legal: 9220154-1-1 Lacombe County - DA#1, Tier 1, LDR 5A-3 Legal: 9220154-1-2 Lacombe County - DA#1, Tier 1, LDR 5A-4 Legal: 3814ET-OT Lacombe County - DA#1, Tier 1, LDR	265		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Low – based land area, the opportunity to support parking, location on the sandstone aquifer and adjacent to key fisheries habitat - HIGH rating). ROSP Opportunities (TSAS): Regional Trail and Node development, linking with Jarvis Bay Provincial Park (to the east) and the Summer Village of Birchcliff and area 3A (to the west). Note: Regional Trail development should be developed between Jarvis Bay Provincial Park and the Summer Village of Birchcliff along Township Road 392 if 5A is not developed in the future.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5A	SLWC Lacombe County Property Owners - 5A	To be determined by Developer
5B	5B-1 Legal: 6260 MC - A Lacombe County - DA#1, Tier 1, HDN 5B-2 Legal: 5-1-39-19 NW Lacombe County - DA#1, Tier 1, HDN	241		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Low – located on the sandstone aquifer and has steep slopes with signs of erosion - MODERATE ranking). ROSP Opportunities: Potential MiPAS 2 development, complete with Regional Trail and Node development; linking with the Summer Village of Birchcliff, area 4A, and future land development to the west. Note: Regional Trail development proposed west from the Summer Village of Birchcliff along Range Road 15 and Township 394 until link through 5B can be developed.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5B	SLWC Lacombe County Property Owners - 5B	To be determined by Developer
5C	5C-1 Legal: 5-2-39-24 NE Lacombe County - DA#1, Tier 1, HDN 5C-2 Legal: 9622893-1 Lacombe County - DA#1, Tier 1, HDN	214		✔		Private Property - Future possible Land Development site. Boat Launch Development (Low – located on the sandstone aquifer and has steep slopes with signs of erosion). ROSP Opportunities: Potential MiPAS 2 development, complete with Regional Trail and Node development; linking with either area 5B or Township Road 394, area 4A, and future land development to the west. Note: Regional Trail development proposed west through area 5D to the Summer Village of Sunbreaker Cove.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5C	SLWC Lacombe County Property Owners - 5C	To be determined by Developer
5D	Legal: 5-2-39-25 SW Lacombe County - DA#1, Tier 1, HDN	214		✔		Private Property - Future possible Land Development site. Boat Launch Development (Low – located on the sandstone aquifer and has steep slopes). ROSP Opportunities: Potential MiPAS 2 development, complete with Regional Trail and Node development; linking with area 5C, Range Road 21 and the Summer Village of Sunbreaker Cove.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5D	SLWC Lacombe County Property Owners - 5D	To be determined by Developer
5E	Legal: 5-2-39-34 SE Lacombe County - DA#1, Tier 1, LDR	283		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Low – located on the sandstone aquifer and has limited lakefront access - HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development; linking with the Summer Village of Sunbreaker Cove to the east, Range Road 22 and site 5F to the west.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5E	SLWC Lacombe County Property Owners - 5E	To be determined by Developer

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5F	Legal: 5-2-39-34 NW 5-2-39-34 SW Lacombe County - DA#1, Tier 1, HDN	348		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries and ungulate habitat - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development that links with area 5E and the Summer Village of Sunbreaker Cove to the east and Palm Bay Road, existing residential lots and area 2E to the west.	Mitigation of potential habitat, sandstone aquifer and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5F	SLWC Lacombe County Property Owners - 5F	To be determined by Developer
5G	Legal: 5-2-39-33 NE Lacombe County - DA#2, Tier 1, HDN	373		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries and ungulate habitat - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development that links with Palm Bay Road, areas 2E and 5F, and the Summer Village of Sunbreaker Cove to the east and area 5H to the southwest.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5G	SLWC Lacombe County Property Owners - 5G	To be determined by Developer
5H	Legal: 5-2-39-33-5-6 Lacombe County - DA#2, Tier 1, LDR	388		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries and ungulate habitat - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development that links with 5G and through the Sylvan Lake Natural Area.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5H	SLWC Lacombe County Property Owners - 5H	To be determined by Developer
5I	Legal: 5-2-39-29 NE Lacombe County - DA#2, Tier 1, LDR	388		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries and ungulate habitat - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development that links with the Sylvan Lake Natural Area to the north and area 5J to the south.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5I	SLWC Lacombe County Property Owners - 5I	To be determined by Developer
5J - Refer to assessment above (New Boat Launch)										
5K	Legal: 5-2-39-21 NW Lacombe County - DA#2, Tier 1, HDN	363		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries and ungulate habitat - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail linkages with area 5J to the north and area 5L to the south, incorporating Range Road 24 in the short-term.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5K	SLWC Lacombe County Property Owners - 5K	To be determined by Developer

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										Refer to Appendix Breakdown (+/- 50%)
		Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
5L	5L-1 Legal: 5-2-39-21 NW Lacombe County - DA#2, Tier 1, LDR 5L-2 Legal: 9421037-1-1 Lacombe County - DA#2, Tier 1, LDR 5L-3 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-4 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-5 Legal: 5-2-39-21 SW Lacombe County - DA#2, Tier 1, LDR 5L-6 Legal: 5-2-39-21 SW (portion of 5M-5) Lacombe County - DA#2, Tier 1 (portion of 5M-5), LDR	288		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Low – based on key fisheries habitat, steep slopes and clarification of PNT areas - HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development; linking with area 5K and Range Road 24 to the north and west, and to Kuusamo Krest (area 5M) to the east.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5L	SLWC Lacombe County Property Owners - 5L	To be determined by Developer
5M	5M-1 Legal: 567TR-1-R1 Lacombe County - DA#2, Tier 1, HDN 5M-2 Legal: 5-2-39-21 SE Lacombe County - DA#2, Tier 1, HDN	309		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on key fisheries habitat and steep slopes - VERY HIGH rating). ROSP Opportunities: Potential TSAS development, complete with Regional Trail and Node development, linking with area 5L (to the west) and Range Road 23 and area 5N to the southeast.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Lacombe County Provincial/Federal Government Property Owners - 5M	SLWC Lacombe County Property Owners - 5M	To be determined by Developer
5N	5N-1 Legal: 5-2-39-22 SW Lacombe County - DA#2, Tier 1, HDN 5N-2 Legal: 5-2-39-15 NW, SW Lacombe County - DA#2, Tier 1, HDN	280		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – based on current habitat and PNT assessment - HIGH rating). ROSP Opportunities: Regional Trail and Node development (TSAS) that links to Range Road 23 and area 5M to the northwest, area 5O to the east, and Township Road 392 to the south. Scenic Drive development along TWP 392, complete with asphalt paving and Regional Trail development (rest nodes, way-finding & directories).	Mitigation of potential habitat and PNT areas to be assessed as part of private future land development. Emergency Response Plan assessment and requirements.	SLWC Lacombe County Provincial/Federal Government Adjacent Property Owner (5P) 5N-1 - Legal: 5-2-39-22 SW 5N-2 - Legal: 5-2-39-15 NW, SW	SLWC Lacombe County Property Owners: 5N	To be determined by Developer
5O to 5Q - Refer to assessment above (new Boat Launch)										
5R	Legal: 5-2-39-13 SW 5-2-39-13 SE Red Deer County – Agricultural District	339		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (Not recommended – fisheries, undulate and wildfowl habitat. Identified as Natural Area within the RDC – Inter-municipal Development Plan - VERY HIGH rating). ROSP Opportunities: Potential Regional Trail and Node development that links to area 5S, 5T and 5U to the south and the Summer Village of Half Moon Bay, site 1A, and Range Road 21 to the west.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Red Deer County Provincial/Federal Government Property Owners - 5R	SLWC Red Deer County Property Owners - 5R	To be determined by Developer

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5T	5T-1 Legal: 849HW-A Red Deer County – Public Service District 5T-2 Legal: 5-2-39-12 NW Red Deer County – Agricultural District	348		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development (legal area:849HW-A) in conjunction with site 1A and terminus of Range Road 21. Area 5-2-39-12 NW identified with undulate and wildfowl habitat and VERY HIGH rating. Identified Recreational (849HW-A) or Natural Area (5-2-39-12 NW) within the RDC – Inter-municipal Development Plan). ROSP Opportunities: Day use development in area 849HW-A. Potential Regional Trail and Node development that links to area 5R, 5S, 5U and 5V to the north, south and east.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Red Deer County Provincial/Federal Government Property Owners - 5T	SLWC Red Deer County Property Owners - 5T	To be determined by Developer
5U	Legal: 5-2-39-12 SW 5-2-39-12 SE Red Deer County – Agricultural District	348		✔	✔	Private Property - Future possible Land Development site. Boat Launch Development Not recommended – fisheries, undulate and wildfowl habitat - VERY HIGH rating. Identified as Natural Area within the RDC – Inter-municipal Development Plan). ROSP Opportunities: Potential Regional Trail and Node development that links to area 5T and 5V to the north and southeast.	Mitigation of potential habitat and PNT areas to be assessed as part of future enhancements. Maintain separation between adjacent Property Owners. Emergency Response Plan assessment and requirements	SLWC Red Deer County Provincial/Federal Government Property Owners - 5U	SLWC Red Deer County Property Owners - 5U	To be determined by Developer

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									Refer to Appendix Breakdown (+/- 50%)
	Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
SCENIC DRIVE DEVELOPMENT *Commencement Point (HWY 20 & HWY 11A) - west*									
Primary - 33 Street to Lakeshore Drive		✔	✔		Existing paved roadway. Regional Trail - utilize existing trail and promenade. Way-finding & Directory development.		SLWC Town of Sylvan Lake Provincial/Federal Government	SLWC Town of Sylvan Lake	NA
Primary - Lakeshore Drive to TWP 390 (RR15)		✔	✔		Existing paved roadway. Regional Trail - utilize existing trail and promenade. Way-finding & Directory development.		SLWC Town of Sylvan Lake Provincial/Federal Government	SLWC Town of Sylvan Lake	NA
Primary - TWP 390 (RR15) to RR 21		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Red Deer County Provincial/Federal Government	SLWC Red Deer County	NA
Primary - RR 21 to 1A and Half Moon Drive		✔	✔		RR21 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Red Deer County Lacombe County Provincial/Federal Government	SLWC Red Deer County Lacombe County	NA
Primary - Half Moon Drive: RR 21 to TWP 392		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Summer Village of Half Moon Bay Provincial/Federal Government	SLWC Summer Village of Half Moon Bay	NA
Primary - TWP 392: Half Moon Drive to RR 23		✔	✔		TWP 392 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Secondary - TWP 392 to RR24 and 2F		✔	✔		RR 24 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - TWP 392: RR 23 to RR 24		✔	✔		TWP 392 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - RR 24: TWP 392 to TWP 394		✔	✔		RR 24 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - TWP 394: RR24 to RR 25		✔	✔		TWP 394 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - RR25: TWP 394 to Rainy Creek Road		✔	✔		RR25 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - Rainy Creek Road: RR25 to Palm Bay Road		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Secondary - Palm Bay Road to 2E		✔	✔		Palm Bay Road paving required (optional). Regional Trail - dedicated lane development required (optional). Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - Rainy Creek Road: Palm Bay Road to RR 22		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Secondary - RR22: Rainy Creek Road to Sunbreaker Cove & site 1		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Summer Village of Sunbreaker Cove Lacombe County Provincial/Federal Government	SLWC Summer Village of Sunbreaker Cove Lacombe County	NA

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									Refer to Appendix Breakdown (+/- 50%)
	Impact rating (high / medium / low) relative to the sites assessed.	No Modifications (Leave as is)	Development	Remove & Mitigate	Refer to Sylvan Lake - Lake Access & Regional Tourism Plan document for abbreviated Recreation and Open Space development categories and types of use.		SLWC - Sylvan Lake Watershed Committee		
Primary - Rainy Creek Road: RR 22 to RR 20		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - RR 20: Rainy Creek Road to TWP 394		✔	✔		RR 20 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - TWP 394: RR 20 to RR 15		✔	✔		TWP 394 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Secondary - RR 15: TWP 394 to intersection of Birchcliff Road (loop) Birchcliff Road east to RR 14 & TWP 392		✔	✔		RR 15 paving required. Paving extension for Regional Trail development around Birchcliff Road loop and along Birchcliff Road (east) to RR 14 & TWP 392 to be assessed. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Summer Village of Birchcliff Lacombe County Provincial/Federal Government	SLWC Summer Village of Birchcliff Lacombe County	NA
Primary - TWP 394: RR 15 to RR 14		✔	✔		TWP 394 paving required. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - RR 14: TWP 394 to TWP 392		✔	✔		RR 14 paving required to Birchcliff Road. Regional Trail - dedicated lane development required. Way-finding & Directory development.		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - TWP 392: RR14 to HWY 20		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
Primary - HWY 20 to HWY 11A		✔	✔		Existing paved roadway. Regional Trail - dedicated lane development required. Way-finding & Directory development		SLWC Lacombe County Provincial/Federal Government	SLWC Lacombe County	NA
REGIONAL TRAIL DEVELOPMENT					Refer above and to the Action Master Plan for all proposed Regional Trail alignments. Regional Trail links are proposed with all primary and secondary Scenic Drive development. A dedicated lane width of 2.5 meters (approx.) should be incorporated with Scenic Drive upgrades. Regional Trail extensions are to be incorporated through future private development lands. Way-finding & Directory development should be incorporated along all Scenic Drive and Regional Trail alignments. Way-finder markers should be developed for Scenic Drive (primary & secondary) and Regional Trails alignments, and located at key intersections and/or at intervals of 500m. Regional Trail maps should be included on trail markers, especially at key intersections. Directories should be developed at all key public lake access locations. Directories should provide the opportunity to communicate lake management; public education/interpretation; lake/community events; and any other marketing initiatives.				NA

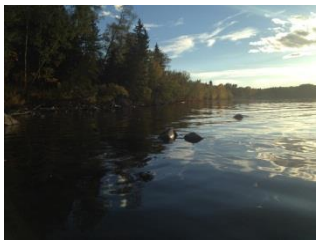
Appendix E - Range Road 21 Feasibility Study

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

TECHNICAL MEMORANDUM

Lacombe & Red Deer Counties, Town of Sylvan Lake & Summer Villages of Sylvan Lake

Range Road 21 Boat Launch
Feasibility Study



January 2016

CANADA'S BEST MANAGED COMPANIES Platinum member

Table of Contents

1 Introduction

Sylvan Lake (the Lake) is a popular destination for regional and provincial-wide water related activities. In recent years, there has been rapid growth in residential development and recreational (i.e. boating, fishing, picnicking, camping) activities in and around the Lake. Currently there are numerous locations along the Lake that provide formal and informal shoreline and lake access. The formal boat launches are: Sunbreaker Cove (public), Marina Bay (private), and Sylvan Lake Marina (private). These existing facilities are not able to meet the demand arising from popular water activities. In particular, water-users are:

- long wait-times for launching and loading at formal boat launches;
- insufficient parking areas, including parking vehicles up to 1 km away from launch; and
- using informal boat launches located at road ends, which impacts the existing lake and shoreline environment.

The Sylvan Lake Access Management Steering Committee (the Committee) has determined that Range Road 21, in Red Deer County, is an ideal location for a new formal boat launch. The site is currently being used as an informal boat launch location.

The Committee retained Associated Engineering (AE), and Summit Environmental Consultants Inc. (Summit) to review the development of a formal boat launch located at Range Road 21.

1.1 PROJECT SCOPE

This feasibility study included the following tasks:

- Perform a fisheries assessment of the existing informal boat launch on Range Road 21.
- Complete a Traffic Impact Assessment on Range Road 21.
- Provide Design Criteria and Investigate Layout Configurations for a new formal boat launch at Range Road 21.

This report provides the findings of the feasibility study and recommendations for the development of a formal boat launch at Range Road 21.

2 Range Road 21 Fisheries Assessment

It was suggested that the existing (informal) boat launch at Range Road 21, adjacent to Half Moon Bay, may be improved to provide a more suitable public launch location. As part of the location assessment, Summit completed a fisheries assessment to evaluate the available fish habitat and potential habitat usage in the lake near Half Moon Bay, and to provide information that would assist in selecting a location for a new boat launch facility.

A fish inventory and habitat assessment was completed for the Half Moon Bay area as per the following:

- database and literature review;
- electrofishing (backpack method along the shore);
- sample angling (from the shore and from a canoe);
- creel surveys; and
- recording of general observations.

Figure 2-1 shows the fish and habitat assessment area evaluated.

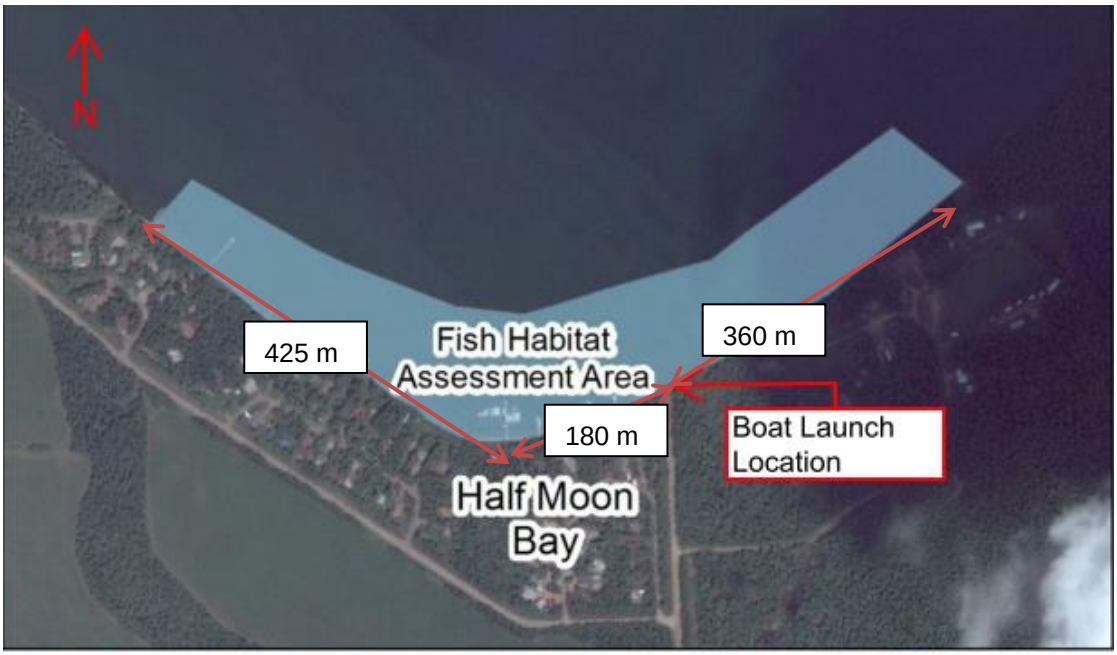


Figure 2-1
Fish Habitat Assessment Area

In the detailed fisheries assessment in Appendix A, it is identified that the assessment area provides habitat for a number of fish species; however, given that no emergent vegetation was observed in the assessment area, none of the fish habitat observed is considered critical. There is suitable habitat for multiple species throughout the assessment area, but the area east of Range Road 21 contains higher-quality fish habitat.

This part of the assessment area features suitable spawning habitat for burbot and lake whitefish, and a small area at the easternmost extent of the assessment area contains suitable spawning habitat for walleye and white sucker.

Water depth in Half Moon Bay is shallow relative to the 1.2 m depth requirement for traditional boat launches (American Society of Civil Engineers 1994). Engineering solutions are available to achieve the depth required to operate a boat launch at Range Road 21; however, each has associated environmental impacts which should be thoroughly considered when selecting a boat launch type. Additionally, water levels in Sylvan Lake have recently (2011) been at the historic high but are known to drop by approximately 1.0 m (derived data, Environment Canada Station 05CC003 [Government of Canada 2014b]). Such a reduction in water level would expose nearly 100 m of beach and present additional design considerations for a boat launch at Range Road 21.

Construction of a boat launch at the terminus of Range Road 21 (which currently shows signs of disturbance) would not significantly impact fish habitat, provided that the suitable spawning habitat east of the proposed boat launch location remains undisturbed by increased traffic, wave action, and other impacts from added boats in the area. Long-term use of a boat launch at this location is expected to reduce current environmental impacts by reducing the disturbance of substrate caused by trucks and boat trailers should Range Road 21 be selected for the construction of a boat launch.

3 Range Road 21 - Traffic Impact Assessment

As part of the Range Road 21 boat launch location assessment, AE completed a Traffic Impact Assessment (TIA) on Range Road 21. The main objective of the TIA was to identify potential traffic impacts associated with the proposed development of a formal boat launch near the Range Road 21 and Highway 11A intersection.

The TIA analysis of the post development conditions to determine the impact that the additional traffic will have on the intersection of Range Road 21 and Highway 11A, and improvements, if any, will be required to accommodate the additional traffic demand. In accordance with the Alberta Transportation TIA guidelines, analysis of the projected traffic volumes was completed on opening day (assumed to be 2015) and at the 20-year design horizon (2035). Figure 3-1 shows the site location of the TIA.

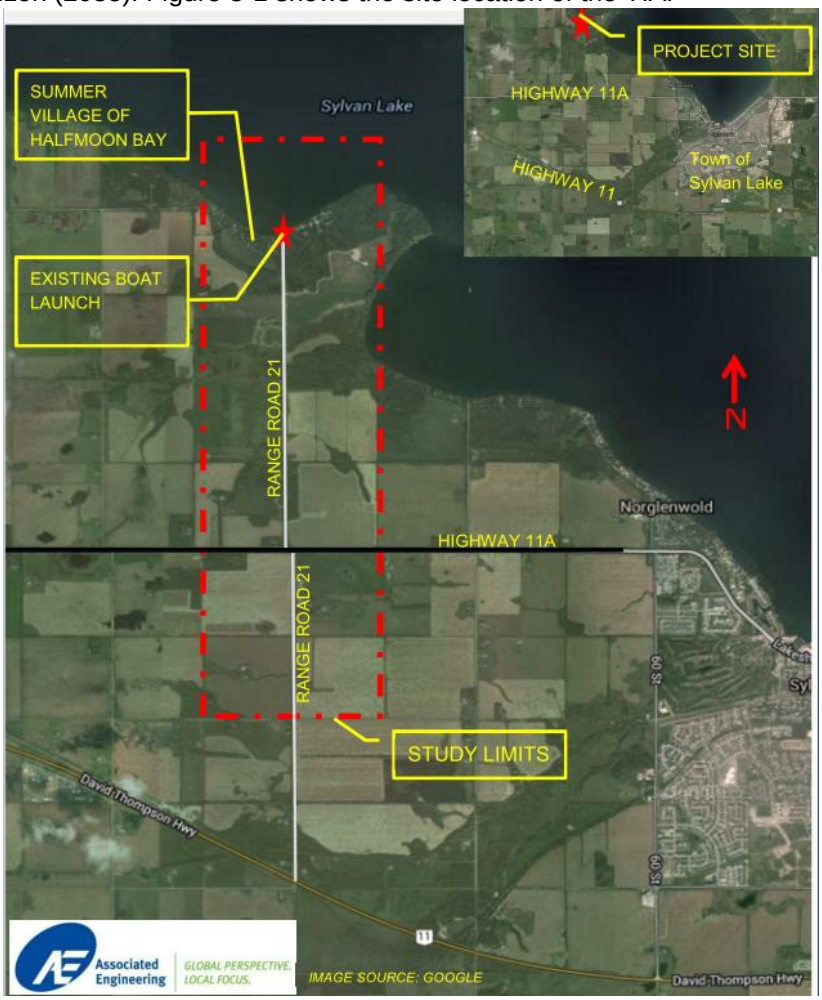


Figure 3-1
Site Location

Based on the findings from the TIA, AE recommends realigning the existing two T- intersections on Highway 11A to form a four legged intersection as well as upgrade the existing Alberta Transportation Type I intersection to Type IIB intersection within the analysis horizon.

The above recommendations apply whether the boat launch is redeveloped or not. The background traffic alone requires the above intersection improvements and the redevelopment of the boat launch adds negligible traffic to the intersection. AE recommends that the Committee meet with Alberta Transportation to discuss the findings and recommendations presented in the TIA report.

A copy of the TIA is provided in Appendix B.

4 Range Road 21 - Boat Launch Concept Plan

The Committee identified that the proposed formalized boat launch at Range Road 21 should provide the same level of service as the existing public boat launch at Sunbreaker Cove. Sunbreaker Cove Boat launch consists of the following:

- Double boat launch;
- Paved public parking less than 500m from the boat launch; and
- Two floating docks.

The following section outlines the design criteria for a new boat launch and provides concept plans to improve the launch area while minimizing the environmental impact and reducing impact to surrounding property owners and residents.

4.1 BOAT LAUNCH DESIGN CRITERIA

There are no federal or provincial design standards associated with the design of boat launches. In order to develop design criteria for the proposed boat launch, AE has reviewed and compiled the design criteria established by different organizations and in discussion with the Committee. These organizations include the following:

- American Society of Civil Engineers
- State of California, US
- British Columbia Parks

The design criteria from these organizations outline the best management practices for boat launch design. Table 4-1 summarizes the design criteria that was discussed and reviewed with the Committee to assess the proposed Range Road 21 boat launch.

Table 4-1
Boat Launch Design Criteria

Design Criteria	Design Value	Range Road 21 Location
Boat Launch Ramp		
• Minimum Single Lane Ramp Width	5-6 m 6m is recommended	• Land is available to meet this requirement
• Minimum lane width with launching ramps of two (2) or more lanes	4.6 m	• Land is available to meet this requirement
• Number of boats one launching lane will handle a day	up to 50 launchings and 50 retrievals a day	• The site can accommodate the single ramp which meets this requirement.
• Minimum diameter turn around if launching ramp is longer than 61m and has less than 4 lanes (<18.3m wide).	18.3 m	• Insufficient land available to accommodate the minimum turn diameter and drainage.
• Head of ramp elevation	No less than 0.3m above high water level	• Land is available to meet this requirement.
• Elevation of the toe of the ramp	No less than 1m below low water level based on 25 year water level average	• Land is available to meet this requirement.
• Ramp Slope	Outside water 2-10%, 5% ideal Under water 10-15%, 12% ideal	• Existing grade on site is less than the design criteria; therefore, the site does not meet this requirement.
• Vertical curve must be constructed at the head of ramp	4.5m to 6m vertical curve	• To be designed
Boat Launching Depth		
• Minimum water depth at design low water at the end of the ramp	1.2 m	• To be designed

Design Criteria	Design Value	Range Road 21 Location
• Required length beyond the toe of ramp at design low water; area shall be absolutely clear of navigational hazards and obstructions	15.2 m	• To be designed.
Parking		
• Distance of parking from head of ramp	180m	• Proposed location for the parking area is approximately 260m from the proposed ramp location.
• Typical minimum parking requirement per launching lane	30 - 50 car-trailer spaces	• Can be accommodated by the proposed parking location reviewed.
• Pull through car trailer parking spaces are typically preferred and are easier for site users.		• Can be accommodated by the proposed parking location reviewed.
• A nominal number of car only spaces should be provided.		• Can be accommodated by the proposed parking location reviewed.
• Handicap parking spaces required	1 handicapped for 50 car-trailer spaces and one for every 40 single car spaces should be provided	• Can be accommodated by the proposed parking location reviewed.

In review of the site characteristics to the design criteria in Table 4-1, construction of a new boat launch at Range Road 21 does not meet the identified design criteria. Specifically the slopes required for the ramp and within the lake at the boat launch.

As stated previously, the water depth in Half Moon Bay is shallow relative to the 1.2 m depth requirement for traditional boat launches, as well has a shallow upland and underwater grade. If the Committee wishes to construct a boat launch, which has similar capacities as the Sunbreaker Cove facility, significant work will be required to modify the area. This may include:

- Dredging a channel to create the minimum depth of 1.2 m at the launch location or
- Extending an earthen causeway until a minimum water depth of 1.2 m is obtained.

Both of these options would require ongoing maintenance requirements, increased environmental regulation constraints and higher capital cost.

Based on the criteria outlined in Table 4-1, the following additional parcels have been identified as potential public boat launch sites that may meet the Committee's requirements:

- SE 29-39-2-W5M – located within Lacombe County
- SE 15-39-2-W5M – located within Lacombe County
- Legal: 0924467-1-1 and 2 – located within Lacombe County

The review of the suitability of these sites for a proposed boat launch is not included in this scope.

4.2 LAYOUT CONCEPTS

AE has developed three (3) formalized boat launch concepts for the Range Road 21 site. These concepts are based on the launch being utilized during periods of high lake levels, when there is significant water depth to launch a boat.

The options are described in the following sections.

4.2.1 Option 1 –Single Launch – 20m ROW

Option 1, shown in Figure 4.1, is based on the following criteria:

- 20m wide right-of-way (R.O.W.) at the lake.
- A single ramp boat launch.
- A 10m wide access road.
- A 7m minimum turning radius for a vehicle and trailer.
- 5m on either side of the traffic lane for drainage.
- Parallel parking may be accommodated along the lane.

4.2.2 Option 2 – Single Launch – 25m ROW

Option 2, shown in Figure 4.2, is based on the following criteria:

- A 25 m wide R.O.W at the lake, this would require the acquisition of 5m of land to accommodate this proposed layout.
- A single ramp boat launch.
- A minimum turning radius of 8.5m to accommodate a vehicle and trailer.
- A 6.5m allowance for drainage (4m) and parallel parking (3.5m) on either side of the lane.

4.2.3 Option 3 – Double Launch – 30m ROW

Option 3, shown in Figure 4.3, is based on the following criteria:

- A 30m wide R.O.W at the lake, this would require the acquisition of 10m of land to accommodate this proposed layout.
- A Double ramp boat launch.
- A minimum turning radius of 8.5m would be provided.
- 4.2m on either side of the turnaround for drainage.

All options will require either dredging or lengthen the causeway to reach required launch depth.

As illustrated, Options 2 and 3 will required the purchasing land adjacent to the existing right-of-way. Should additional land not be purchased, Option 1 (single launch) configuration should be considered.

4.3 PARKING

Based on the parking criteria recommended in Table 4-1, 50 car-trailer stalls and 10 car parking stalls should be provided for a single launch, and 100 car-trailer stalls and 20 car parking stalls should be provided for a double launch.

An area south-west of the boat launch has been identified as a potential parking area. The site is located approximately 250m south of the boat launch. This is further than the recommended 180 m from the head of the ramp; however, this area is the most feasible location for a large parking area.

Figure 4-1 shows the proposed parcel of land.

Figure 4-1
Proposed Parking Location

4.4 SITE OPERATIONS

Four different site operations were examined for the upgraded boat launch at Range Road 21. The four options examined are as follows:

1. **Unmanned facility** - No staff inspection, signage provided only.
2. **Unmanned facility with regular inspection** - Staff visit the site on a regular basis to ensure that site is operating as intended, and provide general assistance, and maintenance. Signage will be provided to the public describing boat launch use.
3. **Supervised site, part time or full time** - Supervisor to assist with directing traffic and users. Supervisor will also be responsible for site maintenance. . Signage will be provided to the public describing boat launch use.

4. **Controlled site** – Staff would launch and retrieve all boats from the launch. Staff would be onsite full time to run the launch and to do maintenance as required.

The operating costs would increase when more supervision/higher level of service is assigned. For example the operating costs associated with an unmanned facility are very low as there is no need to pay an employee; however there is no site monitoring or assistance provided. In contrast, a controlled site would provide a much higher level of service, but has much higher costs associated with employment.

The Committee preferred an unmanned facility with a User Pay system that uses a remote electronic payment kiosk. In addition the site parking would also be a user pay system using a remote electronic payment kiosk.

IF NOT 25 mm ADJUST SCALES

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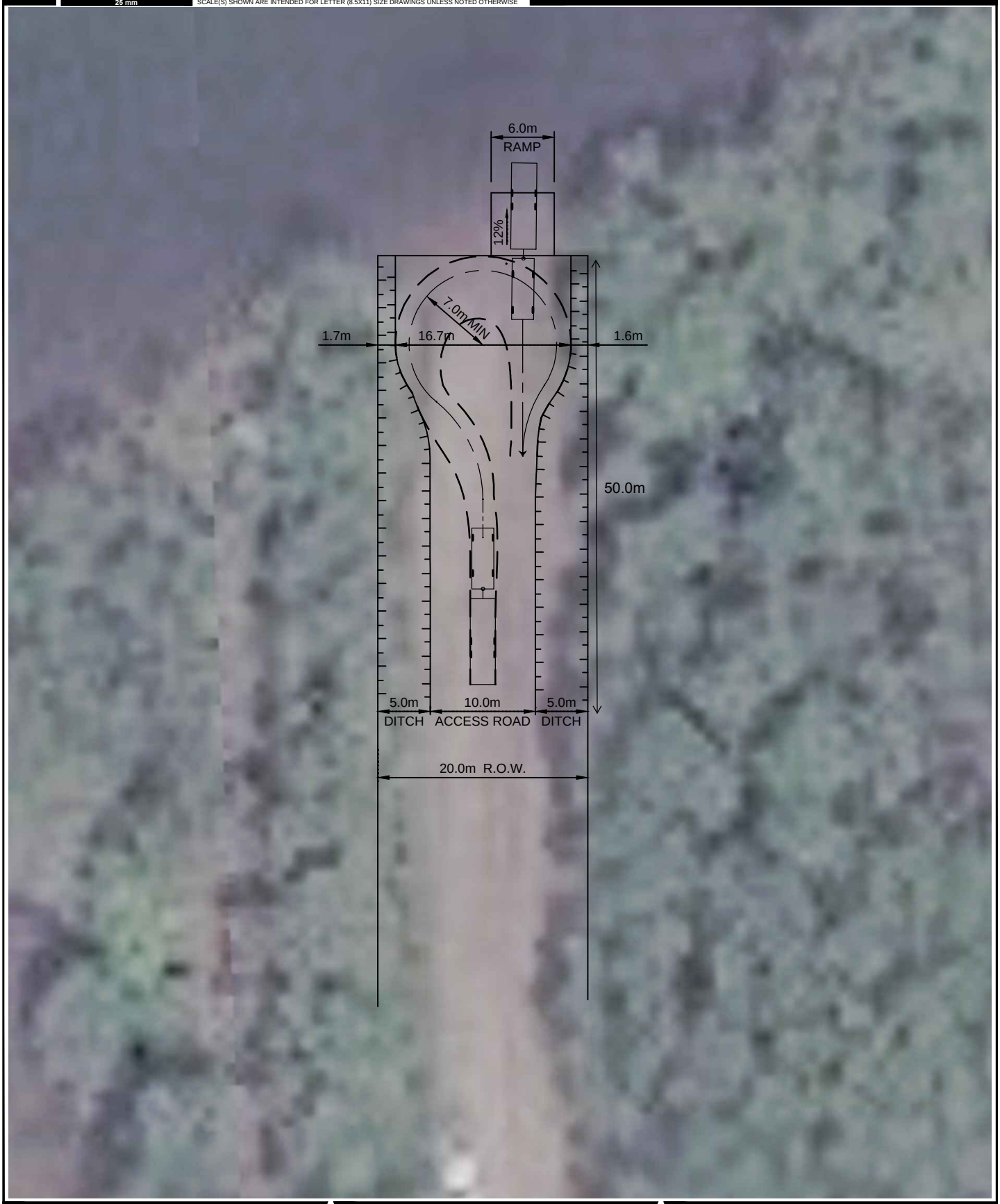
SCALE(S) SHOWN ARE INTENDED FOR LETTER (8.5X11) SIZE DRAWINGS UNLESS NOTED OTHERWISE



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DESCRIPTION	

FIGURE No. 4- 2

LACOMBE COUNTY

BOAT LAUNCH RAMP - OPTION 1

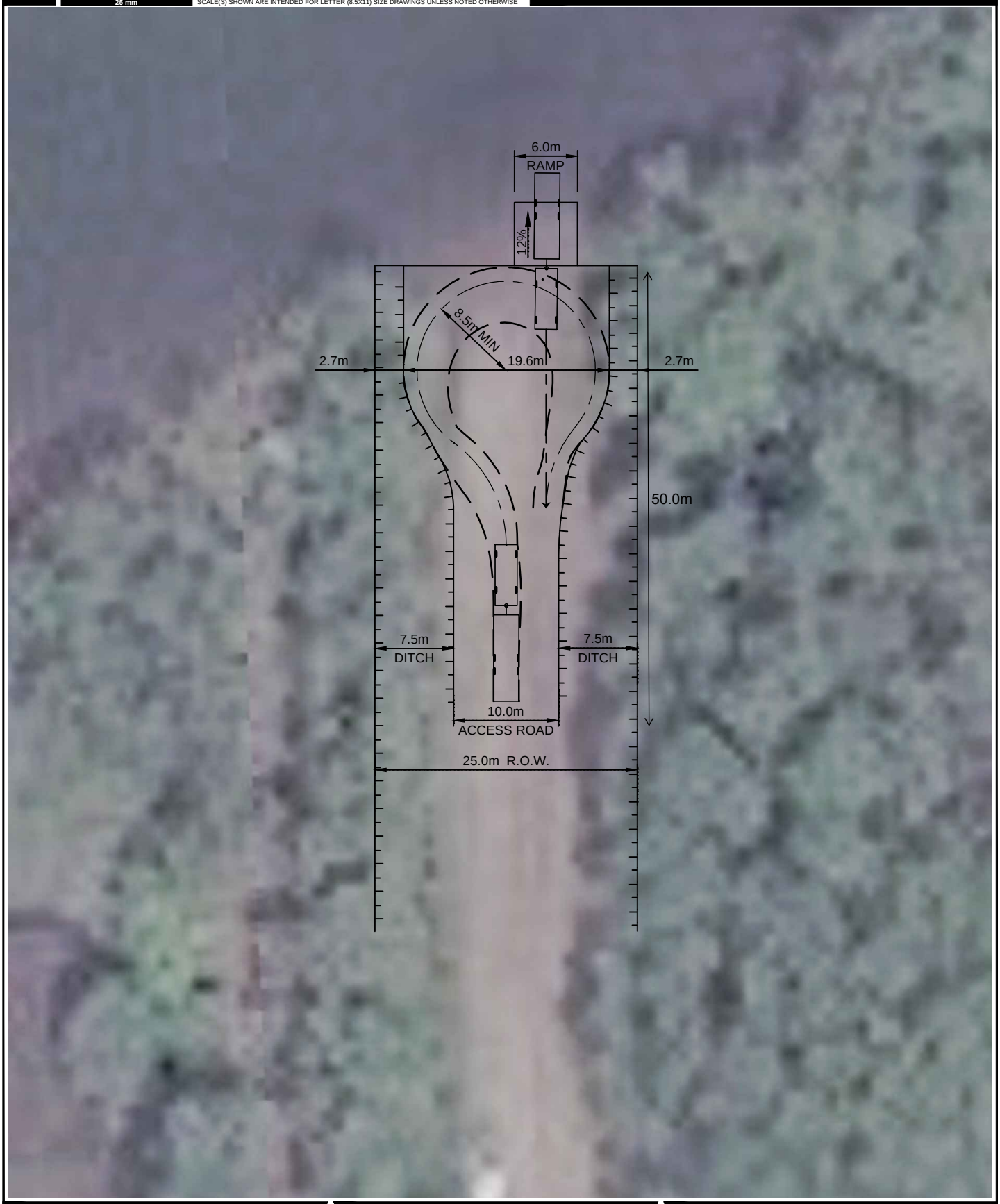

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FIGURE No. 4-3

LACOMBE COUNTY

BOAT LAUNCH RAMP - OPTION 2

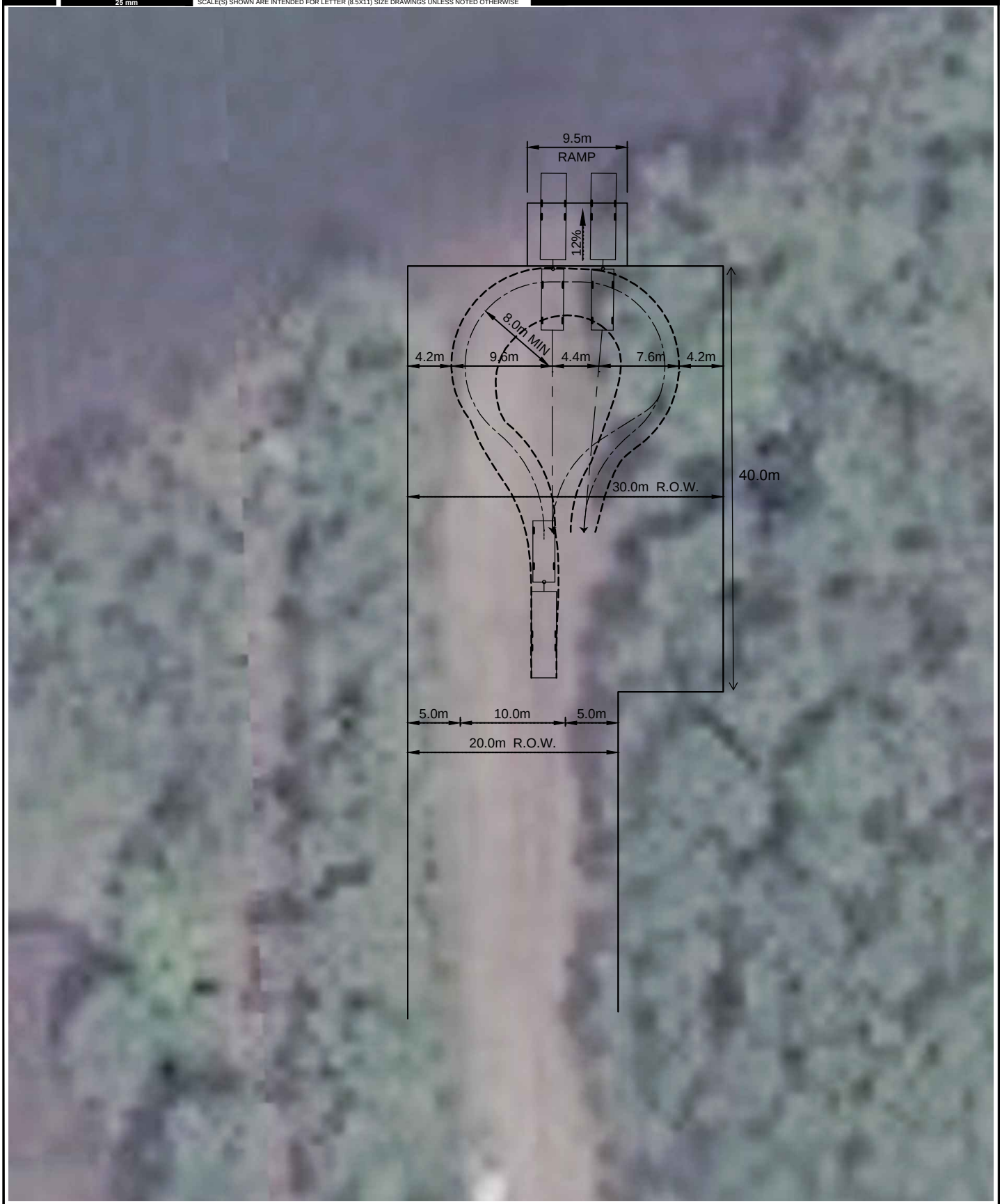

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FIGURE No. 4-4

LACOMBE COUNTY

BOAT LAUNCH RAMP - OPTION 3

5 Conclusions and Recommendations

5.1 CONCLUSIONS

The following is a summary of conclusions:

- Based on the fisheries assessment, a formal boat launch constructed at Range Road 21 will not significantly impact fish habitat.
- The Traffic Impact Assessment indicated that under current conditions, without the Boat Launch, the Range Road 21/ Highway 11A intersection should be upgraded to a Type IIB intersection based on Alberta Transportations guidelines. The proposed boat launch does not add significant traffic to the intersection.
- The Range Road 21 boat launch location does not meet the minimum design criteria. If the Committee wishes to construct a boat launch which has similar capacities as the Sunbreaker Cove facility, significant work will be required to modify the area, either through dredging or constructing an earthen causeway.
- The following parcels have been identified as alternate public boat launch sites that may meet the Committee requirements:
  - SE 29-39-2-W5M – located within Lacombe County
  - SE 15-39-2-W5M – located within Lacombe County
  - Legal: 0924467-1-1 and 2 – located within Lacombe County
- Three boat launch configurations were proposed; however, due to site limitations, Range Road 21 will have a reduced level of service as compared to the Sunbreaker Cove facility.
- Depending on the selected boat launch option additional land may need to be acquired.
- The Committee preferred an unmanned facility and parking with a user pay system that uses remote electronic payment.

5.2 RECOMMENDATIONS

The following recommendations are:

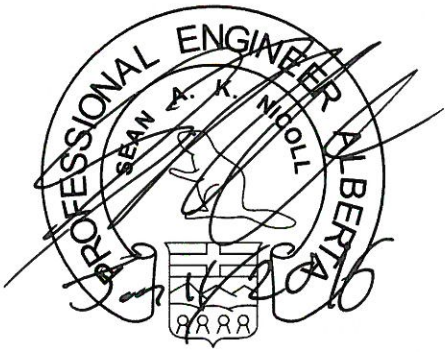
- The Committee and Associated Engineering should meet with Alberta Transportation to discuss the TIA.
- Should the Committee want to develop a formal boat launch facility at Range Road 21, the adjacent land owners to the launch site should be contacted to acquire additional land for its development and potential parking areas. This should be completed prior to selecting a launch configuration.
- If the Committee would like a boat launch with similar functionality as Sunbreaker Cove, an alternative site location should be investigated.

Closure

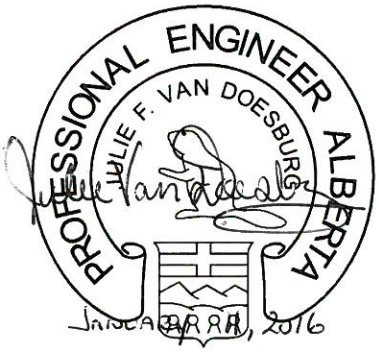
This report was prepared for the Lacombe & Red Deer Counties, Town of Sylvan Lake & Summer Villages of Sylvan Lake to identify the impact and requirements to develop a boat launch at Range Road 21.

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

Respectfully submitted,
Associated Engineering Alberta Ltd.



Sean Nicoll, P.Eng.
Project Manager



Julie Van Doesburg, P.Eng.
Project Engineer

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature:
Date: Jan 11, 2016

APEGA Permit to Practice P 3979

Appendix A - Fisheries Assessment

SUMMIT
ENVIRONMENTAL CONSULTANTS INC.
A Member of the Associated Engineering Group of Companies

REPORT

Sylvan Lake Steering Committee
Associated Engineering Alberta Ltd.

Half Moon Bay
Fish Habitat Assessment




November 2014

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1 Introduction

Sylvan Lake, Alberta is a widely used year-round recreational lake and growing municipality that experienced rapid increases in popularity in recent years. Between 2006 and 2011, the population of the greater Sylvan Lake area increased by 18% (from 10,997 to 12,981), with most of this growth occurring in the Town of Sylvan Lake on the lake's southeast shores (Statistics Canada 2014). Sylvan lake and the surrounding areas are located in Alberta Census Division Number 8 (CS8), and population growth in CS8 is projected to increase 74% (median projection) from 2013 population levels by 2041 (Alberta Treasury Board and Finance 2014).

The heightened popularity of the Sylvan Lake area has resulted in increased recreational demands on the lake and surrounding lands (i.e. boating, fishing, picnicking, camping, swimming, sailing), and lakeside development continues in many areas, primarily at the west end of the lake. During the summer months and especially on weekends, the existing recreation infrastructure is frequently at capacity or unable to meet demands. Users who are unable to access existing over-capacity boat launch infrastructure, trails, and beaches are using unofficial recreation sites at various locations, creating and exacerbating environmental impacts to environmentally sensitive areas (such as Kuusamo Krest at the terminus of Range Road 23 on the south shores of Sylvan Lake).

There are growing concerns regarding public safety at the existing facilities with respect to increased vehicle/boat traffic. Additionally, increased potential environmental impacts are an issue, including harm to fish and fish habitat; water quality; riparian, aquatic, and emergent vegetation; and the lake substrate. The threat of introduced invasive species to Sylvan Lake is a serious concern, as invasive species can potentially cause significant damage to the lake.

With these increasing recreation pressures on the lake, existing boat launch facilities at Sylvan Lake are frequently at capacity or insufficient to meet demands. Users who are unable to access launch infrastructure are using unofficial launch sites, exacerbating environmental impacts to environmentally sensitive areas. Recognizing these issues, the Sylvan Lake Steering Committee retained Associated Engineering (AE), AE's environmental science division Summit Environmental Consultants Inc. (Summit), and EIDOS Consultants Inc. to complete a recreation study and assess a number of locations as potential boat launch facilities. Part of this evaluation involved a fish habitat assessment at Half Moon Bay.

1.1 PROJECT RATIONALE

The purpose of this fish habitat assessment was to evaluate the available fish habitat and potential habitat usage in the lake at Half Moon Bay, and to provide information that would assist in selecting a location for a new boat launch facility. This report provides a brief outline of the location and background for the assessment, the fisheries inventory and habitat mapping methods that were used, results, interpretation, and environmental concerns.

1.2 LOCATION

Sylvan Lake is located in central Alberta, approximately 16 km west of the City of Red Deer. The Town of Sylvan Lake and the Summer Villages of Birchcliff, Half Moon Bay, Jarvis Bay, Norglenwold, and Sunbreaker Cove border the lake, as do Lacombe Country to the north and Red Deer County to the south. AE, Summit, and EIDOS reviewed a variety of material including previous environmental studies of Sylvan Lake, lake bathymetry, access, environmentally sensitive areas, critical fish habitat, previous fish habitat assessment reports, and land availability for a new boat launch. Half Moon Bay was selected by the Sylvan Lake Steering Committee as a potential boat launch site and summit completed a fish habitat assessment of the area. The summer village of Half Moon Bay is approximately 30 km west of Red Deer, AB. The village is located at the northern terminus of Range Road 21 where the road meets Sylvan Lake's southwest shore (Figure 1-1). The fish habitat assessment near Half Moon Bay was conducted within NE-11-39-02-W5M and NW-12-39-02-W5M. The specific area assessed (the assessment area) extended 300 m along the shoreline east and west of Range Road 21, and 150 m into the lake.

1.3 BIOPHYSICAL BACKGROUND

At 106 km^2, the Sylvan Lake drainage basin is small in comparison to the basins of similar-sized Alberta lakes. The lake has a surface area of 42 km^2, an average depth of 10.4 m, and is 18.3 m at its deepest point (Alberta Lake Management Society 2006, Sylvan Lake Watershed Stewardship Society 2014). Sylvan Lake is located in the Low Boreal Mixedwood ecoregion at the southernmost extent of the Boreal Forest. This ecoregion is characterized by aspen communities in succession to white spruce forest and gray luvisol soils (Alberta Forestry, Lands and Wildlife 1992). Sylvan Lake provides habitat for seven species of fish; all these are listed as "secure" by Environment and Sustainable Resource Development (ESRD) in the General Status of Alberta Wild Species 2010 (ESRD 2014a).

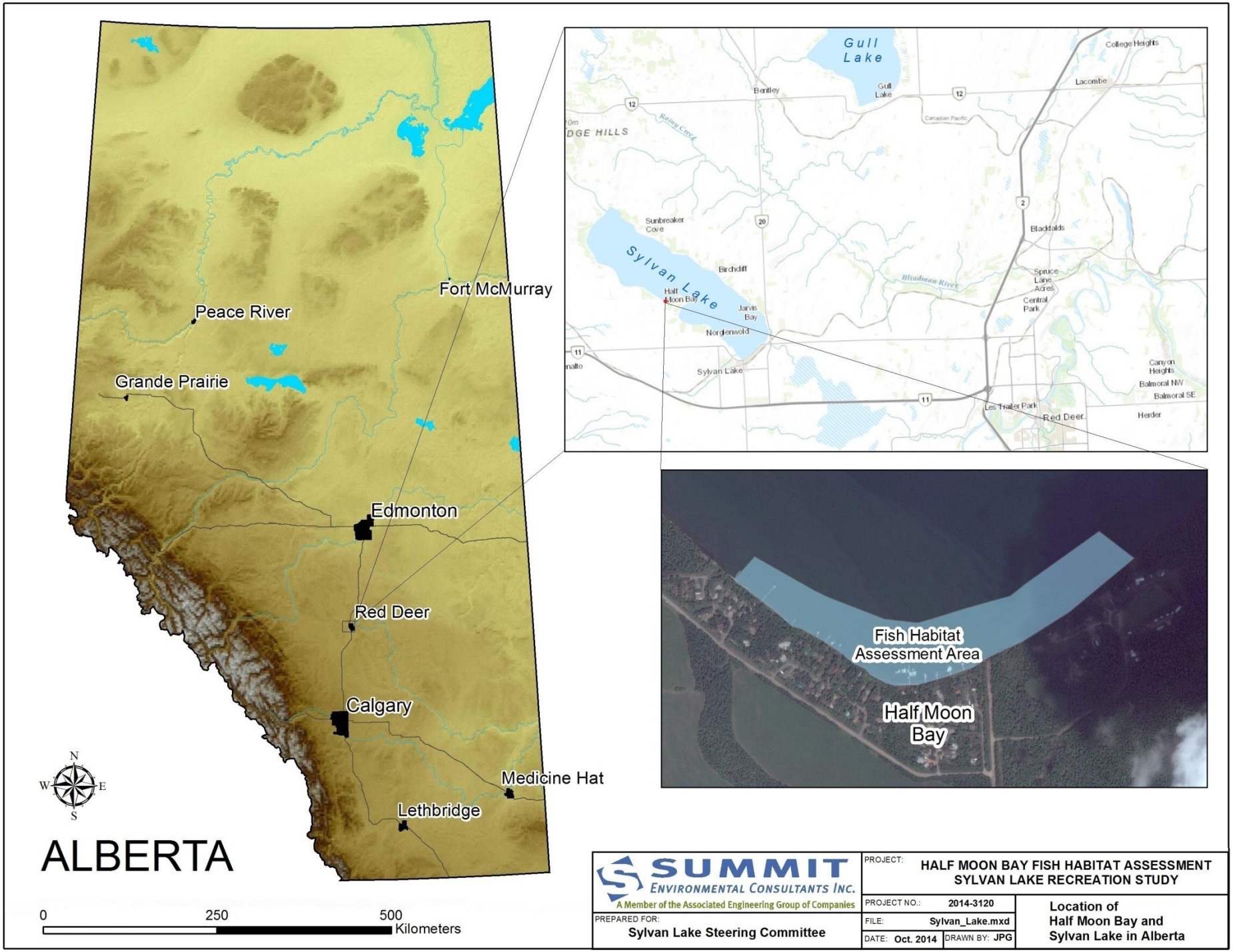

Figure 1-1 Location of the fish habitat assessment area in Half Moon Bay at Sylvan Lake, Alberta

2 Methods

2.1 FISH INVENTORY

The fisheries inventory and habitat mapping methods were designed with consideration for habitat that would be used by the fish species expected in the area, and were tailored to the scope of the project. Inventory methods employed to complete the fisheries inventory were as follows:

- database and literature review;
- electrofishing (backpack method along the shore);
- sample angling (from the shore and from a canoe);
- creel surveys; and
- recording of general observations.

A search of the province's Fish and Wildlife Management Information System database (ESRD 2014b) was completed prior to a field assessment of the Half Moon Bay FHA area (the assessment area). The purpose of the search was to identify which fish species had been documented in the area of interest previously, and to determine whether electrofishing would be required as a sampling method.

Electrofishing was carried out using a Smith-Root LR20 backpack electrofisher. The electrofishing effort consisted of 1,232 seconds in one pass from the east end to the west end of the assessment area. Surveyors fished around rocks and boulders, in cobble / gravel / fine substrate complexes, in vegetation beds, and around man-made structures, such as (seasonal) docks and portable boat launches.

To calibrate the electrofisher, in-field water parameters were measured 10 m from the shore at Range Road 21 using a YSI ProPlus multimeter (Table 2-1).

Table 2-1 Water chemistry values recorded 10 m offshore at Range Road 21 and used to calibrate the electrofisher on September 19, 2014

Parameter (unit)	Data
Water temperature (℃)	15.9
Dissolved oxygen (mg/L	6.36
pH	8.96
Conductivity (µS/cm)	522
Oxidation-reduction potential (mV)	145.8

Sample angling was completed on shore using jigs and various sizes and patterns of spoons. Sample angling effort consisted of 1 hour, during which the shore sampler slowly walked the length of the sample area and cast 10 m to 20 m into the lake. Sample angling was also completed from a canoe to reach areas

further into the lake; various sizes of spoons and patterns were used. This angling effort consisted of 1.5 hours, during which the canoe was slowly paddled in a zigzag pattern along the length of the sampling area 50 m to 150 m from shore, and samplers cast 10 m to 30 m from both sides of the canoe.

Creel surveys were also used to gather information about the fish populations of Half Moon Bay and surrounding areas. Sport fishers in and around Half Moon Bay were asked where and how long they had been fishing, and what equipment they had been using. They were also asked for catch information, including species and catch numbers.

Additionally, surveyors recorded fish observed while electrofishing and canoeing in the assessment area.

2.2 HABITAT ASSESSMENT

Habitat mapping was completed from a canoe that was paddled from the shore along transects that extended approximately 150 m into the lake. Substrate composition and vegetation cover were classified and sketched onto a map, and depth was measured at 25 m increments along each paddling transect. Transects were perpendicular to the shore and spaced approximately 30 m apart.

Emergent vegetation in Sylvan Lake provides foraging and rearing habitat for many fish species in the lake and is protected by protective notations held by ESRD. For this reason, areas containing emergent vegetation are considered “critical fish habitat” as defined in the Sylvan Lake Management Plan: 2000 Update (IBI Group 2000). Emergent vegetation was specifically investigated during the fish habitat assessment.

3 Results and Interpretation

3.1 FISH INVENTORY

A search of the Fish and Wildlife Management Information System database revealed that seven fish species have been documented in Sylvan Lake (ESRD 2014b). Table 3-1 summarizes these species and their conservation statuses.

The list of species was assessed to determine whether any were environmentally sensitive when considering the expected impacts associated with the construction and operation of a boat launch. Species statuses in Alberta are determined by ESRD in the General Status of Alberta Wild Species 2010, and in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; COSEWIC 2014; ESRD 2014a). Provincially, all fish species documented in Sylvan Lake are considered "secure." Federally, none of the noted fish species is listed by COSEWIC; therefore, none is listed in Schedule 1 of the *Species at Risk Act* (SARA). Electrofishing captured one emerald shiner (*Notropis atherinoides*). In addition, of the seven species documented in the lake, five (bolded in Table 3-1) have been documented in the assessment area during previous studies.

Table 3-1. Fish species documented in Sylvan Lake, Alberta

Common Name	Scientific Name	Alberta Status[1]	COSEWIC Status[2]	SARA Status[3]	Schedule under SARA[3]
Burbot	*Lota lota*	Secure	Not listed	No Status	Not Scheduled
Emerald shiner	*Notropis atherinoides*	Secure	Not listed	No Status	Not Scheduled
Lake whitefish	*Coregonus clupeaformis*	Secure	Not listed	No Status	Not Scheduled
Northern pike	*Esox lucius*	Secure	Not listed	No Status	Not Scheduled
Walleye	*Stizostedion vitreum*	Secure	Not listed	No Status	Not Scheduled
White sucker	*Catostomus commersoni*	Secure	Not listed	No Status	Not Scheduled
Yellow perch	*Perca flavescens*	Secure	Not listed	No Status	Not Scheduled

Notes:
Bold indicates that the species has been historically documented specifically within the assessment as well as in Sylvan Lake
[1] General Status of Alberta Wild Species 2010 (ESRD 2014a)
[2] Database of wildlife species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2014)
[3] Species at Risk Public Registry under SARA (*Species at Risk Act*; Environment Canada 2014a)

Sample angling captured no fish from shore or from the canoe. Creel surveys were conducted with all anglers in the bay or along its shores. The following anglers were interviewed on September 19, 2014 during the fish habitat assessment:

- two anglers who had fished from the shore at Half Moon Bay for 3 hours using spoons;
- three anglers who had fished in the bay from a boat for 1 hour using spoons;.
- two anglers who had fished from a boat off the shoals to the west of the bay for 3 hours using spoons and pickerel jigs; and
- two anglers who had fished from a boat off the shoals to the east of the bay using walleye jigs (fished the same location for three consecutive days).

Sport anglers reported that angling in Half Moon Bay was best in spring and early summer, and tended to be best during evenings. During the interviews, sport anglers indicated that no fish were caught by those fishing from shore or from a boat in Half Moon Bay. However, those who returned from a 3-hour fishing trip at the east shoal reported catching two northern pike, and anglers who returned from their third day of fishing at the west shoal reported catching a total of 260 walleye over the 3 days of their trip. Anglers reported that all fish caught were released; therefore, it is possible that some of the fish counted were re-captures.

During electrofishing, habitat mapping, and sample angling, surveyors observed six northern pike and three schools of minnows (Family Cyprinidae) within the assessment area. One of the northern pike was observed stalking one of the schools of minnows.

3.2 HABITAT ASSESSMENT

The assessment area was divided into two parts for reference: an area west of Range Road 21 and an area east of Range Road 21. The west area contained numerous cottages and portable boat launch structures and docks. In most of this area, riparian vegetation along the shore had been removed to provide lake access for the cottages beyond the shore. Motorized watercraft were docked at most of the structures in the west area. The east area contained no boat launch structures except for one dock at its eastern extent. Most of the riparian vegetation along the shore in this area was intact; exceptions were several lake access points at the Camp Kasota property. Emergent vegetation was not observed anywhere within the assessment area and therefore, habitat is not considered “critical fish habitat” in the assessment area.

Habitat mapping revealed a diverse array of lake substrates and suitable spawning habitat for four of the lake’s seven fish species. The available fish habitat contains a variety of components including:

- substrate complexes of fines, small gravels, large gravels, cobbles, boulders, and large woody debris (Figure 3-1);
- sparse and dense vegetation beds (Figure 3-2); and
- open areas; with man-made structures.

Spawning habitat suitable for burbot and lake whitefish was observed in much of the eastern portion of the assessment area. At the eastern extent of the assessment area, substrates featured higher proportions of cobbles, boulders, and small gravels. This area contains suitable spawning habitat for walleye and white

sucker. These species have been documented to spawn in shallow areas near shore with suitable substrates (McPhail 2007).

On average, the lake depth in the west portion of the assessment area was shallower than that in the east portion (Figure 3-3). Compared to the west, the east portion featured cleaner lake substrates and a higher degree of substrate consolidation. In general, the lake in the west area, the existing Range Road 21 launch site, and a small portion of lake next to the existing launch site in the east side of the assessment area showed signs of impact from boat traffic. These impacts included an increase in the amount of unconsolidated fines, higher turbidity, substrate rutting, substrate excavations, and vegetation removal. Compared to the rest of the lake within the assessment area, water depths in the proposed boat launch area (north of the Range Road 21 terminus) are shallower by approximately 0.3 m to 0.5 m (Figure 3-3).

A selection of photographs depicting the substrates, shorelines, boat launch structures, and the bay within the assessment area is included in Appendix A.

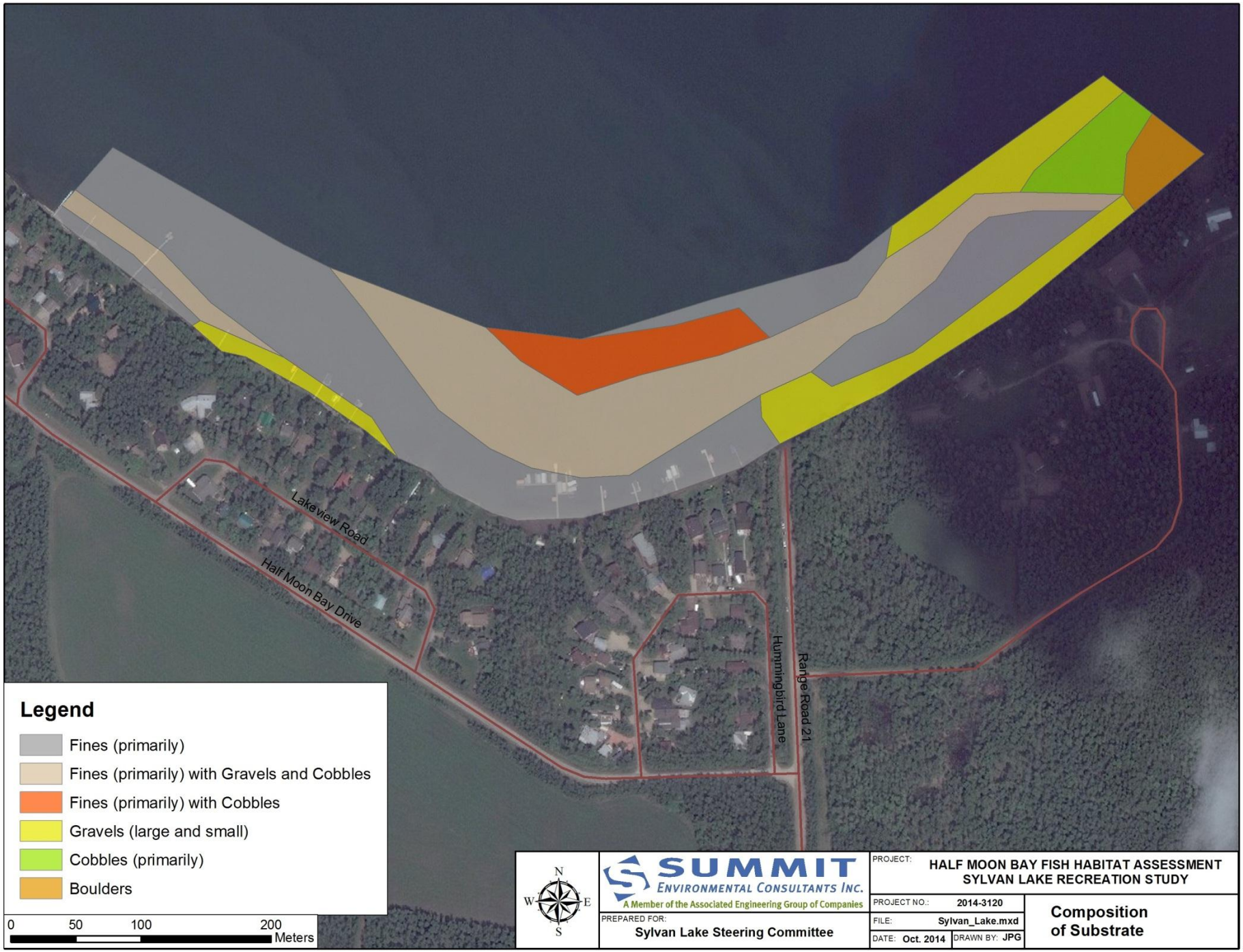

Figure 3-1 Substrate composition in the assessment area

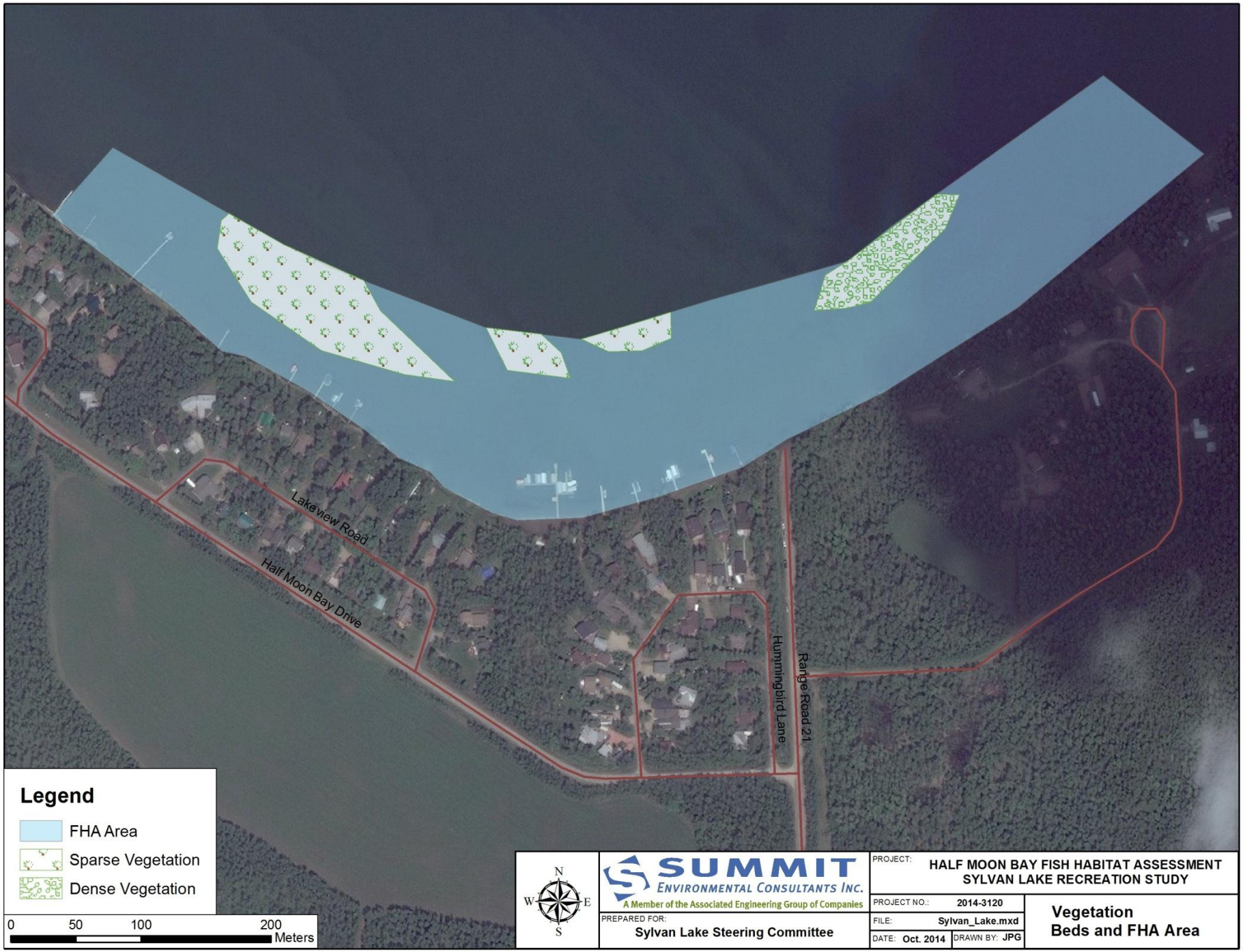

Figure 3-2 Sparse and dense vegetation beds in the assesment area

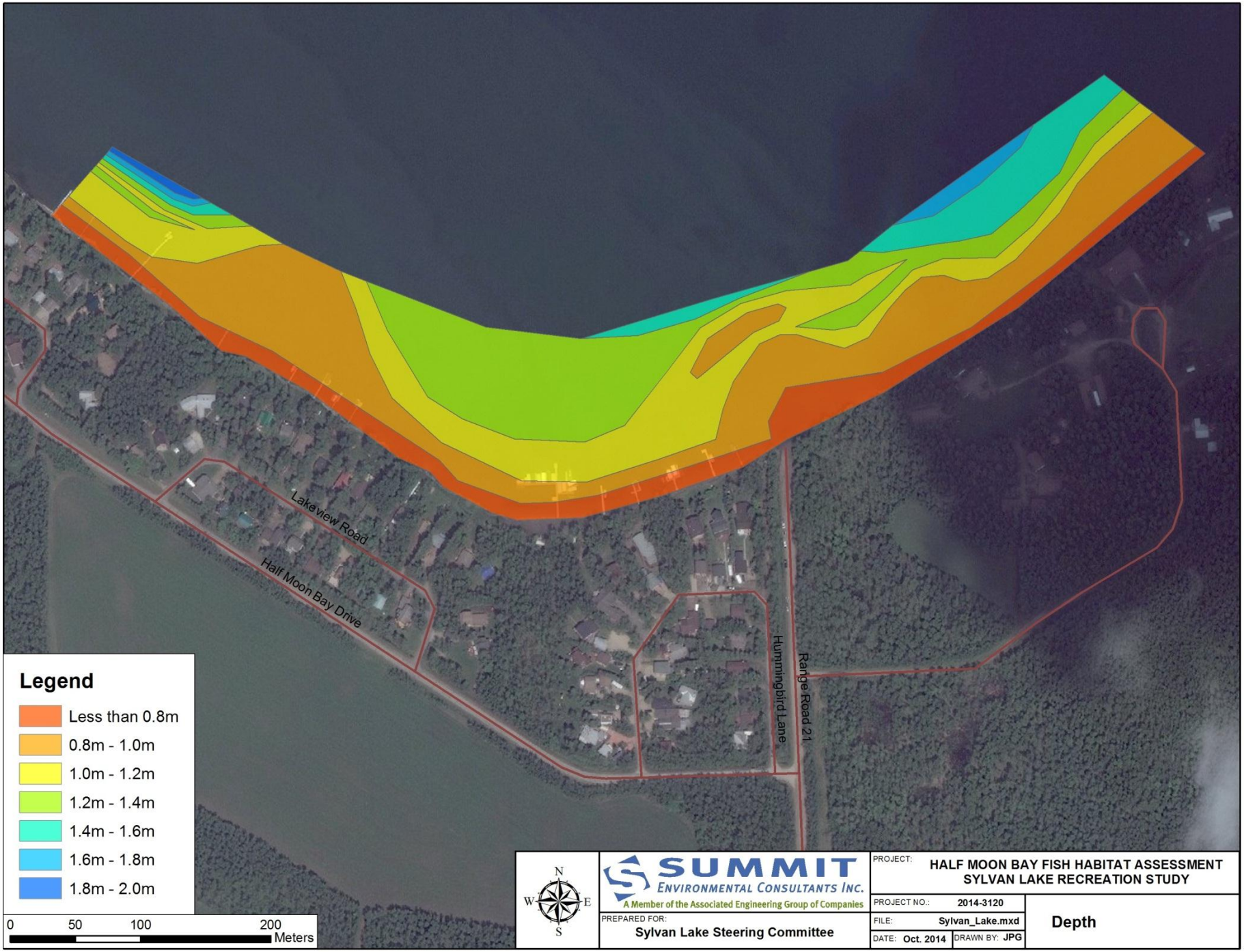

Figure 3-3 Water depths in the assessment area on September 19, 2014

4 Environmental Concerns

Habitat suitable for spawning and rearing activities of burbot and lake whitefish was identified in the assessment area. At the far eastern extent of the area, habitat suitable for spawning and rearing activities of walleye and white sucker was identified. As such, these species have been identified as species of minor concern regarding the construction of a boat launch and boat operation during spawning and rearing seasons. An increase in sedimentation has potential to smother fish eggs; therefore, it is important that project scheduling consider critical timing windows for affected species. Additionally, white suckers exhibit homing behaviour; they return to historical spawning areas to spawn and therefore it is important to ensure minimal loss or alteration of their habitat (McPhail 2007). Habitat at the eastern extent of the assessment area should be considered environmentally sensitive if, after adequate investigation, a white sucker spawning event is confirmed at the location.

Figure 4-1 shows the water levels of Sylvan Lake as derived from 30 years of data that were recorded daily at a monitoring station on Sylvan Lake from May to October between 1981 and 2011. The data were analyzed to determine the maximum, mean and minimum water levels in the lake for each year. Although data were only available for 2011 and earlier, Figure 4-1 indicates that in 2011 the water level of Sylvan Lake peaked at approximately 937.2 m (above sea level), matching peaks in 1991 and 1998. Water levels fluctuated from these peaks to as low as 936.2 m in 1981. Although the levels recorded in 1981 have not recurred since, relatively low water levels occurred in 1987, 1994, and 2003 (Environment Canada 2014b). The shallow grade of the lake bottom in many areas of Sylvan Lake presents an additional environmental concern when selecting a location for a boat launch. A drop in water level to the historic minimum could potentially result in nearly 100 m of temporarily dry land between the water's edge and the Range Road 21 terminus. Designs for a boat launch should accommodate for low- and high-water scenarios.

The shallow gradient at Half Moon Bay raises additional concerns. This bay is very shallow considering the 1.2 m depth requirement for a boat launch (American Society of Civil Engineers 1994). This issue is compounded when fluctuating water levels are considered. For the past several years, water levels in Sylvan Lake have been at the historic high water mark. Water levels have fluctuated by approximately 1.0 m and are currently at their highest in the last 30 years (Environment Canada 2014b). A 1.0 m drop in water levels at Half Moon Bay would expose a significant portion of beach and greatly extend the distance from the Range Road 21 terminus to the water's edge. While engineering solutions are available (rail system, hoist system, routine dredging, land berm, marina, pier), it is recommended that the environmental impacts of each option be thoroughly studied, or an alternate deep-water location be selected provided that environmental impacts to such a location can be adequately mitigated.

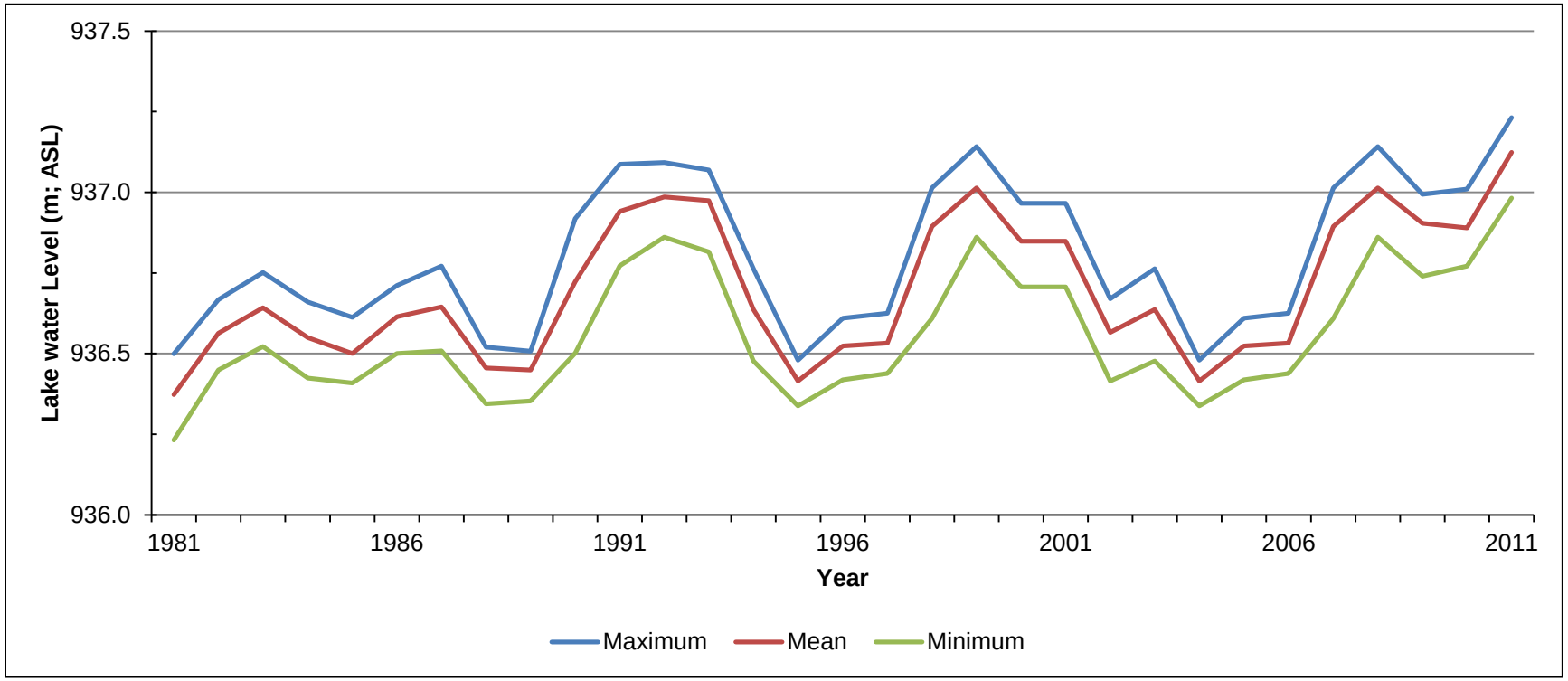

Figure 4-1 Water levels in Sylvan Lake for 1981 to 2011, as derived from Environment Canada Station 05CC003

5 Conclusion

The assessment area provides habitat for a number of fish species; however, for the purposes of this report, and based on the Sylvan Lake Management Plan: 2000 Update, “critical fish habitat” is defined as that which contains emergent vegetation (IBI Group 2000). Given that no emergent vegetation was observed in the assessment area, none of the fish habitat observed is considered critical. There is suitable habitat for multiple species throughout the assessment area, but the east portion has higher-quality fish habitat. This part of the assessment area features suitable spawning habitat for burbot and lake whitefish, and a small area at the easternmost extent of the assessment area contains suitable spawning habitat for walleye and white sucker.

Water depth in Half Moon Bay is shallow relative to the 1.2 m depth requirement for traditional boat launches (American Society of Civil Engineers 1994). Engineering solutions are available to achieve the depth required to operate a boat launch at Half Moon Bay; however, each has associated environmental impacts which should be thoroughly considered when selecting a boat launch type. Additionally, water levels in Sylvan Lake have recently (2011) been at the historic high but are known to drop by approximately 1.0 m. Such a reduction in water level would expose nearly 100 m of beach and present additional design considerations for a boat launch at Half Moon Bay.

Construction of a boat launch at the terminus of Range Road 21 (which currently shows signs of disturbance) would not significantly impact fish habitat, provided that the suitable spawning habitat east of the proposed boat launch location remains undisturbed by increased traffic, wave action, and other impacts from added boats in the area. Long-term use of a boat launch at this location is expected to reduce current environmental impacts by reducing the disturbance of substrate caused by trucks and boat trailers should Half Moon Bay be selected for the construction of a boat launch.

Closure

This report was prepared for the Sylvan Lake Steering Committee and Associated Engineering Alberta Ltd. to present the results of a fish habitat assessment completed at Half Moon Bay on Sylvan Lake. The purpose of the report is to supplement other information that pertains to the selection of a potential boat launch location.

The services provided by Summit Environmental Consultants Inc. in preparing this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

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Appendix A – Photographs

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Photograph 2: Boulders in water at the eastern extent of the assessment area.

Photograph 3: View of the eastern portion of the assessment area.

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Appendix B - Traffic Impact Assessment

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

TRAFFIC IMPACT ASSESSMENT

Lacombe County

Boat Launch - Strategy and Action Plan
for Recereational Access To Sylvan Lake

January 2015

CANADA'S BEST MANAGED COMPANIES

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1 Introduction

1.1 BACKGROUND

Sylvan Lake is located west of Red Deer, and is a popular tourist destination in Central Alberta. Sylvan Lake is currently managed by the surrounding eight municipal authorities: Lacombe County, Town of Sylvan Lake, Red Deer County, and five Summer Villages of Sylvan Lake.

In recent years, there has been a rapid growth in residential development and recreational activities in and around Sylvan Lake. The existing lake recreational facilities and accesses are not able to meet the demand arising from these activities. Tourists are experiencing problems due to lack of sufficient facilities, including lake accesses and residents have concerns due to improper use of undeveloped public lake accesses. In addition, informal lake accesses have increased the impacts on the water quality and adjacent fish habitat.

This recreational pressure placed on the lake by the residents and tourists has prompted the municipal authorities responsible for Sylvan Lake to initiate a Strategy and Action Plan for the recreational accesses to the lake. The intent of the Strategic Plan is to incorporate the public's needs, safety and environmental values of the area and develop decision-making criteria that will enable the municipalities to prioritize and justify locations for new recreational areas. The Action Plan will focus on the development of a formal boat launch and recreational access located on Range Road 21 with the guiding principles identified in the strategy.

Lacombe County has retained Associated Engineering (AE) to carry out an Action Plan and the Implementation Study for lake recreational usage. The main access to the formal boat launch is through the intersection of Range Road 21 and Highway 11A. This Traffic Impact Assessment (TIA) was developed as part of the Action Plan for the intersection of the Range Road 21 and Highway 11A to identify any potential impacts and improvements if required as a result of the formal boat launch located east of the Summer Village of Half Moon Bay.

1.2 STUDY OBJECTIVE

The main objective of the study is to identify the traffic impacts of converting the existing informal boat launch area into a formal boat launch on the intersection of Range Road 21 and Highway 11A.

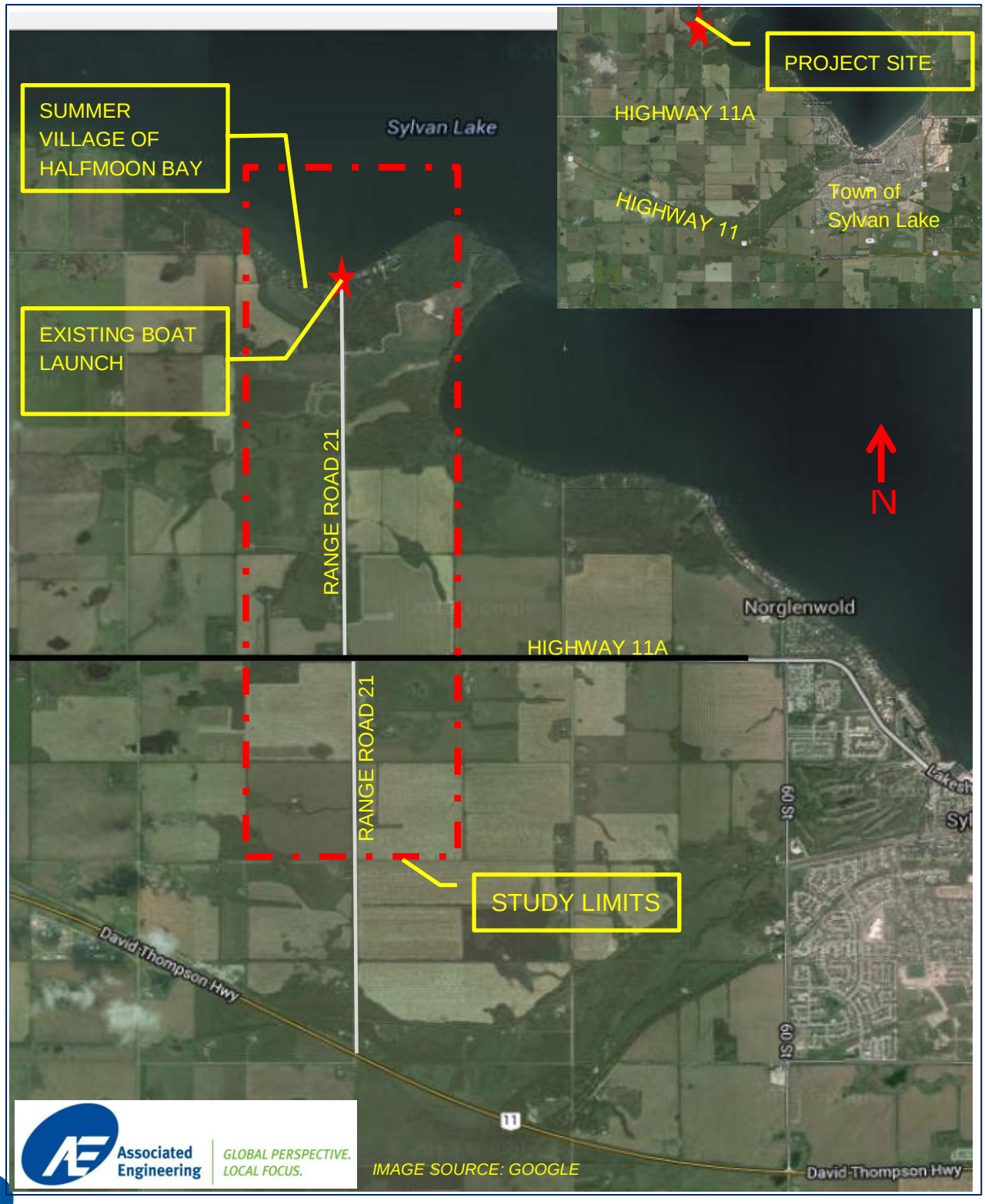
1.3 SCOPE OF WORK

This TIA will analyze the post development conditions in order to determine the impact that the additional traffic will have on the intersection of Range Road 21 and Highway 11A and what improvements, if any, will be required to accommodate the additional traffic demand. In accordance with the Alberta Transportation TIA guidelines, analysis of the projected traffic volumes was completed on opening day (assumed to be 2015) and at the 20-year design horizon (2035).

1.4 STUDY LIMITS

Study limits boundary was determined based on the proposed development's influence on traffic network. From preliminary investigation, it was found that the nearby intersection that would be majorly influenced by the proposed development was Range Road 21 and Highway 11A. The site location and study limits are shown in Figure 1-1.

Figure 1-1: Site Location



2 Existing and Proposed Conditions

2.1 EXISTING CONDITIONS

The current informal boat launch at Sylvan Lake is located 8km northwest of the Town of Sylvan Lake. The boat launch is accessed through the intersection of Highway 11A and Range Road 21. The intersection is 5km from the west side of the Town. The boat launch is located south of Sylvan Lake on Range Road 21 just east of the Summer Village of Half Moon Bay.

Associated Engineering (AE) completed a site visit to review the existing intersection configuration and sight lines. The following provides a summary of the site visit:

2.1.1 Intersection of Range Road 21 and Highway 11A

- Highway 11A is a correction line and therefore Range Road 21 has two three-leg intersections on Highway 11A that are offset by about 75m. The north approach is on the west side and the south approach is on the east side.
- North of Highway 11A, Range Road 21 provides access to the Summer Village of Half Moon Bay, the Boy Scout Camp and the boat launch. Range Road 21 ends near the shore of the Sylvan Lake at the boat launch site.
- South of Highway 11A, Range Road 21 continues south.
- The two intersections are un-signalized Alberta Transportation Type Ia intersections. The intersections are located in an area with a posted speed limit of 100 km/h on Highway 11A.
- Highway 11A is an undivided two lane paved highway with a rural cross section. Range Road 21 has a rural gravel cross section with a posted speed of 80 km/h.
- Currently there is no illumination at the intersections.
- The available intersections sight distance is not limited by any vertical grades or horizontal curves.

There are a few residences and farm lands adjoining Range Road 21 south and north of Highway 11A. The Summer Village of Half Moon Bay is on the west side of boat launch and the Boy Scout Campground is on the east side. Most of the residences in the Summer Village of Half Moon Bay are vacation homes (part time residents) and a few are full time residences. These developments are primarily rural in nature in terms of trip generation. The current boat launch is capable of launching one boat at a time.

As indicated earlier, the two Range Road 21 T-intersections with Highway 11A are offset by approximately 75m. Further investigation is needed to realign Range Road 21 to form a four legged intersection with Highway 11A and is beyond the scope of this TIA. For the purpose of this TIA, AE has assumed that the two T-intersections are realigned to form a four legged intersection.

2.2 PROPOSED CONDITIONS

As part of a feasibility study, Lacombe County, Red Deer County, Town of Sylvan Lake and the Summer Villages of Sylvan Lake together would like to study the impacts of formalizing the boat launch area. The

municipalities proposed to construct a dual boat launch pad that can launch two boats simultaneously. It is also proposed to develop this site with amenities like a fuel station and merchandise at this location. The proposed boat launch site is included in Appendix A.

3 Traffic Volumes

The developments north of Highway 11A include the Summer Village of Half Moon Bay, Boy Scout Campground, a few residences and farmland. These developments on either side of Range Road 21 contribute few trips on Range Road 21. The development south of Highway 11A includes several farms which contribute fewer trips on Range Road 21. The Majority of traffic in this area is on Highway 11A. The traffic generation from within the study area is analyzed and discussed below.

3.1 BACKGROUND TRAFFIC VOLUMES

3.1.1 Current (2014) Background Traffic

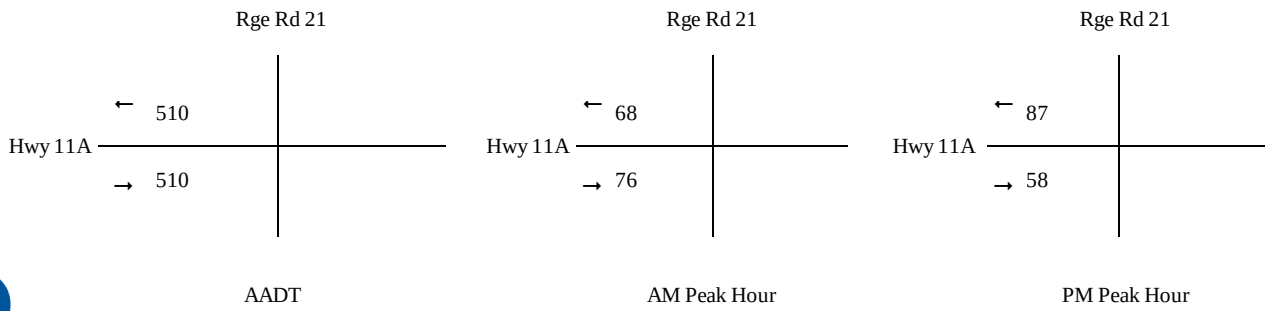
The existing traffic volumes (2014) at the intersection of Highway 11A and Range Road 21 were not available and were determined from two sources: Daily traffic counts carried out on Range Road 21 for a week in the years 2009, 2010, 2011, 2012 by Red Deer County, and Alberta Transportation's 2002 to 2013 traffic counts at the intersection of Highway 11 and Highway 11A. The traffic count data is included in Appendix B. The following discussion outlines the method of determining the traffic movement counts on Highway 11A at this intersection.

3.1.1.1 Highway 11A Background Traffic

The 2013 Alberta Transportation traffic data available for the intersection of Highway 11A and Highway 11 were used to determine the through traffic on Highway 11A at the intersection of Range Road 21 and Highway 11A. Based on the land development adjoining Highway 11A between the intersections of Highway 11 and Highway 11A, and Highway 11A and Range Road 21, it is assumed that the through traffic on Highway 11A at the intersection of Range Road 21 and Highway 11A is same as the traffic on Highway 11A at the intersection of Highway 11 and Highway 11A. Figure 3-1 illustrates the 2013 traffic counts at the intersection of Highway 11A and Range Road 21.

To determine the growth rate on Highway 11A, an analysis of the 2002 to 2013 Highway 11A AADT traffic data from Alberta Transportation yielded a negative growth rate of -2.47%. Due to the negative growth rate this rate was not used. Using Alberta Transportation's TIA guidelines, a 2.5 % growth rate is assumed to estimate the through traffic on Highway 11A in the year 2014.

Figure 3-1: Traffic on Highway 11A in 2013



3.1.1.2 Trip Generation From Developments Along Range Road 21 North of Highway 11A

Within the study limits, the existing full time and part time residences adjoining Range Road 21 north of Highway 11A were analyzed to determine the number of trips that generated from these developments. The traffic volumes associated with these existing developments have been estimated using the trip generation information available from the Institute of Transportation Engineers Trip Generation Manual (9th Edition). These trips were also discounted due to their rural nature based on the local traffic counts.

For estimating the trips generated from the current boat launch it was assumed that vehicles would be arriving at the existing launch pad at about 2 per hour in the AM peak and 4 per hour in the PM peak. This assumption was based on the condition of the current boat launch facility. In general the boat launch is more utilized in the evening. It takes around 15 minutes to take a boat in or out of the lake during the PM peak hour. So in one hour four trips will be generated from the boat launch during the PM peak. In the morning, the boat launch is less utilized and the trips would likely be fishing trips. The trips would not be as high as in the PM peak hour and assumed to be 2 per hour in the AM peak. The current boat launch facility is inefficient in taking boats in and out of the lake and requires improvements to increase the capacity and will be discussed in the subsequent sections.

For estimating the trips generated from the Boy Scout Campground, it is assumed that these do not generate trips during the peak hours due to the nature of the type of development. Typically the primary mode of transport to this development will be school buses. Buses typically arrive and leave the campground to drop off and pick up the kids, during the midday or evening hours (off peak hours). As such no trips were assumed during the AM and PM peak hours.

The trips generated by the above described developments during the AM and PM peak hours have been summarized in Table 3-1.

Table 3-1: Trip Generation from Existing Development – Range Road 21 - North

Development Type	ITE Code	Units	% of Residences	Discount Factor	Daily	% In	% Out	Trips In	Trips Out	AM Peak	% In	% Out	Trips In	Trips Out	PM Peak	% In	% Out	Trips In	Trips Out
Boat Launch	-	1	-	-	36.00	50	50	18	18	2.00	100	0	2	0	4.00	25	75	1	3
Half Moon Bay (Full Time)	210	67	20	0.6	9.52	50	50	38	38	0.75	25	75	2	5	1.00	63	37	5	3
Half Moon Bay (Half Time)	210	67	80	0.3	9.52	50	50	77	77	0.75	25	75	3	9	1.00	63	37	10	6
Rural Residences along RR21	210	15	100	0.6	9.52	50	50	43	43	0.75	25	75	2	5	1.00	63	37	6	3
Total								**176**	**176**				**9**	**19**				**22**	**15**

3.1.1.3 Trip Generation From Developments Along Range Road 21 South of Highway 11A

Within the study limits, the existing residences adjacent to Range Road 21 south of Highway 11A were analyzed to determine the number of trips that will be generated from these developments. The traffic volumes associated with these existing developments have been estimated using the trip generation information available from the Institute of Transportation Engineers Trip Generation Manual (9th Edition). These trips were also discounted due to their rural nature based on the local traffic counts.

The trips generated by the above described developments during the AM and PM peak hours have been summarized in Table 3-2.

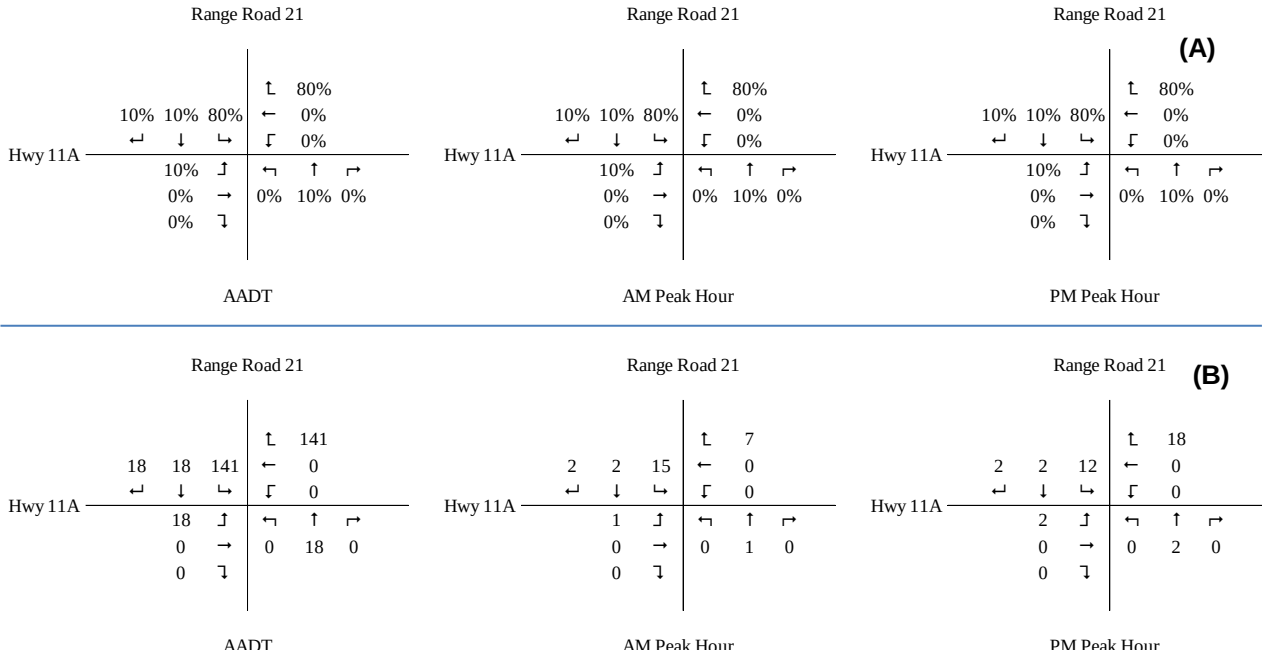
Table 3-2: Trip Generation from Existing Development– Range Road 21 - South

Development Type	ITE Code	Units	% of Residences	Discount Factor	Daily	% In	% Out	Trips In	Trips Out	AM Peak	% In	% Out	Trips In	Trips Out	PM Peak	% In	% Out	Trips In	Trips Out
Rural Residences along RR 21	210	3	100	0.6	9.52	50	50	9	9	0.75	25	75	0	1	1.00	63	37	1	1
Total								**9**	**9**				**0**	**1**				**1**	**1**

3.1.1.4 Trip Distribution and Assignment from Developments along Range Road 21 North of Highway 11A

For determining the trip distribution pattern for the traffic from the existing development along Range Road 21 north of Highway 11A, based on the intersection's neighbourhood characteristics it is assumed that 80% of the traffic will be from the east, 10% will be from the south, and 10% will be from west. The percentages and corresponding trips are shown in Figure 3-2 (A) and (B).

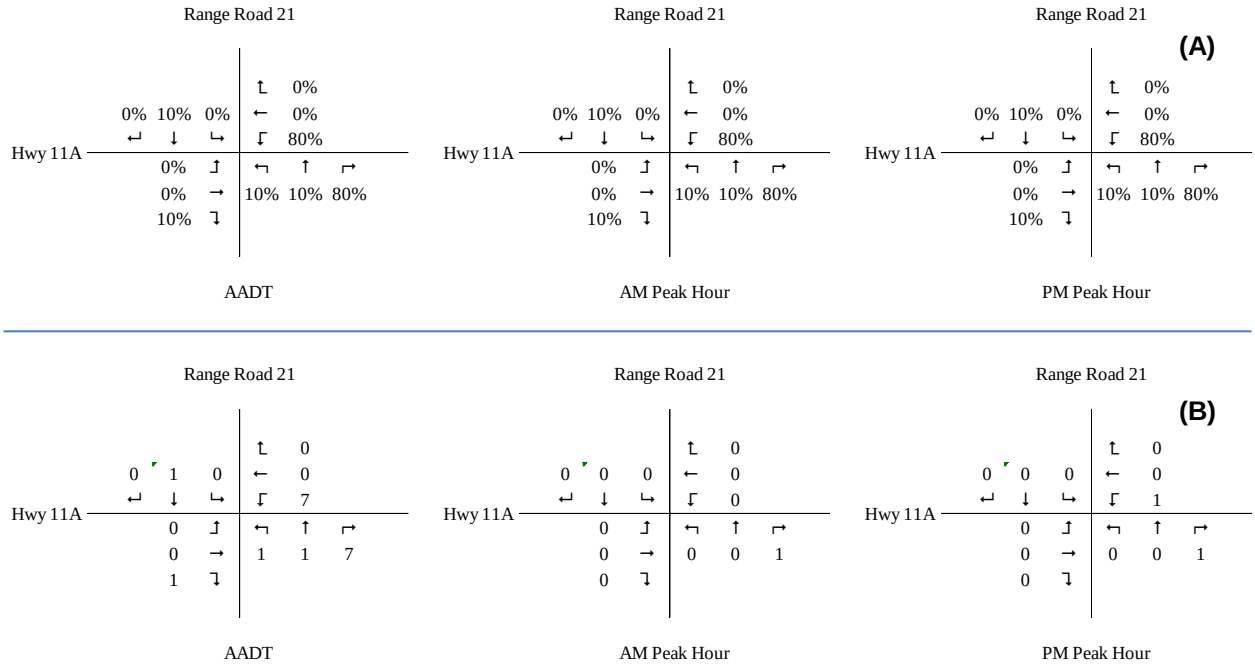
Figure 3-2: Trip Distribution From Development North of Highway 11A



3.1.1.5 Trip Distribution and Assignment from Developments along Range Road 21 South of Highway 11A

For determining the trip distribution pattern for the traffic from the existing development along Range Road 21 south of Highway 11A, based on the intersection's neighbourhood characteristics it is assumed that 80% of the traffic will be from the east, 10% will be from the north, and 10% will be from the west. The percentages and corresponding trips are shown in Figure 3-3 (A) and (B).

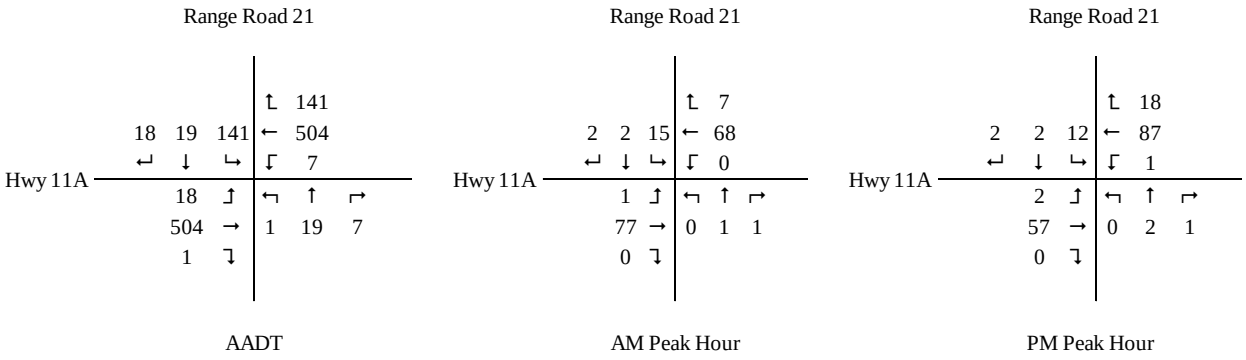
Figure 3-3: Trip Distribution From Development South of Highway 11A



3.1.1.6 Existing 2014 Combined Background Traffic

To determine the combined background traffic volumes, the existing development traffic was added together. The current background traffic volumes for the intersection are shown in Figure 3-4. The AADT on Range Road 21 was compared with the traffic data obtained from Red Deer County and determined to be similar.

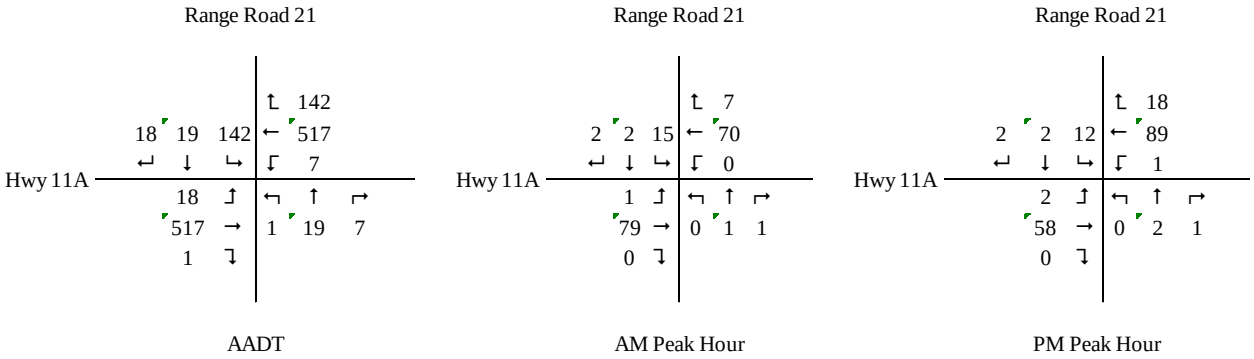
Figure 3-4: 2014 Background Traffic Volumes



3.1.2 Opening Day (2015) Background Traffic

As discussed in 3.1.1.1, a 2.5 % growth rate was used to estimate the through traffic on Highway 11A in the year 2015. Based on the growth constraints along Range Road 21, a 1% growth rate was assumed for all movements other than through traffic on Highway 11A. The projected 2015 background traffic (projected opening day) turning movement diagrams for the intersection are shown in Figure 3-5.

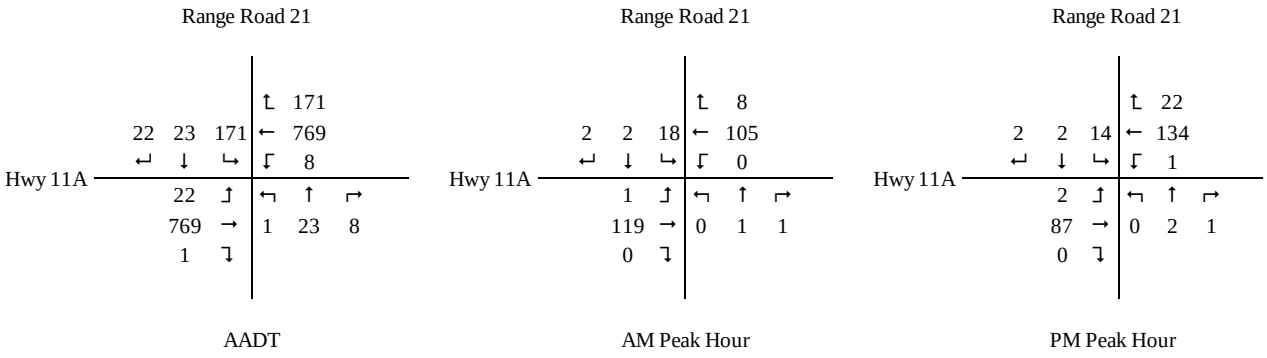
Figure 3-5: 2015 Background Traffic Volumes



3.1.3 Horizon Design/Full Build-Out Year (2035) Background Traffic

As discussed in 3.1.1.1, a 2.5 % growth rate was used to estimate the through traffic on Highway 11A in the year 2035. Based on the growth constraints along Range Road 21, a 1% growth rate was assumed for all movements other than through traffic on Highway 11A. The projected 2035 background traffic (horizon year) turning movement diagrams for the intersection is shown in Figure 3-6.

Figure 3-6: 2035 Background Traffic Volumes



3.2 DEVELOPMENT TRAFFIC VOLUMES

3.2.1 Trip Generation

As discussed in 3.1.1.2, the existing boat launch is inefficient taking boats in and out of the lake. By upgrading the current boat launch area and adding a second launch area to launch two boats simultaneously, it should take approximately 10 minutes to take a boat in and out of the lake. So in one hour, 12 boats can be taken in and out of the lake in the PM peak hour. In the morning hour, the area is less utilized and assumed to generate four trips per hour in the AM peak hour. So additional trips generated due to the second boat launch pad are about 2 per hour in the AM peak (2 already generated by the existing boat launch) and 8 per hour in the PM peak (4 already generated by the existing boat launch). The trips generated by the development during the AM and PM peak hours have been summarized in Table 3-3.

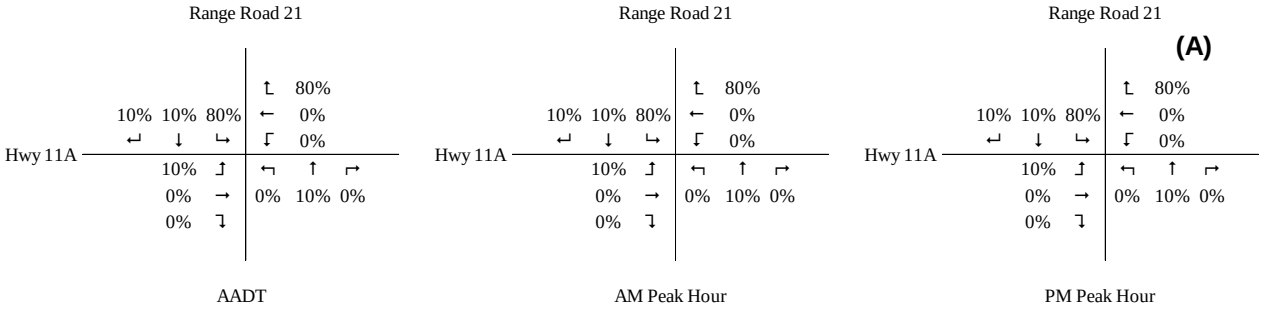
Table 3-3: Projected Development Trips

Development Type	Daily	% In	% Out	Trips In	Trips Out	AM Peak	% In	% Out	Trips In	Trips Out	PM Peak	% In	% Out	Trips In	Trips Out
Second Boat Launch	54.00	50	50	27	27	2.00	100	0	2	0	8.00	25	75	2	6
Total				**27**	**27**				**2**	**0**				**2**	**6**

3.2.2 Trip Distribution and Assignment

For determining the trip distribution pattern for the traffic at the proposed development along Range Road 21 north of Highway 11A, it was assumed that 80% of the traffic will be from east, 10% will be from the south and 10% will be from west. The percentages are shown in Figure 3-7.

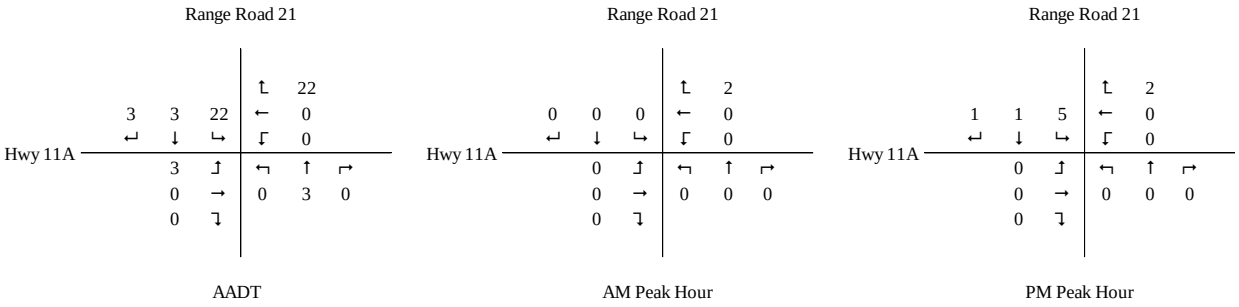
Figure 3-7: Projected Development Traffic Trip Distribution



3.2.3 Development Traffic

Based on the traffic pattern and distribution assumptions, the opening day (2015) traffic from proposed development is shown in Figure 3-8.

Figure 3-8: Projected Development Traffic Volumes



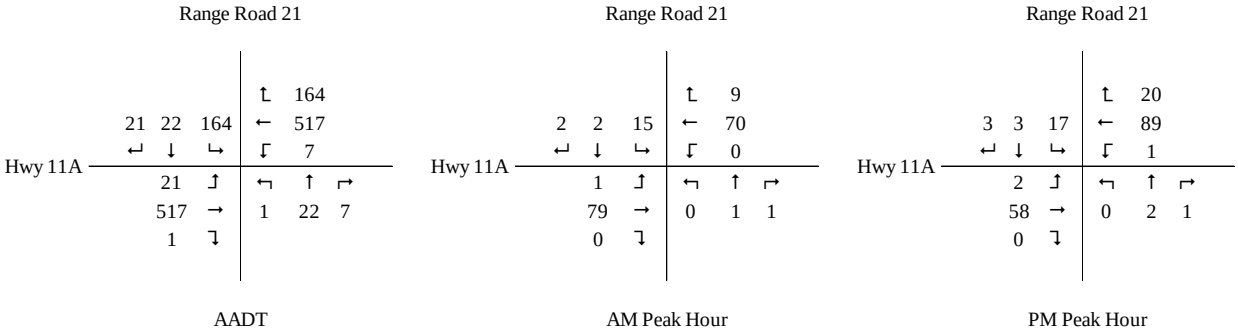
3.3 COMBINED TRAFFIC VOLUMES

To determine the combined traffic volumes, the development traffic was added to the background volumes for each development horizon. These traffic volumes form the basis of the analysis for this study.

3.3.1 Opening Day (2015) Combined Traffic

Figure 3-9 shows opening day (2015) combined traffic volumes.

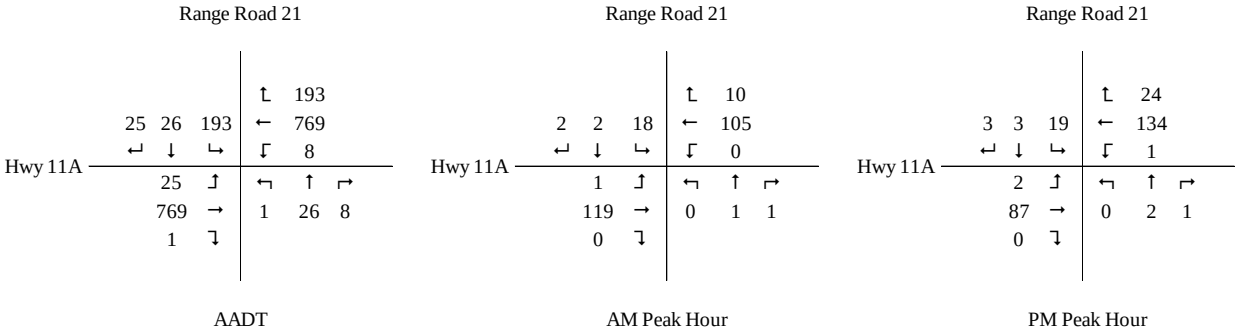
Figure 3-9: Projected 2015 Combined Traffic Volumes



3.3.2 Horizon Design/Full Build-Out Year (2035) Combined Traffic

Figure 3-10 shows horizon year (2035) combined traffic volumes.

Figure 3-10: Projected 2035 Combined Traffic Volumes



4 Intersection Analysis

4.1 LEFT TURN WARRANT ANALYSIS

To determine the required intersection treatment, AE used the intersection analysis procedure outlined in the Alberta Transportation Highway Geometric Design Guide. The requirement for a left turn lane is based on a combination of the number of left turning vehicles during the peak hour, and the volume of both advancing and opposing traffic. The following tables present a summary of the traffic volumes used in the analysis, and the warranted left turn treatment.

4.1.1 Background Traffic

Table 4-1 shows left turn warrant analysis summary for background traffic.

Table 4-1: Left Turn Warrant Analysis Summary – Background Traffic

Highway 11A Eastbound	2015		2035	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Volume of left turns (VL)	1	2	1	2
Volume of advancing traffic (Va)	80	60	120	89
Percentage of left turns (%L)	1%	3%	1%	2%
Volume of opposing traffic (Vo)	77	108	113	157
Warranted left turn treatment	None	Type II	Type II	Type II
Highway 11A Westbound	**2015**		**2035**	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Volume of left turns (VL)	0	1	0	1
Volume of advancing traffic (Va)	77	108	113	157
Percentage of left turns (%L)	0%	1%	0%	1%
Volume of opposing traffic (Vo)	80	60	120	89
Warranted left turn treatment	None	None	Type II	None

The results of the analysis show that a dedicated left turn lane is not warranted for the eastbound and westbound direction in the 2015 and 2035 design horizons; based on the analysis completed using background traffic, AE has determined that a Type II intersection treatment is warranted at this location.

4.1.2 Combined Traffic

Table 4-2 shows left turn warrant analysis summary for combined traffic.

Table 4-2: Left Turn Warrant Analysis Summary – Combined Traffic

Highway 11A Eastbound	2015		2035	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Volume of left turns (VL)	1	2	1	2
Volume of advancing traffic (Va)	80	60	120	89
Percentage of left turns (%L)	1%	3%	1%	2%
Volume of opposing traffic (Vo)	79	110	115	159
Warranted left turn treatment	None	Type II	Type II	Type II
Highway 11A Westbound	**2015**		**2035**	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Volume of left turns (VL)	0	1	0	1
Volume of advancing traffic (Va)	79	110	115	159
Percentage of left turns (%L)	0%	1%	0%	1%
Volume of opposing traffic (Vo)	80	60	120	89
Warranted left turn treatment	None	None	Type II	None

The results of the analysis show that a dedicated left turn lane is not warranted for the eastbound and westbound direction in 2015 and 2035 design horizons; based on the analysis completed combined traffic, AE has determined that a Type II intersection treatment is warranted at this location.

4.2 RIGHT TURN WARRANT ANALYSIS

Section D.7.7 of the Alberta Transportation Highway Geometric Design Guide outlines the three conditions that must be met to warrant the construction of a dedicated right turn lane:

- Main (or through) road AADT ≥ 1800
- Intersecting road AADT ≥ 900, and
- Right turn daily traffic volume ≥ 360 for the movement in question.

4.2.1 Background Traffic - Highway 11A

Table 4-3 shows right turn warrant analysis summary for background traffic.

Table 4-3: Right Turn Warrant Analysis Summary – Background Traffic

Warrant Threshold	Highway 11A Eastbound		Highway 11A Westbound	
	2015	2035	2015	2035
Main Road AADT >1800	1072 (No)	1584 (No)	1332 (No)	1896 (Yes)
Intersecting Road AADT > 900	54 (No)	64 (No)	358 (No)	432 (No)
Daily Right Turn Volume >360	1 (No)	1 (No)	142 (No)	171 (No)
Right Turn Lane Warranted (Yes/No)	No	No	No	No

The results of the analysis indicate that no right turn treatment is required in the eastbound and westbound direction.

4.2.2 Combined Traffic

Table 4-4 shows right turn warrant analysis summary for combined traffic.

Table 4-4: Right Turn Warrant Analysis Summary – Combined Traffic

Warrant Threshold	Highway 11A Eastbound		Highway 11A Westbound	
	2015	2035	2015	2035
Main Road AADT >1800	1078 (No)	1590 (No)	1376 (No)	1940 (Yes)
Intersecting Road AADT > 900	60 (No)	70 (No)	414 (No)	488 (No)
Daily Right Turn Volume >360	1 (No)	1 (No)	164 (No)	193 (No)
Right Turn Lane Warranted (Yes/No)	No	No	No	No

The results of the analysis indicate that no right turn treatment is required in the eastbound and westbound direction.

4.3 CAPACITY ANALYSIS

The Synchro/SimTraffic 8 traffic analysis program is based on the Institute of Transportation Engineers Highway Capacity Manual and was used to analyze the capacity of the study intersections and determine the need for additional intersection and capacity improvements. This program applies the methodology established by the Highway Capacity Manual to output a Level of Service for a study intersection, given the lane designations, vehicular volumes, signal timing and heavy vehicle percentages. Intersection operations are typically rated by two measures: Level of Service and volume-to-capacity ratios.

Level of Service is based on the estimated average delay per vehicle for all traffic passing through an intersection. A high Level of Service is a result of a very low average delay; the highest Level of Service is identified as Level of Service A. A low Level of Service is a result of a large average delay; typically, the lowest Level of Service is identified as Level of Service F. The Level of Service categories varies depending on whether an intersection is signalized or stop or yield-controlled. The Highway Capacity Manual justifies this difference by noting that drivers stopped at a signal light will have more tolerance for delays because they will perceive that eventually they will get their turn. Table 4-5 identifies the Level of Service criteria for intersections.

Table 4-5: Level of Service Criteria

Level of Service	Average Signalized Control Delay per Vehicle (s)	Average Stop Control Delay per Vehicle (s)
A	less than 10	less than 10
B	10 – 20	10 – 15
C	20 – 35	15 – 25
D	35 – 55	25 – 35
E	55 – 80	35 – 50
F	greater than 80	greater than 50

The volume-to-capacity ratio of an intersection describes the extent to which the traffic volumes can be accommodated by the theoretical capacity of the intersection. A volume-to-capacity ratio below 0.9 indicates that there is generally sufficient capacity to accommodate the traffic on the approach or at the intersection. A value between 0.9 and 1.0 suggests unstable operations and congestion may occur as

volumes are nearing the theoretical capacity of the roadway. A calculated value over 1.0 indicates that volumes are theoretically exceeding capacity.

For the Highway 11A intersection with Range Road 21, a minimum Level of Service D was required for the intersection and for each approach at all horizon analysis.

4.3.1 Background Traffic Volumes

4.3.1.1 Opening Day (2015) Background Traffic Volumes

Based on the 2015 background traffic volumes, the intersection is expected to operate at Level of Service A during the AM and PM peak hours. Table 4-6 shows the level of service summary for 2015 background traffic.

Table 4-6: Level of Service Summary - 2015 Background Traffic

Peak Hour	Movement	Highway 11A (eastbound)			Highway 11A (westbound)			Range Road 21 (northbound)			Range Road 21 (southbound)		
		L	T	R	L	T	R	L	T	R	L	T	R
AM	Volume	1	79	0	0	70	7	0	1	1	15	2	2
	V/C		0.00			0.00			0.00			0.03	
	Movement LOS		A			A			A			B	
	Approach Delay		0.1			0.0			9.3			10.1	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											
PM	Volume	2	58	0	1	89	18	0	2	1	12	2	2
	V/C		0.00			0.00			0.00			0.02	
	Movement LOS		A			A			A			B	
	Approach Delay		0.3			0.1			9.6			10.2	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											

4.3.1.2 Horizon Year (2035) Background Traffic Volumes

Based on the 2035 background traffic volumes, the intersection is expected to operate at Level of Service A during the AM and PM peak hours. Table 4-7 shows the level of service summary for 2035 background traffic.

Table 4-7: Level of Service Summary - 2035 Background Traffic

Peak Hour	Movement	Highway 11A (eastbound)			Highway 11A (westbound)			Range Road 21 (northbound)			Range Road 21 (southbound)		
		L	T	R	L	T	R	L	T	R	L	T	R
AM	Volume	1	119	0	0	105	8	0	1	1	18	2	2
	V/C		0.00			0.00			0.00			0.04	
	Movement LOS		A			A			A			B	
	Approach Delay		0.1			0.0			9.6			10.7	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											
PM	Volume	2	87	0	1	134	22	0	2	1	14	2	2
	V/C		0.00			0.00			0.00			0.03	
	Movement LOS		A			A			A			B	
	Approach Delay		0.2			0.0			10.0			10.9	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											

4.3.2 Combined Traffic Volumes

4.3.2.1 Opening Day (2015) Combined Traffic Volumes

Based on the 2015 combined traffic volumes, the intersection is expected to operate at Level of Service A during the AM and PM peak hours. Table 4-8 shows the level of service summary for 2015 combined traffic.

Table 4-8: Level of Service Summary - 2015 Combined Traffic

Peak Hour	Movement	Highway 11A (eastbound)			Highway 11A (westbound)			Range Road 21 (northbound)			Range Road 21 (southbound)		
		L	T	R	L	T	R	L	T	R	L	T	R
AM	Volume	1	79	0	0	70	9	0	1	1	15	2	2
	V/C		0.00			0.00			0.00			0.03	
	Movement LOS		A			A			A			B	
	Approach Delay		0.1			0.0			9.3			10.1	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											
PM	Volume	2	58	0	1	89	20	0	2	1	17	3	3
	V/C		0.00			0.00			0.00			0.04	
	Movement LOS		A			A			A			B	
	Approach Delay		0.3			0.1			9.6			10.3	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											

4.3.2.2 Horizon Year (2035) Combined Traffic Volumes

Based on the 2035 combined traffic volumes, the intersection is expected to operate at Level of Service A during the AM and PM peak hours; Table 4-9 shows the level of service summary for 2035 combined traffic.

Table 4-9: Level of Service Summary - 2035 Combined Traffic

Peak Hour	Movement	Highway 11A (eastbound)			Highway 11A (westbound)			Range Road 21 (northbound)			Range Road 21 (southbound)		
		L	T	R	L	T	R	L	T	R	L	T	R
AM	Volume	1	119	0	0	105	10	0	1	1	18	2	2
	V/C		0.00			0.00			0.00			0.04	
	Movement LOS		A			A			A			B	
	Approach Delay		0.1			0.0			9.6			10.7	
	Approach LOS		A			A			A			B	
	Intersection LOS	**A**											
PM	Volume	2	87	0	1	134	24	0	2	1	19	3	3
	V/C		0.00			0.00			0.00			0.04	
	Movement LOS		A			A			B			B	
	Approach Delay		0.2			0.0			10.0			11.0	
	Approach LOS		A			A			B			B	
	Intersection LOS	**A**											

4.3.3 Capacity Analysis Summary

The results of the capacity analysis show that the intersection will have sufficient capacity to accommodate the projected 2015 and 2035 background traffic volumes based on the AT intersection warranted Type II intersection. In an alternate scenario where the development does occur, the intersection will similarly function acceptably in 2015 and 2035.

4.4 SIGNAL WARRANT ANALYSIS

A Traffic Signal Warrant Analysis was completed using the procedure outlined by the Transportation Association of Canada. In accordance with Alberta Transportation policy, a warrant score in excess of 80 indicates that traffic signals should be considered. The Traffic Signal Warrant results are summarized in Table 4-10 for the 2015 background traffic, 2035 background traffic, 2015 and 2035 combined traffic. Using the projected traffic volumes Associated Engineering calculated a warrant score of 3 in 2035. Therefore signalization of this intersection will not be required. The signal warrant analysis output is included in Appendix D.

Table 4-10: Traffic Signal Warrant Results

Intersection	2015 Background Traffic		2035 Background Traffic		2015 Combined Traffic		2035 Combined Traffic	
	Warrant Points	Warranted	Warrant Points	Warranted	Warrant Points	Warranted	Warrant Points	Warranted
Highway 11A and Range Road 21	1	No	2	No	2	No	3	No

4.5 ILLUMINATION WARRANT ANALYSIS

An illumination warrant analysis was completed using the procedure outlined in the Design of Roadway Lighting by the Transportation Association of Canada (TAC). TAC illumination warrant conditions are shown in Table 4-11.

Table 4-11: TAC Illumination Warrant Conditions

Warrant Points	Illumination Warrants
Total Points > 240	Full Illumination Warranted
120 < Total Points < 240	Partial and/or delineation lighting warranted:
	if Geometric Factors Subtotal > 80 points: partial lighting to illuminate key decision areas, potential conflict points and/or hazards
	if Operational Factors Subtotal >120 points: delineation lighting to illuminate pedestrians or cross street traffic
	if Collision History Subtotal = 120 points: review collisions to determine appropriate lighting strategy
Total Points < 120	Lighting not warranted

Using the projected traffic volumes Associated Engineering calculated warrant scores for different scenarios and is given in Table 4-12. None of the scenarios exceeded warrant points of 120. Therefore illumination of this intersection will not be required. The illumination warrant analysis output is included in Appendix F.

Table 4-12: Illumination Warrant Results

Intersection	2015 Background Traffic		2035 Background Traffic		2015 Post Development		2035 Post Development	
	Warrant Points	Warranted	Warrant Points	Warranted	Warrant Points	Warranted	Warrant Points	Warranted
Highway 11A and Range Road 21	50	No	50	No	50	No	50	No

4.6 SIGHT DISTANCE

A WB-21 Design vehicle was used to determine the available sight distance at these intersections. Based on Alberta Transportation Highway Geometric Design Guide, Chapter D, Figure D-4.2.2.2, a minimum sight distance of 560m (See Appendix G) is required for a WB-21 to make a left turn onto Highway 11A from Range Road 21. Site investigation at this intersection reveals that it has sufficient sight distance of more than 560m from Range Road 21. This intersection does not have any sight distance issues in terms of horizontal or vertical grades.

5 Conclusions and Recommendations

Lacombe County, Red Deer County, Town of Sylvan Lake and the five Summer Villages of Sylvan Lake, with Lacombe County as the lead, have launched a program to study the feasibility of developing the informal boat launch on Range Road 21 south of Sylvan Lake. As a part of the program, AT requires a Traffic Impact Assessment (TIA) as a result of redeveloping the boat launch. AE completed the TIA and the following are conclusions and recommendations.

5.1 CONCLUSIONS

- Based on the site review it was determined that the majority of traffic within the study limits will be passing through the Highway 11A and Range Road 21 intersection.
- The Summer Village of Half Moon Bay will generate the majority of traffic within the study area and will be using Range Road 21 to reach the intersection of Highway 11A and Range Road 21.
- Area surrounding Range Road 21 south of Highway 11A does not generate major traffic.
- Based on existing conditions, it was determined that Highway 11A is a correction line and therefore Range Road 21 has two three-leg intersections on Highway 11A that are offset by about 75m. The intersections will need to be realigned to form a four legged intersection.
- Based on the Left-Turn Warrant Analysis, it was determined that an Alberta Transportation Type II intersection is required within the analysis horizon.
- Based on the Right-Turn Warrant Analysis, it was determined that no dedicated right turns are required for any lanes within the analysis horizon.
- Based on the Capacity Analysis, it was determined this intersection has no issues in terms of Level of Service within the analysis horizon.
- Based on Signal Warrant Analysis, it was determined that this intersection does not warrant signalization within the analysis horizon.
- Based on Illumination Warrant Analysis, it was determined that this intersection does not warrant illumination within the analysis horizon.
- Based on Sight Distance Analysis, it was determined that this intersection does not have any sight distance issues.

5.2 RECOMMENDATIONS

- AE recommends realigning the existing two T- intersections on Highway 11A to form a four legged intersection.
- It is recommended to upgrade the existing Alberta Transportation Type I intersection to Type IIB intersection within the analysis horizon.
- During the detailed design stage it is recommended that the proposed four legged intersection be reviewed for any operational and sight distance issues.
- The above recommendations apply whether the boat launch is redeveloped or not. The background traffic alone requires the above intersection improvements and the redevelopment of the boat launch adds negligible traffic to the intersection.

Closure

This report was prepared for Lacombe County to study the traffic impacts on the intersection of Highway 11A and Range Road 21 caused by the redevelopment of existing single boat launch to a dual boat launch.

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

Respectfully submitted,
Associated Engineering Alberta Ltd.

Steven Kennedy
Project Manager

PROFESSIONAL ENGINEER
GAUTHAM KARRI
Jan 15 2015

Gautham Karri, P. Eng.
Project Engineer

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature: _____
Date: JAN 9, 2015

APEGA Permit to Practice P 3979

Appendix A - Proposed Development


PROPOSED
BOAT LAUNCH
N
BOYS SCOUT
CAMPGROUND
SUMMER
VILLAGE OF
HALFMOON BAY
Hummingbird Ln
RANGE ROAD 2-1
Range Rd 21
Hummingbird Ln
Hummingbird Ln
Halfmoon Bay Dr

Appendix B - Traffic Volumes

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

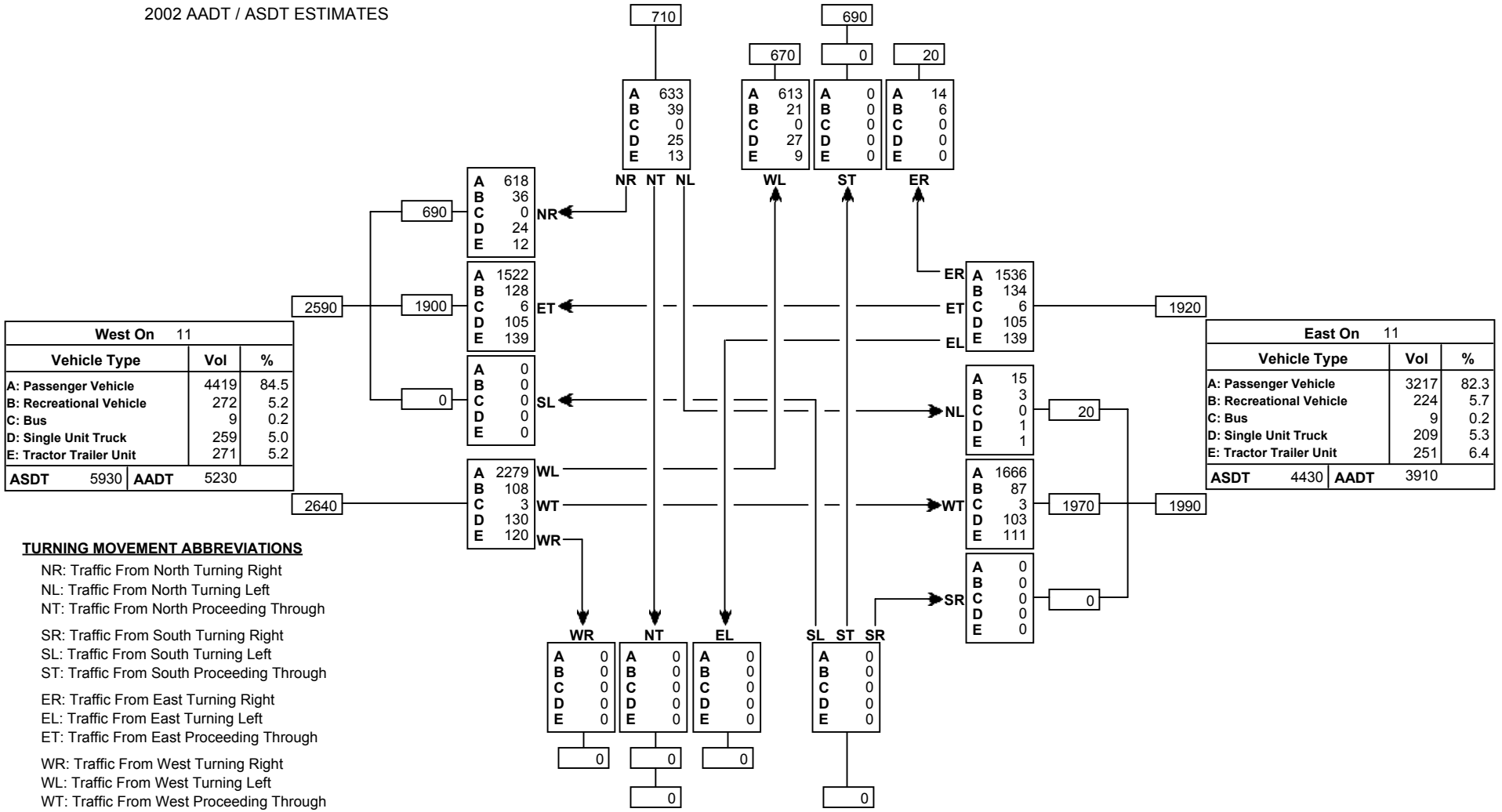
2002 AADT / ASDT ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1260	90.0
B: Recreational Vehicle	66	4.7
C: Bus	0	0.0
D: Single Unit Truck	52	3.7
E: Tractor Trailer Unit	22	1.6
ASDT 1590	**AADT** 1400	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4419	84.5
B: Recreational Vehicle	272	5.2
C: Bus	9	0.2
D: Single Unit Truck	259	5.0
E: Tractor Trailer Unit	271	5.2
ASDT 5930	**AADT** 5230	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	3217	82.3
B: Recreational Vehicle	224	5.7
C: Bus	9	0.2
D: Single Unit Truck	209	5.3
E: Tractor Trailer Unit	251	6.4
ASDT 4430	**AADT** 3910	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

TURNING MOVEMENT ABBREVIATIONS

AADT: Average Annual Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

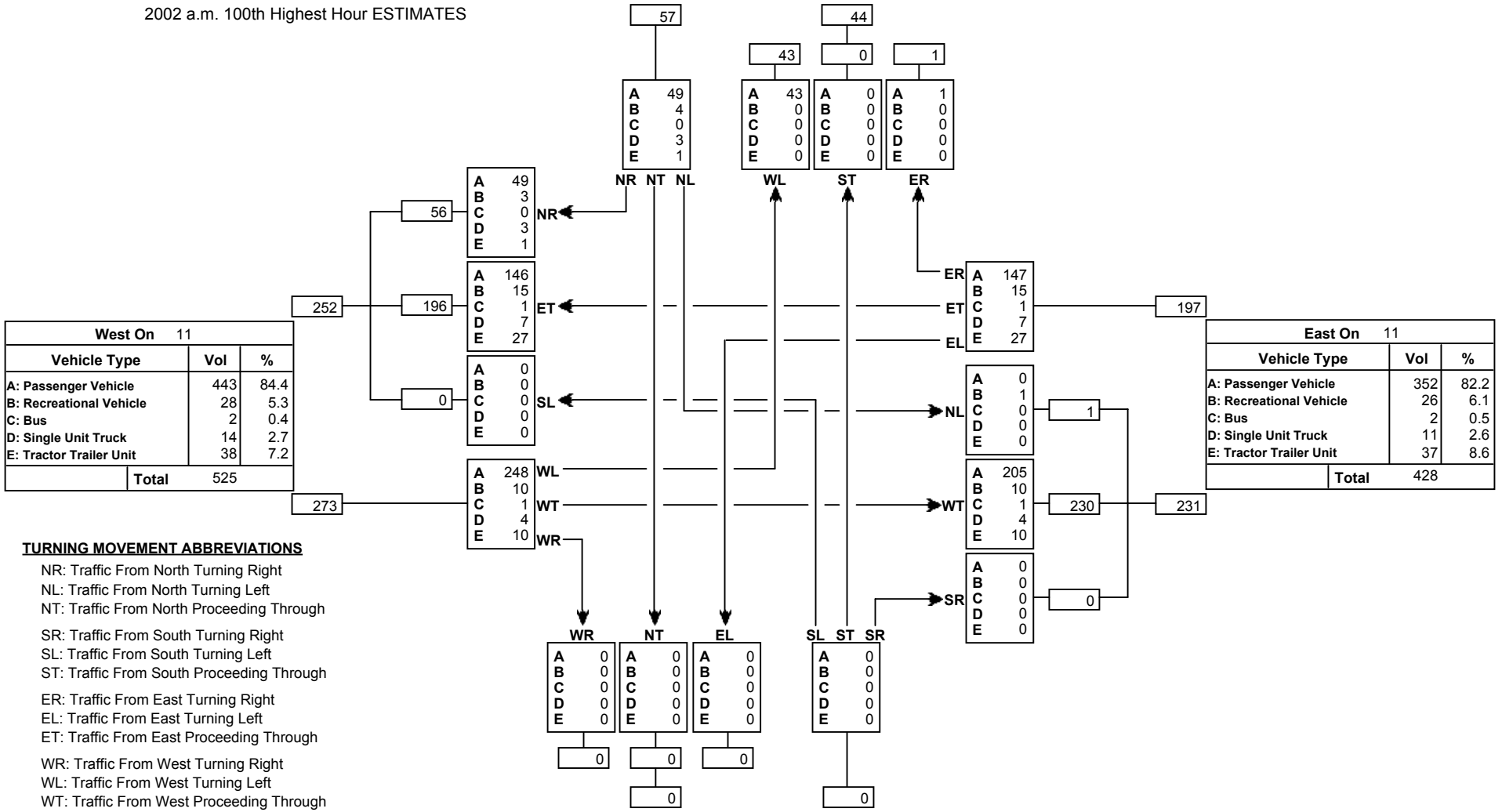
2002 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	93	92.1
B: Recreational Vehicle	4	4.0
C: Bus	0	0.0
D: Single Unit Truck	3	3.0
E: Tractor Trailer Unit	1	1.0
Total	101	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	443	84.4
B: Recreational Vehicle	28	5.3
C: Bus	2	0.4
D: Single Unit Truck	14	2.7
E: Tractor Trailer Unit	38	7.2
Total	525	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	352	82.2
B: Recreational Vehicle	26	6.1
C: Bus	2	0.5
D: Single Unit Truck	11	2.6
E: Tractor Trailer Unit	37	8.6
Total	428	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

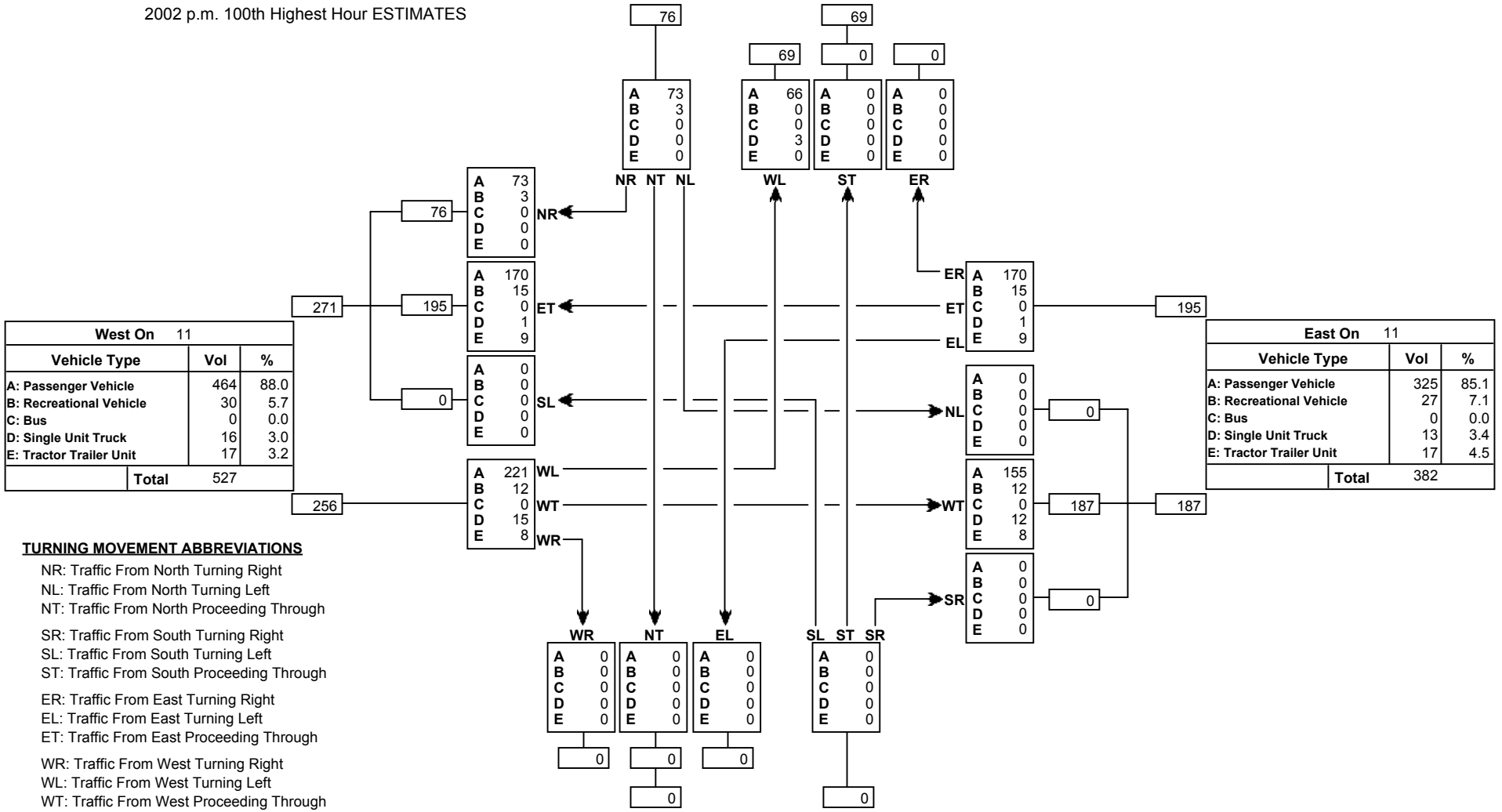
2002 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	139	95.9
B: Recreational Vehicle	3	2.1
C: Bus	0	0.0
D: Single Unit Truck	3	2.1
E: Tractor Trailer Unit	0	0.0
Total	145	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	464	88.0
B: Recreational Vehicle	30	5.7
C: Bus	0	0.0
D: Single Unit Truck	16	3.0
E: Tractor Trailer Unit	17	3.2
Total	527	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	325	85.1
B: Recreational Vehicle	27	7.1
C: Bus	0	0.0
D: Single Unit Truck	13	3.4
E: Tractor Trailer Unit	17	4.5
Total	382	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

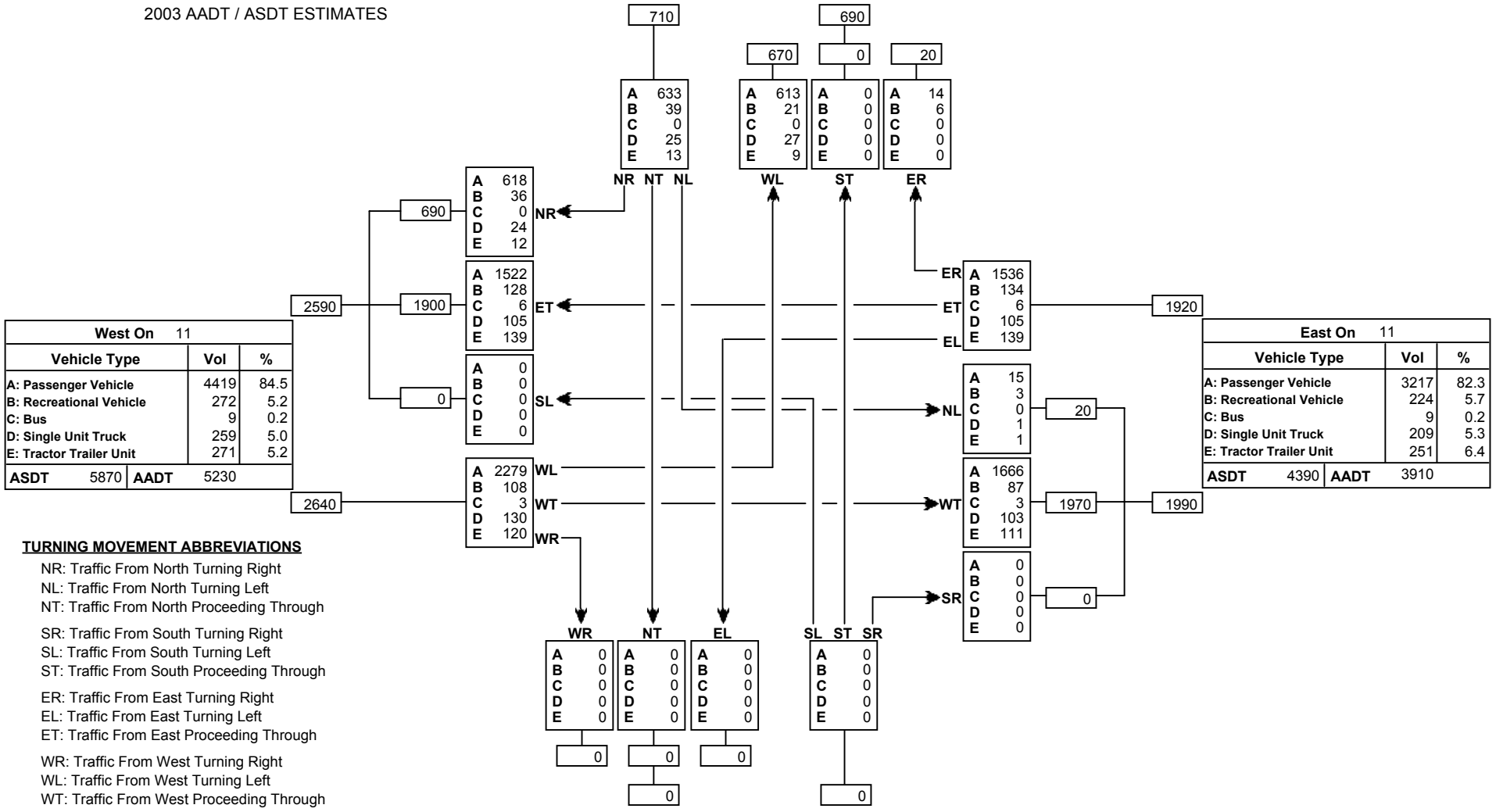
Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

2003 AADT / ASDT ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1260	90.0
B: Recreational Vehicle	66	4.7
C: Bus	0	0.0
D: Single Unit Truck	52	3.7
E: Tractor Trailer Unit	22	1.6
ASDT 1700	**AADT** 1400	



West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4419	84.5
B: Recreational Vehicle	272	5.2
C: Bus	9	0.2
D: Single Unit Truck	259	5.0
E: Tractor Trailer Unit	271	5.2
ASDT 5870	**AADT** 5230	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	3217	82.3
B: Recreational Vehicle	224	5.7
C: Bus	9	0.2
D: Single Unit Truck	209	5.3
E: Tractor Trailer Unit	251	6.4
ASDT 4390	**AADT** 3910	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	

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period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

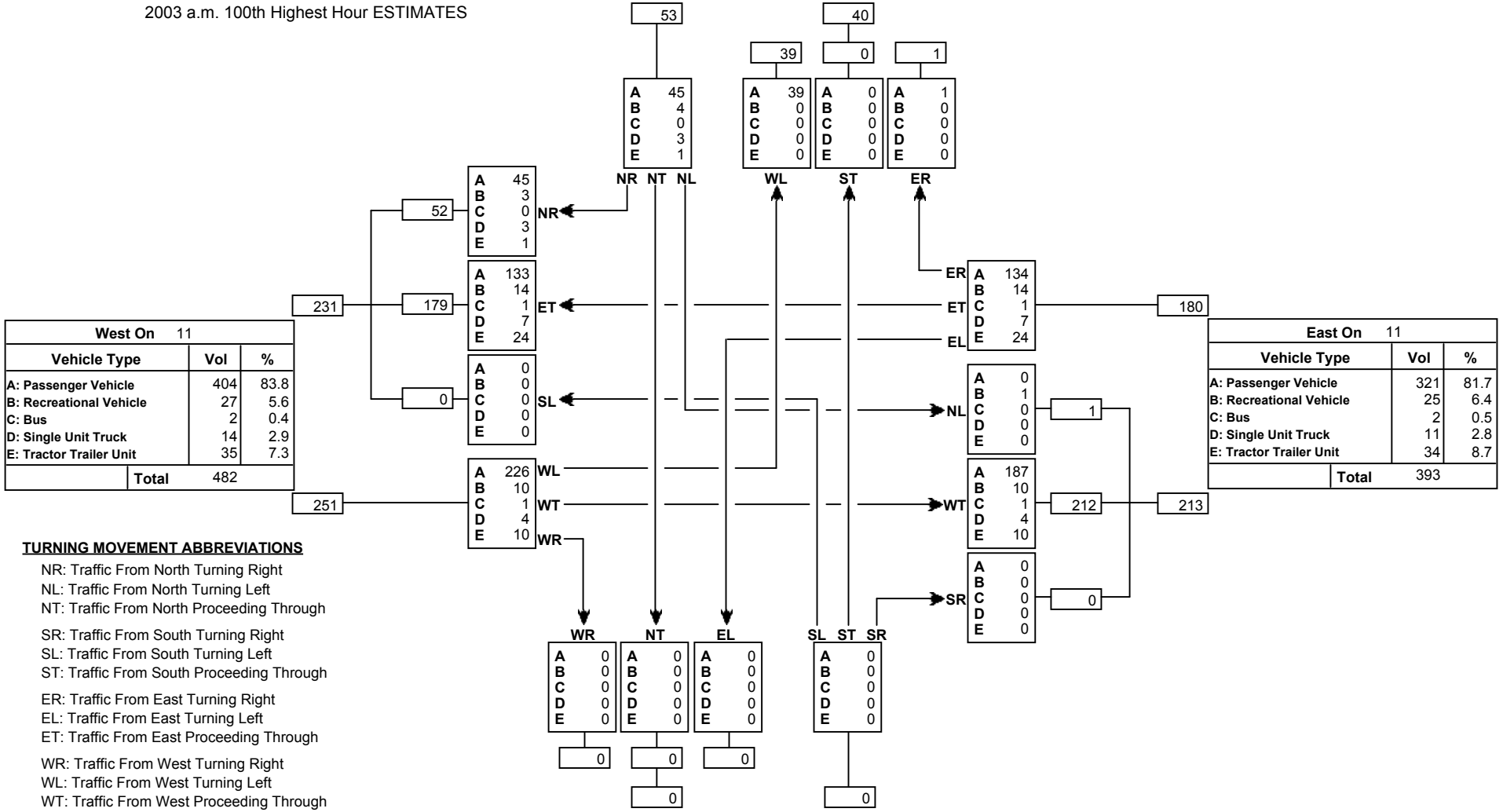
2003 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	85	91.4
B: Recreational Vehicle	4	4.3
C: Bus	0	0.0
D: Single Unit Truck	3	3.2
E: Tractor Trailer Unit	1	1.1
Total	93	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	404	83.8
B: Recreational Vehicle	27	5.6
C: Bus	2	0.4
D: Single Unit Truck	14	2.9
E: Tractor Trailer Unit	35	7.3
Total	482	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	321	81.7
B: Recreational Vehicle	25	6.4
C: Bus	2	0.5
D: Single Unit Truck	11	2.8
E: Tractor Trailer Unit	34	8.7
Total	393	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

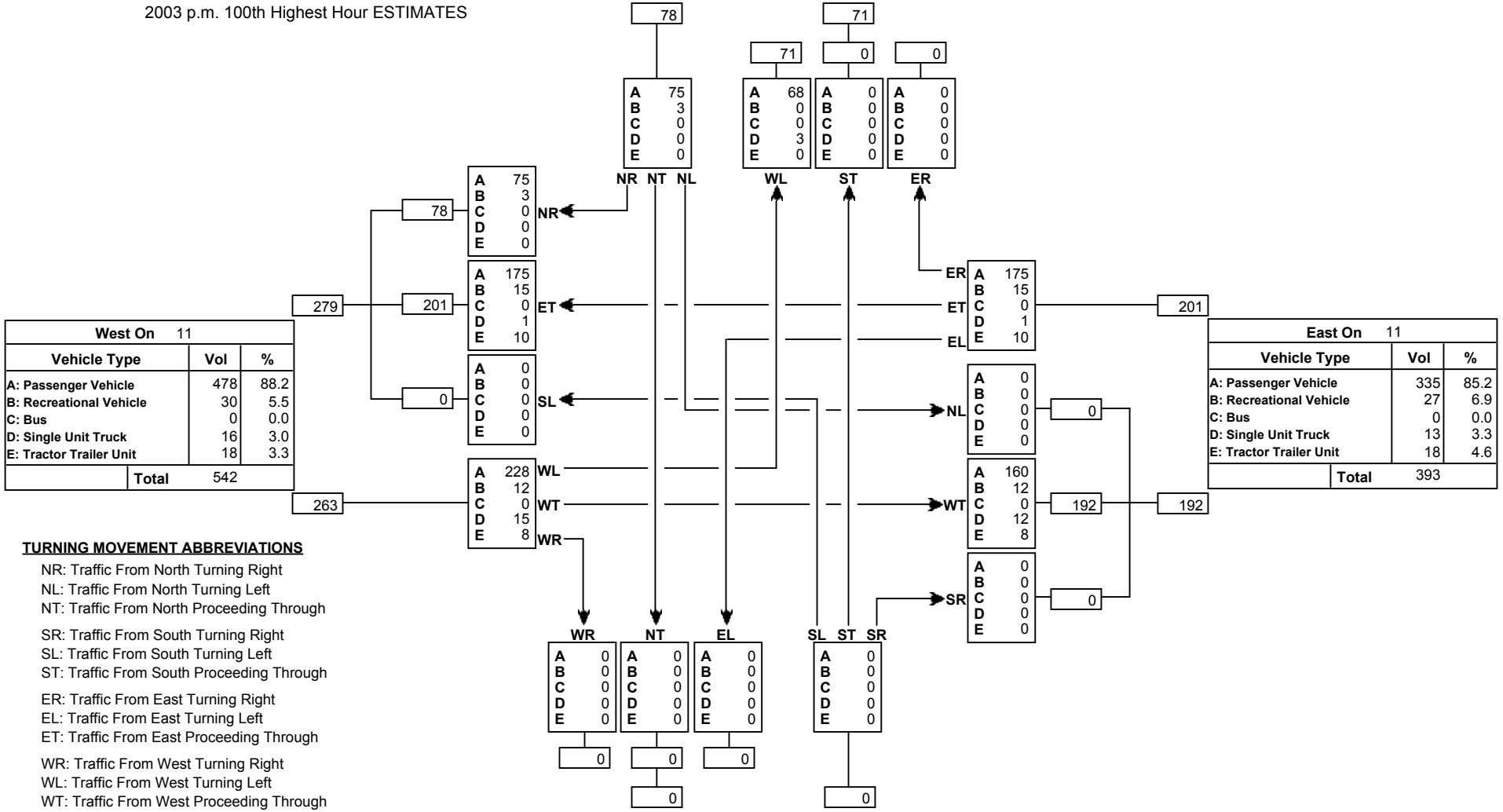
2003 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	143	96.0
B: Recreational Vehicle	3	2.0
C: Bus	0	0.0
D: Single Unit Truck	3	2.0
E: Tractor Trailer Unit	0	0.0
Total	149	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	478	88.2
B: Recreational Vehicle	30	5.5
C: Bus	0	0.0
D: Single Unit Truck	16	3.0
E: Tractor Trailer Unit	18	3.3
Total	542	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	335	85.2
B: Recreational Vehicle	27	6.9
C: Bus	0	0.0
D: Single Unit Truck	13	3.3
E: Tractor Trailer Unit	18	4.6
Total	393	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

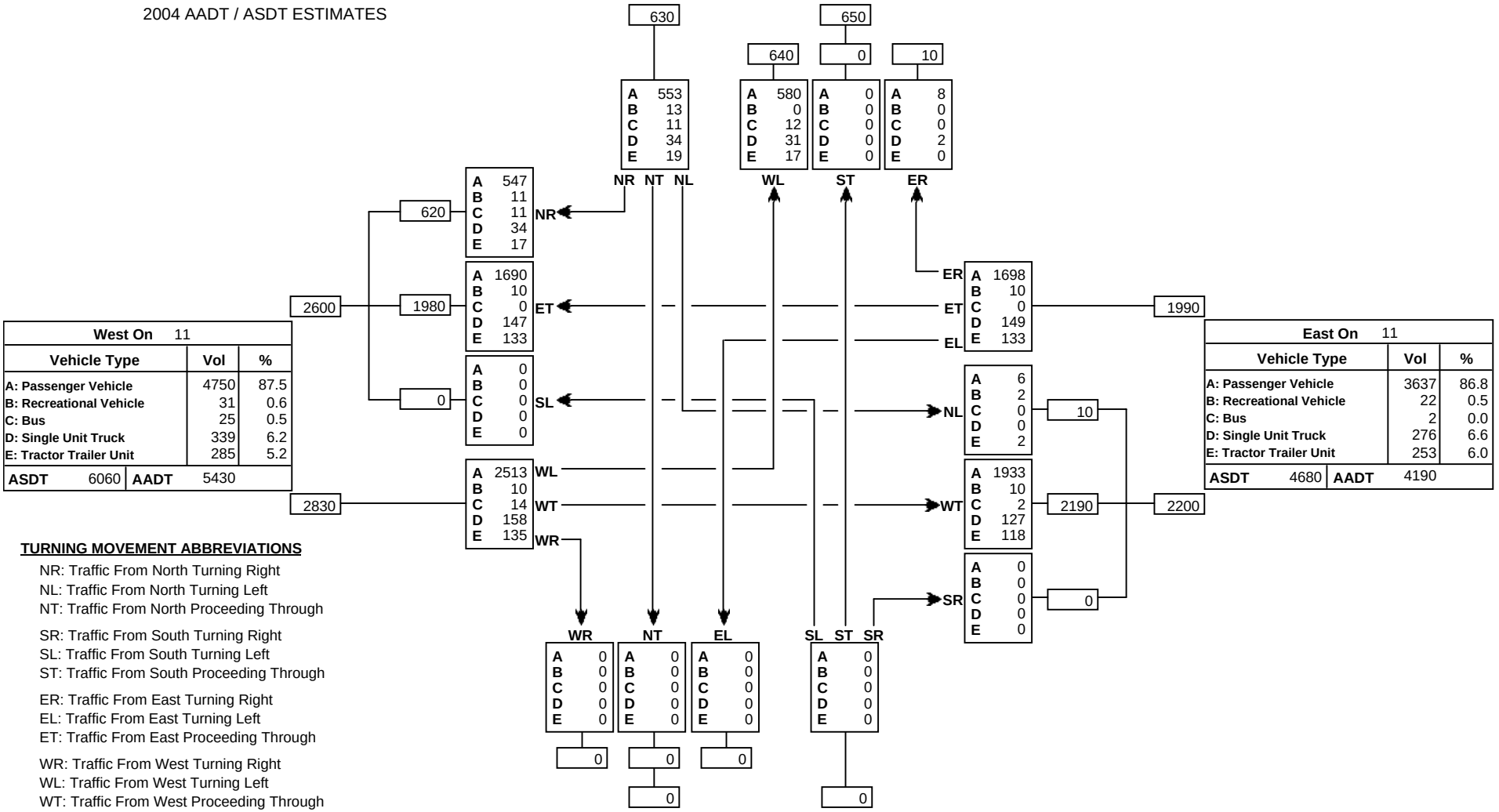
2004 AADT / ASDT ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1141	89.1
B: Recreational Vehicle	13	1.0
C: Bus	23	1.8
D: Single Unit Truck	67	5.2
E: Tractor Trailer Unit	36	2.8
ASDT 1440	**AADT** 1280	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4750	87.5
B: Recreational Vehicle	31	0.6
C: Bus	25	0.5
D: Single Unit Truck	339	6.2
E: Tractor Trailer Unit	285	5.2
ASDT 6060	**AADT** 5430	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	3637	86.8
B: Recreational Vehicle	22	0.5
C: Bus	2	0.0
D: Single Unit Truck	276	6.6
E: Tractor Trailer Unit	253	6.0
ASDT 4680	**AADT** 4190	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



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SL: Traffic From South Turning Left
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TURNING MOVEMENT ABBREVIATIONS

AADT: Average Annual Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

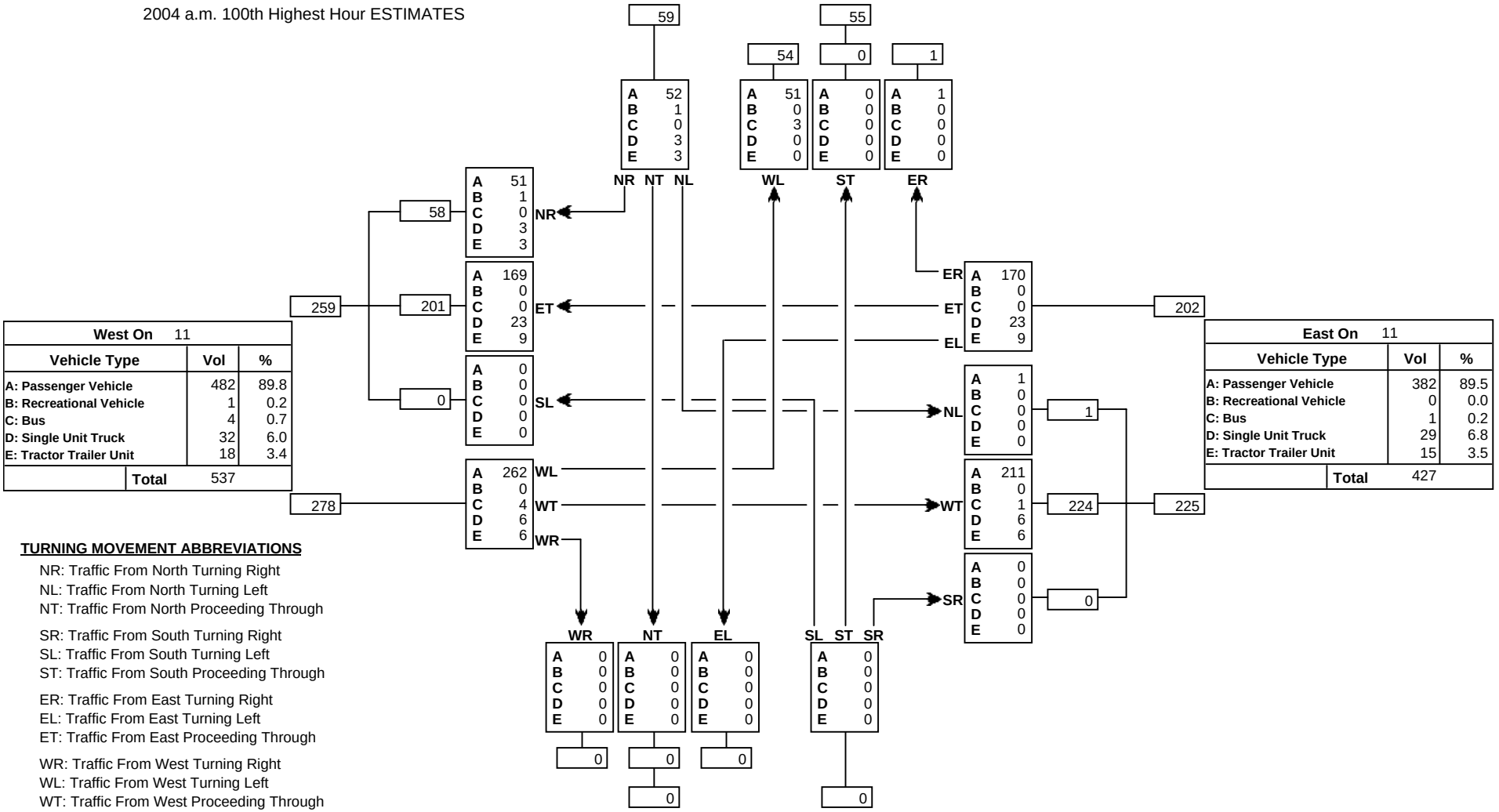
2004 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	104	91.2
B: Recreational Vehicle	1	0.9
C: Bus	3	2.6
D: Single Unit Truck	3	2.6
E: Tractor Trailer Unit	3	2.6
Total	114	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	482	89.8
B: Recreational Vehicle	1	0.2
C: Bus	4	0.7
D: Single Unit Truck	32	6.0
E: Tractor Trailer Unit	18	3.4
Total	537	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	382	89.5
B: Recreational Vehicle	0	0.0
C: Bus	1	0.2
D: Single Unit Truck	29	6.8
E: Tractor Trailer Unit	15	3.5
Total	427	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

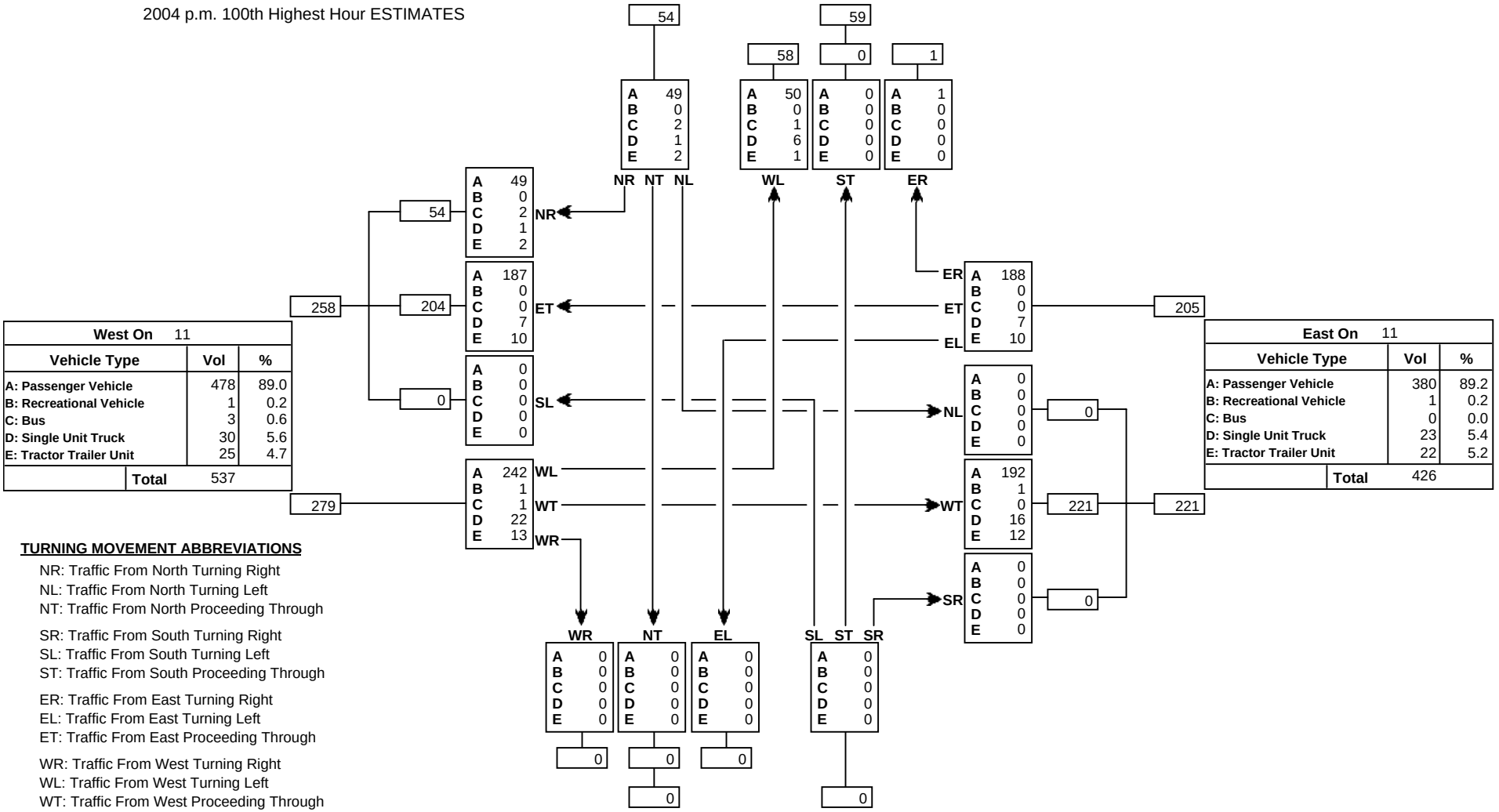
2004 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	100	88.5
B: Recreational Vehicle	0	0.0
C: Bus	3	2.7
D: Single Unit Truck	7	6.2
E: Tractor Trailer Unit	3	2.7
Total	113	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	478	89.0
B: Recreational Vehicle	1	0.2
C: Bus	3	0.6
D: Single Unit Truck	30	5.6
E: Tractor Trailer Unit	25	4.7
Total	537	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	380	89.2
B: Recreational Vehicle	1	0.2
C: Bus	0	0.0
D: Single Unit Truck	23	5.4
E: Tractor Trailer Unit	22	5.2
Total	426	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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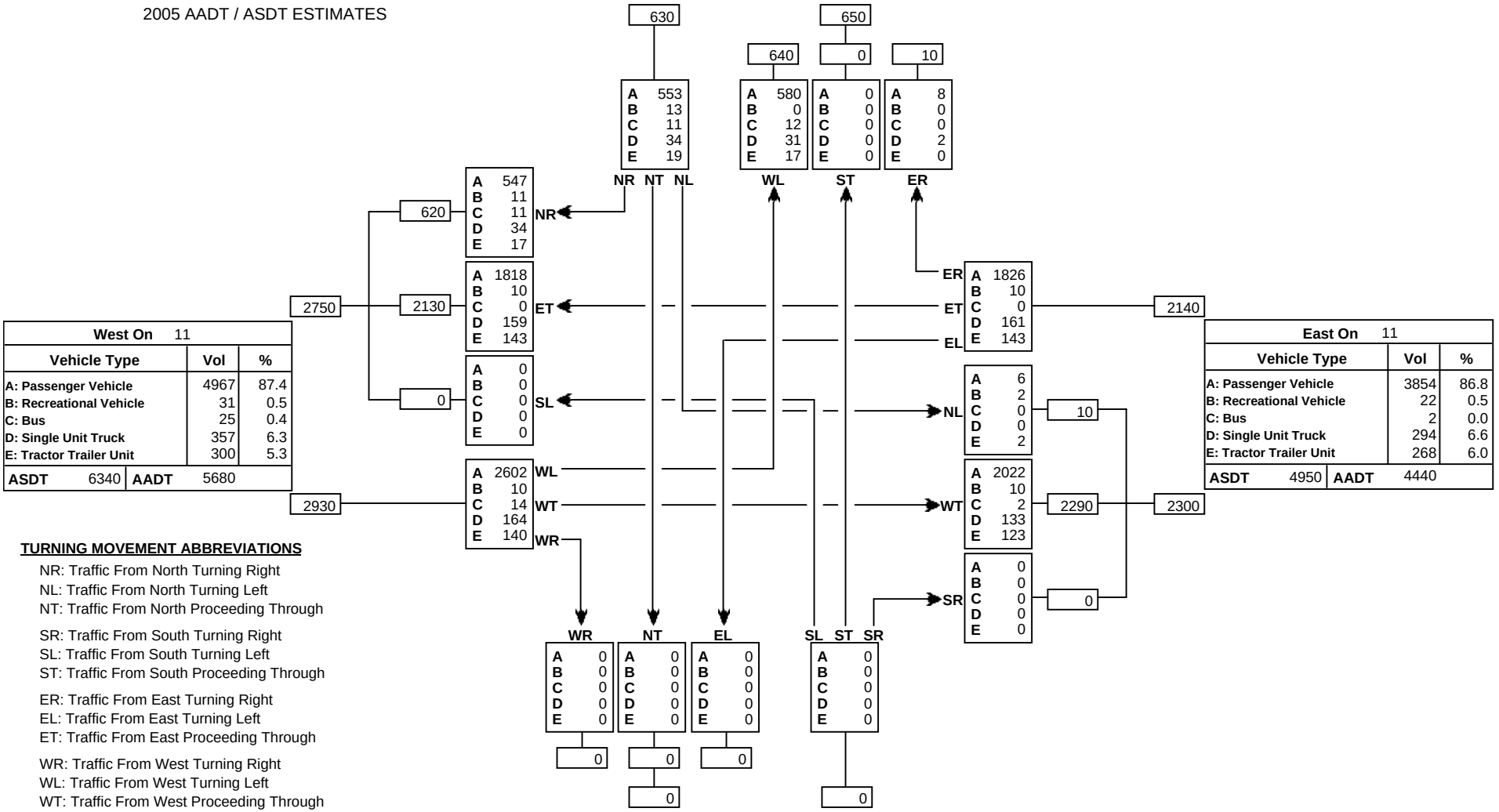
Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

2005 AADT / ASDT ESTIMATES



North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1141	89.1
B: Recreational Vehicle	13	1.0
C: Bus	23	1.8
D: Single Unit Truck	67	5.2
E: Tractor Trailer Unit	36	2.8
ASDT 1430	**AADT** 1280	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4967	87.4
B: Recreational Vehicle	31	0.5
C: Bus	25	0.4
D: Single Unit Truck	357	6.3
E: Tractor Trailer Unit	300	5.3
ASDT 6340	**AADT** 5680	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	3854	86.8
B: Recreational Vehicle	22	0.5
C: Bus	2	0.0
D: Single Unit Truck	294	6.6
E: Tractor Trailer Unit	268	6.0
ASDT 4950	**AADT** 4440	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	

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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

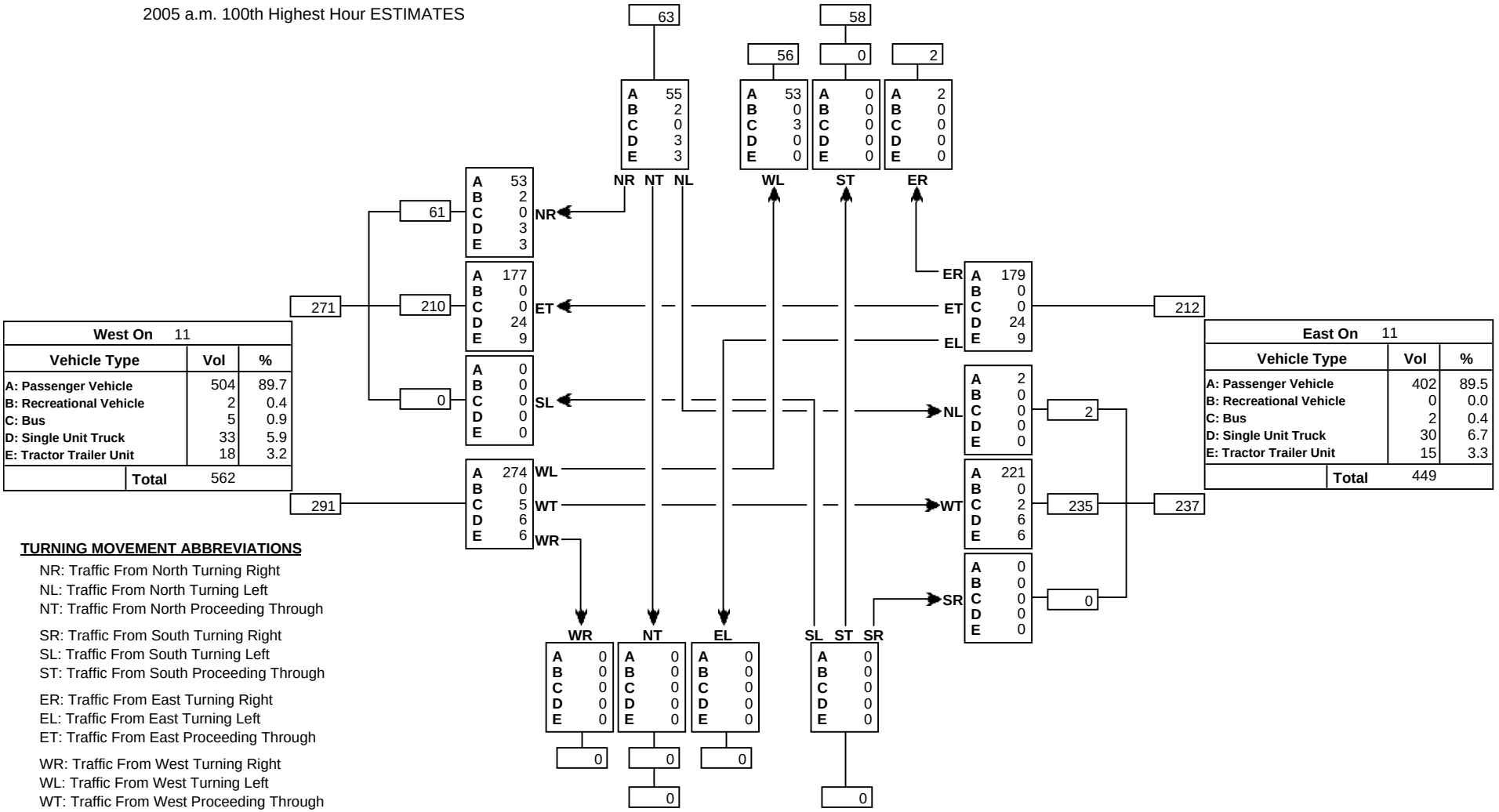
2005 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	110	90.9
B: Recreational Vehicle	2	1.7
C: Bus	3	2.5
D: Single Unit Truck	3	2.5
E: Tractor Trailer Unit	3	2.5
Total	121	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	504	89.7
B: Recreational Vehicle	2	0.4
C: Bus	5	0.9
D: Single Unit Truck	33	5.9
E: Tractor Trailer Unit	18	3.2
Total	562	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	402	89.5
B: Recreational Vehicle	0	0.0
C: Bus	2	0.4
D: Single Unit Truck	30	6.7
E: Tractor Trailer Unit	15	3.3
Total	449	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

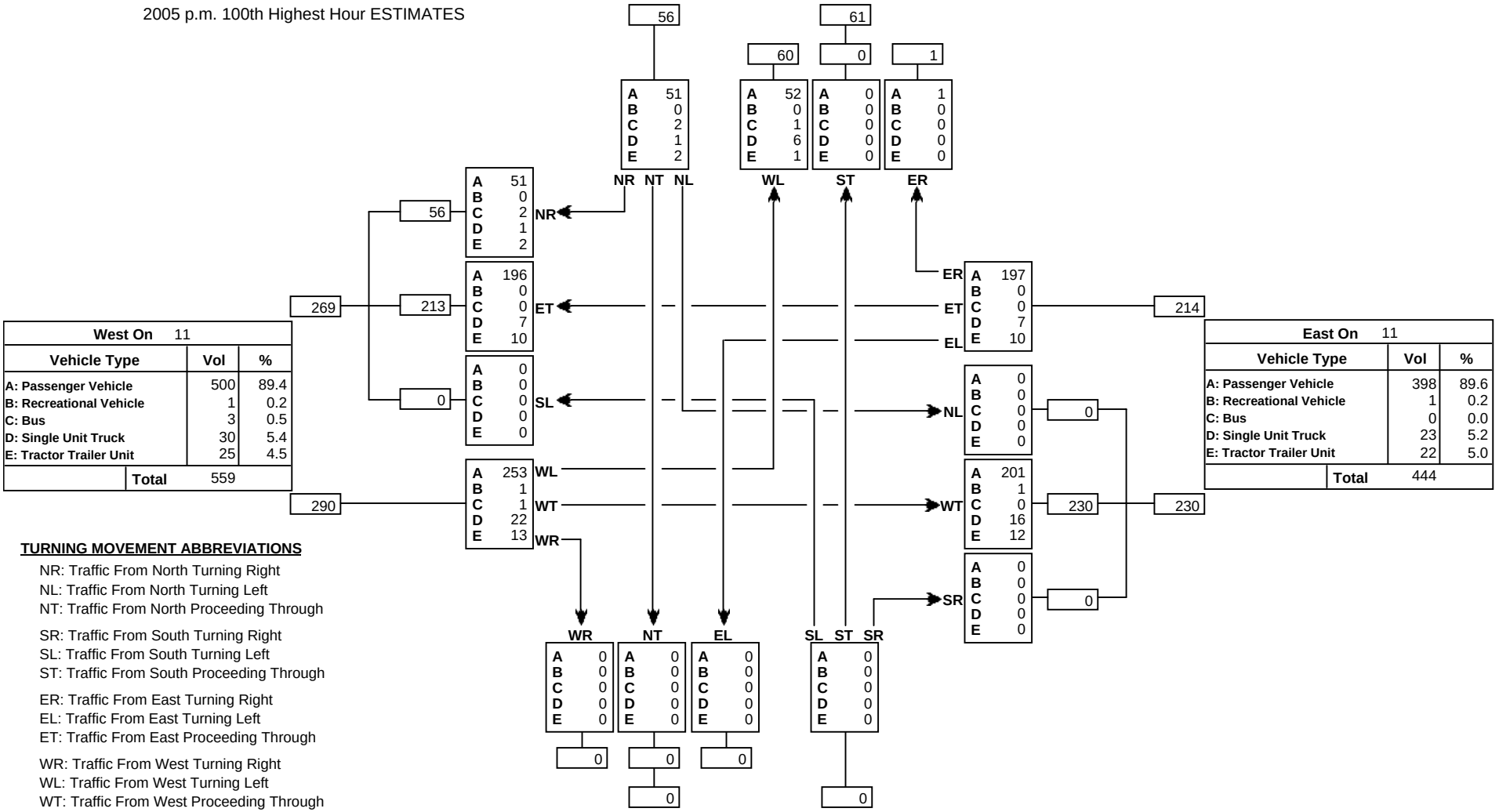
2005 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	104	88.9
B: Recreational Vehicle	0	0.0
C: Bus	3	2.6
D: Single Unit Truck	7	6.0
E: Tractor Trailer Unit	3	2.6
Total	117	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	500	89.4
B: Recreational Vehicle	1	0.2
C: Bus	3	0.5
D: Single Unit Truck	30	5.4
E: Tractor Trailer Unit	25	4.5
Total	559	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	398	89.6
B: Recreational Vehicle	1	0.2
C: Bus	0	0.0
D: Single Unit Truck	23	5.2
E: Tractor Trailer Unit	22	5.0
Total	444	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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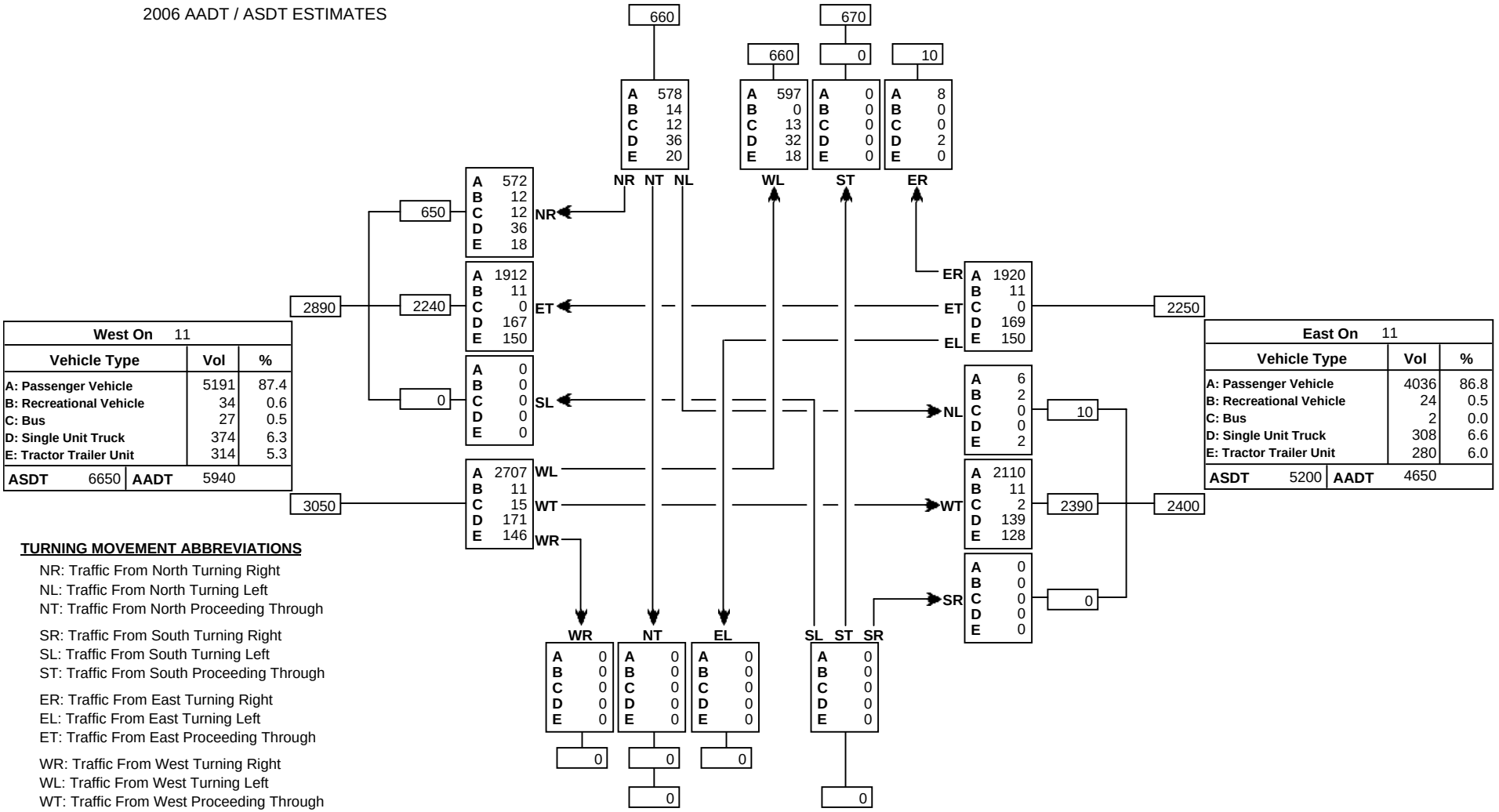
Intersection of:
11 & 11A E OF BENALTO

2006 AADT / ASDT ESTIMATES



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Turning Movement Summary Diagram

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Intersection of:
11 & 11A E OF BENALTO

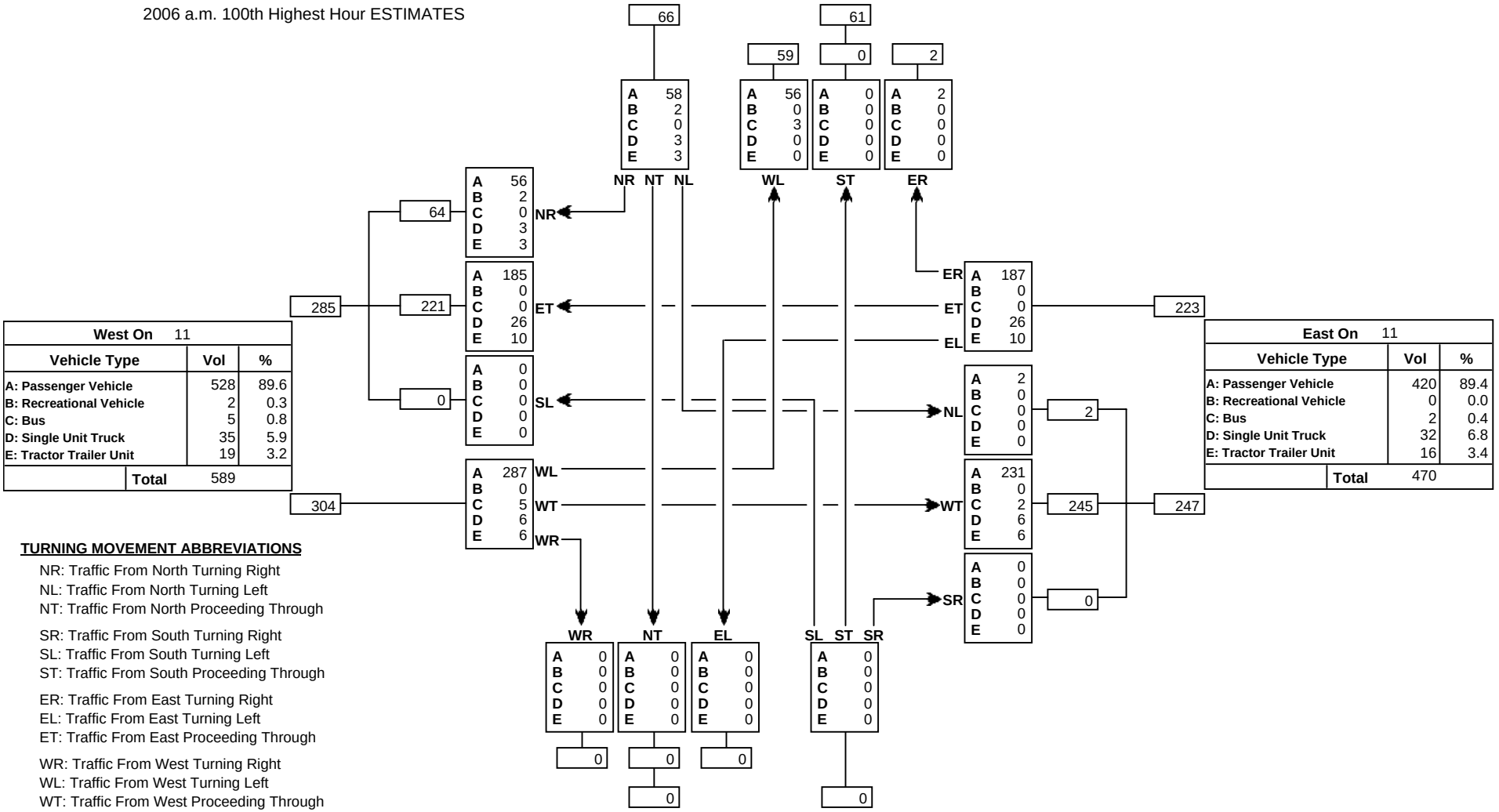
2006 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	116	91.3
B: Recreational Vehicle	2	1.6
C: Bus	3	2.4
D: Single Unit Truck	3	2.4
E: Tractor Trailer Unit	3	2.4
Total	127	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	528	89.6
B: Recreational Vehicle	2	0.3
C: Bus	5	0.8
D: Single Unit Truck	35	5.9
E: Tractor Trailer Unit	19	3.2
Total	589	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	420	89.4
B: Recreational Vehicle	0	0.0
C: Bus	2	0.4
D: Single Unit Truck	32	6.8
E: Tractor Trailer Unit	16	3.4
Total	470	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & 11A E OF BENALTO

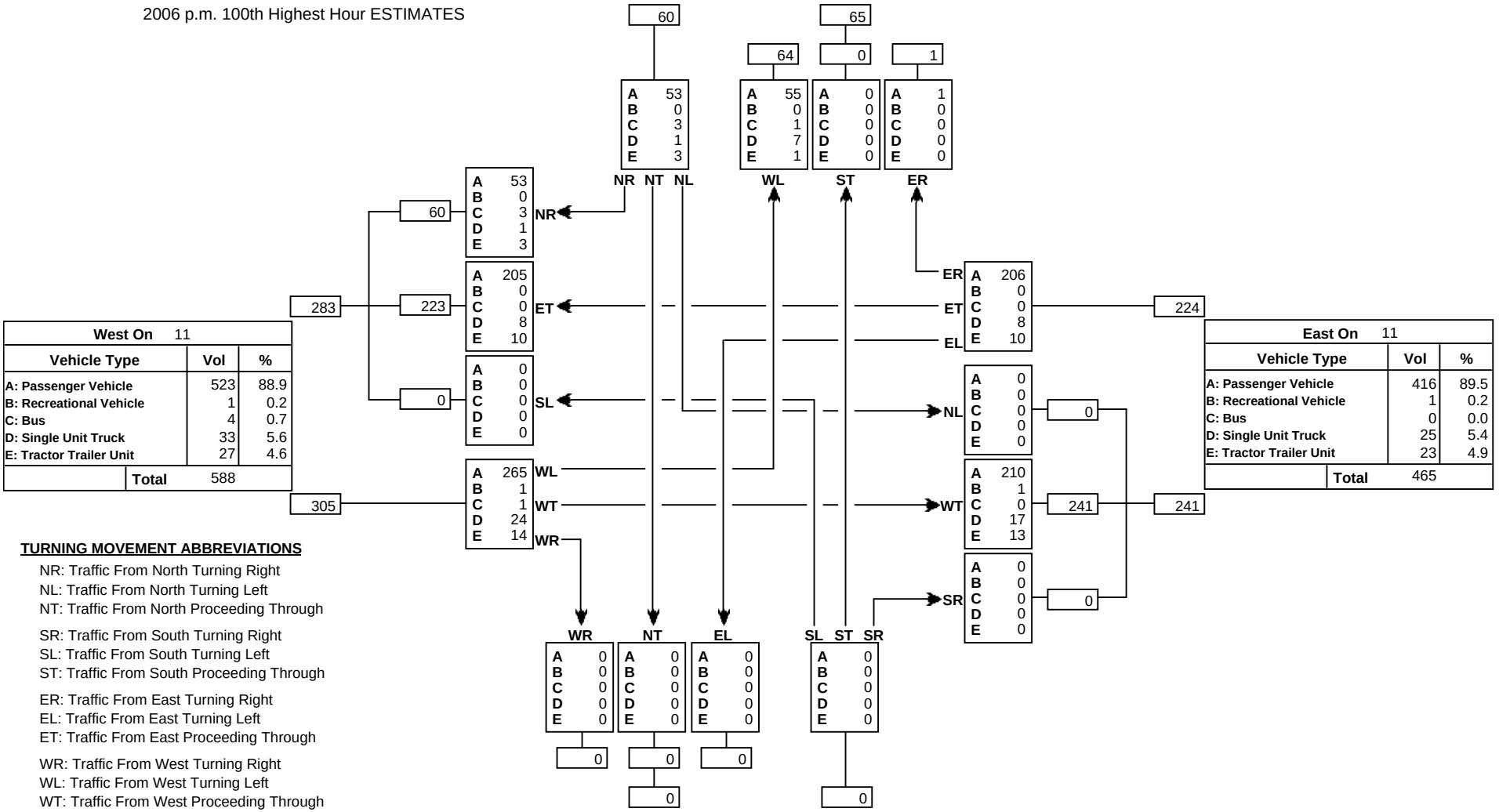
2006 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	109	87.2
B: Recreational Vehicle	0	0.0
C: Bus	4	3.2
D: Single Unit Truck	8	6.4
E: Tractor Trailer Unit	4	3.2
Total	125	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	523	88.9
B: Recreational Vehicle	1	0.2
C: Bus	4	0.7
D: Single Unit Truck	33	5.6
E: Tractor Trailer Unit	27	4.6
Total	588	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	416	89.5
B: Recreational Vehicle	1	0.2
C: Bus	0	0.0
D: Single Unit Truck	25	5.4
E: Tractor Trailer Unit	23	4.9
Total	465	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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Intersection of:
11 & 11A E OF BENALTO

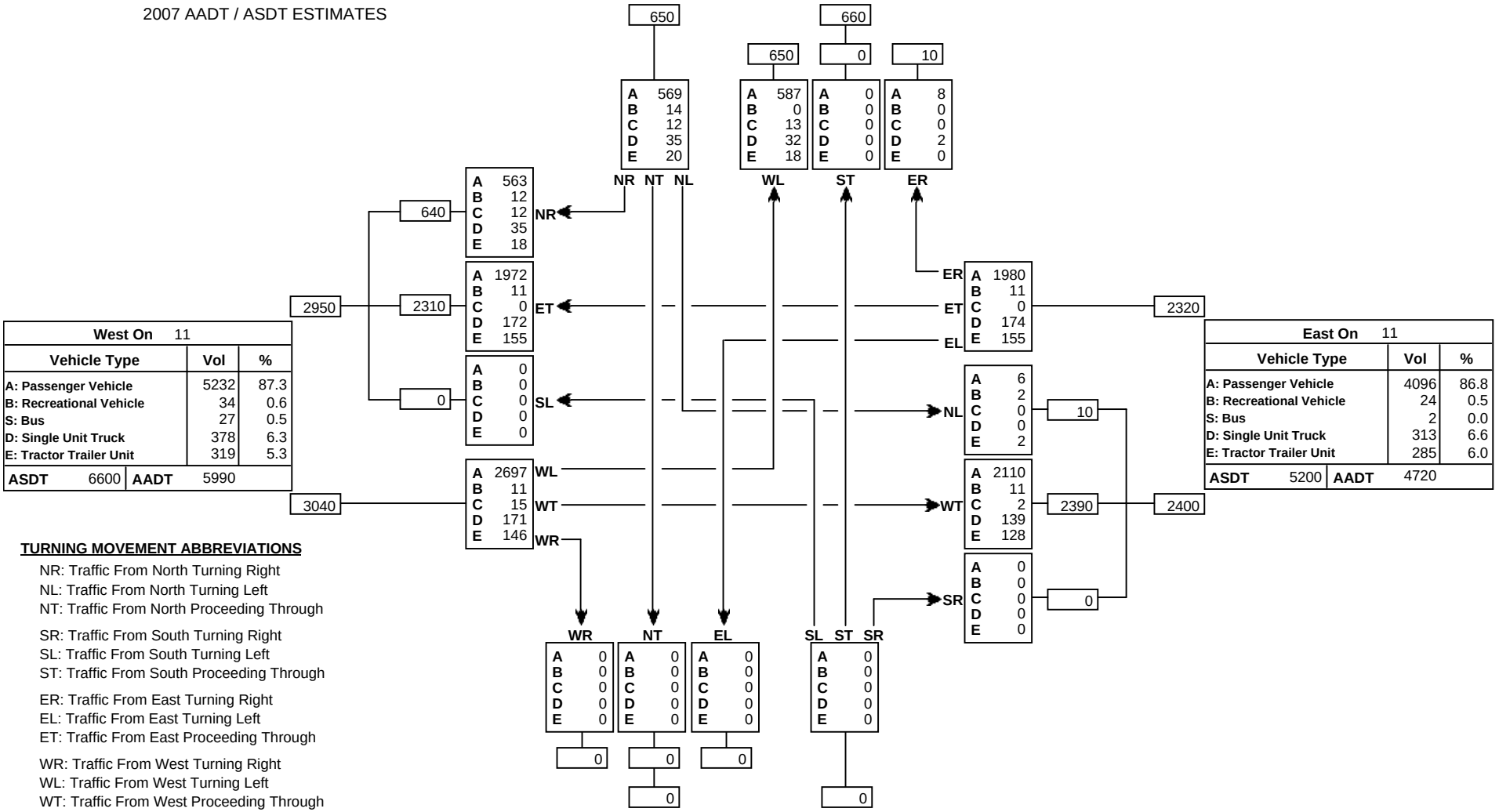
2007 AADT / ASDT ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1164	88.9
B: Recreational Vehicle	14	1.1
S: Bus	25	1.9
D: Single Unit Truck	69	5.3
E: Tractor Trailer Unit	38	2.9
ASDT 1440	**AADT** 1310	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	5232	87.3
B: Recreational Vehicle	34	0.6
S: Bus	27	0.5
D: Single Unit Truck	378	6.3
E: Tractor Trailer Unit	319	5.3
ASDT 6600	**AADT** 5990	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4096	86.8
B: Recreational Vehicle	24	0.5
S: Bus	2	0.0
D: Single Unit Truck	313	6.6
E: Tractor Trailer Unit	285	6.0
ASDT 5200	**AADT** 4720	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



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Intersection of:
11 & 11A E OF BENALTO

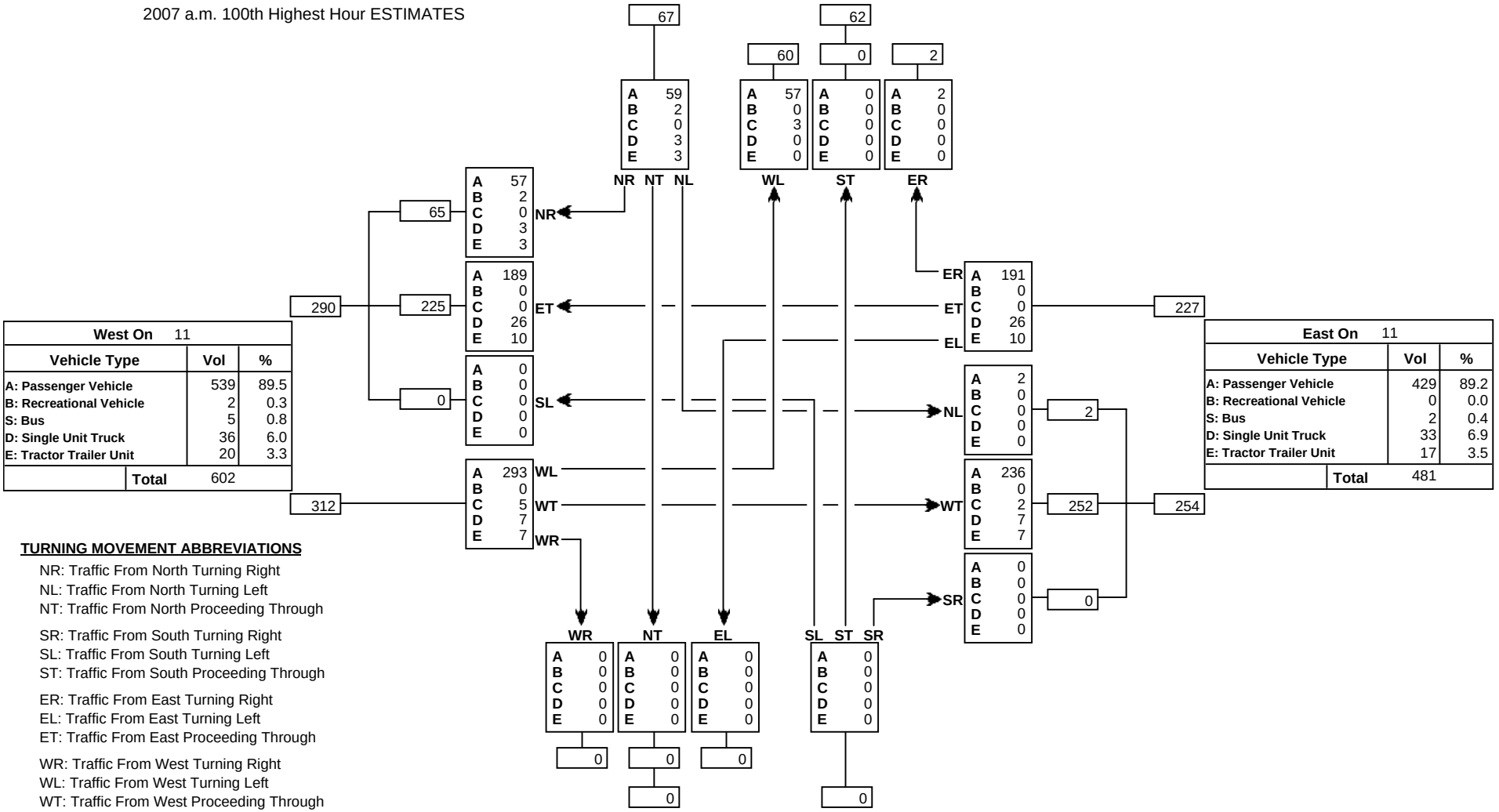
2007 a.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	118	91.5
B: Recreational Vehicle	2	1.6
S: Bus	3	2.3
D: Single Unit Truck	3	2.3
E: Tractor Trailer Unit	3	2.3
Total	129	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	539	89.5
B: Recreational Vehicle	2	0.3
S: Bus	5	0.8
D: Single Unit Truck	36	6.0
E: Tractor Trailer Unit	20	3.3
Total	602	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	429	89.2
B: Recreational Vehicle	0	0.0
S: Bus	2	0.4
D: Single Unit Truck	33	6.9
E: Tractor Trailer Unit	17	3.5
Total	481	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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Intersection of:
11 & 11A E OF BENALTO

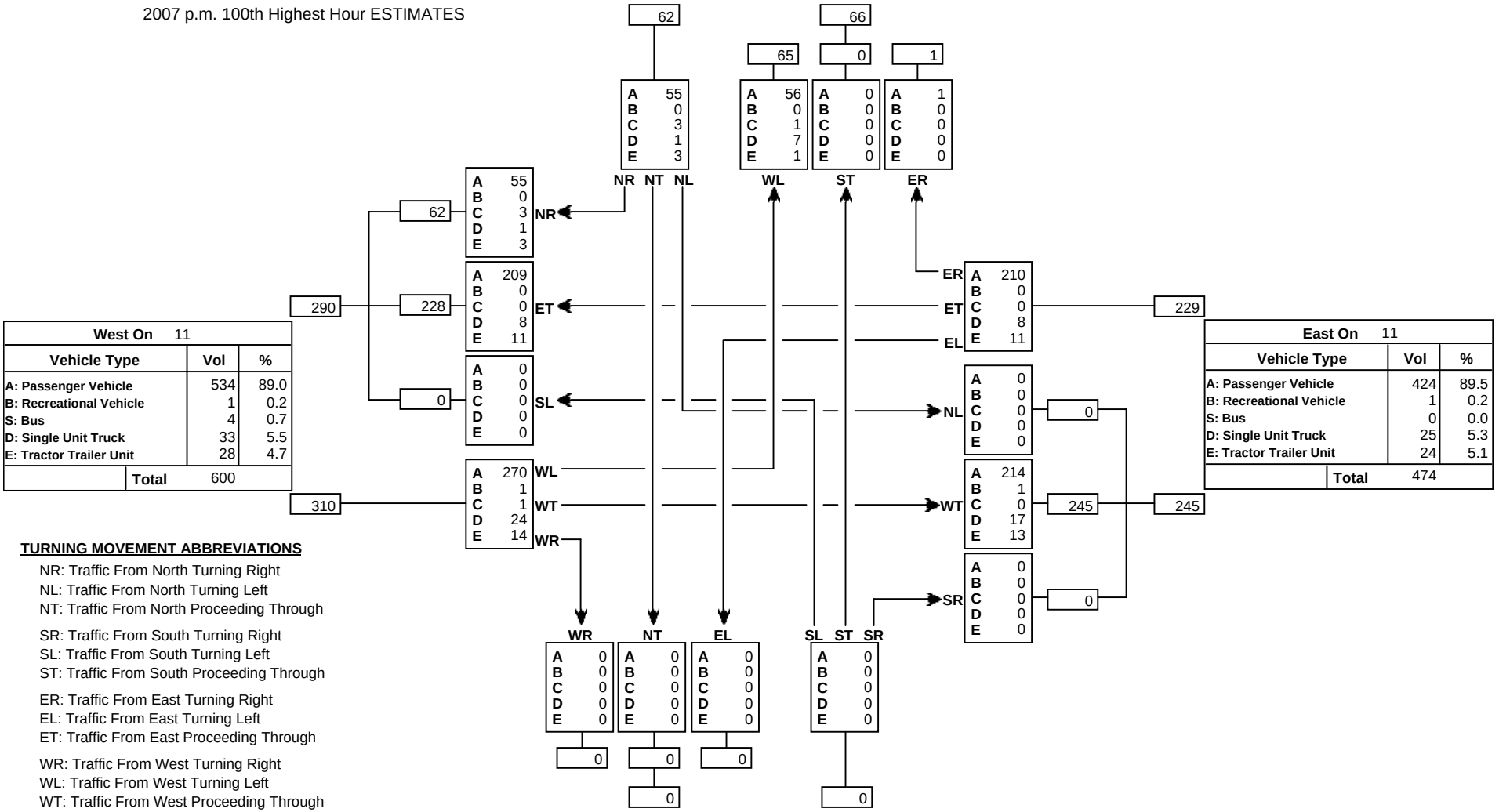
2007 p.m. 100th Highest Hour ESTIMATES

North On 11A		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	112	87.5
B: Recreational Vehicle	0	0.0
S: Bus	4	3.1
D: Single Unit Truck	8	6.3
E: Tractor Trailer Unit	4	3.1
Total	128	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	534	89.0
B: Recreational Vehicle	1	0.2
S: Bus	4	0.7
D: Single Unit Truck	33	5.5
E: Tractor Trailer Unit	28	4.7
Total	600	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	424	89.5
B: Recreational Vehicle	1	0.2
S: Bus	0	0.0
D: Single Unit Truck	25	5.3
E: Tractor Trailer Unit	24	5.1
Total	474	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

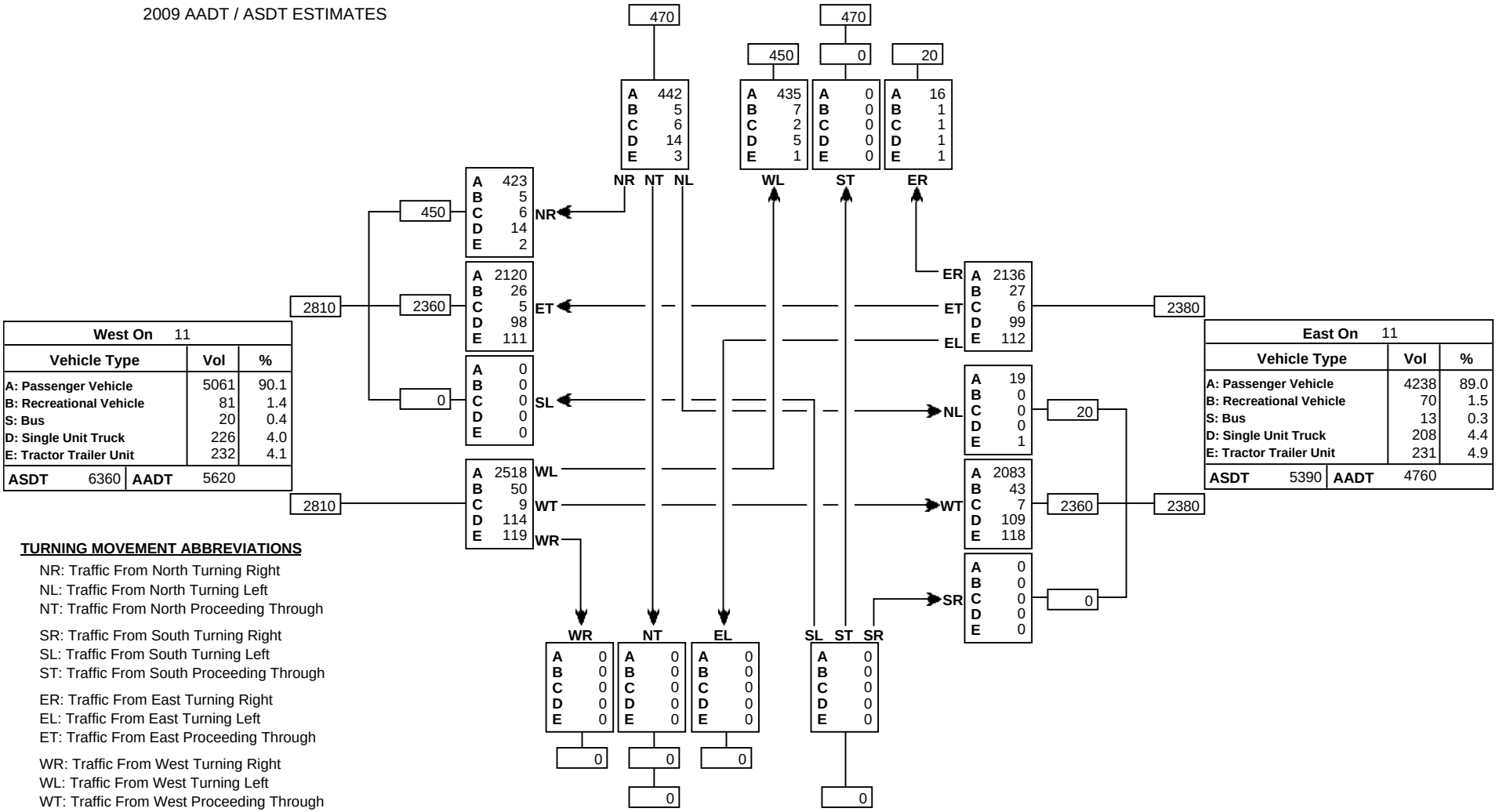
2009 AADT / ASDT ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	893	95.0
B: Recreational Vehicle	13	1.4
S: Bus	9	1.0
D: Single Unit Truck	20	2.1
E: Tractor Trailer Unit	5	0.5
ASDT 1060	**AADT** 940	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	5061	90.1
B: Recreational Vehicle	81	1.4
S: Bus	20	0.4
D: Single Unit Truck	226	4.0
E: Tractor Trailer Unit	232	4.1
ASDT 6360	**AADT** 5620	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4238	89.0
B: Recreational Vehicle	70	1.5
S: Bus	13	0.3
D: Single Unit Truck	208	4.4
E: Tractor Trailer Unit	231	4.9
ASDT 5390	**AADT** 4760	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



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TURNING MOVEMENT ABBREVIATIONS

AADT: Average Annual Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

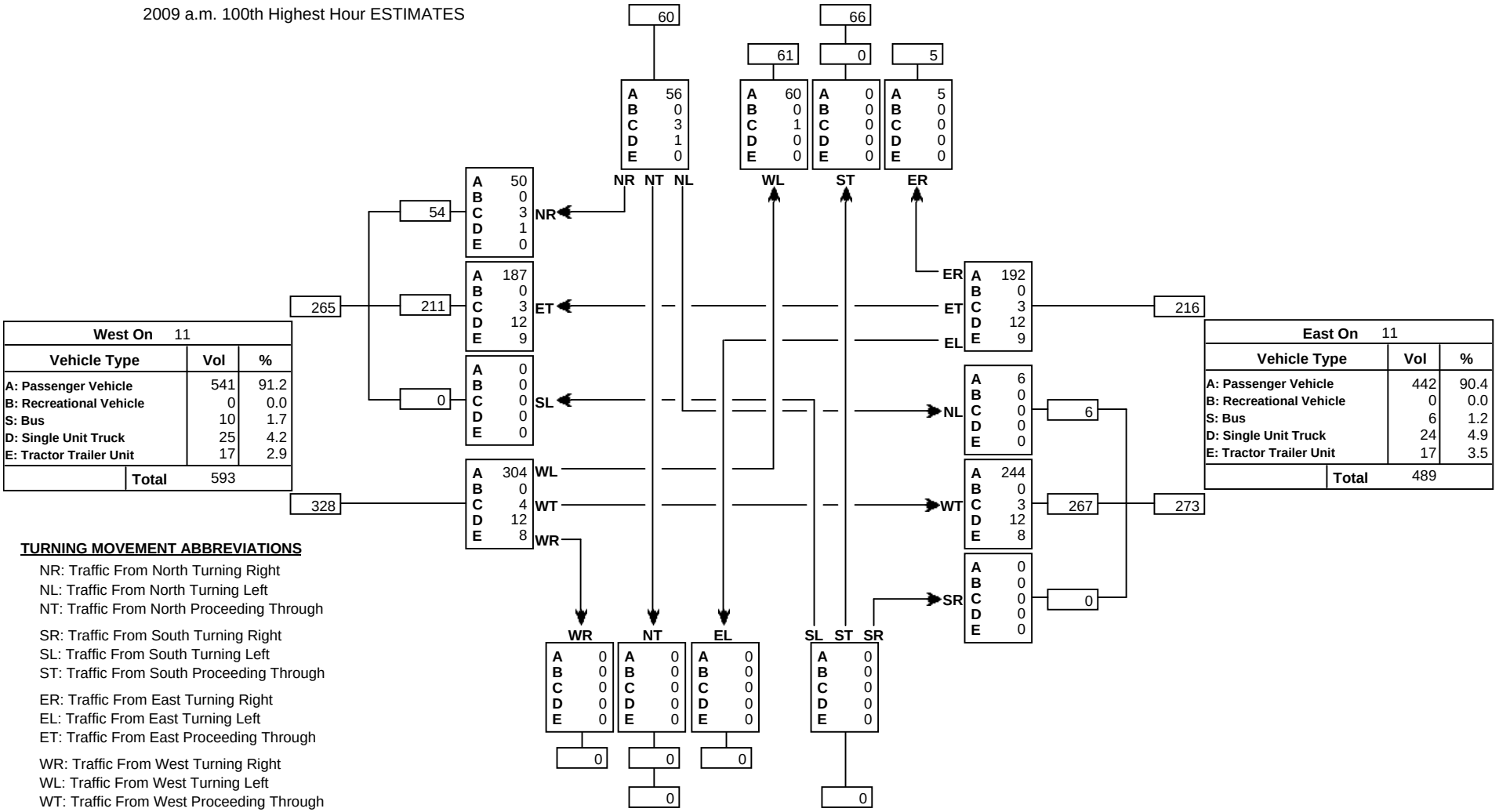
2009 a.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	121	96.0
B: Recreational Vehicle	0	0.0
S: Bus	4	3.2
D: Single Unit Truck	1	0.8
E: Tractor Trailer Unit	0	0.0
Total	126	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	541	91.2
B: Recreational Vehicle	0	0.0
S: Bus	10	1.7
D: Single Unit Truck	25	4.2
E: Tractor Trailer Unit	17	2.9
Total	593	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	442	90.4
B: Recreational Vehicle	0	0.0
S: Bus	6	1.2
D: Single Unit Truck	24	4.9
E: Tractor Trailer Unit	17	3.5
Total	489	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
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WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

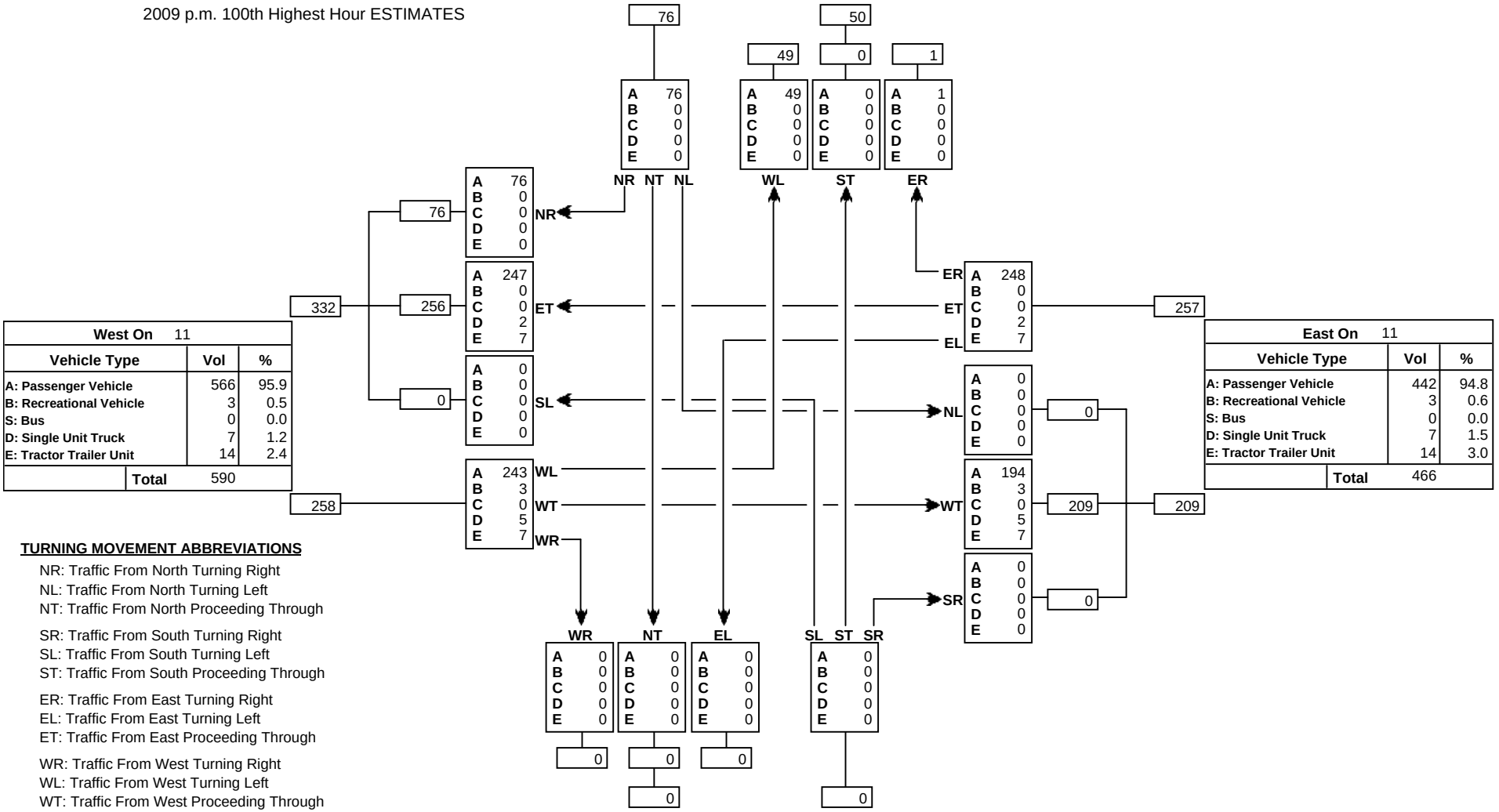
2009 p.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	126	100.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	126	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	566	95.9
B: Recreational Vehicle	3	0.5
S: Bus	0	0.0
D: Single Unit Truck	7	1.2
E: Tractor Trailer Unit	14	2.4
Total	590	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	442	94.8
B: Recreational Vehicle	3	0.6
S: Bus	0	0.0
D: Single Unit Truck	7	1.5
E: Tractor Trailer Unit	14	3.0
Total	466	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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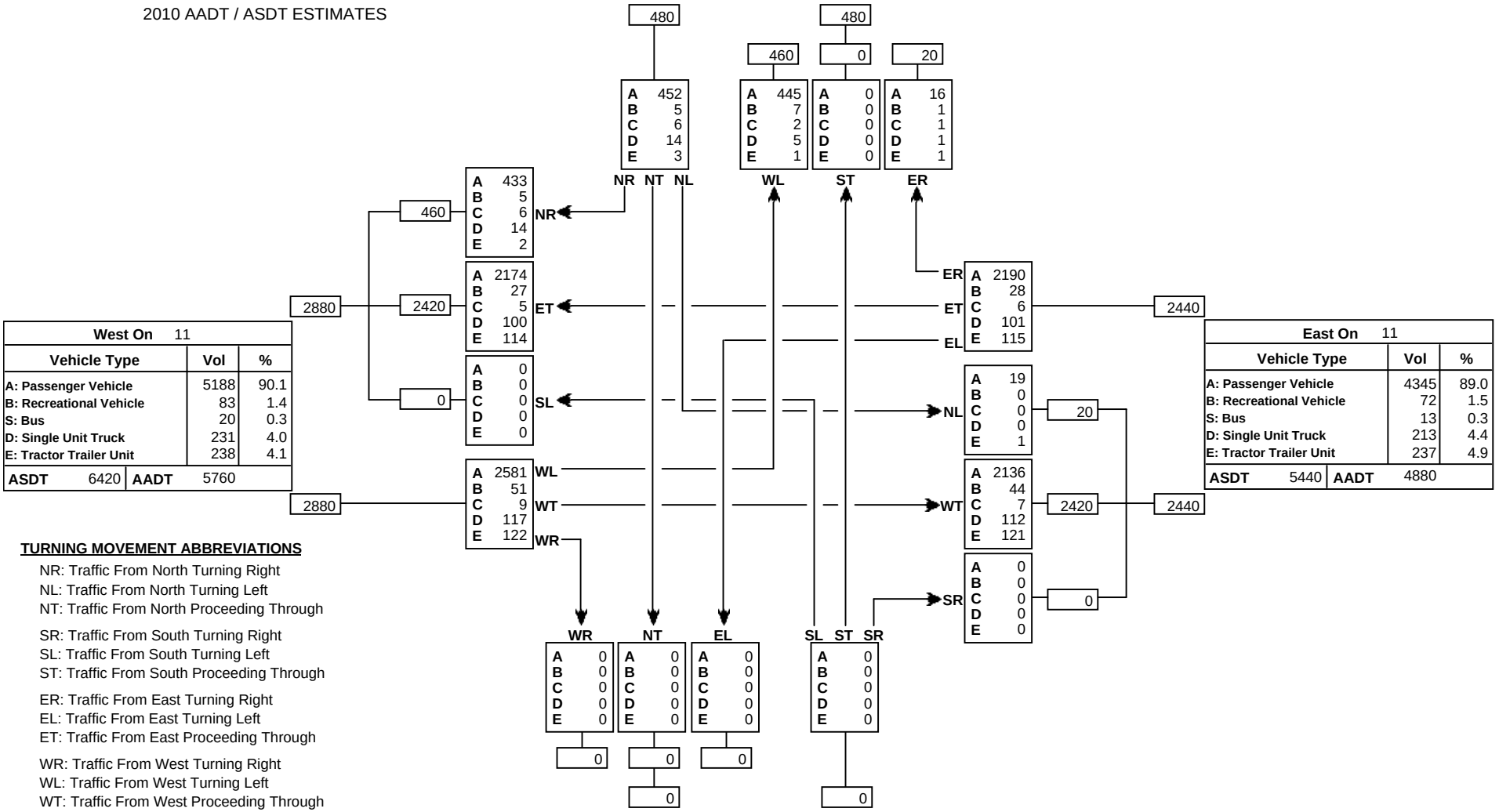
Intersection of:
11 & TWP RD 390 32-38-2-503000150

2010 AADT / ASDT ESTIMATES



North On Twp Rd 390

Vehicle Type	Vol	%
A: Passenger Vehicle	913	95.1
B: Recreational Vehicle	13	1.4
S: Bus	9	0.9
D: Single Unit Truck	20	2.1
E: Tractor Trailer Unit	5	0.5
ASDT 1070	**AADT** 960	

West On 11

Vehicle Type	Vol	%
A: Passenger Vehicle	5188	90.1
B: Recreational Vehicle	83	1.4
S: Bus	20	0.3
D: Single Unit Truck	231	4.0
E: Tractor Trailer Unit	238	4.1
ASDT 6420	**AADT** 5760	

East On 11

Vehicle Type	Vol	%
A: Passenger Vehicle	4345	89.0
B: Recreational Vehicle	72	1.5
S: Bus	13	0.3
D: Single Unit Truck	213	4.4
E: Tractor Trailer Unit	237	4.9
ASDT 5440	**AADT** 4880	

South On

Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	

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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

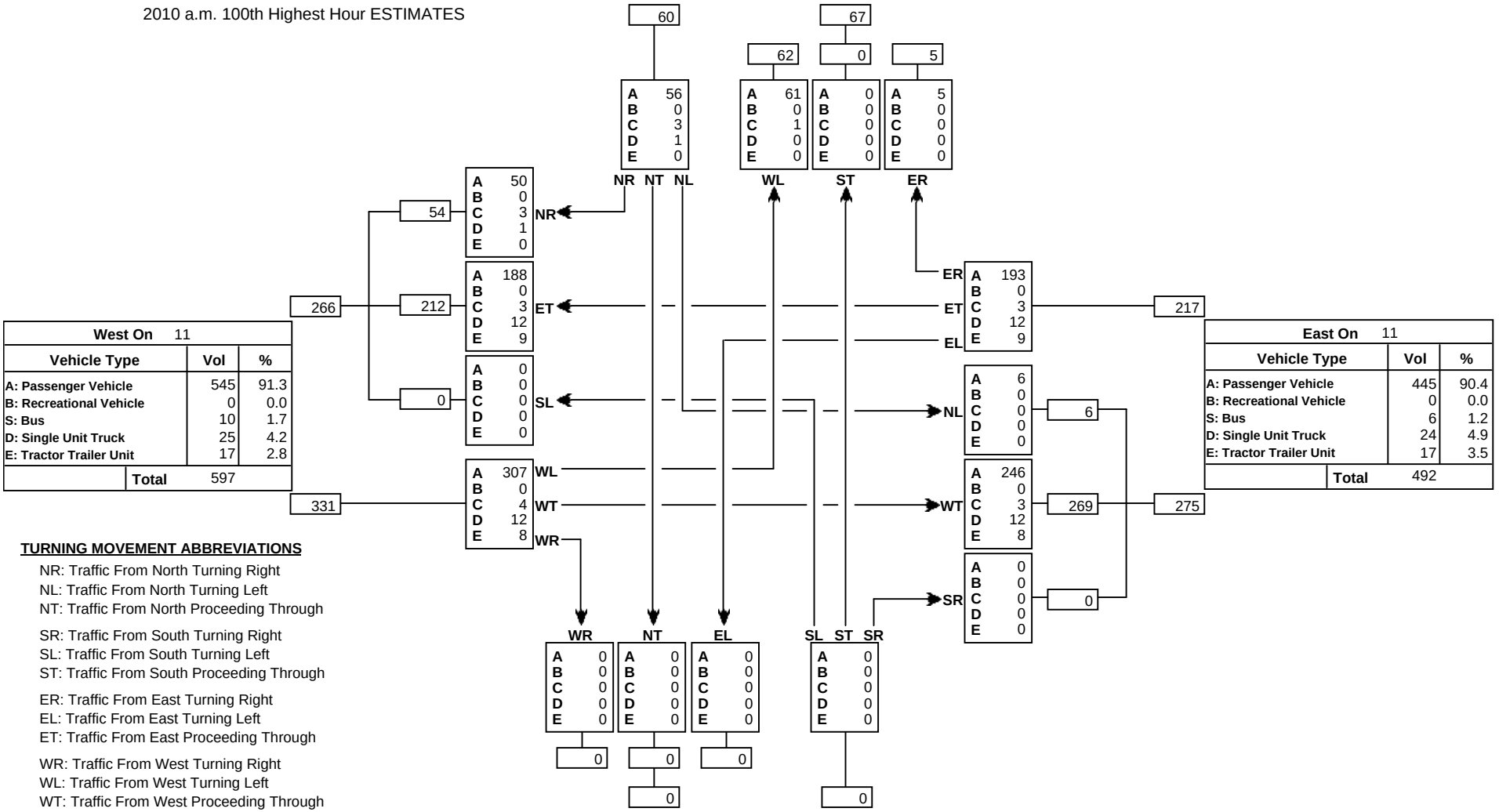
2010 a.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	122	96.1
B: Recreational Vehicle	0	0.0
S: Bus	4	3.1
D: Single Unit Truck	1	0.8
E: Tractor Trailer Unit	0	0.0
Total	127	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	545	91.3
B: Recreational Vehicle	0	0.0
S: Bus	10	1.7
D: Single Unit Truck	25	4.2
E: Tractor Trailer Unit	17	2.8
Total	597	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	445	90.4
B: Recreational Vehicle	0	0.0
S: Bus	6	1.2
D: Single Unit Truck	24	4.9
E: Tractor Trailer Unit	17	3.5
Total	492	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

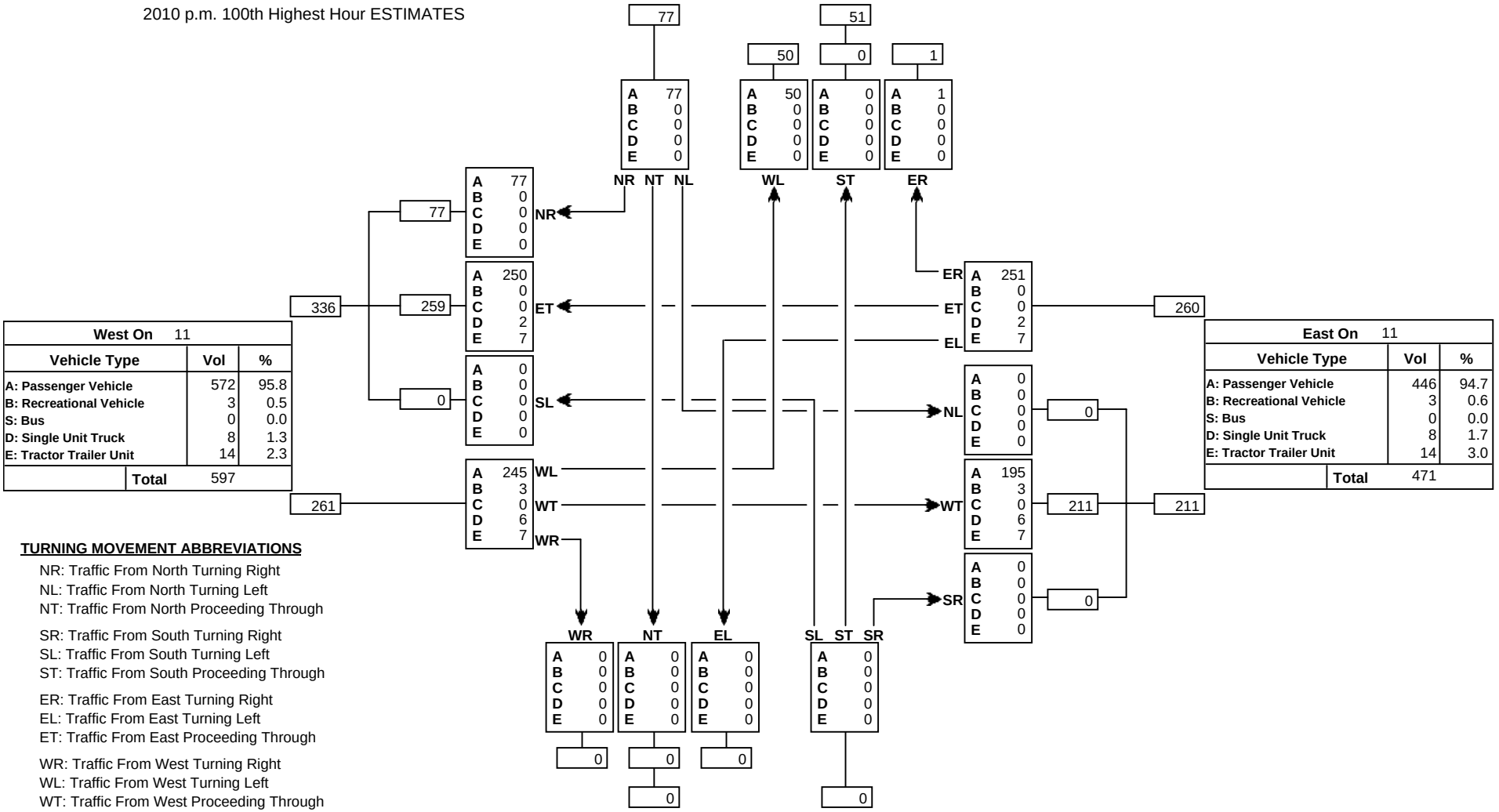
2010 p.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	128	100.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	128	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	572	95.8
B: Recreational Vehicle	3	0.5
S: Bus	0	0.0
D: Single Unit Truck	8	1.3
E: Tractor Trailer Unit	14	2.3
Total	597	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	446	94.7
B: Recreational Vehicle	3	0.6
S: Bus	0	0.0
D: Single Unit Truck	8	1.7
E: Tractor Trailer Unit	14	3.0
Total	471	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

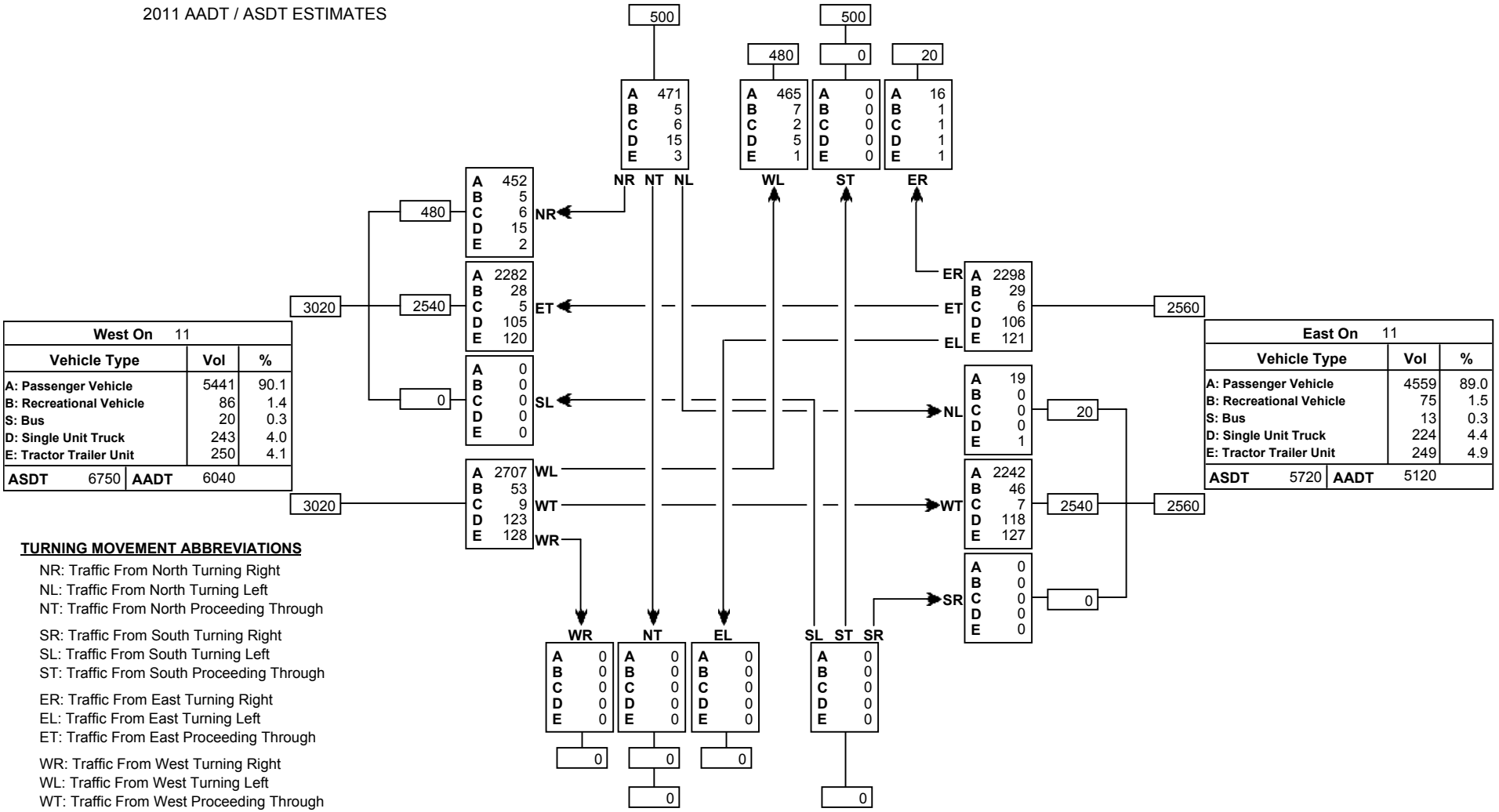
2011 AADT / ASDT ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	952	95.2
B: Recreational Vehicle	13	1.3
S: Bus	9	0.9
D: Single Unit Truck	21	2.1
E: Tractor Trailer Unit	5	0.5
ASDT 1120	**AADT** 1000	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	5441	90.1
B: Recreational Vehicle	86	1.4
S: Bus	20	0.3
D: Single Unit Truck	243	4.0
E: Tractor Trailer Unit	250	4.1
ASDT 6750	**AADT** 6040	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4559	89.0
B: Recreational Vehicle	75	1.5
S: Bus	13	0.3
D: Single Unit Truck	224	4.4
E: Tractor Trailer Unit	249	4.9
ASDT 5720	**AADT** 5120	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

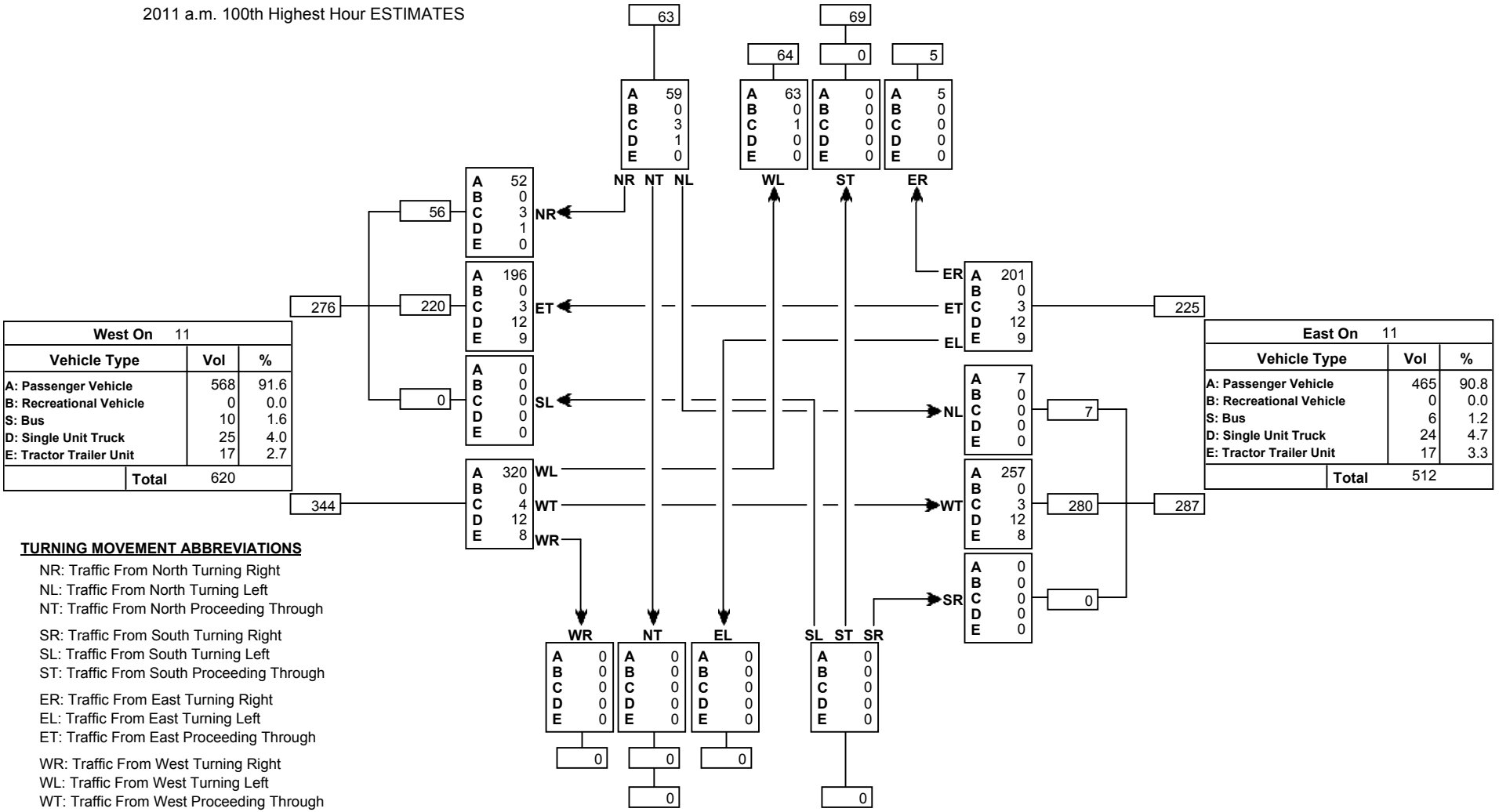
2011 a.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	127	96.2
B: Recreational Vehicle	0	0.0
S: Bus	4	3.0
D: Single Unit Truck	1	0.8
E: Tractor Trailer Unit	0	0.0
Total	132	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	568	91.6
B: Recreational Vehicle	0	0.0
S: Bus	10	1.6
D: Single Unit Truck	25	4.0
E: Tractor Trailer Unit	17	2.7
Total	620	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	465	90.8
B: Recreational Vehicle	0	0.0
S: Bus	6	1.2
D: Single Unit Truck	24	4.7
E: Tractor Trailer Unit	17	3.3
Total	512	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

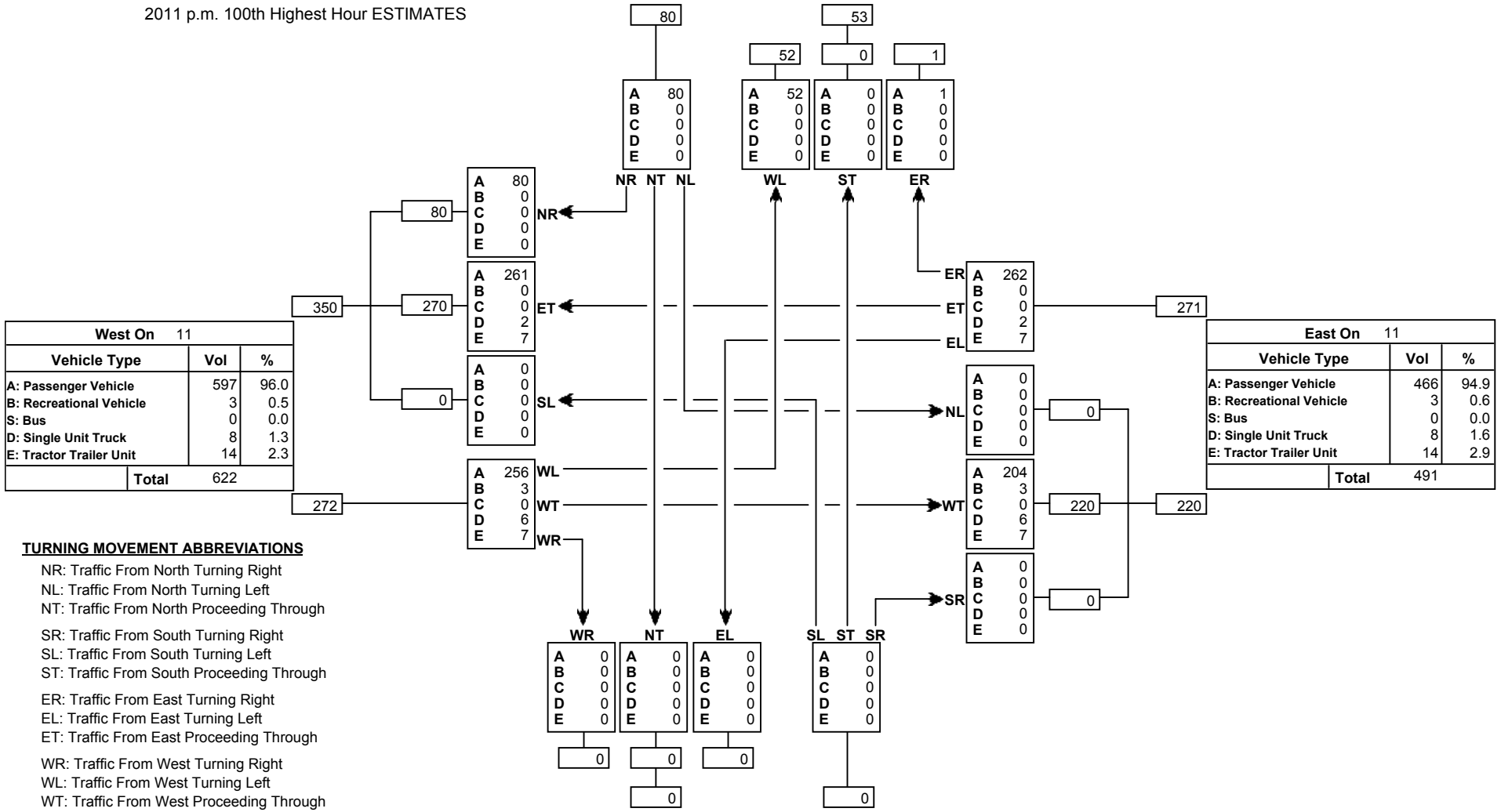
2011 p.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	133	100.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	133	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	597	96.0
B: Recreational Vehicle	3	0.5
S: Bus	0	0.0
D: Single Unit Truck	8	1.3
E: Tractor Trailer Unit	14	2.3
Total	622	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	466	94.9
B: Recreational Vehicle	3	0.6
S: Bus	0	0.0
D: Single Unit Truck	8	1.6
E: Tractor Trailer Unit	14	2.9
Total	491	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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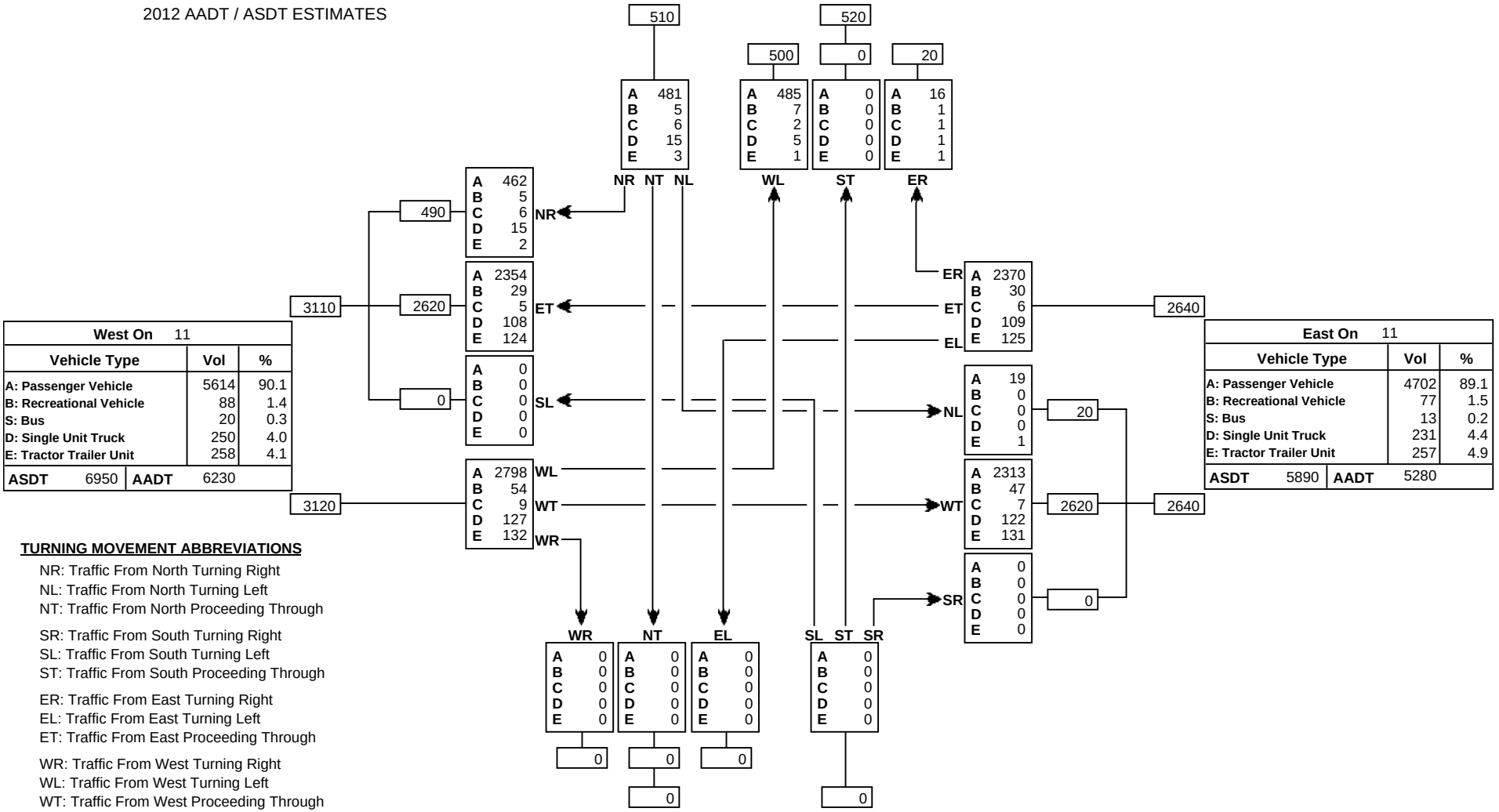
Intersection of:
11 & TWP RD 390 32-38-2-503000150

2012 AADT / ASDT ESTIMATES



North On Twp Rd 390

Vehicle Type	Vol	%
A: Passenger Vehicle	982	95.3
B: Recreational Vehicle	13	1.3
S: Bus	9	0.9
D: Single Unit Truck	21	2.0
E: Tractor Trailer Unit	5	0.5
ASDT 1150	**AADT** 1030	

West On 11

Vehicle Type	Vol	%
A: Passenger Vehicle	5614	90.1
B: Recreational Vehicle	88	1.4
S: Bus	20	0.3
D: Single Unit Truck	250	4.0
E: Tractor Trailer Unit	258	4.1
ASDT 6950	**AADT** 6230	

East On 11

Vehicle Type	Vol	%
A: Passenger Vehicle	4702	89.1
B: Recreational Vehicle	77	1.5
S: Bus	13	0.2
D: Single Unit Truck	231	4.4
E: Tractor Trailer Unit	257	4.9
ASDT 5890	**AADT** 5280	

South On

Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	

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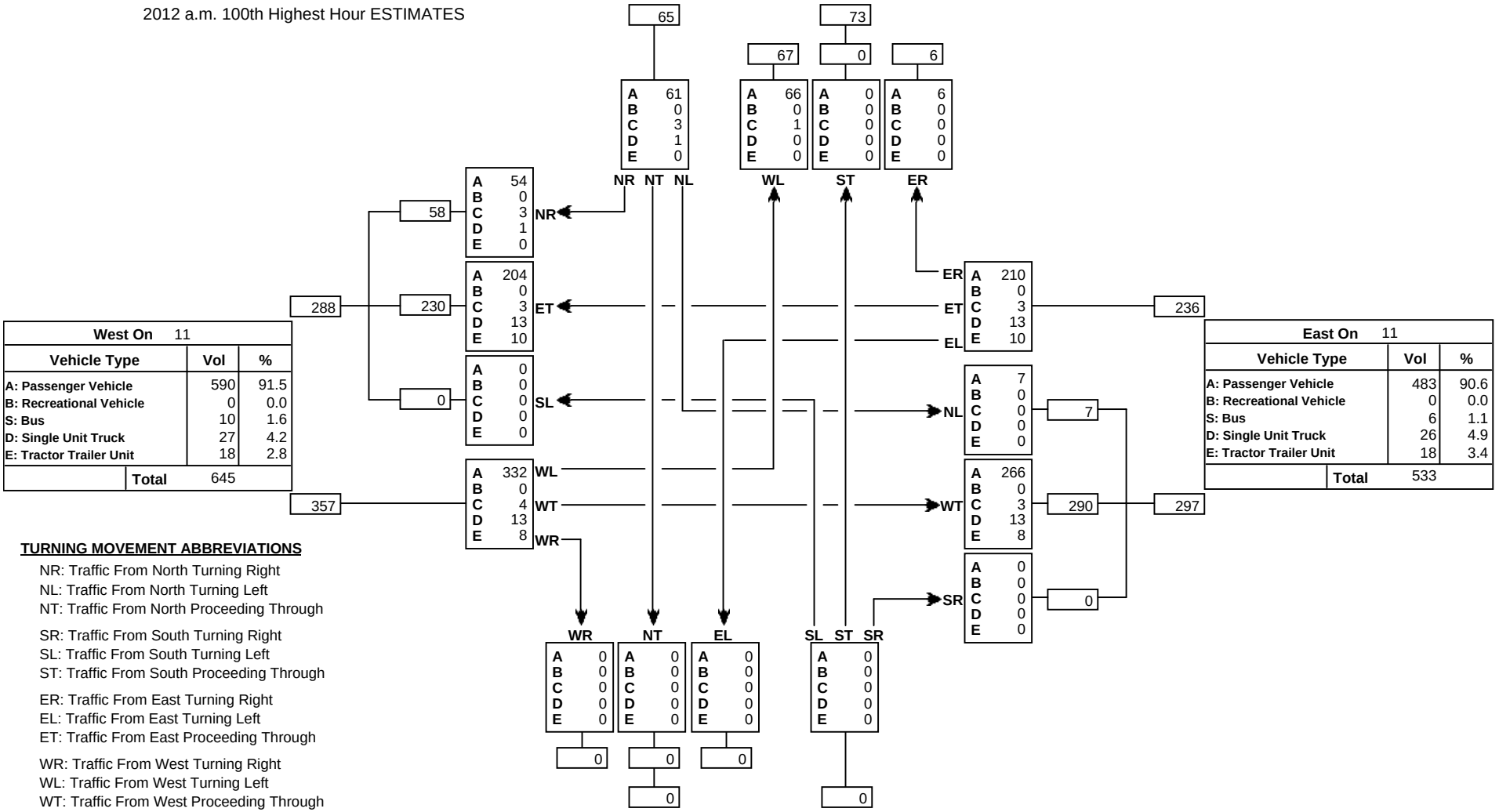
2012 a.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	133	96.4
B: Recreational Vehicle	0	0.0
S: Bus	4	2.9
D: Single Unit Truck	1	0.7
E: Tractor Trailer Unit	0	0.0
Total	138	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	590	91.5
B: Recreational Vehicle	0	0.0
S: Bus	10	1.6
D: Single Unit Truck	27	4.2
E: Tractor Trailer Unit	18	2.8
Total	645	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	483	90.6
B: Recreational Vehicle	0	0.0
S: Bus	6	1.1
D: Single Unit Truck	26	4.9
E: Tractor Trailer Unit	18	3.4
Total	533	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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2012 p.m. 100th Highest Hour ESTIMATES

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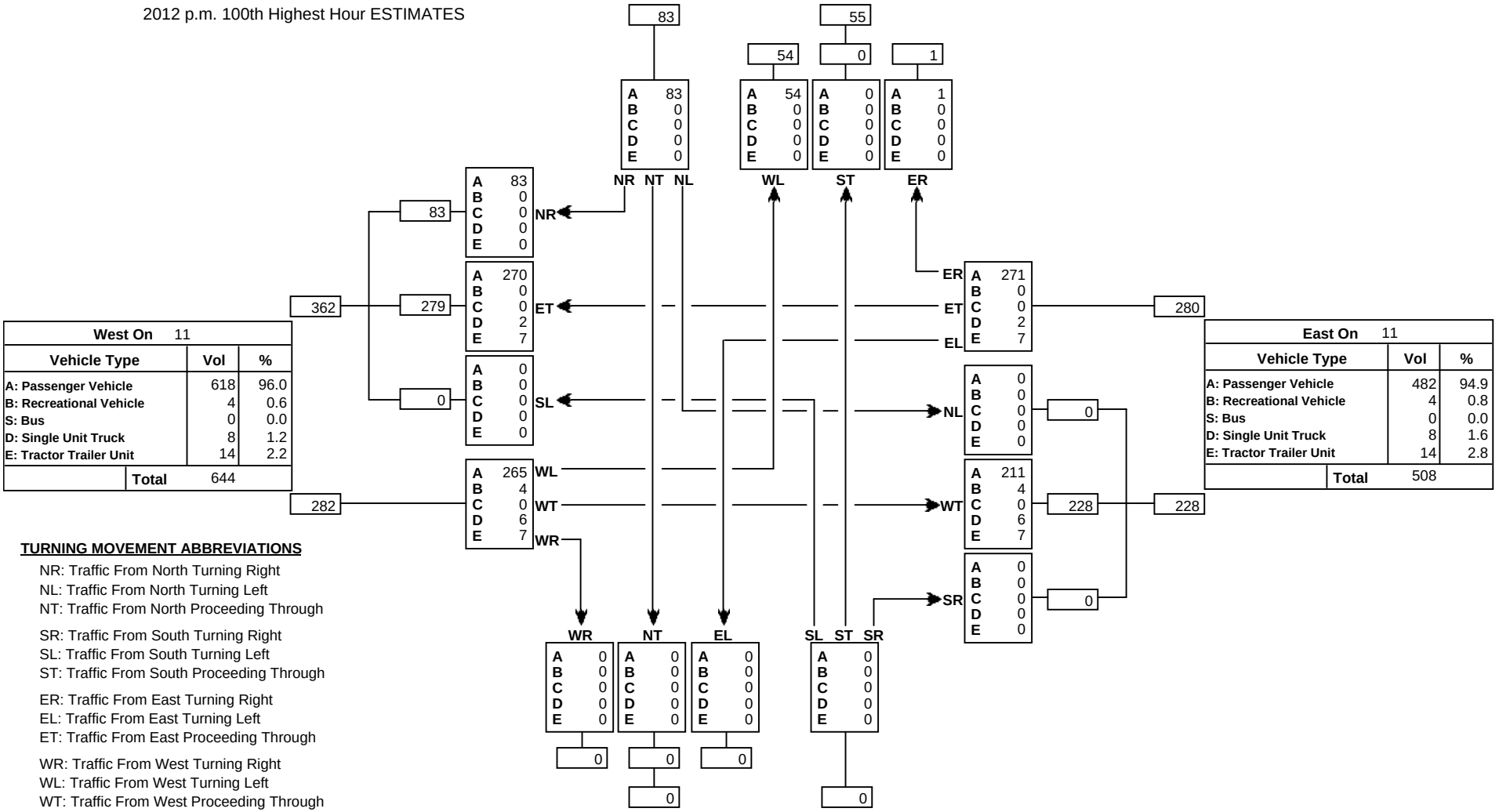
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	138	100.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	138	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	618	96.0
B: Recreational Vehicle	4	0.6
S: Bus	0	0.0
D: Single Unit Truck	8	1.2
E: Tractor Trailer Unit	14	2.2
Total	644	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	482	94.9
B: Recreational Vehicle	4	0.8
S: Bus	0	0.0
D: Single Unit Truck	8	1.6
E: Tractor Trailer Unit	14	2.8
Total	508	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



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Turning Movement Summary Diagram

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Intersection of:
11 & TWP RD 390 32-38-2-503000150

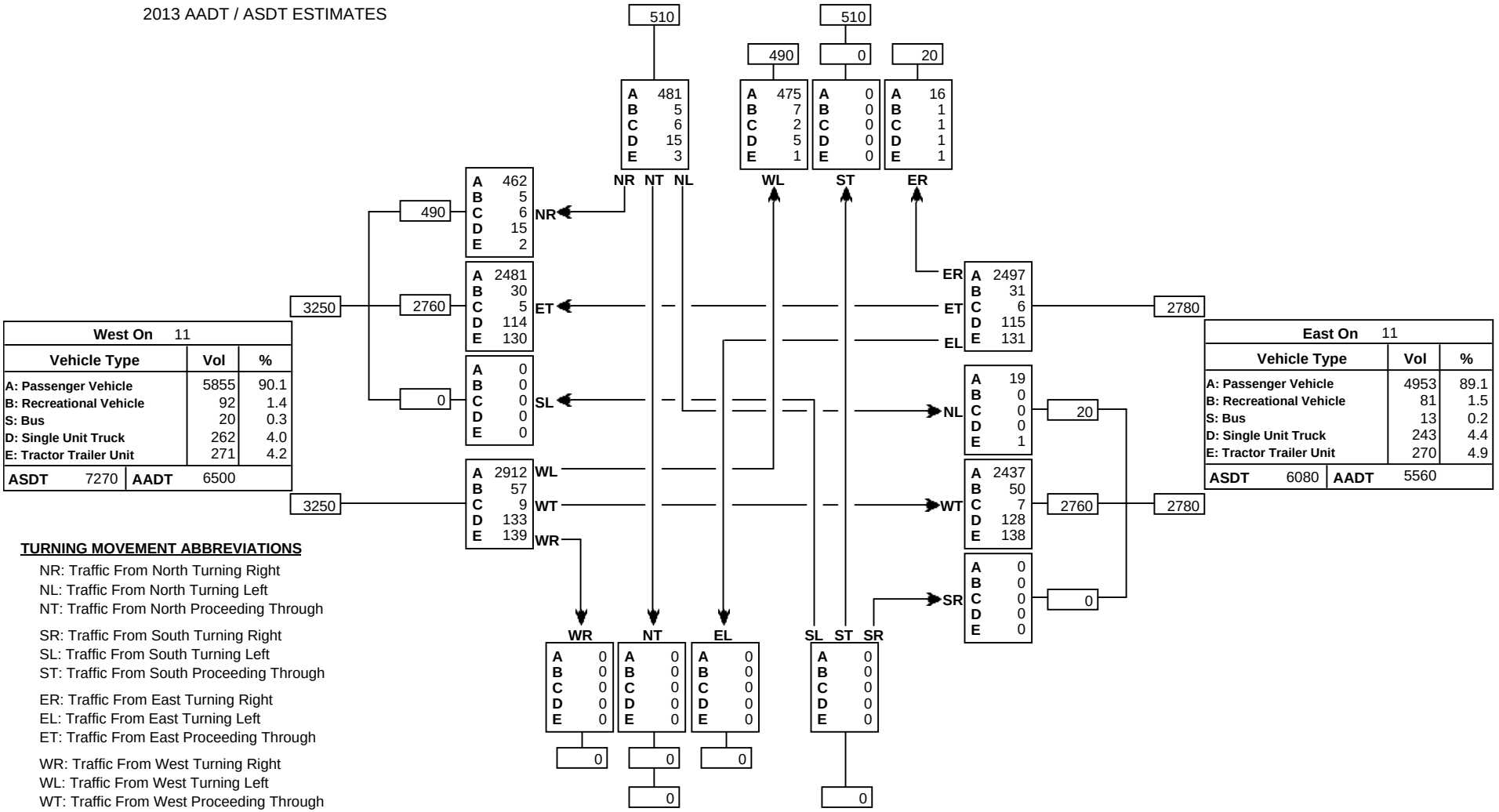
2013 AADT / ASDT ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	972	95.3
B: Recreational Vehicle	13	1.3
S: Bus	9	0.9
D: Single Unit Truck	21	2.1
E: Tractor Trailer Unit	5	0.5
ASDT 1140	**AADT** 1020	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	5855	90.1
B: Recreational Vehicle	92	1.4
S: Bus	20	0.3
D: Single Unit Truck	262	4.0
E: Tractor Trailer Unit	271	4.2
ASDT 7270	**AADT** 6500	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	4953	89.1
B: Recreational Vehicle	81	1.5
S: Bus	13	0.2
D: Single Unit Truck	243	4.4
E: Tractor Trailer Unit	270	4.9
ASDT 6080	**AADT** 5560	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
ASDT	**AADT** 0	



TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

TURNING MOVEMENT ABBREVIATIONS

AADT: Average Annual Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo
period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

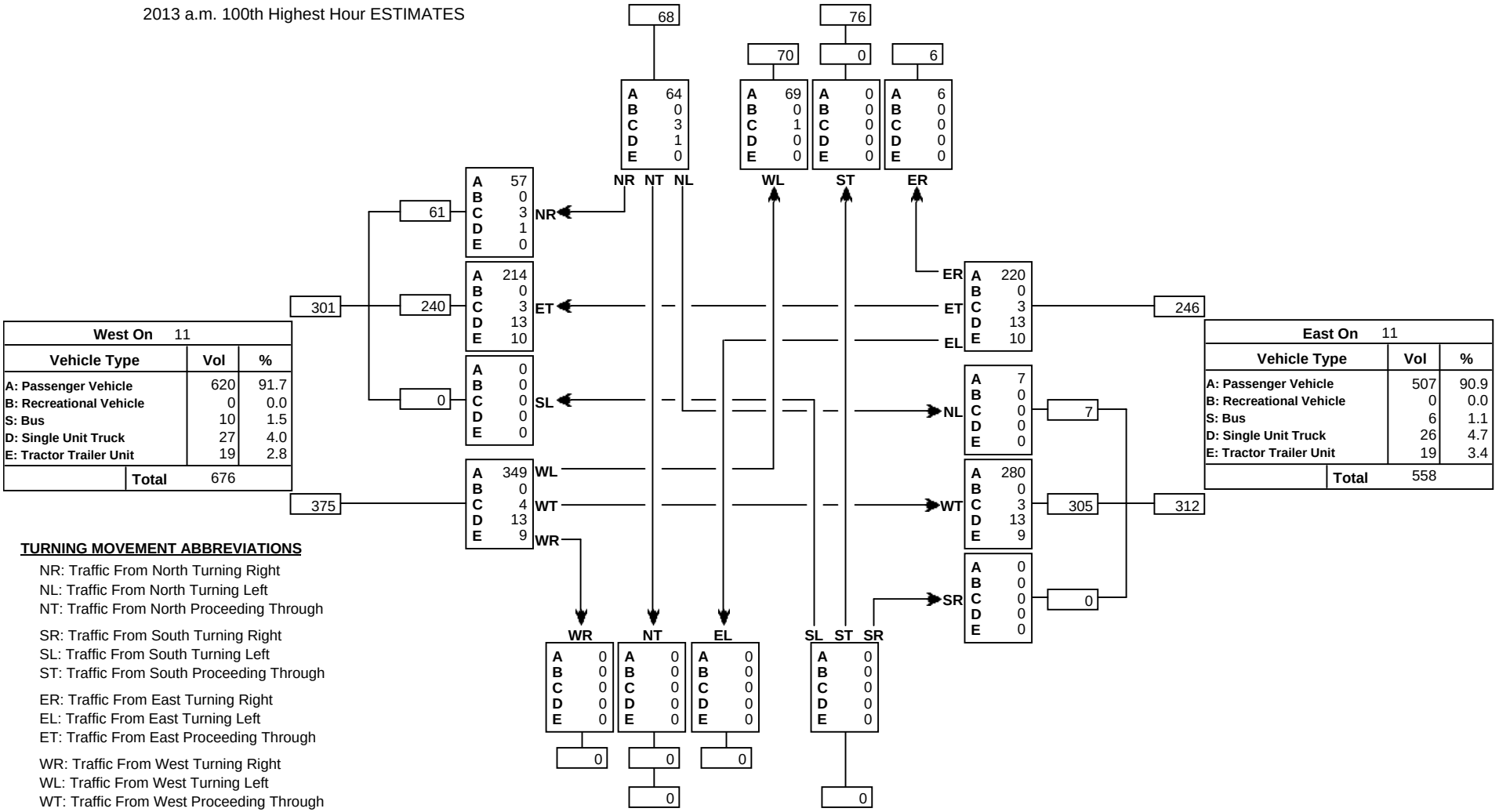
2013 a.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	139	96.5
B: Recreational Vehicle	0	0.0
S: Bus	4	2.8
D: Single Unit Truck	1	0.7
E: Tractor Trailer Unit	0	0.0
Total	144	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	620	91.7
B: Recreational Vehicle	0	0.0
S: Bus	10	1.5
D: Single Unit Truck	27	4.0
E: Tractor Trailer Unit	19	2.8
Total	676	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	507	90.9
B: Recreational Vehicle	0	0.0
S: Bus	6	1.1
D: Single Unit Truck	26	4.7
E: Tractor Trailer Unit	19	3.4
Total	558	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



TURNING MOVEMENT ABBREVIATIONS

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NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

Turning Movement Summary Diagram

Reference No.: 66330

Intersection of:
11 & TWP RD 390 32-38-2-503000150

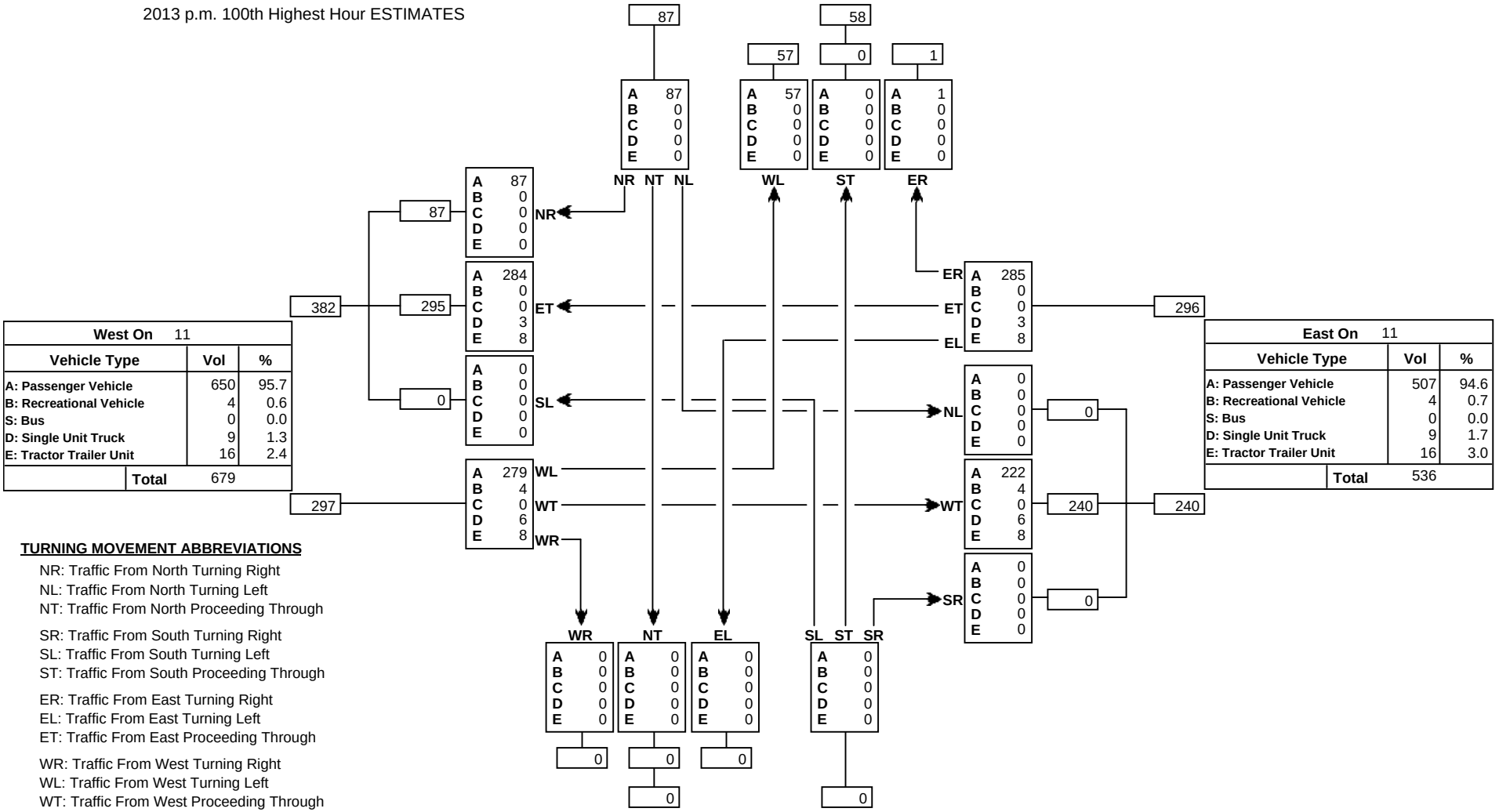
2013 p.m. 100th Highest Hour ESTIMATES

North On Twp Rd 390		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	145	100.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	145	

West On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	650	95.7
B: Recreational Vehicle	4	0.6
S: Bus	0	0.0
D: Single Unit Truck	9	1.3
E: Tractor Trailer Unit	16	2.4
Total	679	

East On 11		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	507	94.6
B: Recreational Vehicle	4	0.7
S: Bus	0	0.0
D: Single Unit Truck	9	1.7
E: Tractor Trailer Unit	16	3.0
Total	536	

South On		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
S: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	0	



TURNING MOVEMENT ABBREVIATIONS

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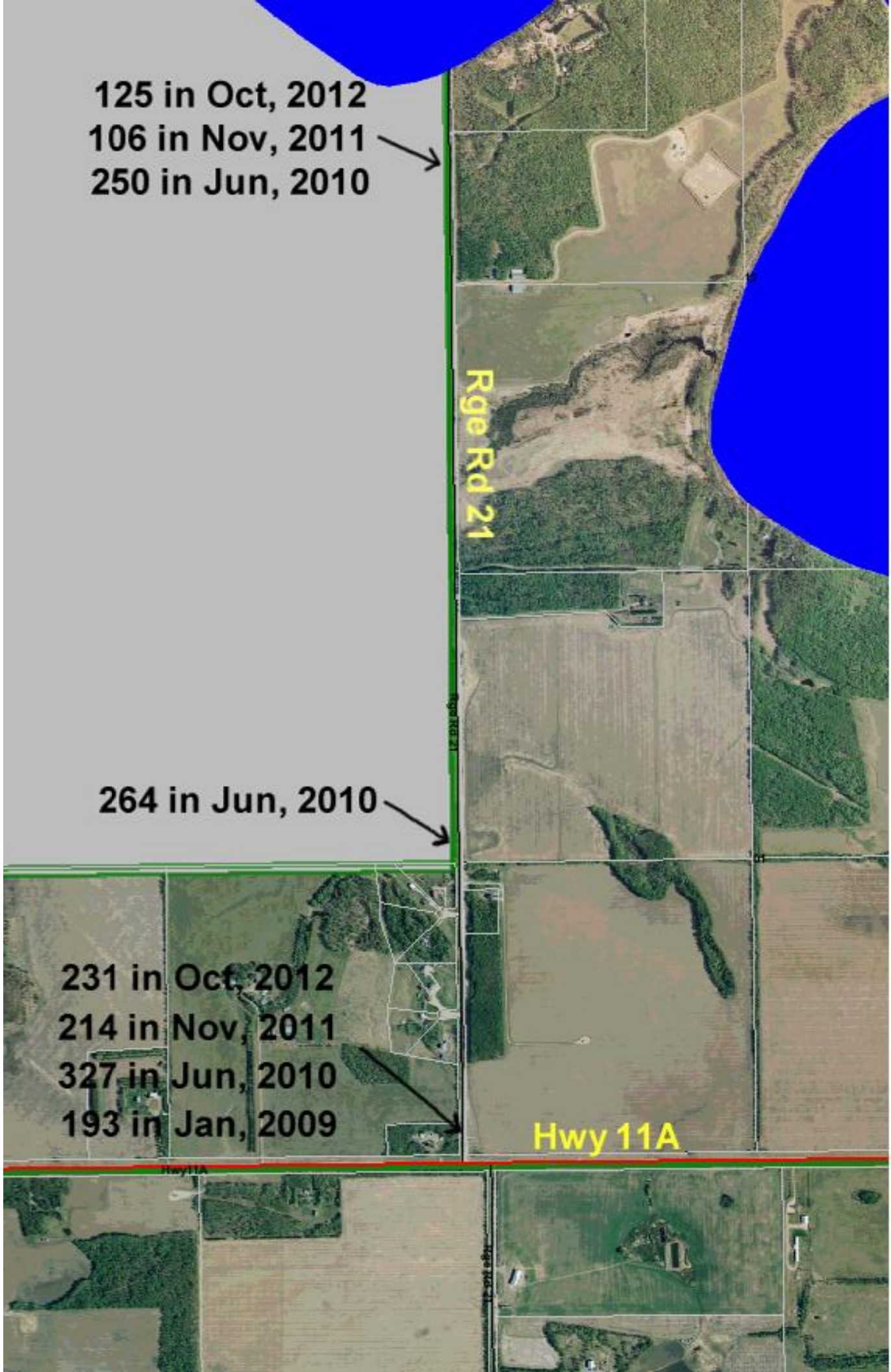
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

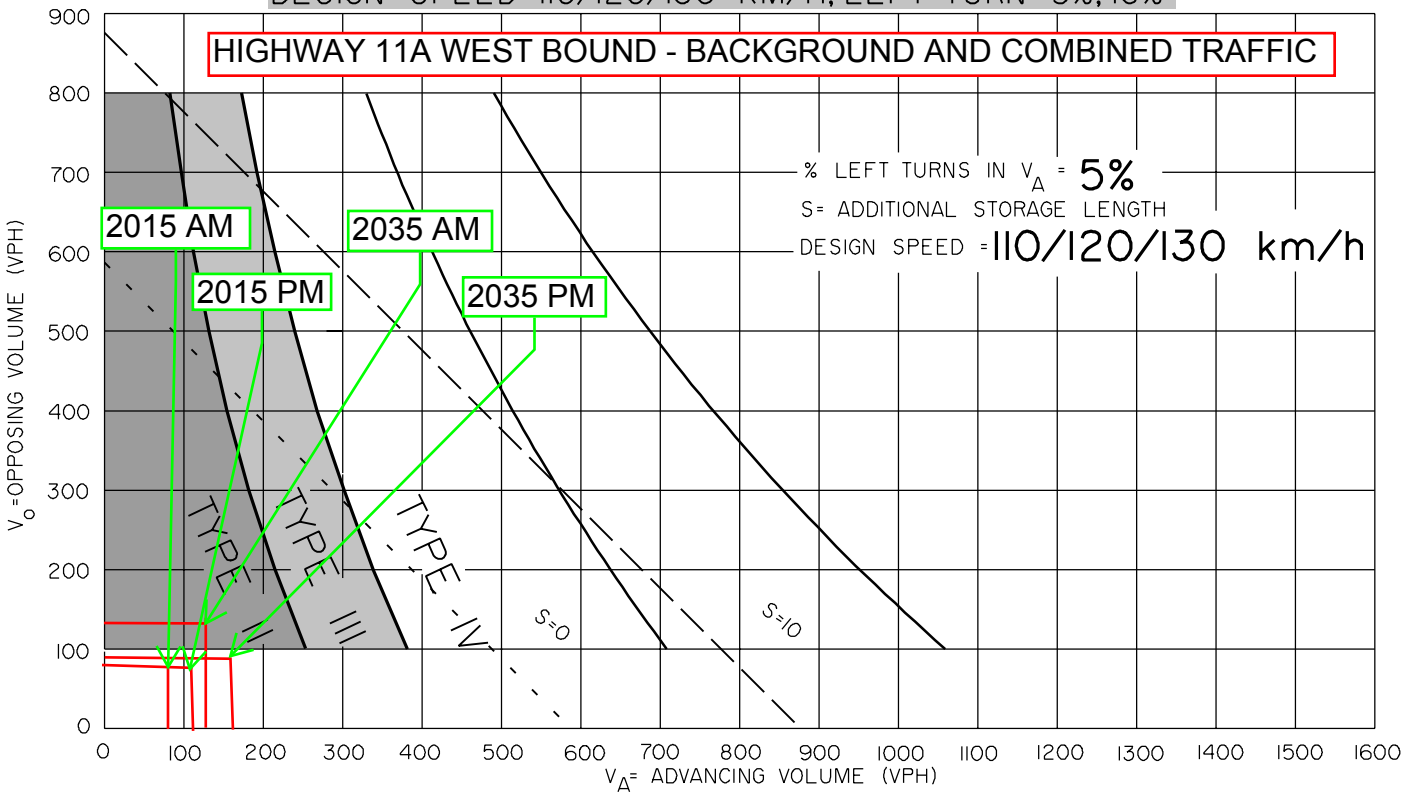
ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through


125 in Oct, 2012
106 in Nov, 2011
250 in Jun, 2010
Rge Rd 21
264 in Jun, 2010
231 in Oct, 2012
214 in Nov, 2011
327 in Jun, 2010
193 in Jan, 2009
Hwy 11A

Appendix C - Left Turn Lane Warrant Analysis

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



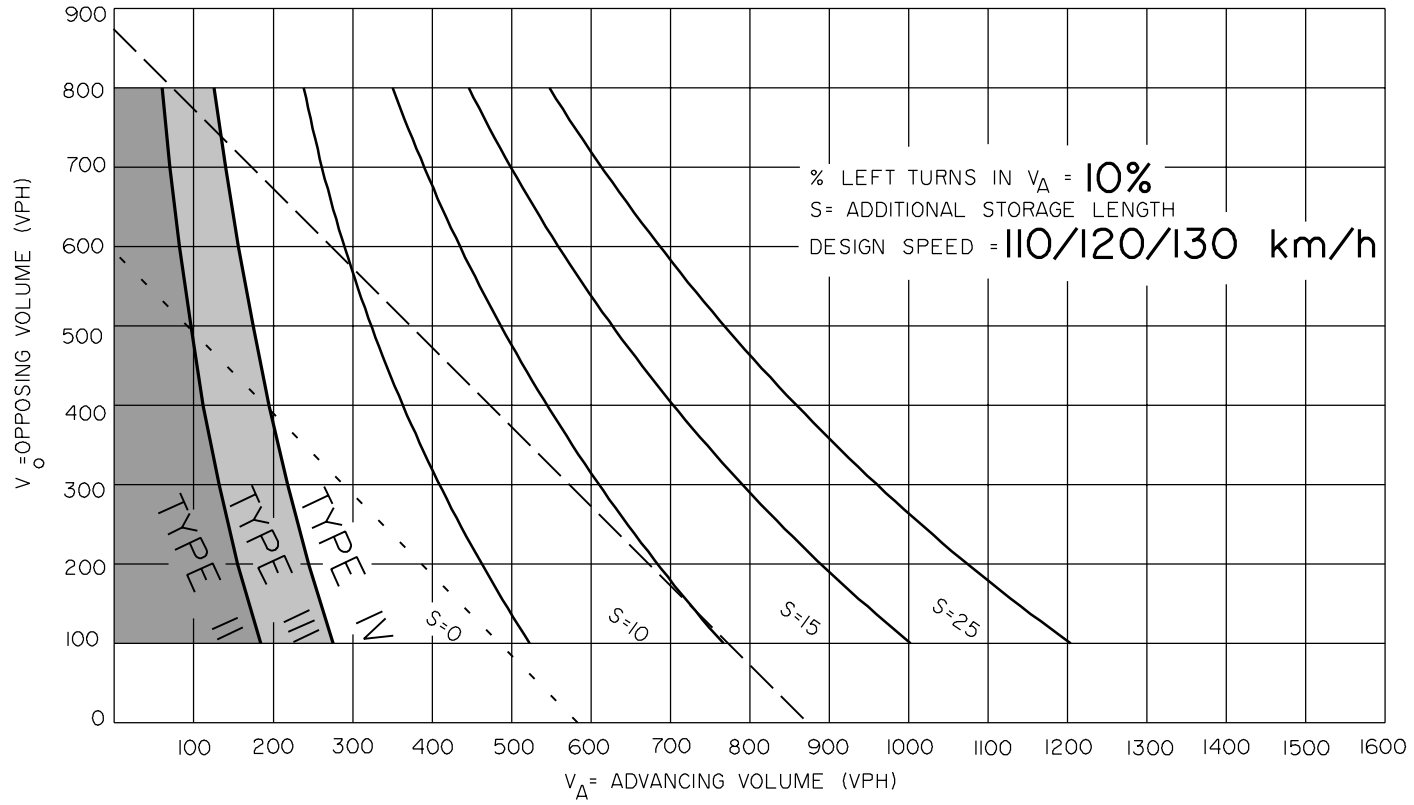
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— Traffic signals may be warranted in "free flow" urban areas.

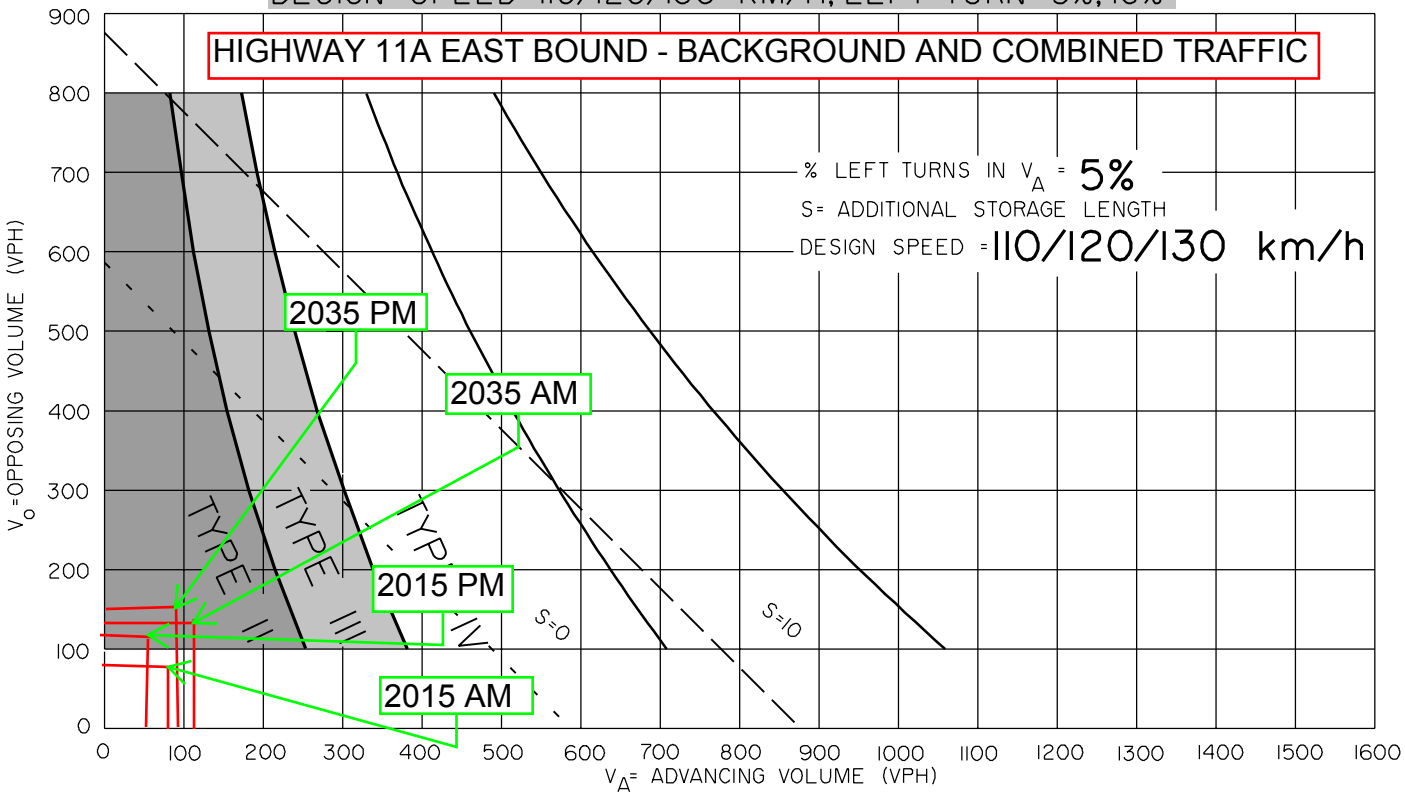
Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



GRAPHICS FILE: debd767a.man

FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%



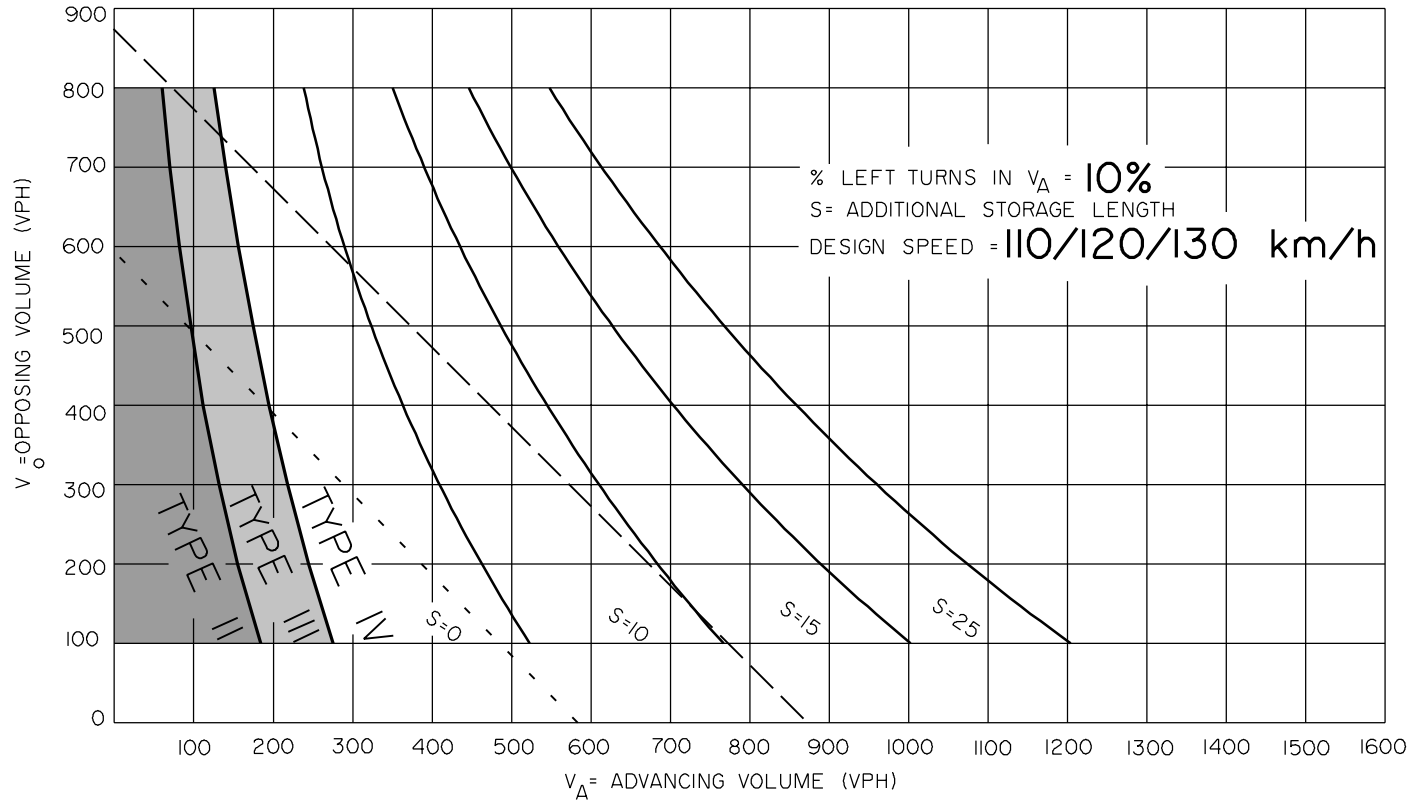
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

- - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

—— —— Traffic signals may be warranted in "free flow" urban areas.

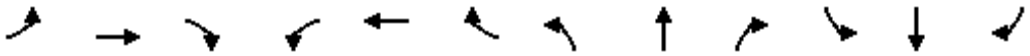
Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



GRAPHICS FILE: debd767a.man

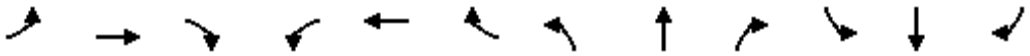
Appendix D - Synchro Outputs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	79	0	0	70	7	0	1	1	15	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	86	0	0	76	8	0	1	1	16	2	2
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	84			86			129	172	43	127	168	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	84			86			129	172	43	127	168	42
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	98	100	100
cM capacity (veh/h)	1511			1508			826	720	1018	713	723	883

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	44	43	38	46	2	21
Volume Left	1	0	0	0	0	16
Volume Right	0	0	0	8	1	2
cSH	1511	1700	1508	1700	843	729
Volume to Capacity	0.00	0.03	0.00	0.03	0.00	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.7
Control Delay (s)	0.2	0.0	0.0	0.0	9.3	10.1
Lane LOS	A				A	B
Approach Delay (s)	0.1		0.0		9.3	10.1
Approach LOS					A	B

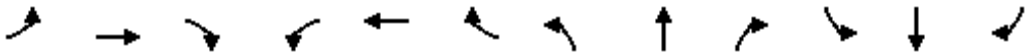
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	58	0	1	89	18	0	2	1	12	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	63	0	1	97	20	0	2	1	13	2	2
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	116			63			121	186	32	147	176	58
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	116			63			121	186	32	147	176	58
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	98	100	100
cM capacity (veh/h)	1470			1538			836	706	1035	686	715	860

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	34	32	49	68	3	17
Volume Left	2	0	1	0	0	13
Volume Right	0	0	0	20	1	2
cSH	1470	1700	1538	1700	790	708
Volume to Capacity	0.00	0.02	0.00	0.04	0.00	0.02
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.6
Control Delay (s)	0.5	0.0	0.2	0.0	9.6	10.2
Lane LOS	A		A		A	B
Approach Delay (s)	0.3		0.1		9.6	10.2
Approach LOS					A	B

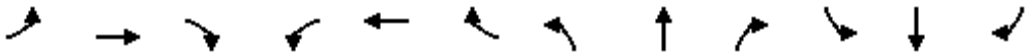
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	119	0	0	105	8	0	1	1	18	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	129	0	0	114	9	0	1	1	20	2	2
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	123			129			192	254	65	187	250	61
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	123			129			192	254	65	187	250	61
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	97	100	100
cM capacity (veh/h)	1462			1454			746	648	986	639	651	855

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	66	65	57	66	2	24
Volume Left	1	0	0	0	0	20
Volume Right	0	0	0	9	1	2
cSH	1462	1700	1454	1700	782	655
Volume to Capacity	0.00	0.04	0.00	0.04	0.00	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.9
Control Delay (s)	0.1	0.0	0.0	0.0	9.6	10.7
Lane LOS	A				A	B
Approach Delay (s)	0.1		0.0		9.6	10.7
Approach LOS					A	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	87	0	1	134	22	0	2	1	14	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	95	0	1	146	24	0	2	1	15	2	2
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	170			95			177	271	47	214	259	85
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	170			95			177	271	47	214	259	85
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	97	100	100
cM capacity (veh/h)	1405			1497			763	633	1012	607	643	822

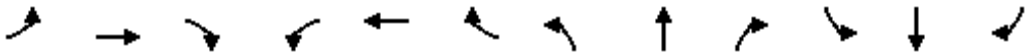
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	49	47	74	97	3	20
Volume Left	2	0	1	0	0	15
Volume Right	0	0	0	24	1	2
cSH	1405	1700	1497	1700	723	629
Volume to Capacity	0.00	0.03	0.00	0.06	0.00	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.7
Control Delay (s)	0.3	0.0	0.1	0.0	10.0	10.9
Lane LOS	A		A		A	B
Approach Delay (s)	0.2		0.0		10.0	10.9
Approach LOS					A	B

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	19.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	79	0	0	70	9	0	1	1	15	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	86	0	0	76	10	0	1	1	16	2	2
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	86			86			129	174	43	128	169	43
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	86			86			129	174	43	128	169	43
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	98	100	100
cM capacity (veh/h)	1508			1508			826	718	1018	712	722	882

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	44	43	38	48	2	21
Volume Left	1	0	0	0	0	16
Volume Right	0	0	0	10	1	2
cSH	1508	1700	1508	1700	842	728
Volume to Capacity	0.00	0.03	0.00	0.03	0.00	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.7
Control Delay (s)	0.2	0.0	0.0	0.0	9.3	10.1
Lane LOS	A				A	B
Approach Delay (s)	0.1		0.0		9.3	10.1
Approach LOS					A	B

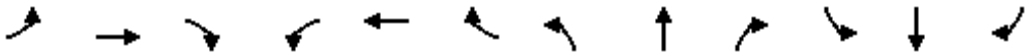
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	58	0	1	89	20	0	2	1	17	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	63	0	1	97	22	0	2	1	18	3	3
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	118			63			123	188	32	148	177	59
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	118			63			123	188	32	148	177	59
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	97	100	100
cM capacity (veh/h)	1467			1538			832	704	1035	685	714	858

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	34	32	49	70	3	25
Volume Left	2	0	1	0	0	18
Volume Right	0	0	0	22	1	3
cSH	1467	1700	1538	1700	788	707
Volume to Capacity	0.00	0.02	0.00	0.04	0.00	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.8
Control Delay (s)	0.5	0.0	0.2	0.0	9.6	10.3
Lane LOS	A		A		A	B
Approach Delay (s)	0.3		0.1		9.6	10.3
Approach LOS					A	B

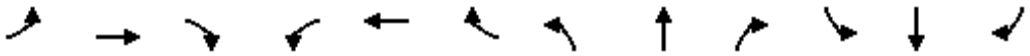
Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	119	0	0	105	10	0	1	1	18	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	129	0	0	114	11	0	1	1	20	2	2
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	125			129			192	257	65	188	251	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	125			129			192	257	65	188	251	62
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	97	100	100
cM capacity (veh/h)	1459			1454			746	646	986	638	650	853

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	66	65	57	68	2	24
Volume Left	1	0	0	0	0	20
Volume Right	0	0	0	11	1	2
cSH	1459	1700	1454	1700	780	654
Volume to Capacity	0.00	0.04	0.00	0.04	0.00	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	0.9
Control Delay (s)	0.1	0.0	0.0	0.0	9.6	10.7
Lane LOS	A				A	B
Approach Delay (s)	0.1		0.0		9.6	10.7
Approach LOS					A	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	87	0	1	134	24	0	2	1	19	3	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	95	0	1	146	26	0	2	1	21	3	3
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	172			95			179	273	47	215	260	86
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	172			95			179	273	47	215	260	86
tC, single (s)	4.1			4.1			7.5	6.5	6.9	8.5	6.5	7.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	4.0	4.0	3.8
p0 queue free %	100			100			100	100	100	97	99	100
cM capacity (veh/h)	1403			1497			759	631	1012	606	642	821

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	49	47	74	99	3	27
Volume Left	2	0	1	0	0	21
Volume Right	0	0	0	26	1	3
cSH	1403	1700	1497	1700	722	630
Volume to Capacity	0.00	0.03	0.00	0.06	0.00	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	1.0
Control Delay (s)	0.3	0.0	0.1	0.0	10.0	11.0
Lane LOS	A		A		B	B
Approach Delay (s)	0.2		0.0		10.0	11.0
Approach LOS					B	B

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	19.9%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix E - Signal Warrant Analysis

Alberta Transportation - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hwy 11A	Direction (EW or NS)	EW	Road Authority:	Alberta Transportation
Side Street (name)	Range Rd 21	Direction (EW or NS)	NS	City:	Lacombe County
Quadrant / Int #	1	Comments	Enter Comments about the analysis here.	Analysis Date:	2014 Nov 13, Thu
	CHECK SHEET			Count Date:	2015 Background Traffic
for Warrant Calculation Results, please hit 'Page Down'				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hwy 11A	WB		1			1			5,000	2		y	
Hwy 11A	EB		1			1			5,000	2		y	
Range Rd 21	NB				1				5,000	1		y	
Range Rd 21	SB				1					1		y	

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn	1,900	1,650
Through	1,900	1,800
Right Turn	1,900	1,500

Are the Range Rd 21 NB right turns significantly impeded by through movements? (y/n)	n
Are the Range Rd 21 SB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A WB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A EB right turns significantly impeded by through movements? (y/n)	n

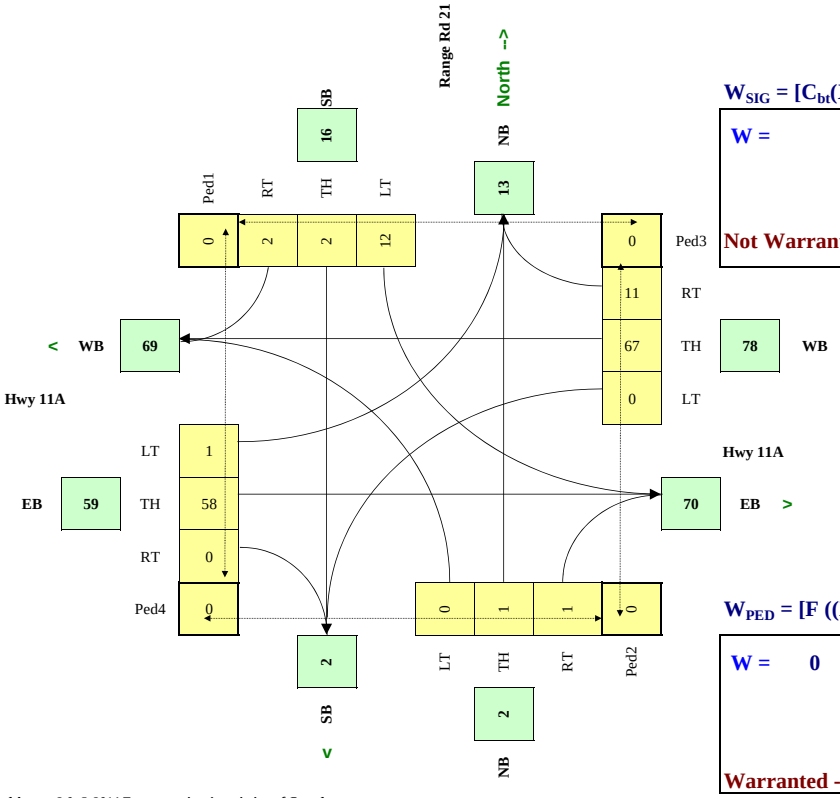
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	60,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hwy 11A	EW	110	2.0%	y	0.0
Range Rd 21	NS	60	1.0%	y	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	0	1	1	12	2	2	0	56	6	1	63	0				
	0	1	1	15	2	2	0	70	7	1	79	0				
	0	1	1	9	2	2	0	51	8	1	44	0				
	0	1	1	11	2	2	0	64	10	1	55	0				
	0	2	1	10	2	2	1	71	14	2	46	0				
	0	2	1	12	2	2	1	89	18	2	58	0				
Total (6-hour peak)	0	8	6	69	12	12	2	401	63	8	345	0	0	0	0	0
Average (6-hour peak)	0	1	1	12	2	2	0	67	11	1	58	0	0	0	0	0
Actual Pedestrian Crossing Distance (m)																

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$

W = 1 (Veh) 1 (Ped) 0

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 0

Warranted - Complex Intersection

Alberta Transportation - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hwy 11A	Direction (EW or NS)	EW	Road Authority:	Alberta Transportation
Side Street (name)	Range Rd 21	Direction (EW or NS)	NS	City:	Lacombe County
Quadrant / Int #	1	Comments	Enter Comments about the analysis here.	Analysis Date:	2014 Nov 13, Thu
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	2035 Background Traffic
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hwy 11A	WB		1			1			5,000	2		y	
Hwy 11A	EB		1			1			5,000	2		y	
Range Rd 21	NB				1				5,000	1		y	
Range Rd 21	SB				1					1		y	

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn	1,900	1,650
Through	1,900	1,800
Right Turn	1,900	1,500

Are the Range Rd 21 NB right turns significantly impeded by through movements? (y/n)	n
Are the Range Rd 21 SB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A WB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A EB right turns significantly impeded by through movements? (y/n)	n

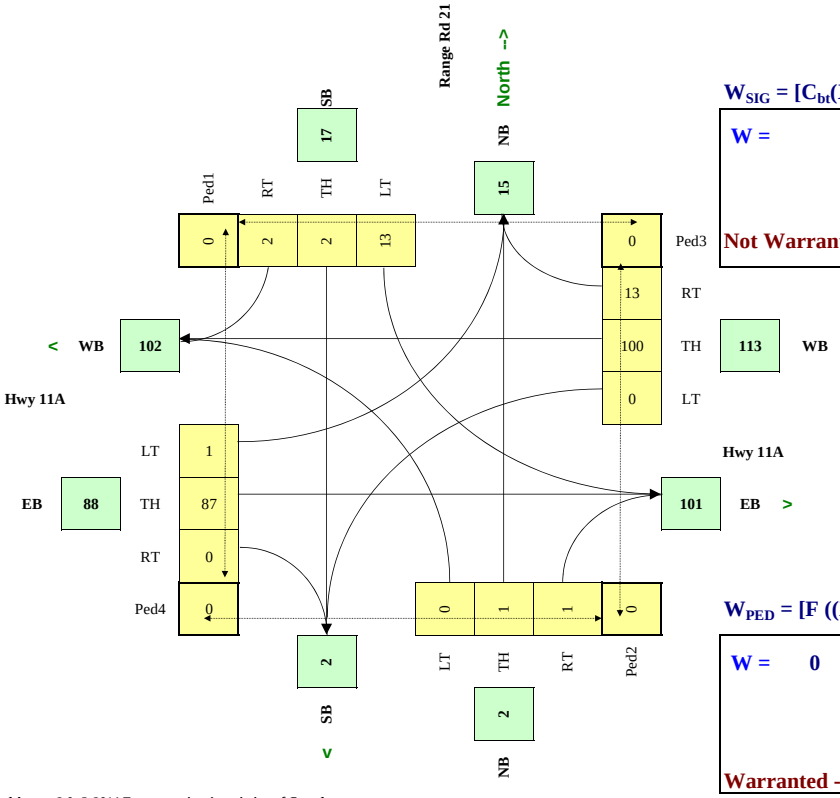
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	60,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hwy 11A	EW	110	2.0%	y	0.0
Range Rd 21	NS	60	1.0%	y	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	0	1	1	14	2	2	0	84	6	1	95	0				
	0	1	1	18	2	2	0	105	8	1	119	0				
	0	1	1	10	2	2	0	76	10	1	66	0				
	0	1	1	13	2	2	0	96	12	1	82	0				
	0	2	1	11	2	2	1	107	18	2	70	0				
	0	2	1	14	2	2	1	134	22	2	87	0				
Total (6-hour peak)	0	8	6	80	12	12	2	602	76	8	519	0	0	0	0	0
Average (6-hour peak)	0	1	1	13	2	2	0	100	13	1	87	0	0	0	0	0
Actual Pedestrian Crossing Distance (m)																

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$

W = 2 (Veh) 2 (Ped) 0

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 0

Warranted - Complex Intersection

Alberta Transportation - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hwy 11A	Direction (EW or NS)	EW	Road Authority:	Alberta Transportation
Side Street (name)	Range Rd 21	Direction (EW or NS)	NS	City:	Lacombe County
Quadrant / Int #	1	Comments	Enter Comments about the analysis here.	Analysis Date:	2014 Dec 05, Fri
	CHECK SHEET			Count Date:	2015 Combined Traffic
for Warrant Calculation Results, please hit 'Page Down'				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hwy 11A	WB		1			1			5,000	2		y	
Hwy 11A	EB		1			1			5,000	2		y	
Range Rd 21	NB				1				5,000	1		y	
Range Rd 21	SB				1					1		y	

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn	1,900	1,650
Through	1,900	1,800
Right Turn	1,900	1,500

Are the Range Rd 21 NB right turns significantly impeded by through movements? (y/n)	n
Are the Range Rd 21 SB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A WB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A EB right turns significantly impeded by through movements? (y/n)	n

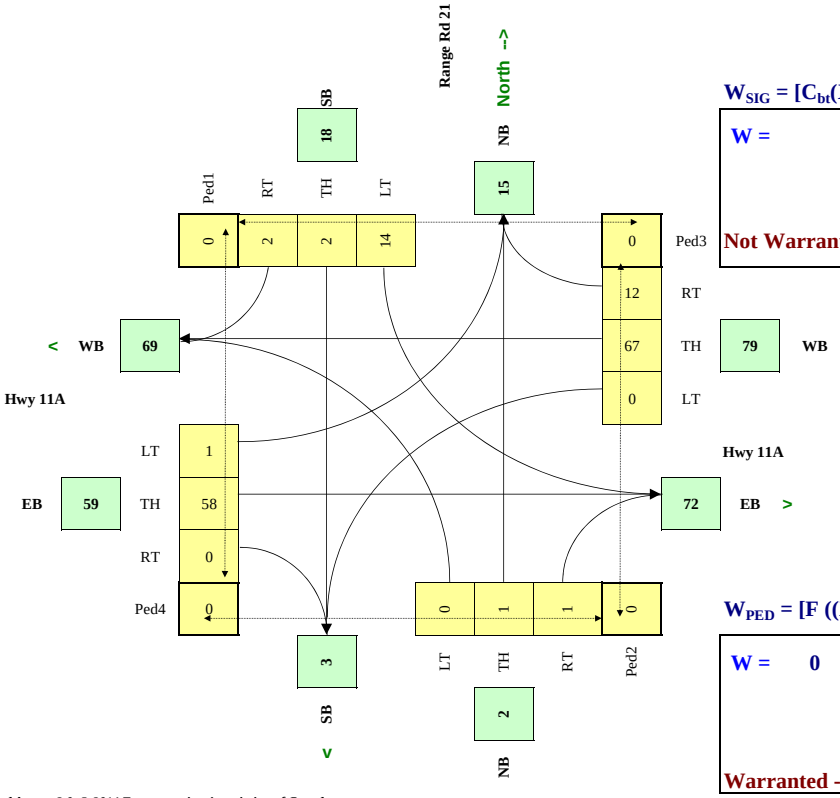
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	60,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hwy 11A	EW	110	2.0%	y	0.0
Range Rd 21	NS	60	1.0%	y	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	0	1	1	12	2	2	0	56	7	1	63	0				
	0	1	1	15	2	2	0	70	9	1	79	0				
	0	1	1	10	2	2	0	51	9	1	44	0				
	0	1	1	13	2	2	0	64	12	1	55	0				
	0	2	1	14	2	2	1	71	16	2	46	0				
	0	2	1	17	3	3	1	89	20	2	58	0				
Total (6-hour peak)	0	8	6	81	13	13	2	401	73	8	345	0	0	0	0	0
Average (6-hour peak)	0	1	1	14	2	2	0	67	12	1	58	0	0	0	0	0
													Actual Pedestrian Crossing Distance (m)			

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$

W = 2 (Veh) 2 (Ped) 0

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 0

Warranted - Complex Intersection

Alberta Transportation - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hwy 11A	Direction (EW or NS)	EW	Road Authority:	Alberta Transportation
Side Street (name)	Range Rd 21	Direction (EW or NS)	NS	City:	Lacombe County
Quadrant / Int #	1	Comments	Enter Comments about the analysis here.	Analysis Date:	2014 Dec 05, Fri
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	2035 Combined Traffic
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hwy 11A	WB		1			1			5,000	2		y	
Hwy 11A	EB		1			1			5,000	2		y	
Range Rd 21	NB				1				5,000	1		y	
Range Rd 21	SB				1					1		y	

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn	1,900	1,650
Through	1,900	1,800
Right Turn	1,900	1,500

Are the Range Rd 21 NB right turns significantly impeded by through movements? (y/n)	n
Are the Range Rd 21 SB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A WB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 11A EB right turns significantly impeded by through movements? (y/n)	n

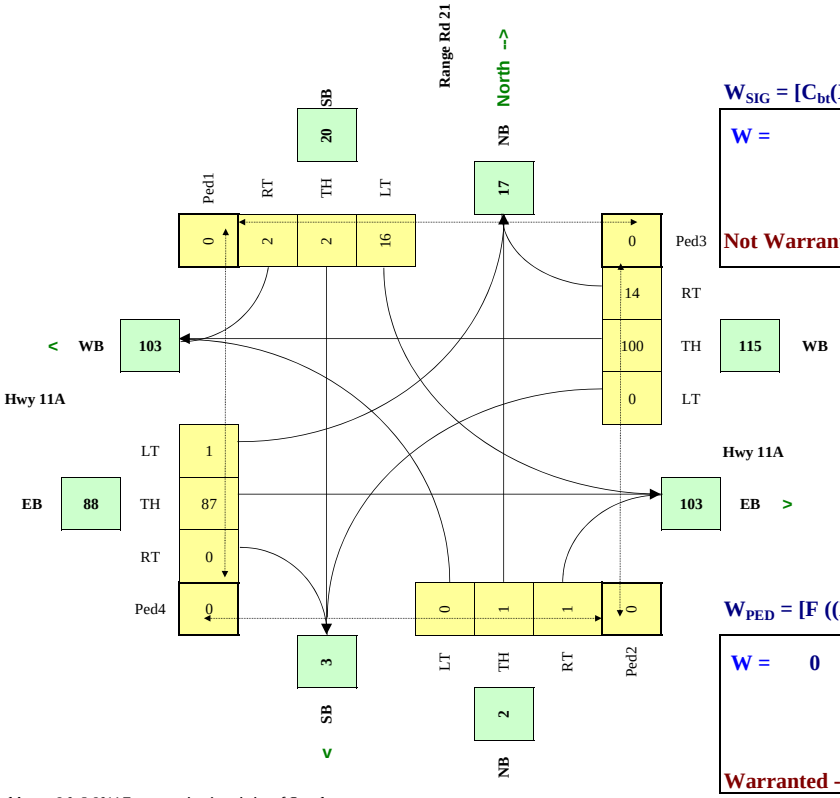
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	60,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hwy 11A	EW	110	2.0%	y	0.0
Range Rd 21	NS	60	1.0%	y	0.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	0	1	1	14	2	2	0	84	8	1	95	0				
	0	1	1	18	2	2	0	105	10	1	119	0				
	0	1	1	12	2	2	0	76	11	1	66	0				
	0	1	1	15	2	2	0	96	14	1	82	0				
	0	2	1	15	2	2	1	107	19	2	70	0				
	0	2	1	19	3	3	1	134	24	2	87	0				
Total (6-hour peak)	0	8	6	93	13	13	2	602	86	8	519	0	0	0	0	0
Average (6-hour peak)	0	1	1	16	2	2	0	100	14	1	87	0	0	0	0	0
Actual Pedestrian Crossing Distance (m)																

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$

W = 3 (Veh) 3 (Ped) 0

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 0

Warranted - Complex Intersection

Appendix F - Illumination Warrant Analysis

Lighting Warrant - Rural Intersection(s)

Analysis : 2015 Background Traffic

** Double Click to Change Cell Colour

Calculate Warrant Points

Project Title	Sylvan Lake Boath Launch
Project Number	20143120
Date	4-Dec-14

CLASSIFICATION	RATING FACTOR 'R'					Weight		Score
FACTOR	**0**	**1**	**2**	**3**	**4**	**W'**		**R'x'W'**
GEOMETRIC FACTORS								
Channelization	none	right and/or left turn lanes on minor approach	right turn lane(s) only on major legs	left turn lane(s) on major legs	left and right turn lanes on all legs	raised and operating speed less than 70km/h on at lease one channelized approach	15	
						raised and operating speed at least 70km/h or more on channelized approach	20	
						painted only	5	
Approach sight distance on the most constrained approach (relative to recommended minimum intersection sight distance	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%	10		0
Horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110km/h	tangent	>1800m	1150 to 1800m	750 to 1150m	<750m	5		0
90 or 100 km/h	tangent	>1400m	950 to 1400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m			
Angle of Intersection or Offset Intersection	90 deg angle	80 or 100 deg angle	--	70 or 110 deg angle	<70deg or >110deg OR offset intersection	5		0
Downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 5.9% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	5		0
Sub-Total Geometric Factors								**0**

OPERATIONAL FACTORS							
IF THE INTERSECTION IF SIGNALIZED, ILLUMINATION IS WARRANTED							
IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of either the AADT factor or the signalization warrant							
AADT (2-way)							
on major road and	<1000	1000 to 2000	2000 to 3000	3000 to 5000	>5000	10	10
on minor road	<500	500 to 1000	1000 to 1500	1500 to 2000	>2000	20	0
or							
Signalization Warrant	Intersection not signalized and volume based signal warrant is less than 20% satisfied	Intersection not signalized and volume based warrant is 20% to 40% satisfied	Intersection not signalized and volume based warrant is 40% to 60% satisfied	Intersection not signalized and volume based warrant is 60% to 80% satisfied	Intersection not signalized and volume based warrant is over 80% satisfied	30	0
Regular Night Time hourly pedestrian traffic	no pedestrians	up to 10	10 to 30	30 ro 50	over 50	10	0
Intersecting roadway classifications	no primary road involved	primary/rural major, primary/rural minor, or primary/ designated community access	primary/ secondary	primary/primary	Intersection includes divided highway	5	5
Operating Speed or posted speed limit on major road	50km/h or less	60km/h	70km/h	80km/h	90km/h or over	5	20
Operating Speed or posted speed limit on minor road	50km/h or less	60km/h	70km/h	80km/h	90km/h or over	5	15
Sub-Total Operational Factors							**50**

ENVIRONMENTAL FACTORS							
Lighted Development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants	5	0
Sub-Total Environmental Factors							**0**

ACCIDENT FACTORS								
Average annual night time collision frequency or rate over last 3 years (only collisions attributable to inadequate lighting)	0 per year	1 per year	--	2 per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year and an average ratio of all night to day collisions of at least 1.5	1 or 2 per year	15	
						3 or more per year OR rate => 1.5 collisions/MEV	30	
Sub-Total Accident Factors								**0**

Geometric + Operational + Environmental + Accident = TOTAL WARRANT POINTS		**50**
WARRANTING CONDITIONS		
Total Points > 240	Full Illumination Warranted	
120 < Total Points < 240	Partial and/or delineation lighting warranted: if Geometric Factors Subtotal > 80 points: partial lighting to illuminate key decision areas, potential conflict points and/or hazards if Operational Factors Subtotal >120 points: delineation lighting to illuminate pedestrians or cross street traffic if Collision History Subtotal = 120 points: review collisions to determine appropriate lighting strategy	
Total Points < 120	Lighting not warranted	

Lighting Warrant - Rural Intersection(s)

Analysis : 2035 Background Traffic

** Double Click to Change Cell Colour

Calculate Warrant Points

Project Title	Sylvan Lake Boath Launch
Project Number	20143120
Date	4-Dec-14

CLASSIFICATION	RATING FACTOR 'R'					Weight		Score
FACTOR	**0**	**1**	**2**	**3**	**4**	**W'**		**R'x'W'**
GEOMETRIC FACTORS								
Channelization	none	right and/or left turn lanes on minor approach	right turn lane(s) only on major legs	left turn lane(s) on major legs	left and right turn lanes on all legs	raised and operating speed less than 70km/h on at lease one channelized approach	15	
						raised and operating speed at least 70km/h or more on channelized approach	20	
						painted only	5	
Approach sight distance on the most constrained approach (relative to recommended minimum intersection sight distance	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%	10		0
Horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110km/h	tangent	>1800m	1150 to 1800m	750 to 1150m	<750m	5		0
90 or 100 km/h	tangent	>1400m	950 to 1400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m			
Angle of Intersection or Offset Intersection	90 deg angle	80 or 100 deg angle	--	70 or 110 deg angle	<70deg or >110deg OR offset intersection	5		0
Downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 5.9% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	5		0
Sub-Total Geometric Factors								**0**

OPERATIONAL FACTORS							
IF THE INTERSECTION IF SIGNALIZED, ILLUMINATION IS WARRANTED							
IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of either the AADT factor or the signalization warrant							
AADT (2-way)							
on major road and	<1000	1000 to 2000	2000 to 3000	3000 to 5000	>5000	10	10
on minor road	<500	500 to 1000	1000 to 1500	1500 to 2000	>2000	20	0
or							
Signalization Warrant	Intersection not signalized and volume based signal warrant is less than 20% satisfied	Intersection not signalized and volume based warrant is 20% to 40% satisfied	Intersection not signalized and volume based warrant is 40% to 60% satisfied	Intersection not signalized and volume based warrant is 60% to 80% satisfied	Intersection not signalized and volume based warrant is over 80% satisfied	30	0
Regular Night Time hourly pedestrian traffic	no pedestrians	up to 10	10 to 30	30 ro 50	over 50	10	0
Intersecting roadway classifications	no primary road involved	primary/rural major, primary/rural minor, or primary/ designated community access	primary/ secondary	primary/primary	Intersection includes divided highway	5	5
Operating Speed or posted speed limit on major road	50km/h or less	60km/h	70km/h	80km/h	90km/h or over	5	20
Operating Speed or posted speed limit on minor road	50km/h or less	60km/h	70km/h	80km/h	90km/h or over	5	15
Sub-Total Operational Factors							**50**

ENVIRONMENTAL FACTORS							
Lighted Development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants	5	0
Sub-Total Environmental Factors							**0**

ACCIDENT FACTORS								
Average annual night time collision frequency or rate over last 3 years (only collisions attributable to inadequate lighting)	0 per year	1 per year	--	2 per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year and an average ratio of all night to day collisions of at least 1.5	1 or 2 per year	15	
						3 or more per year OR rate => 1.5 collisions/MEV	30	
Sub-Total Accident Factors								**0**

Geometric + Operational + Environmental + Accident = TOTAL WARRANT POINTS		**50**
WARRANTING CONDITIONS		
Total Points > 240	Full Illumination Warranted	
120 < Total Points < 240	Partial and/or delineation lighting warranted: if Geometric Factors Subtotal > 80 points: partial lighting to illuminate key decision areas, potential conflict points and/or hazards if Operational Factors Subtotal >120 points: delineation lighting to illuminate pedestrians or cross street traffic if Collision History Subtotal = 120 points: review collisions to determine appropriate lighting strategy	
Total Points < 120	Lighting not warranted	

Lighting Warrant - Rural Intersection(s)

Analysis : 2015 Combined Traffic

Project Title	Sylvan Lake Boath Launch
Project Number	20143120
Date	4-Dec-14

** Double Click to Change Cell Colour

Calculate Warrant Points

CLASSIFICATION	RATING FACTOR 'R'					Weight		Score
FACTOR	**0**	**1**	**2**	**3**	**4**	**W'**		**R'x'W'**
GEOMETRIC FACTORS								
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						painted only	5	
Approach sight distance on the most constrained approach (relative to recommended minimum intersection sight distance	100% or more	75% - 99%	50% - 74%	25% - 49%	<25%	10		0
Horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110km/h	tangent	>1800m	1150 to 1800m	750 to 1150m	<750m	5		0
90 or 100 km/h	tangent	>1400m	950 to 1400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
60 km/h	tangent	>575m	320 to 575m	190 to 320m	<190m			
Angle of Intersection or Offset Intersection	90 deg angle	80 or 100 deg angle	--	70 or 110 deg angle	<70deg or >110deg OR offset intersection	5		0
Downhill approach grades at or immediately before intersection on any leg	<3.0%	3.1 to 3.9% and meets design guidelines for type and speed of road	4.0 to 4.9% and meets design guidelines for type and speed of road	5.0 to 5.9% and meets design guidelines for type and speed of road	>7.0% OR exceeds maximum gradient for the type and speed of road	5		0
Sub-Total Geometric Factors								**0**

OPERATIONAL FACTORS							
IF THE INTERSECTION IF SIGNALIZED, ILLUMINATION IS WARRANTED							
IF THE INTERSECTION IS NOT SIGNALIZED, points should be calculated on the basis of either the AADT factor or the signalization warrant							
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on minor road	<500	500 to 1000	1000 to 1500	1500 to 2000	>2000	20	0
or							
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Sub-Total Operational Factors							**50**

ENVIRONMENTAL FACTORS							
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Sub-Total Environmental Factors							**0**

ACCIDENT FACTORS								
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Sub-Total Accident Factors								**0**

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Total Points < 120	Lighting not warranted	

Lighting Warrant - Rural Intersection(s)

Analysis : 2035 Combined Traffic

** Double Click to Change Cell Colour

Calculate Warrant Points

Project Title	Sylvan Lake Boath Launch
Project Number	20143120
Date	4-Dec-14

CLASSIFICATION	RATING FACTOR 'R'					Weight		Score
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Horizontal curvature (radius) at or immediately before intersection on any leg for posted speed limit of:								
110km/h	tangent	>1800m	1150 to 1800m	750 to 1150m	<750m	5		0
90 or 100 km/h	tangent	>1400m	950 to 1400m	600 to 950m	<600m			
70 or 80 km/h	tangent	>950m	550 to 950m	340 to 550m	<340m			
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Sub-Total Geometric Factors								**0**

OPERATIONAL FACTORS							
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or							
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Sub-Total Operational Factors							**50**

ENVIRONMENTAL FACTORS							
Lighted Development within 150m radius of intersection	--	in one quadrant	in two quadrants	in three quadrants	in four quadrants	5	0
Sub-Total Environmental Factors							**0**

ACCIDENT FACTORS								
Average annual night time collision frequency or rate over last 3 years (only collisions attributable to inadequate lighting)	0 per year	1 per year	--	2 per year	3 or more per year OR at least 1.5 collisions per million entering vehicles per year and an average ratio of all night to day collisions of at least 1.5	1 or 2 per year	15	
						3 or more per year OR rate => 1.5 collisions/MEV	30	
Sub-Total Accident Factors								**0**

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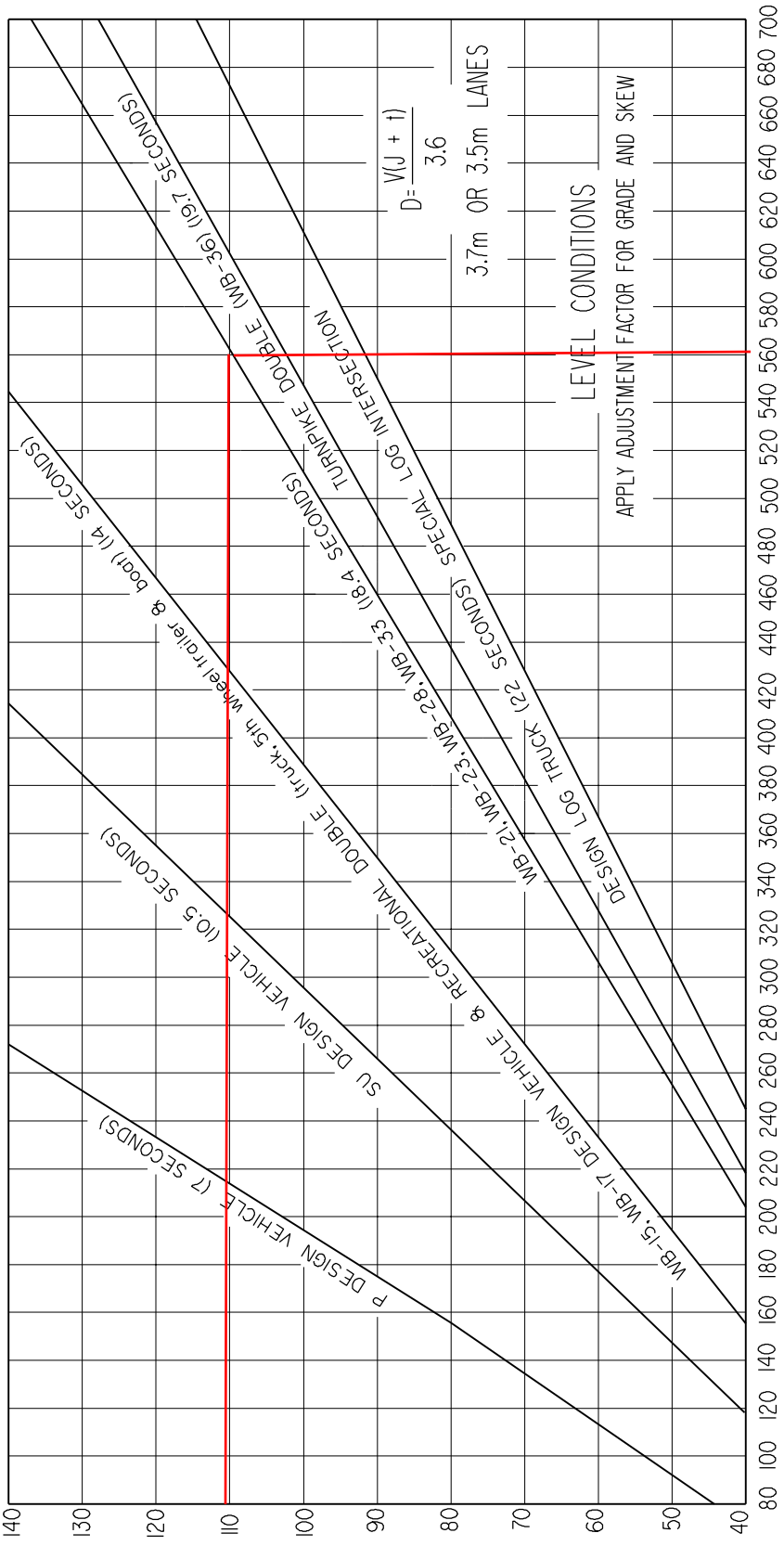
Total Points < 120	Lighting not warranted	

Appendix G - Sight Distance

FIGURE D-4.2.2.2 SIGHT DISTANCES FOR LEFT TURN ONTO HIGHWAY*



NOTES:

1. To determine the sight distance requirements at an intersection, the designer should select the longest vehicle or vehicle with the greatest I.S.D. need, that uses the intersection on a regular basis, i.e., daily. Because of the various eye heights, the I.S.D. available for several design vehicles may have to be checked.
2. The usefulness of intersection sight distances in excess of 500m has been debated and will be the subject of future research into gap acceptance by large trucks on rural highways in Alberta. Changes to this table may be made based on that research.

* INTERSECTION SIGHT DISTANCE (I.S.D.)

- THE I.S.D.'s SHOWN IN THIS FIGURE ARE BASED ON THE DISTANCE TRAVELLED AT DESIGN SPEED DURING A CRITICAL TIME (SHOWN ON THE FIGURE IN SECONDS). THE CRITICAL TIME INCLUDES THE TIME TAKEN FOR THE MANOEUVRE (LEFT TURN FROM THE MINOR ROAD) PLUS 2 SECONDS FOR PERCEPTION/REACTION TIME.
- THE INTERSECTION SIGHT DISTANCE AVAILABLE IS TO BE DETERMINED USING AN EYE HEIGHT (BASED ON THE DESIGN VEHICLE) LOCATED AT THE JUNCTION AND AN OBJECT HEIGHT OF 1.3m (REPRESENTING THE ROOF OF A PASSENGER VEHICLE) ON THE THROUGH ALIGNMENT. THE EYE HEIGHTS TO BE USED ARE SHOWN IN FIGURE D-5a.

* THIS CHART IS BASED ON CRITERIA USED BY AASHTO FOR "SIGHT DISTANCE" AT STOP LOCATIONS. THE SET OF CRITERIA IS DESCRIBED AS CASE IIIB IN THE AASHTO PUBLICATION "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 1994"

REVISIONS	No. 2	BY		DATE
	No. 1	BY BK	ADDED NOTE	DATE AUG / 99

GRAPHICS FILE: debd4222.mgn

Appendix F – Sites 5S and 5V: Fish Habitat Assessment Summary

SUMMIT
ENVIRONMENTAL CONSULTANTS INC.
A Member of the Associated Engineering Group of Companies

REPORT

Sylvan Lake Steering Committee

Kasota Bay Fish Habitat Assessment
And Bathymetric Evaluation

August 2015

CANADA'S BEST MANAGED COMPANIES
Platinum member

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1 Background

1.1 PROJECT OBJECTIVES AND OVERVIEW

The existing boat launch facilities at Sylvan Lake, Alberta are frequently at capacity (or exceed capacity) due to the level of recreational use of the lake. Users who are unable to access existing boat launch facilities due to capacity issues are using unofficial launch sites at various locations, resulting in environmental impacts. Recognizing these issues, the Sylvan Lake Steering Committee retained Associated Engineering (AE), Summit Environmental Consultants Inc. (Summit), and EIDOS Consultants Inc. (EIDOS) to complete a lake access and recreation study and assess locations for potential additional boat launch facilities. Summit, the environmental division of AE, identified and evaluated the environmental constraints for developing a new boat launch and day use area at various areas in the lake.

In a 2014 study, Summit completed a background literature and database review to identify the environmental constraints, legislation, requirements, potential invasive species, and potential impacts of developing additional boat launch infrastructure at Sylvan Lake. Associated Engineering and EIDOS completed multiple components including traffic studies, boat launch design, emergency access and egress, and day use infrastructure. The project team also completed a detailed assessment of the Half Moon Bay site located along the southern shore of Sylvan Lake intersecting with Range Road 21; however, a boat launch was determined to be unfeasible at this site (Associated Engineering et al. 2015). The Sylvan Lake Steering Committee then requested that Sites 5S and 5V in Kasota Bay be evaluated. Site 5S is located along the northern shoreline of Kasota Bay in NE-12-039-02-W5M, and Site 5V is located along the southern shoreline of Kasota Bay in NE-01-039-02-W5M (Figure 1-1).

The Kasota Bay desktop level assessment (Appendix A) provides an overview of several Sylvan Lake studies and the findings of provincial fish and wildlife databases. The desktop assessment identifies the environmental constraints related to each boat launch and day use area. The resulting literature and environmental constraints review is found in the June 2015 Sylvan Lake Access Strategy and Action Plan (Associated Engineering et al. 2015). The Kasota Bay desktop level assessment (Appendix A) determined that the environmental constraints associated with the development of a boat launch in Sylvan Lake include:

- critical aquatic (along the shores of Sylvan Lake, AEP considered emergent vegetation, which is in decline due to rising water levels, as critical habitat [J. Reilly, personal communication, 2015]) and terrestrial habitat;
- emergent vegetation protected through a number of protective notations (PNTs) held by Alberta Environment and Parks (AEP); and
- shallow lake bathymetry unable to meet engineering requirements without impacting the environment.

Accordingly, a fish habitat assessment (FHA) was completed at and surrounding Sites 5S and 5V in Sylvan Lake in July 2015. The purpose of the FHA was to assess the available fish habitat, assess potential habitat usage in the lake along the shoreline of Kasota Bay, and locate areas which met the boat launch depth

requirement of 1.2 m specified by the American Society of Civil Engineers (1994). This report contains the results and conclusions of the FHA and bathymetry evaluation conducted at Sites 5S and 5V, and makes recommendations for potential boat launch development in Kasota Bay which meets the engineering requirements and avoid the environmental constraints associated with Sylvan Lake.

1.2 STUDY AREA LOCATION

Sylvan Lake is approximately 30 km west of Red Deer, Alberta. The south, west, and north shores of Kasota Bay where assessed from a point approximately 400 m west of the northern terminus of Range Road 20 with Sylvan Lake, to the northern most tip of Kasota Point in SE-13-039-02-W5M. Approximately 2.8 km of shoreline was assessed and the area assessed extended 100-200 m into the lake from the shore. Sites 5S and 5V are located in the study area.

1.3 BIOPHYSICAL CHARACTERISTICS OF THE STUDY AREA

Sylvan Lake is located in the Low Boreal Mixedwood ecoregion at the southernmost extent of the boreal forest. This ecoregion is characterized by aspen communities in succession to white spruce forest with soils comprised of gray luvisols (GOA 1992). A search of the Alberta Conservation Information Management System (ACIMS) database for rare or endangered plant species in or near Kasota Bay did not reveal that any candidate plants have been documented in the study area (GOA 2015; Appendix B).

1.4 FISH AND FISH HABITAT

The Sylvan Lake Management Plan: 2000 Update identified areas of key fisheries, ungulate, and waterfowl habitat in and around Sylvan Lake (Appendix B). Kasota Bay contains key fisheries habitat throughout the bay, and the bay is adjacent to key ungulate habitat in certain areas (IBI Group 2000).

Sylvan Lake provides habitat for a number of native fish species . A search of the Fish and Wildlife Information Management System (FWMIS) database revealed that the following native fish species have been documented in and near Kasota Bay(GOA 2014b):

- burbot (*Lota lota*);
- emerald shiner (*Notropis atherinoides*);
- northern pike (*Esox lucius*);
- walleye (*Stizostedion vitreum*);
- white sucker (*Catostomus commersoni*);

All 5 native species are listed as “secure” by AEP in the General Status of Alberta Wild Species 2010 (Government of Alberta [GOA] 2014a).

In addition to these native species, there has been a history of fish stocking in Sylvan Lake. The following 6 species were stocked in the 1940s and 1950s; however, not all were able to establish a sustained population in the lake. (GOA 2014b):

- brown trout; (*Salmo trutta*)
- lake trout;(*Salvelinus namaycush*)

- lake whitefish (*Coregonus clupeaformis*);
- rainbow trout; (*Oncorhynchus mykiss*)
- spottail shiner (*Notropis hudsonius*); and
- yellow perch (*Perca flavescens*).

Figure 1-1. Kasota Bay in Sylvan Lake

2 Study Methods

2.1 HABITAT INVESTIGATION

Habitat mapping was conducted by Joël Gervais (Qualified Aquatic Environmental Specialist [QAES]) of Summit on July 17, 2015 and took place with consideration of specific life-stage habitat needs of the fish species documented in and near Kasota Bay. The study area consisted of a shoreline distance approximately 2.8 km long, extended 100 – 200 m into the lake, and was assessed via kayak. Habitat features were recorded using a handheld GPS. The following habitat structures were noted and examined:

- emergent vegetation;
- submerged vegetation;
- substrates type;
- features providing cover (such as woody debris, boulders and fractured bedrock); and
- streams and ephemeral drainages.

Three additional "alternate" locations for a potential boat launch within Kasota Bay were also included in the assessment (Figure 1-1). These locations were selected in the field as they had minimal macrophytic vegetation and no emergent vegetation. Before further investigating an "alternate" location, a preliminary in-field assessment was completed to ensure that the fish habitat present was not critical habitat to the species or life stages present in the area. The following "alternate" sites, presented in Figure 1-1, include:

- **3C / Alternate RR20**, located at 11U 694485 5801858 (northern point of Range Road 20 with south shore of Sylvan Lake);
- **5R / Alternate Pt140**, located at 11U 693612 5803872 (northern most tip on Kasota Point); and
- **5R / Alternate Pt137**, located at 11U 693910 5803663 (north of Site 5S and around the point).

2.2 BATHYMETRIC EVALUATION

Water depth was measured along transects extending perpendicular from shore at Sites 5S and 5V, and at the 3 "alternate" locations where a boat launch could be constructed. Because a water depth of 1.2 m is required to meet the engineering requirements for a boat launch, the distance from shore where the depth was 0.5 m, 1.0 m, and 1.2 m was recorded. Depth was measured using a paddle (with 0.1 m increments marked along the paddle's blade and shaft) from the kayak. The minimum and maximum depth where emergent vegetation was present was also recorded in order to use its presence as a proxy for depth in areas between transects. The November 2014 Half Moon Bay Fish Habitat Assessment contains a review of historical lake water levels and may be used to compare present water levels (Summit 2014).

3 Results

3.1 GENERAL OBSERVATIONS

See Appendix C for photographs. Several general observations were made regarding the entire Kasota Bay area:

1. Much of the shoreline of Kasota Bay (excluding shoreline containing residential development) contains emergent vegetation. Emergent vegetation is comprised entirely of bulrush (*Scirpus spp.*) which was growing in water of 0.3 m to 1.4 m deep, found in substrates dominated by fines with some gravels and cobbles present.
2. Areas along the shoreline without emergent vegetation were generally shallower than 0.3 m, and contained a variety of submerged macrophytes. These macrophytes were present in patches evenly distributed (e.g.: 10-15 patches per 100 m of shoreline). Each patch of macrophytes contained a variety of species dominated by:
    - Canada waterweed (*Elodea canadensis*);
    - northern water-milfoil (*Myriophyllum sibiricum*);
    - Richardson's pondweed (*Potamogeton richardsonii*); and
    - slender pondweed (*Potamogeton pusillus*).
3. Areas containing emergent vegetation were noted to provide excellent rearing habitat for yellow perch, which were observed using these areas. The shoreline of Kasota Bay also provides excellent rearing, and moderate value spawning habitat for northern pike.
4. Kasota Bay is sheltered from the prevailing northwesterly winds and storms; however, Kasota Point is not sheltered from the prevailing winds.
5. Generally, Kasota Bay has a gentle gradient (Figure 3-1) from the shoreline and some of the bay does not reach 1.2 m of depth (engineering requirement for a boat launch) until a distance 100 m (or more) from the shore. There are exceptions to this observation such as Alternates 3C / RR20 and 5R / Pt140 where suitable boat launch depth is present 25 m or less from the shoreline.
6. Terrestrial vegetation at all sites includes a forest floor community of grasses and forbs with minimal shrubs and a dense canopy cover of trees. The following species were present at all sites:

Shrubs

- snowberry
- raspberry
- Saskatoon
- alder
- prickly rose
- red-osier dogwood

Grasses

- Kentucky bluegrass
- reed canary grass

Forbs / Ferns

- wild sarsaparilla
- dew berry
- common horsetail
- northern bedstraw
- golden rod

Trees

- aspen poplar
- black poplar
- white spruce
- paper birch

7. The Sylvan Lake Management Plan 2000 Update identified several areas in and around the lake with key fisheries, ungulate, and waterfowl habitat (IBI Group 2000). All sites assessed in Kasota Bay are located in key habitats except 3C / Alternate RR20.
8. Lands around Site 5S, 5R / Alternate Pt137, and 5R / Alternate Pt140 are heavily vegetated with aspen parkland forests.

Five characteristics were assessed at each potential boat launch location. Lake depth and gradient are key when considering boat launch locations from a structural perspective, while emergent vegetation and the quality / status of fish habitat are key when considering the environmental impacts. Provincially protected areas in the form of PNTs are important to consider in order to avoid areas where development may be restricted by AEP. Table 3-1 contains a summary of the data collected and fish habitat / vegetation observations made at the 5 sites in Kasota Bay, as well as any PNTs each site may be near to.

Table 3-1. Site assessment characteristics at 5 locations in Kasota Bay

Location	Distance to 1.2m depth	Upland rise and gradient	Presence of emergent vegetation	Quality / status of fish habitat	Provincial protection (PNT)
3C / Alternate RR20	25 m	~2.0 m above lake level @ 10% grade	No	Low / common	None
5R / Alternate Pt140	15 m	~3.0 m above lake level at 15% grade	No	Moderate / common	None
5R / Alternate Pt137	60 m	~3.0 m above lake level at 15% grade	Minimal	Moderate / common	None
Site 5V	45 m	~4.0 m above lake level @ 20% grade	Yes	High / unique	PNT020153
Site 5S	120 m	~1.5 m above lake level @ 10% grade	Yes	Moderate / unique	PNT020140

Because adequate depth is key in the design of a boat launch, a potential site has to have depths greater than 1.2 m, in close proximity to the shoreline. The Water Survey of Canada reported lake's water elevation ranged from 936.76 m, to 936.84 m above sea level on July 17, 2015 (Government of Canada 2015). While options such as dredging are available for achieving the required depth, these high impact / high maintenance options will require more involved habitat compensation plans and negotiations with the approving agencies. Therefore, identifying a suitable boat launch location that already meets the water depth requirement is an important component of the Kasota Bay site assessments. The distance from shore where 1.2 m of depth was found is presented in Table 3-1, and shown in Figure 3-1.

3.2 SITE SPECIFIC OBSERVATIONS

3.2.1 Site 5S

There is a gentle gradient at Site 5S. At this location, the 1.2 m depth is not achieved until 120 m from shore (Figure 3-1, Figure 3-2). The shoreline has a 10% grade to the uplands about 1.5 m higher in elevation. Belterra Land Company is the landowner.

Fish habitat at Site 5S is of moderate quality and unique in Sylvan Lake due to the presence of dense beds of emergent vegetation which flank either side of the site (Figure 3-2). Substrates are composed entirely of fines. Cover for fish is provided along the shoreline by large woody debris. Waters at and surrounding Site 5S are provincially protected by PNT020140.

3.2.2 Site 5V

There is a gentle gradient at Site 5V, though the gradient is steeper at this site than at 5S. At Site 5V, the 1.2 m depth is not achieved until 45 m from the shore (Figure 3-1, Figure 3-3). The shoreline has a steep 20% grade to the uplands about 4 m higher in elevation.

Fish habitat at Site 5V is of high quality and unique in Sylvan Lake due to the presence of dense beds of emergent vegetation (Figure 3-3). Substrates are composed entirely of fines. Cover for fish is provided along the shoreline by large woody debris. Waters at and surrounding Site 5V are provincially protected by PNT020153.

3.2.3 3C / Alternate RR20

There is a moderately steep gradient at 3C / Alternate RR20, and the 1.2 m depth is achieved 25 m from the shore. At this location, the gradient initially drops steeply, and 1.0 m of depth is achieved only 7 m from the shore (Figure 3-1, Figure 3-3). The uplands rise from the shore about 2 m at a grade of about 10%. This location is presently used as an unimproved boat launch for smaller watercraft.

The site contains no aquatic vegetation and is not in close proximity to emergent vegetation (Figure 3-3). Fish habitat at this site is not critical for any Sylvan Lake species and is common throughout the lake. Substrates are dominated by fines and small gravels. Because this area is actively used as an unimproved boat launch, minimal cover for fish is present near the shoreline. Deep waters and nearby docks likely provide cover for fish. 3C / Alternate RR20 is not provincially protected by a PNT; however, waters to the west are protected by PNT020153.

3.2.4 5R / Alternate Pt140

The steepest gradient observed is at 5R / Alternate Pt140. At this location, the 1.2 m depth was achieved only 15 m from the shore (Figure 3-1, Figure 3-4). The shoreline has a 15% grade to the uplands about 3 m higher in elevation. Belterra Land Company is the landowner.

The site contains minimal aquatic vegetation, and is not in close proximity to emergent vegetation (Figure 3-4). Large boulders at this site may provide refuge features for fish near the shore; Cover for fish is provided along the shoreline by large woody debris, as do deeper waters nearby. 5R / Alternate Pt140 is not provincially protected by a PNT.

3.2.5 5R / Alternate Pt137

There is a gentle gradient at 5R / Alternate Pt137. At this location, the 1.2 m depth is not achieved until 60 m from shore (Figure 3-1, Figure 3-4). The shoreline has a 15% grade to the uplands about 3 m higher in elevation. Belterra Land Company is the landowner.

The site contains minimal aquatic vegetation and no emergent vegetation. Despite this lack of emergent vegetation, fish may still use the area as a corridor between patches of emergent vegetation which are located north and south of the site (Figure 3-4). Cover for fish is provided along the shoreline by large woody debris. Although 5R / Alternate Pt137 is not provincially protected, waters to its south are protected by PNT020140.

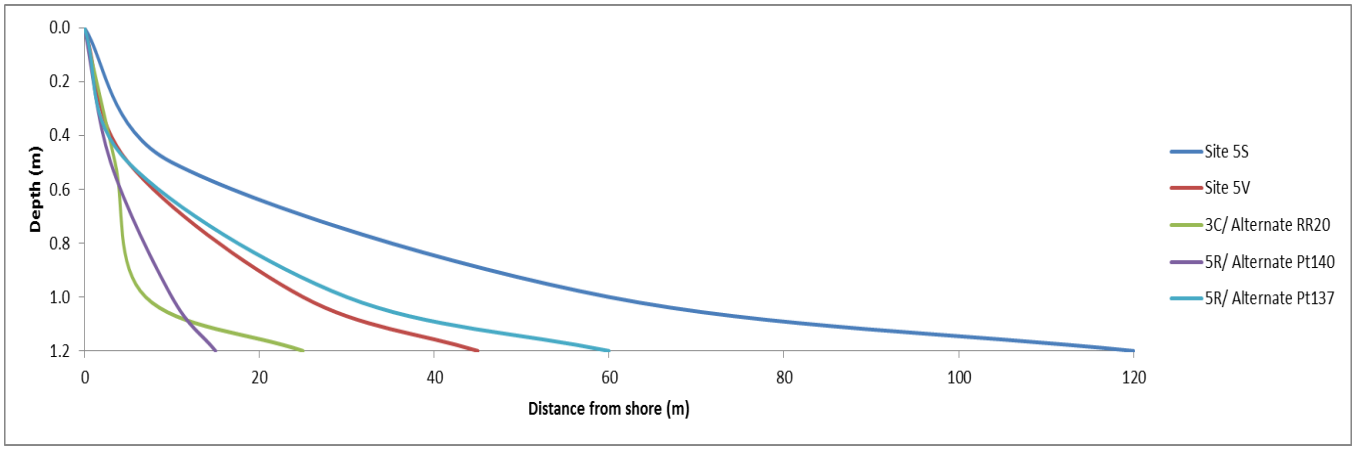

Figure 3-1. Bathometry information at each potential boat launch site

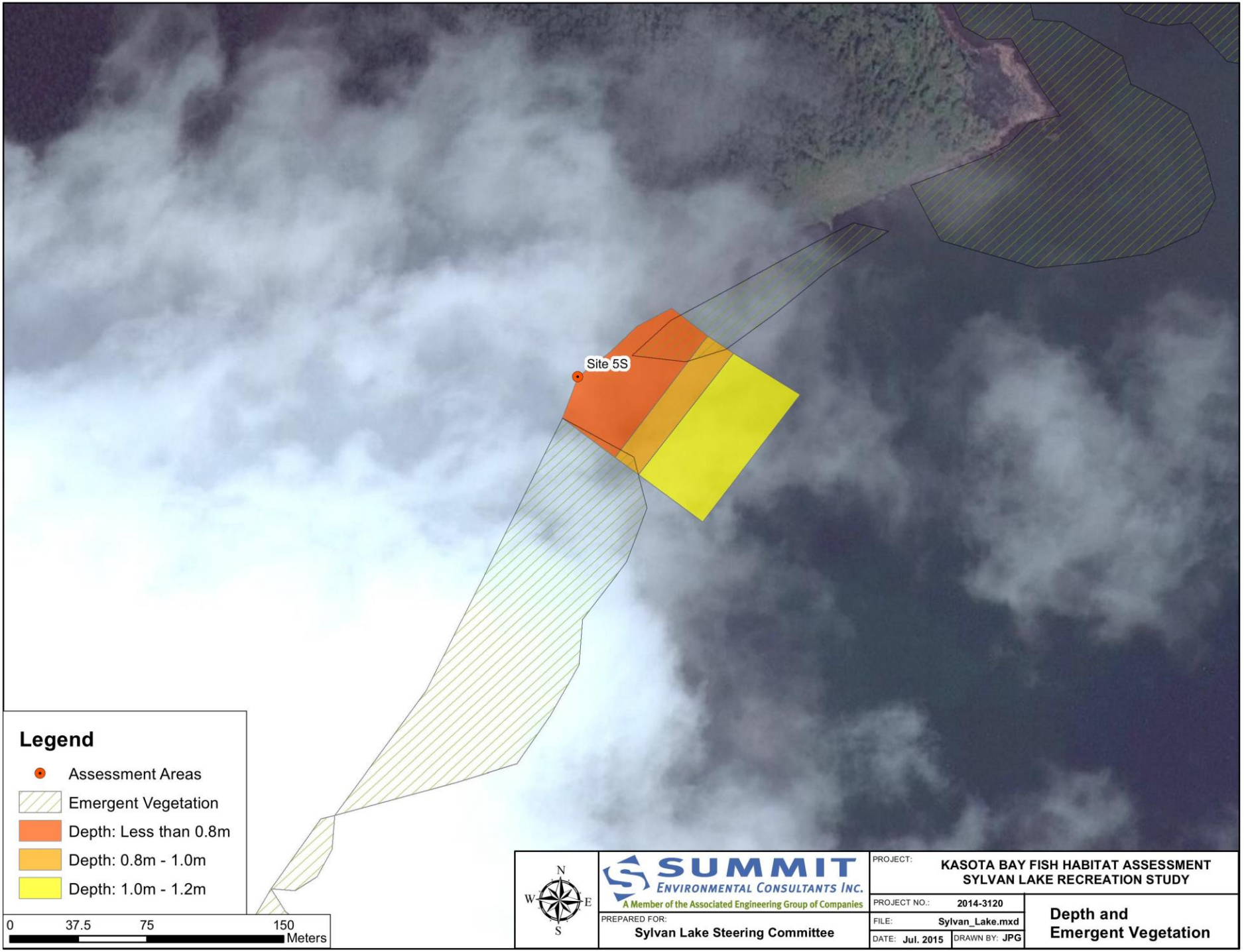

Figure 3-2. Depth and emergent vegetation at Site 5S

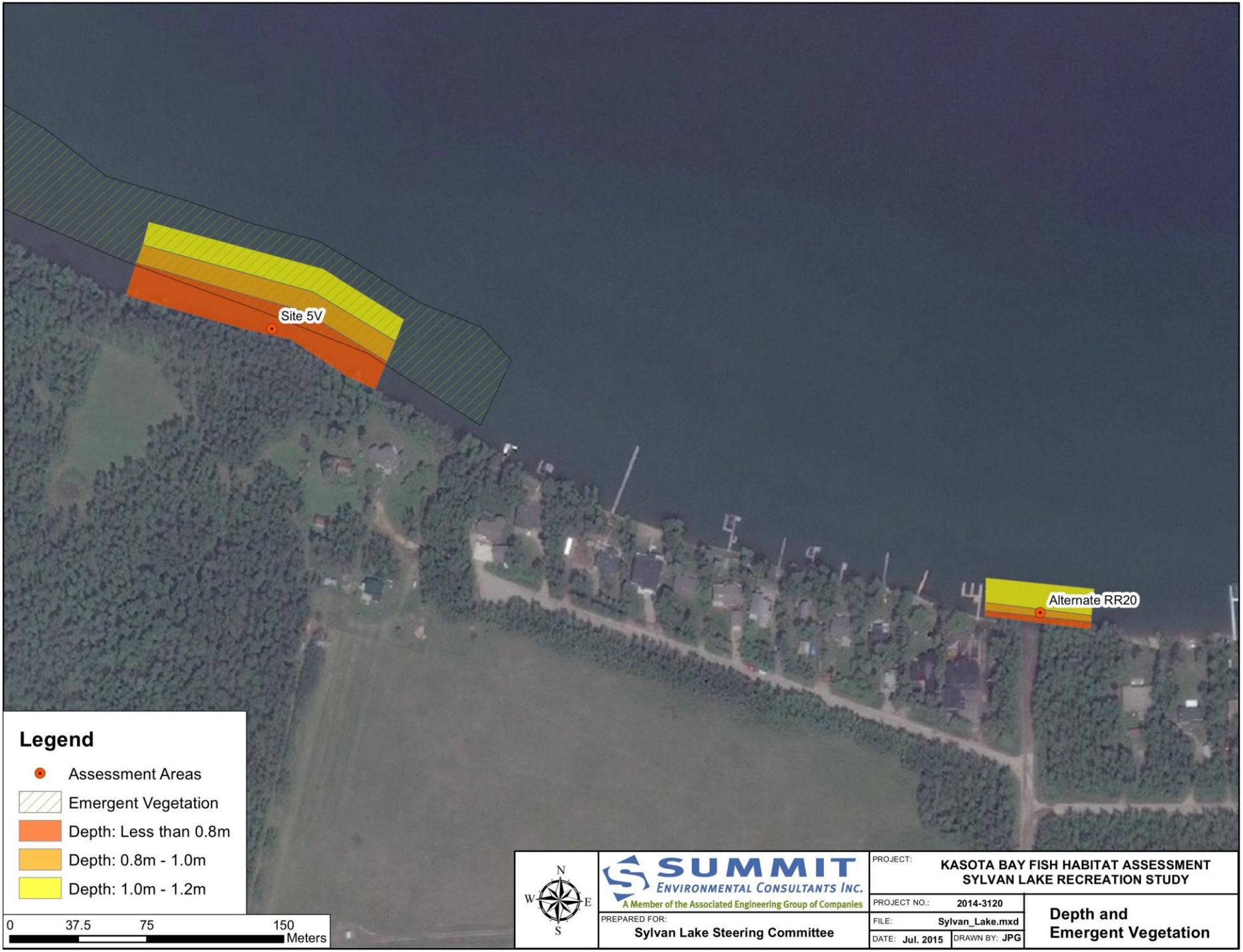

Figure 3-3. Depth and emergent vegetation at Site 5V and 3C / Alternate RR20

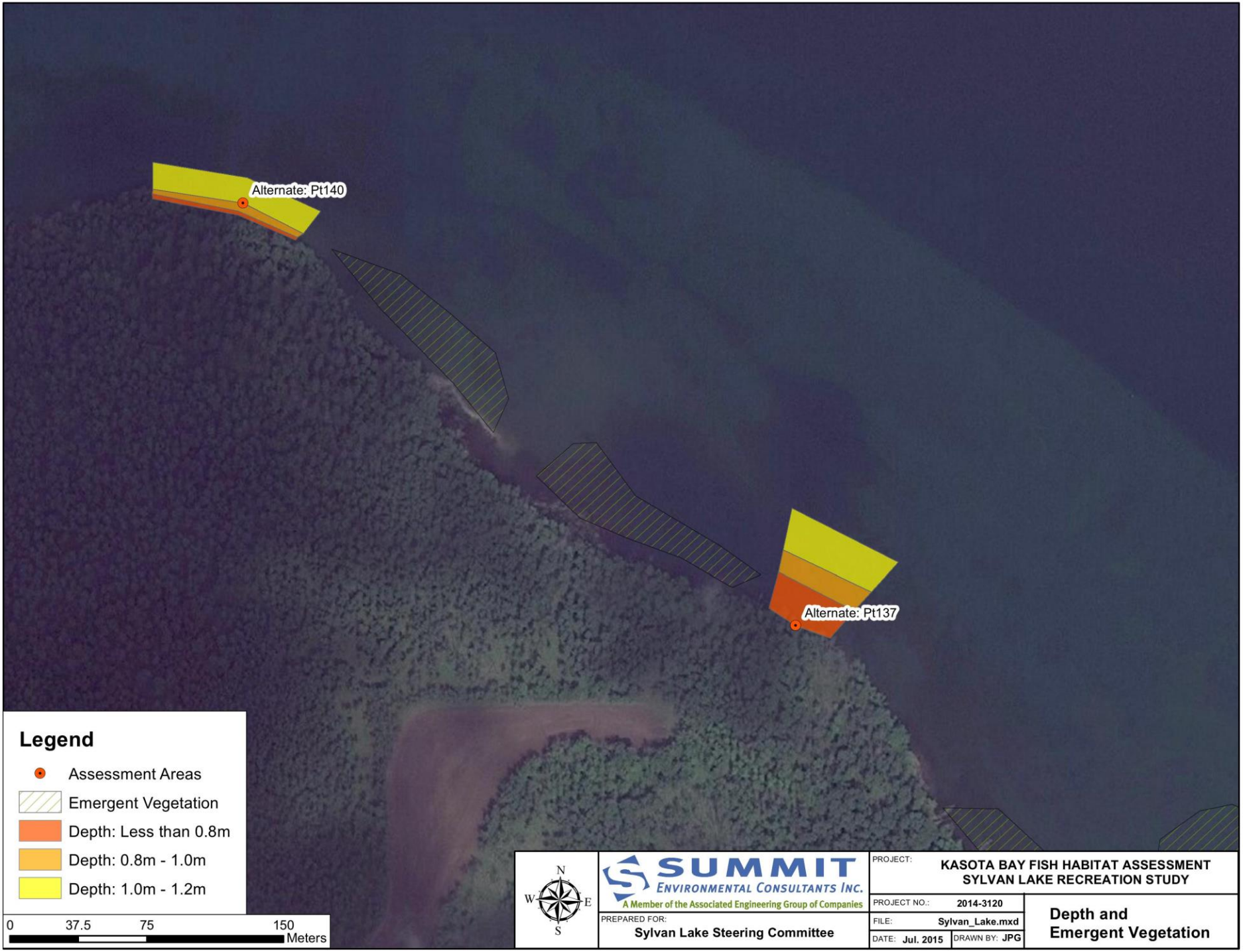

Figure 3-4. Depth and emergent vegetation at 5R / Alternate Pt140 and 5R / Alternate Pt137

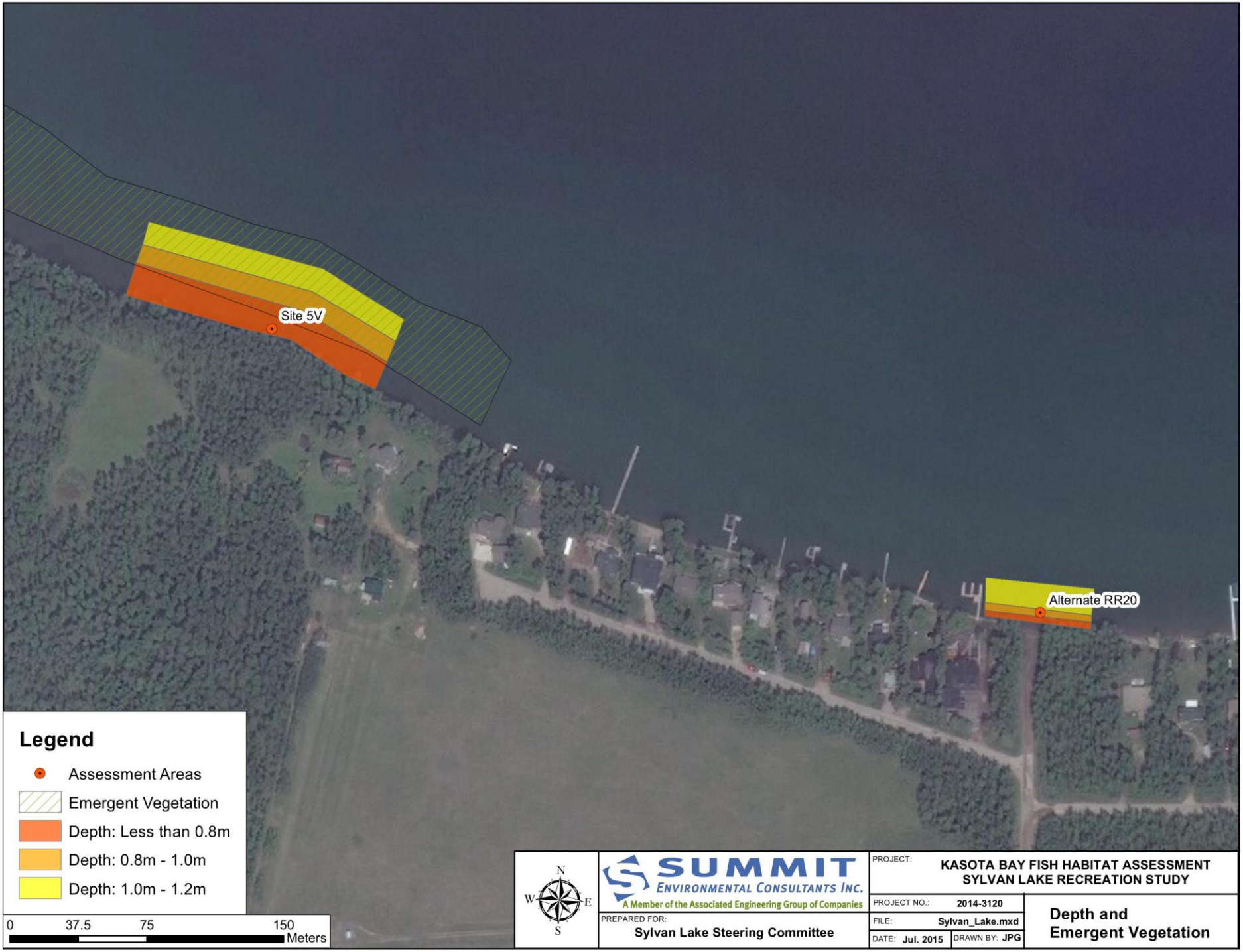

Figure 3-5. Depth and emergent vegetation at Site 5V and 3C / Alternate RR20

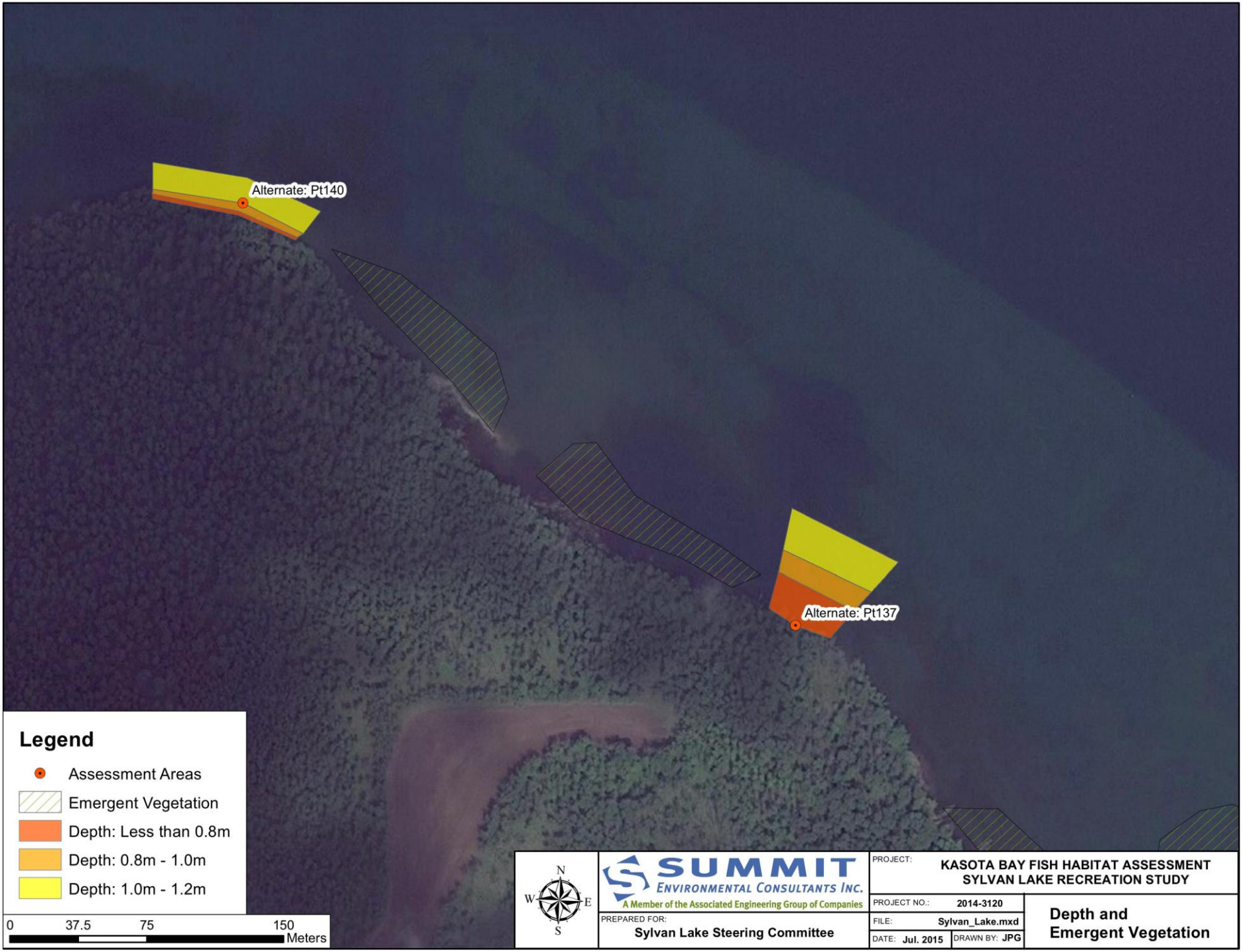

Figure 3-6. Depth and emergent vegetation at 5R / Alternate Pt140 and 5R / Alternate Pt137

4 Conclusions and Recommendations

This fish habitat assessment and bathymetric evaluation was completed within Sylvan Lake's Kasota Bay and assessed five locations: Sites 5S, 5V, 5R / Alternate Pt140, 5R / Alternate Pt137, and 3C Alternate RR20. Conclusions of the work are as follows:

1. At Sites 5S, 5V and 5R / Alternate Pt137 boat launch development should be limited for the following reasons:
    - all 3 sites would require significant in water work, such as dredging, to meet the recommended water depth requirements;
    - significant quantities of emergent vegetation are present at Site 5V, and although reduced in abundance, emergent vegetation is also present to both sides of Site 5S; and
    - yellow perch were observed schooling in large numbers in beds of emergent vegetation, and the areas were noted to provide excellent spawning and rearing opportunities for several fish species.

2. 5R / Alternate Pt140 is a suitable location for a boat launch for the following reasons:
    - It provides the necessary 1.2 m of depth for a boat launch at a distance 15 m from the shore;
    - a boat launch at this location would require little disturbance of the lake's substrate.

    However, large boulders in the area do present dangers to boating and these would need to be flagged, removed, or otherwise accommodated. Second, because the area is surrounded by forest with no indication of historical vegetation removal, access to the boat launch would require the removal of natural vegetation in an area identified as key ungulate habitat. A private unimproved road (servicing local oil and gas infrastructure) exists along the forest edge and could be improved to accommodate access to the site should this area be selected. It should also be noted that 5R / Alternate Pt140 is not sheltered from the prevailing winds which may cause difficulties in launch and retrieval of watercraft during inclement weather.

3. 3C / Alternate RR20 should be considered for a boat launch location for the following reasons:
    - although the necessary 1.2 m depth does not exist nearer than 25 m from the shoreline, the area is presently used as an unimproved boat launch;
    - 3C / Alternate RR20 does not contain unique or high quality fish habitat;
    - access to the site is provided by Range Road 20; and
    - there is minimal forest in the immediate area which would require clearing to provide parking and day use facilities.

    Currently this site is identified within the Summer Village of Norglenwold, Municipal Development Plan as a non-motorized boat launch location.

Should the location not be selected as a boat launch for motorized watercraft, improvements to the existing launch area could be completed. Such improvements could include hardening of the approach and ramp to reduce lake bed scour and erosion, and improve the ditches along Range Road 20 to reduce erosion.

Closure

This fish habitat assessment and bathymetric evaluation was completed within Sylvan Lake's Kasota Bay at Sites 5S and 5V. Additional locations were assessed throughout the bay and selected due to their absence of emergent vegetation, lower importance of habitat for fish, and deep water near shore.

This report was prepared for the Sylvan Lake Steering Committee to present the results of a fish habitat and bathymetric assessment completed in Kasota Bay at Sylvan Lake. The purpose of the report is to supplement other information that pertains to the selection of a potential boat launch location.

The services provided by Summit Environmental Consultants Inc. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

We trust that this report is what you require at this time, please contact the undersigned with any comments or questions.

Summit Environmental Consultants Inc.

Reviewed by:

Joël Gervais, B.Sc.
Qualified Aquatic Environmental Specialist,
Environmental Scientist

Dave Hayward, R.P.Bio., CPESC
Senior Fisheries Biologist

References

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Summit Environmental Consultants Inc. 2015. Desktop Review of Sites 5S and 5V. Prepared for Associated Engineering, and the Sylvan Lake Steering Committee.

Appendix A – Desktop Review of Sites 5S and 5V (Preliminary Environmental Constraints)

SUMMIT ENVIRONMENTAL CONSULTANTS INC.
A Member of the Associated Engineering Group of Companies

Date:	June 15, 2015	**File:**	2014-3120
To:	Sean Nicoll		
From:	Joël Gervais, B.Sc.		
Project:	Sylvan Lake Access Study		
Subject:	Sylvan Lake Access StudyItem 1A: Additional Study At Private Parcels 5S and 5V (Preliminary Environmental Constraints)		

MEMO

Item 1A – Desktop Review of Sites 5S and 5V (Preliminary Environmental Constraints)

1 INTRODUCTION

In response to a scope change (dated May 15, 2015) for the investigation of alternate lake access sites at Sylvan Lake in central Alberta, Associated Engineering Alberta Ltd. (AE), Summit Environmental Consultants Inc. (Summit), and EIDOS Consultants Inc. (EIDOS) further investigated the potential of two locations (5S and 5V) to provide public lake access and day-use facilities.

Both sites were included in an earlier (2014) study of 42 potential access sites where each was analyzed relative to all other sites using a matrix method for determining relative environmental impact. Sites were analyzed independently using the same above mentioned parameters and compared to each other. Relative environmental impact was ranked into four categories (low, medium, high, and very high) using the 25th, 50th, and 75th percentiles to delineate between each impact category. Using the assessment matrix, sites 5S and 5V were determined to have very high and high relative environmental impacts when compared to all the sites at Sylvan Lake (AE et al. 2015).

The following known environmental constraints were considered in more detail for each site pertaining to lake access:

- bathymetry based on the Atlas of Alberta Lakes (University of Alberta 2005),
- mapped known rare plants and animals (Government of Alberta [GoA] 2014a),
- mapped known fish and wildlife habitat (IBI Group 2000, GoA 2014b),
- presence of riparian and upland vegetation (GoA 2014b), and
- proximity to an exposed fractured sandstone formation known to interface with the local groundwater aquifer (Baker 2009).

2 ASSESSMENT RESULTS

2.1 Bathymetry

Bathymetry was assessed at a desktop level using low-resolution bathymetry maps available from the Atlas of Alberta Lakes (University of Alberta 2005). Extrapolating from the contour intervals available in the Atlas of Alberta Lakes, lake gradient appears to be steeper at Site 5V, indicating that disturbance of the lake substrate at Site 5V would be less to achieve sufficient depths for a boat launch compared to Site 5S (University of Alberta 2005). Despite the steeper gradient of Site 5V compared to Site 5S, *neither site appears to meet the design criteria for a boat launch*; as such, disruption of the lake substrate may be required to construct either boat launch. Field measurements are required to determine the exact bathymetric profile of each site.

2.2 Rare Plants and Animals

A search of the Alberta Conservation Information Management System (ACIMS) database revealed no rare plants or animals within either the 5S or 5V parcels (GoA 2014). One non-sensitive species was documented in both areas; the variegated meadowhawk (*Sympetrum corruptum*) is listed as "Secure" in the General Status of Alberta Wild Species 2010 and the site areas likely contain suitable habitat to maintain populations of this species (GoA 2014a).

A search of the Fish and Wildlife Management Information System (FWMIS) database showed that no fish inventories had been conducted within the immediate areas of sites 5V or 5S. Fish inventories nearby at the east land-point in NE-12-39-2-W5M documented six fish species; these species are included in the following list and all are considered "Secure" in the General Status of Alberta Wild Species 2010:

- burbot (*Lota lota*),
- emerald shiner (*Notropis atherinoides*),
- lake whitefish (*Coregonus clupeaformis*),
- northern pike (*Esox lucius*),
- walleye (*Stizostedion vitreum*),
- white sucker (*Catostomus commersoni*), and
- yellow perch (*Perca flavescens*, GoA 2014b).

Preliminary investigation suggests that the shoreline of either site may contain habitat for all above-mentioned species, at various times during the year. The shallow gradient of the lake, sand/gravel/cobble substrate complexes, and emergent vegetation present at Sites 5S and 5V and the areas surrounding these sites may provide prove suitable for various life cycle phases including spawning, rearing, and foraging.

2.3 Fish and Wildlife Habitat

In the Sylvan Lake Management Plan 2000 update, IBI Group (2000) identified key fisheries habitat in several areas that were sheltered from strong currents, shallow enough to support significant emergent vegetation, and provide suitable foraging and rearing habitat for fish. IBI Group also identified key ungulate and waterfowl habitat in their report. Both parcels 5S and 5V are adjacent to key fisheries habitat identified by IBI Group. Key ungulate habitat was also identified where Site 5S is located; site 5V is not located in key ungulate habitat. Neither site is located near to key waterfowl habitat (IBI Group 2000).

A search of FWMIS database identified protective notations (PNTs) along the shore at both Site 5V and 5S. Specifically, PNT020153 occupies the shoreline at Site 5V, and PNT020140 occupies the shoreline at Site 5S (GoA 2014). Both PNTs are held by Alberta Environment and Parks (formerly Environment and Sustainable Resource Development) and protect emergent vegetation which is in decline due to rising water levels and important for foraging and rearing fish (J. Reilly, personal communication, 2014). The operation of motorized watercraft in or near to areas of emergent vegetation may cause the loss or reduction of that vegetation. Alberta Environment and Parks may provide input and place restrictions on the type of development proposed within these areas where PNTs exist.

2.4 Proximity to Groundwater Aquifer

An exposed fractured sandstone formation known to interface with the local groundwater aquifer has been mapped along the north-east shore of Sylvan Lake (Baker 2009). Baker (2009) recommends limiting development in close proximity to the exposed fractured sandstone formation to prevent impacts to, and contamination of the local groundwater aquifer. Both sites 5V and 5S are located along the south-western shores of the lake and are therefore not in proximity of the fractured sandstone formation. *No impacts to the groundwater aquifer are expected to occur at the sites 5V and 5S based on known information.*

3 CONCLUSION

In summary, after conducting this comparison of the known environmental constraints of Sites 5V and 5S, neither site appears to be suitable for a boat launch development, primarily due to the shallow gradient of the lake in these locations and presence of key fisheries habitat. In addition, Site 5S is also within key ungulate habitat (IBI Group 2000, GoA 2014a, GoA 2014b). The shorelines at each site are protected by two PNTs which protect emergent vegetation and Alberta Environment and Parks may place restrictions on development in these areas (GoA 2014b).

The 2014 assessment determined that the level of environmental impact of developing either site will be high for Site 5V and very high for Site 5S (AE et al. 2015). The AE et al. (2015) assessment encompassed sites throughout the lake and provided a list of 13 sites where development is expected to be of least impact. Detailed field assessment of site 5S, 5V, or another site may determine that a site may be able to meet design requirements for a boat launch without generating adverse environmental impacts

We recommend the following options:

1. Complete detailed field investigations to verify the environmental constraints above; or
2. Complete a desktop review of the 13 sites with least environmental impact identified by AE et al. (2015) to determine each site's suitability for development;
    - Based on the AE et al. (2015) assessment, the 13 sites which were ranked with the least environmental impact were:
    - 5O, 5Q, 2A, 2D, 2H, 2G, 4A, 4B, 4C, 4D, 4E-3L (assessed as one site), 5C, and 5D.

Should a detailed field assessment of Sites 5S and 5V determine that environmental constraints may not be a critical issue to development of these sites, development should proceed with mitigation strategies which can be determined by assessing the sites. If detailed field assessment determines that significant environmental constraints are present throughout the area surrounding both sites, Summit would not recommend developing at either site.

Sources:

Associated Engineering Alberta Ltd., EIDOS Consultants Inc., and Summit Environmental Consultants Inc. 2015. Sylvan Lake Boat Launch Access Strategy and Action Plan for Recreational Lake Access Draft Report. Prepared for Lacombe County, Red Deer County, Town of Sylvan Lake, and Summer Villages of Sylvan Lake.

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Appendix B – Supplementary Information

Alberta Environment and Sustainable Resource Development

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 14-Jul-2015 11:13

Species present within the current extent :

Fish Inventory	Wildlife Inventory	Stocked Inventory
BROWN TROUT	WANDERING SHREW	No Species Found in Search Extent
BURBOT		
EMERALD SHINER		
LAKE TROUT		
LAKE WHITEFISH		
NORTHERN PIKE		
RAINBOW TROUT		
SPOTTAIL SHINER		
WALLEYE		
WHITE SUCKER		
YELLOW PERCH		

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Buffer Radius:
558564, 5797116	10-TM AEP Forest	NW 7 39 1 5	-

Wildlife Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Scott Stevens	403-755-1400	Reg.Russell@gov.ab.ca	

Alternative

Name:	Phone:	Email:	Town:

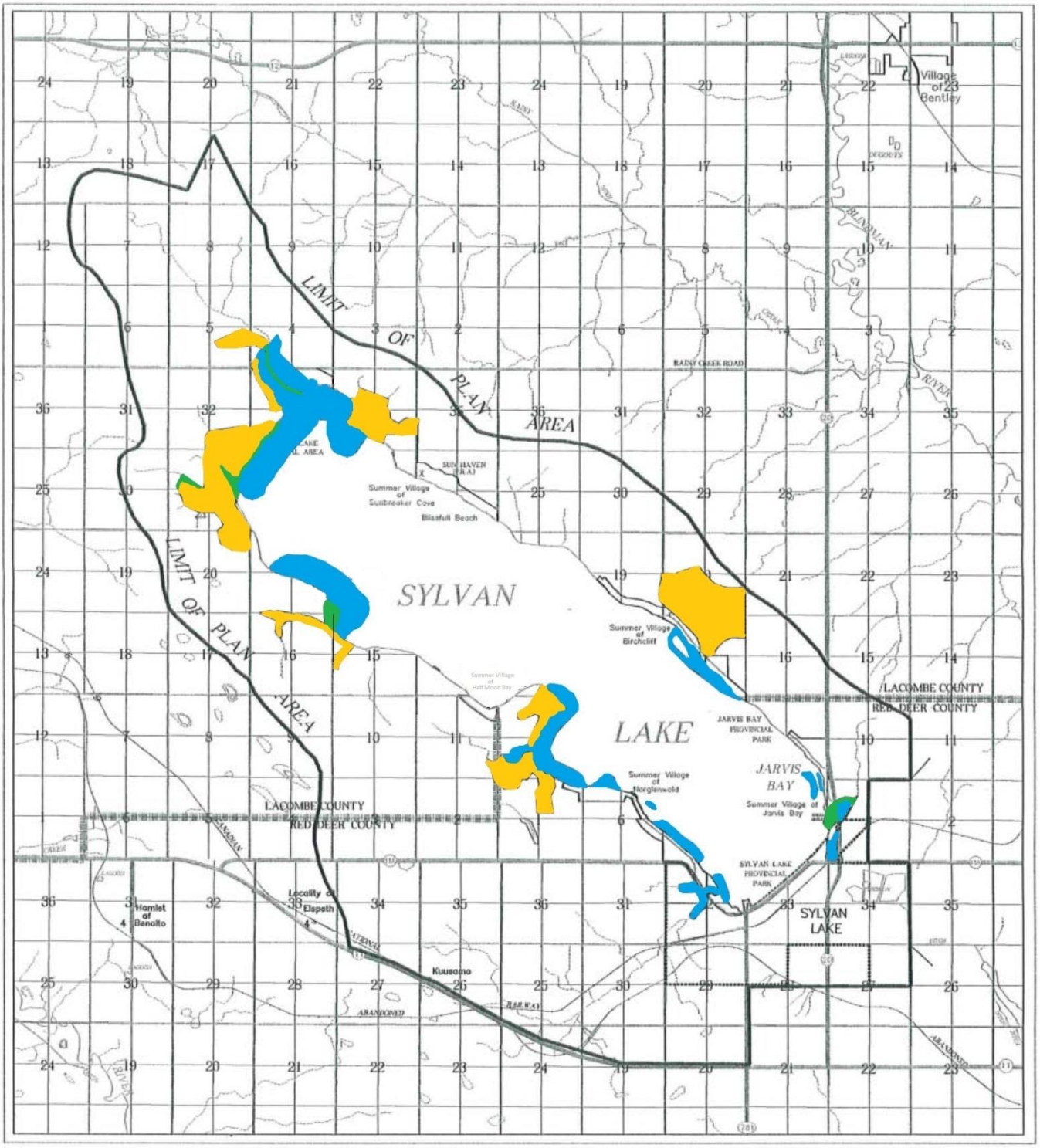
Fisheries Contact Information

Primary Contact

Name:	Phone:	Email:	Town:
Jason Cooper	403-340-7685	Jason.Cooper@gov.ab.ca	Red Deer

Alternative

Name:	Phone:	Email:	Town:
			Red Deer



DRAFT

Note:
The purpose of this map is to illustrate environmentally sensitive areas identified in the Sylvan Lake Management Plan: 2000 Update. The base used for this map is contained within the Sylvan Lake Management Plan: 2000 Update.

SYLVAN LAKE MANAGEMENT PLAN
2000 Update

LEGEND:
- Key Fisheries Habitat
- Key Ungulate Habitat
- Key Waterfowl Habitat

SOURCE: SHORELINE HABITAT ASSESSMENT OF SYLVAN LAKE (EMA, 1990)

ENVIRONMENTALLY SENSITIVE AREAS

Map 4

400m 0 800m 1600m

Appendix C – Photographs

Photograph 1. Bulrush emergent vegetation

Photograph 2. aquatic vegetation shown, bulrush emergent vegetation in background

Photograph 3. Shoreline near 5R / Alternate Pt137

Photograph 4. Large woody debris over/in water along much of natural shoreline

Photograph 5. Juvenile yellow perch (circled) present throughout emergent vegetation

Photograph 6. Shoreline near 5R / Alternate Pt140

Photograph 7. Shoreline at Site 5V

Photograph 8. Forest typical of 5R / Alternate Pt137 and 5R / Alternate Pt140

Appendix G - Received Comments

From: Cajun Paradis
Sent: September-10-15 12:32 PM
To: 'Keith'
Cc: Phil Lodermeier (plodermeier@lacombecounty.com)
Subject: RE: Access report

Hi Keith,

You can find the boating capacity calculation on pages 2-2 and 2-3 of the complete report.

There is as many as 300 boats on the lake at peak times.
There is a total of 1200 moored boats on the lake, and 200 boats launched per day.
Based off of these estimates:
1 in 6 moored boats are used at once
1 in 2 launched boats are used at once
We can come to the conclusion of 300 boats utilized at once on the lake
200 moored boats and
100 launched boats

Let me know if you need more clarification.

Cajun

-----Original Message-----
From: Keith [mailto:kklamb99@hotmail.com]
Sent: September-10-15 12:11 PM
To: Cajun Paradis
Subject: Access report

A point of clarification. I believe it was reported that there are as many as200 boats on the lake on a busy day and that the two existing launches can handle 192. Where do the ones fit in that are stored on boat lifts? Are they part of the 200?

Sent from my iPhone

Sylvan Lake Watershed Stewardship Society (SLWSS) Comments on Report

From:	Graeme Strathdee <strathdeeg@shaw.ca>
Sent:	October-06-15 3:40 PM
To:	Cajun Paradis
Cc:	Keith Stephenson
Subject:	RE: Requested Review of the Lake Access Strategy
Attachments:	Review of the Access Report with Graphics.pdf

Cajun:

Please find attached a review and comment from the Sylvan Lake Watershed Stewardship Society on the Lake Access Strategy report.

Overall, the consultants have provided a useful report.

Our document records input and experience from active boaters with emphasis on some of the important topics not addressed by the consultant team. So as not to over-dramatize the safety issues I have left out a few examples of "stuff that happens" including the cases of a Sylvan Lake councillor's power boat that was blown off a storage rack in a storm, various beachings and sail shredding events in strong winds, collisions and a dismasting in yacht races, a powerboat sinking with release of fuel inventory into Marina Bay, and power boats that break away from moorings because frayed ¼ inch polypropylene line was an inadequate marine accessory.

As you noted, the report does not complete the costing of a recommended boat launch site. It does provide us with enough data to understand that a boat launch will compete for limited capital funds with other projects that are more critical for the Sylvan Lake watershed community.

Please let me know if you have questions about any of the points that we address.

I have sent a copy to Chairman Stephenson of the Sylvan Lake Management Committee as the attached report was promised at the last SLMC meeting.

Regards,

Graeme Strathdee

Graeme Strathdee, Ph.D., FCIC
President
Sylvan Lake Watershed Stewardship Society
25 Willow Springs Crescent
Sylvan Lake, AB, T4S 1G1
Tel: (403) 887-8781
Email 1: strathdeeg@shaw.ca
Email 2: info@slwss.org
Websites: http://slwss.org

From: Graeme Strathdee <strathdeeg@shaw.ca>
Sent: September-10-15 12:48 PM
To: Cajun Paradis
Subject: RE: Requested Review of the Lake Access Strategy

Cajun:

Thanks for the comments. I'll pay attention to the exact scope of the Access Strategy project.

On the broader issues of watershed capital project priorities, my own guess is that if the affected municipalities and populations identified and ranked the top ten community healthcare facility, schools, municipal services, and recreational requirements, boat launches would not make the cut. Even the potential of co-funding from another level of government doesn't alter the reality of a basic present value calculation.

Incidentally, an interesting test of the value of the "Sylvan Lake experience" is on-going. Clearly some boaters reject the $40 ramp-fee cost in Sylvan Lake, although that is the same as the municipal charge at the public Chestermere reservoir ramp east of Calgary. So as an indicator, a Sylvan Lake boating-day for many is apparently not worth $40 as they seek out "free" alternatives. Yet across Lakeshore Drive, golfers willingly pay higher green fees for recreation of similar duration for access to private property. From the economic perspective it would be cheaper to pay power boaters simply to go away than to subsidize their recreation.

Regards,

Graeme

From: Cajun Paradis [mailto:cparadis@lacombecounty.com]
Sent: September-10-15 12:04 PM
To: Graeme Strathdee
Cc: Keith Stephenson; Phil Lodermeier
Subject: RE: Requested Review of the Lake Access Strategy

Hi Graham,

We look forward to reading your complete comments next week, however please keep in mind that the exercise of identifying lake access points was simply to identify the suitability of sites around the lake and provide a recommendation for future management of them. This includes what locations are suitable for a full launch, a non-motorized hand launch, an environmental/community reserve, or natural reserve and mitigation areas. The report provides the baseline that can be taken forward to properly manage access onto the lake – the implementation of said management has not been determined and could vary depending on desires of the municipalities around the lake.

The intentions of the report were also not to economically scrutinize a potential boat launch on the lake. It is important to note that it has not been determined at this point who would fund a potential launch, nor who would develop it. The timeline could vary significantly between different developing scenarios.

Cajun

LACOMBE COUNTY

Cajun Paradis

Planner/Development Officer

403.782.6601 | cparadis@lacombecounty.com

Where People are the Key

From: Graeme Strathdee [mailto:strathdeeg@shaw.ca]
Sent: September-10-15 11:21 AM
To: Cajun Paradis
Cc: Keith Stephenson
Subject: FW: Requested Review of the Lake Access Strategy

Cajun:

This is a rough outline of my Access Strategy review.

In view of the overall Access Strategy report fact finding and recommendations I will provide you with feedback on the data and on some real world experience about boating on Sylvan Lake. It's not all about wake boarding and tubing with the kids on a hot, sunny summer day. Storms (which affect lake accessibility and safety), beachings, sinkings and other really dumb marine practices are part of the big picture and the associated liabilities that extend beyond protection from invasive species.

As you know, and the consultants have tried to address, there is more to boating than wake boarding and tubing. Provision in the report for fishermen, and the paddle and wind sports is limited. I'll comment on that as I have raced and cruised more nautical miles than most power boaters can ever afford to fuel (which is a reminder for me to discuss safe marine fueling and sewage pump-out facilities). I have also analysed wind patterns for the region (for sail racing) and I know a lot about factors and skills that affect safe boating and therefore the viability of and demand for boat launches.

I question some of the data and estimates included in the report. As Google Earth imagery shows, a dock and boat count can be checked quickly by viewing the shoreline of the lake. The feasibility of intense lake use as proposed needs close scrutiny and the concept of shared use of the lake surface should be developed further to understand the capacity limit.

I will also summarize views of some residents who wonder why free launch facilities are planned for some users while they must pay for the same privilege of boating on Sylvan Lake. While the authors of the draft report have provided some engineering cost estimates the over-riding profile of the public investment seems to be problematic. Normally in business projects that require a front-end capital investment but which have no direct revenue stream have, by definition, a net negative present value. That usually means no approval or a losing investment. That political issue will have to be dealt with at some point as it is the basic economic obstacle that any new boat launch will have to overcome. The consultants can do nothing about that, or about the changing demographics and demand for boat launch facilities moving forward, except as part of a sensitivity analysis.

I will try to provide you with my review next week. Please let me know if there are any points that need additional comment, or even if there are topics that you would rather not hear about.

As I noted at your SLMC briefing I think that the consultants have provided the Access committee with a comprehensive useful report that puts the Sylvan Lake situation into practical perspective, especially by screening the potential launch sites.. I will add the SLWSS stewardship and experienced yacht and Laser racer viewpoints.

Regards,

Graeme Strathdee

Graeme Strathdee
President
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Email 2: info@slwss.org
Websites: http://slwss.org
http://slwssnews.com

Sylvan Lake Watershed Stewardship Society
P.O. Box 9012 Sylvan Lake, Alberta T4S 1S6

Comment on the Report

Sylvan Lake Boat Launch Access Strategy and Action Plan for Recreational Lake Access

The Reality of the Sylvan Lake Boating Season and Boating Costs

The report does not describe the present situation for sail, paddle and power boating on Sylvan Lake. This section provides that experience-based background.

The active boating season for ramp-launched powerboats and keelboats on Sylvan Lake typically extends from the long weekend in May to mid-September, that is 15 weeks and weekends. No, or few, boats are on the lake mid-week in May, June and September. Mid-week use in July and August is sparse and dependent on weather. Weekend use in the 8 weekends of July and August can be heavy but it is highly dependent on weather.

Lakefront property-owner powerboats typically are accessories that are stored on racks or secured at docks and are rarely used. The report overestimates the number of powerboats on the lake and the number actually used at any time.

Many powerboats stored on trailers in the Town of Sylvan Lake (TSL) are launched into Sylvan Lake infrequently. Powerboats moored in the Sylvan Lake and Marina Bay marinas are rarely used based on informal tow-bar counts. Most TSL power boaters seem to reject the option of using the Sylvan Lake marina ramp at a fee of $40. That puts a market value rejection point on both the Sylvan Lake experience and on marine facilities.

The maximum season for deep-keel yachts in Marina Bay is 15 to 17 weeks. Those boats leave the harbour less than 30 times each. A representative unit cost per use is close to $100.

Cruising boats in the Sylvan Lake marina might leave the harbour a dozen times in July and August. Since the capital cost of a boat slip, or the annual operating cost equivalent of boat slip rental is high, the unit cost per use is much greater than $100.

Land Identified for 5R or 5S Boat Launches

That point of land, currently in Red Deer County, is classified as Natural Area/Recreational Area in the Town of Sylvan Lake long range infrastructure plan Figure 2-1. Today, that would place the land out of bounds for major conversion from a lake-protective riparian area to one that would be used by just a few boaters, perhaps 1500 launch-days per open water season.

In addition, the lake bottom that surrounds that point of land is annotated as Protective Notation Area even in Figure 2-1 of the report under review here (See your report section 8.1.3. and appendix B maps.)

Effect of Weather and Wind on Boating Days

Between May and September there are about 105 potential boating days.

The 28-30 available weekend days in June-August are effectively reduced to the 8 weekends in July and August, or about 18-20 days. Of those days, a quarter to a third will be unusable by recreational powerboats because of rain or wind speeds above 20 km/h. That leaves 13-15 days that are suitable for family boating in typical powerboat designs of today.

Two or three times each summer, coupled Low and High pressure systems in northern BC and Alberta create very strong northwest winds that make Sylvan Lake exceptionally dangerous for boaters and for launch ramps exposed to wind and the associated wave fronts. See the photographic evidence of extreme conditions included in this report's attachments.

Generally Sylvan Lake is in a low-wind zone. See the wind analyses and statistics included in the attachments. Light winds in the keelboat and dinghy racing season make Sylvan Lake unsuited for championship regattas or as a training venue.

Carrying Capacity

The methodology used by the high-lake-density State of Minnesota for analysis of lake carrying capacity should be compared with that used in the present report. Since that report was issued in 1994 power boating technology has changed dramatically. What was once a safe operating standard of minimum area per boat has increased.

All the evidence that one needs to confirm that fewer boats, or an increased area/boat standard, than in 1994, would be to try power boating, sailing, kayaking or canoeing on Sylvan Lake on a prime long weekend.

In addition, while the Launch Access Strategy briefly suggests that recreational Sylvan Lake might be zoned off to recognize the shared uses of power, sail, and paddle craft boaters and even the rights of non-boating property owners, it reaches no conclusion. Provision for, and monitoring of, a near-shore buffer of 300 to 400 meters would ensure safety and enjoyment for all. Giving priority to the next marginal addition of 100-150 power boaters on a few idyllic Sylvan Lake weekends is a distortion of the reasonable concept of shared use of an Alberta asset.

Safety and Rescue

The Emergency response plan in section 6 is unrealistic. Effectively there is no acceptable marine rescue capability under conditions of extreme weather. The RCMP's boat will be inadequate for any accident in winds above about 25 mph.

Boaters should not expect to be rescued by the RCMP or volunteers when the wind speed exceeds 25 mph and should instead rely on their own training and competency, their safety equipment, and boat design that is qualified for the extreme marine condition.

Boater Competence and Experience

Alberta small craft boaters of all types are marginally capable in flat water conditions at wind speeds under 12 mph.

Typically powerboat operators do not know the marine rules of the road and are hazards to others especially when travelling at planing speed.

Liability

The RR 2-1 site selected in the report is probably the least protected shoreline in strong northwest or southeast winds. Consideration of boat launch closure under unsafe conditions was not discussed in the report.

The attached photo collage of the Sylvan Lake provincial park beach in a NW wind, and the ship wreck case histories should provide convincing evidence that accidents do happen. An exposed south shore boat ramp in a NW wind squall will be a dangerous place, especially for family boating.

The point is, a public boat launch creates liabilities and the report does not address what they are and how either municipalities or users will be protected. Adequate comprehensive insurance is one approach to deal with marine risk but will not prevent accidents..

Regulation

The Sylvan Lake RCMP detachment patrols the lake infrequently. One police patrol craft is inadequate to monitor infractions of boating and safety regulations, drug and alcohol abuse, and noise emissions that are contrary to the national standard.

In addition, boaters have no access to sewage pumpout facilities to enable marine craft, including live-aboard houseboats, to comply with marine holding tank regulations.

Only one marina complies with standards for safe fuel storage and on the water refueling.

Private Property Impacts

Excessive near-shore noise emissions that disturb onshore and offshore residents and visitors is illegal and a chronic intrusion onto the rights of others to enjoy the Sylvan lake environment. The SLWSS Quiet Enjoyment Initiative has investigated the legal aspects of noise pollution on recreational lakes and can elaborate on this topic.

Wave action from wake board boats operating too close to the lakeshore can cause erosion and damage to marine property. That activity transfers real costs to shoreline property owners for modifications to reduce erosion. The costs of shoreline rip rap protection are well known.

Overall Municipal Boat Launch Economics

Expensive boat launch capital projects without a user-pay revenue stream have, by definition, a negative net present value. Projects with that revenue and cost economic profile increase public debt and would not be justified by any normal decision-making standard.

The costs of private boat launch access to Sylvan Lake are presented in Section 1 above.

Some Sylvan Lake boaters who already make private arrangements for boat launch and marina facilities object to the concept of "free" public access by others. Watershed residents and visitors should pay a fair and reasonable fee for use of municipally owned and operated boat launches.

Committee Membership and Sylvan Lake Boating Qualifications

The report does not name the members of the access study committee. Who contributed the primary boating experience from Sylvan Lake to justify confidence in the findings?

Report Appendix 1. Proposed Development.

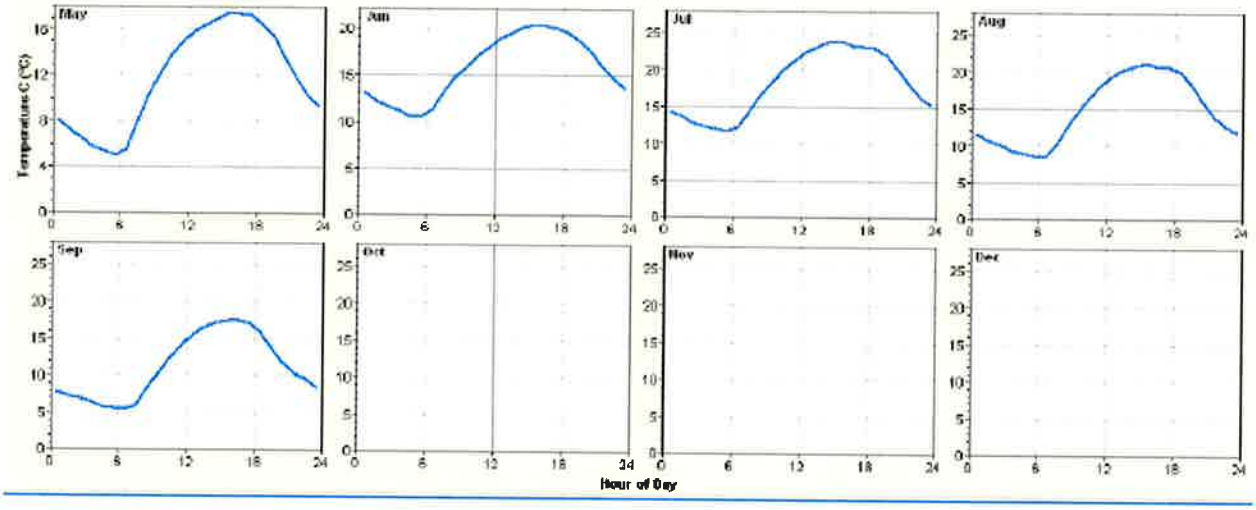
Figure A-1. The Boy Scout camp is not located to the east of Range Road 2-1.

Attachments for this Review

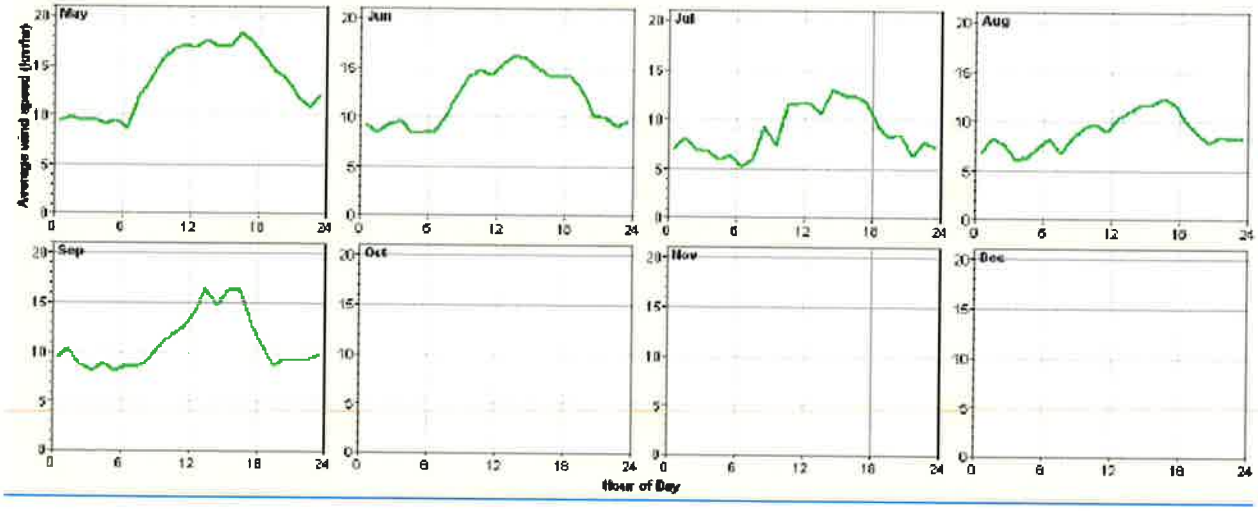
1. Sample Wind Farm Analysis for Sylvan Lake in 2006 and 2007.
2. Example of Typical Hourly Weather Data Archive for a Summer Season
3. Ship Wrecks and Extreme Weather Photographic Evidence for Sylvan Lake

Red Deer Airport, May to September

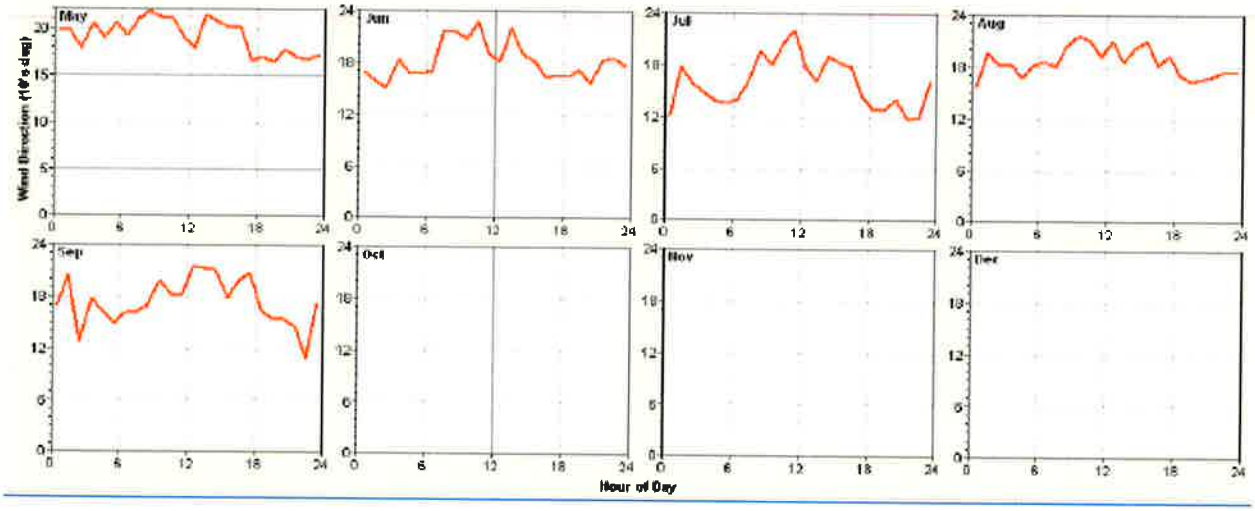
Temperature



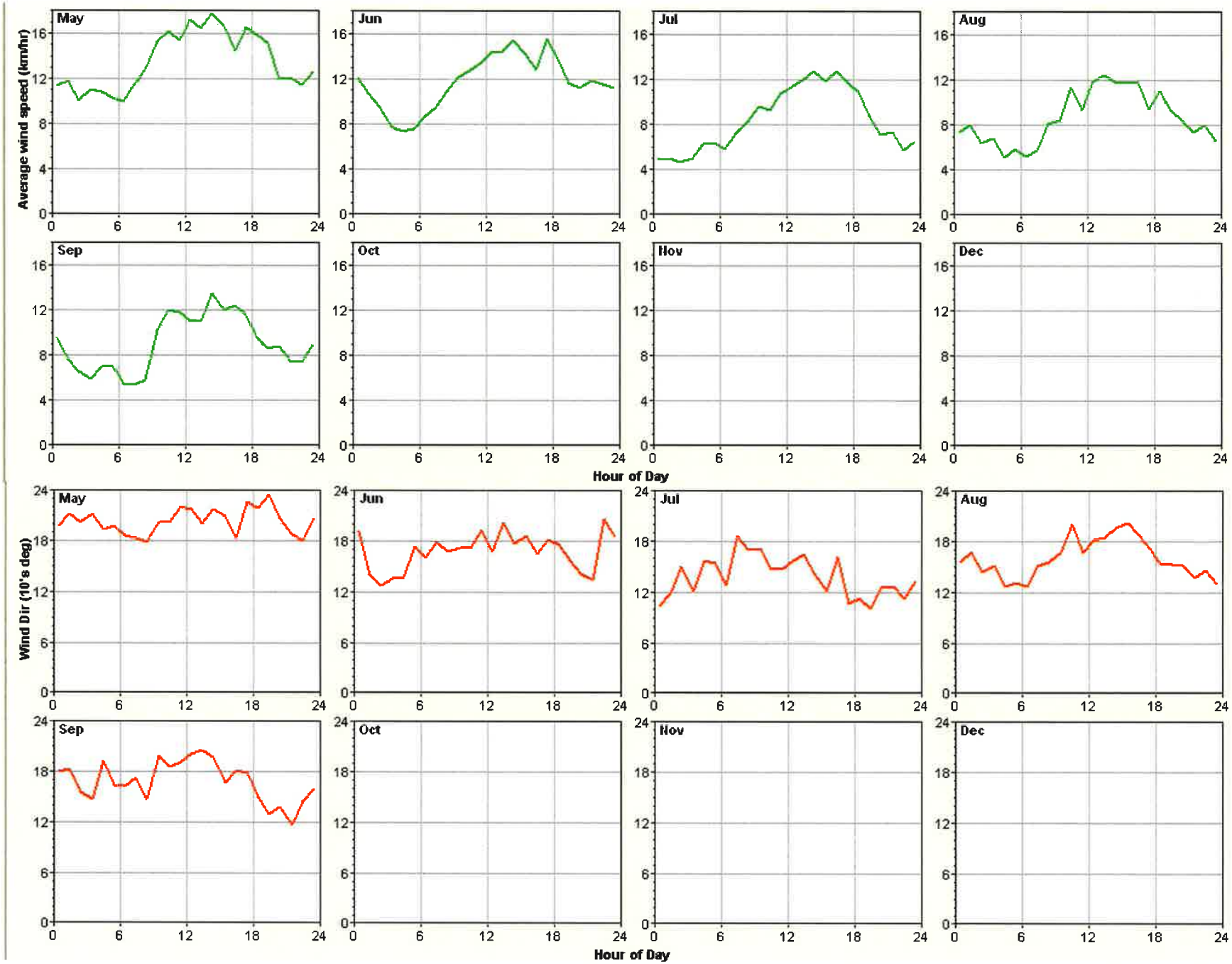
Average Wind Speed



Mean Wind Direction



2007 Sailing Season Average Wind Speed and Wind Direction for each Time of Day



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Hourly Data Report for May 23, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for May 23, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	7.2	3.8	79	36	19	16.1	91.63			Rain Showers
01:00	5.9	2.9	81	35	26	24.1	91.67			Cloudy
02:00	4.5	1.2	79	34	22	24.1	91.71			Cloudy
03:00	3.6	-0.3	76	34	22	24.1	91.74			Cloudy
04:00	3.3	-0.5	76	33	19	24.1	91.77			Cloudy
05:00	3.1	-0.6	77	35	9	24.1	91.77			Mostly Cloudy
06:00	2.7	-2.2	70	2	19	24.1	91.78			Mostly Cloudy
07:00	2.9	-3.1	65	3	19	24.1	91.78			Mostly Cloudy
08:00	3.5	-2.3	66	2	13	24.1	91.76			Mostly Cloudy
09:00	3.6	-2.5	64	1	7	24.1	91.76			Mostly Cloudy
10:00	5.1	-2.5	58	2	6	24.1	91.71			Mostly Cloudy
11:00	5.7	-2.0	58	33	9	24.1	91.72			Mostly Cloudy
12:00	5.6	-1.1	62	36	19	24.1	91.69			Mostly Cloudy
13:00	6.3	-0.1	64	34	11	24.1	91.67			Mostly Cloudy
14:00	5.5	-0.7	64	1	20	19.3	91.67			Rain Showers
15:00	4.8	-0.1	71	34	22	24.1	91.69			Rain Showers
16:00	4.4	-0.7	69	34	19	19.3	91.70			Rain Showers
17:00	2.6	0.6	87	1	19	9.7	91.72			Rain, Snow
18:00	2.7	0.9	88	1	13	12.9	91.70			Rain
19:00	2.9	0.1	82	36	13	16.1	91.67			Rain Showers
20:00	2.8	0.2	83	36	13	16.1	91.67			Rain Showers
21:00	2.9	0.7	85	36	9	16.1	91.68			Cloudy
22:00	2.9	0.0	81	36	19	16.1	91.64			Rain
23:00	1.4	-0.5	87	36	22	2.4	91.69			Snow

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

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Hourly Data Report for May 30, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for May 30, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	7.7	5.0	83	19	4	24.1	91.67			Clear
01:00	7.8	5.7	87	17	4	24.1	91.66			Clear
02:00	6.8	4.7	86		0	24.1	91.65			Clear
03:00	7.4	4.8	84	14	7	24.1	91.65			Clear
04:00	6.3	4.5	88	16	7	24.1	91.63			Clear
05:00	4.6	3.1	90	17	4	16.1	91.61			Clear
06:00	8.0	5.4	84		0	24.1	91.62			Clear
07:00	10.5	6.4	76	13	6	19.3	91.62			Clear
08:00	12.4	7.4	72	14	15	19.3	91.63			Clear
09:00	15.4	8.3	63	17	19	24.1	91.62			Clear
10:00	16.9	7.9	55	15	19	24.1	91.61			Mainly Clear
11:00	17.8	7.1	49	13	11	24.1	91.59			Clear
12:00	19.4	5.9	41	18	7	24.1	91.55			Clear
13:00	20.7	4.2	34	17	11	24.1	91.50			Mainly Clear
14:00	21.1	6.6	39	13	13	24.1	91.47			Clear
15:00	21.5	5.1	34	18	15	24.1	91.43			Clear
16:00	21.8	4.2	32	13	20	24.1	91.41			Clear
17:00	21.9	3.3	29	13	15	24.1	91.36			Clear
18:00	21.5	1.5	27	13	24	24.1	91.32			Clear
19:00	20.6	2.2	30	16	22	24.1	91.28			Clear
20:00	18.6	4.3	39	14	9	24.1	91.28			Clear
21:00	15.6	6.0	53	14	15	24.1	91.28			Clear
22:00	13.3	5.9	61	15	19	24.1	91.28			Clear
23:00	12.4	6.6	68	17	19	24.1	91.28			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for June 06, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for June 6, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	13.4	11.4	88	7	22	19.3	89.36			Cloudy
01:00	13.5	11.0	85	6	32	19.3	89.37			Cloudy
02:00	12.8	10.3	85	5	26	19.3	89.41			Cloudy
03:00	12.2	10.3	88	4	22	19.3	89.45			Rain Showers
04:00	11.4	10.2	92	6	24	2.4	89.52			Rain, Fog
05:00	11.4	10.2	92	4	26	2.4	89.60			Rain, Fog
06:00	11.5	10.5	94	3	19	2.4	89.68			Rain, Fog
07:00	10.6	9.4	92	4	24	3.2	89.76			Rain, Fog
08:00	10.0	9.2	95	2	28	3.2	89.86			Rain, Fog
09:00	10.9	7.6	80	2	28	16.1	89.93			Cloudy
10:00	11.0	7.2	77	1	28	24.1	90.02			Cloudy
11:00	11.6	6.9	73	3	28	24.1	90.11			Cloudy
12:00	12.5	5.4	62	2	22	24.1	90.19			Mostly Cloudy
13:00	12.8	5.0	59	1	26	24.1	90.25			Mostly Cloudy
14:00	14.1	3.0	47	3	28	24.1	90.29			Mostly Cloudy
15:00	14.4	3.5	48	5	19	24.1	90.35			Cloudy
16:00	13.6	4.1	53	1	22	24.1	90.40			Cloudy
17:00	13.8	4.8	55	35	11	24.1	90.43			Cloudy
18:00	12.9	5.7	62	36	22	24.1	90.47			Cloudy
19:00	11.2	5.4	67	36	13	24.1	90.56			Cloudy
20:00	10.9	4.9	66	34	15	24.1	90.61			Cloudy
21:00	10.6	4.4	65	33	19	24.1	90.65			Cloudy
22:00	10.2	3.9	65	32	15	24.1	90.69			Mostly Cloudy
23:00	9.7	5.5	75	30	19	24.1	90.70			Mostly Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

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Hourly Data Report for June 13, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for June 13, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
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01:00	7.2	6.1	93	18	4	24.1	91.21			Clear
02:00	6.3	5.2	93	20	6	24.1	91.22			Mainly Clear
03:00	5.4	4.3	93	19	7	24.1	91.23			Mainly Clear
04:00	4.5	3.3	92	20	6	24.1	91.21			Mainly Clear
05:00	4.3	2.8	90	19	7	24.1	91.22			Clear
06:00	6.1	3.4	83	21	9	24.1	91.21			Mainly Clear
07:00	8.6	3.7	71	21	7	24.1	91.20			Mainly Clear
08:00	10.9	4.8	66	21	7	24.1	91.17			Mainly Clear
09:00	13.6	3.4	50	22	11	24.1	91.14			Mainly Clear
10:00	15.0	2.8	44	25	9	24.1	91.12			Mainly Clear
11:00	16.4	2.3	39	12	9	24.1	91.09			Mainly Clear
12:00	18.1	1.1	32	17	13	24.1	91.04			Mostly Cloudy
13:00	17.5	1.0	33	14	13	24.1	90.98			Mostly Cloudy
14:00	17.8	2.3	35	20	11	24.1	90.94			Mostly Cloudy
15:00	18.0	3.8	39	16	17	24.1	90.90			Mostly Cloudy
16:00	16.4	5.0	47	17	19	24.1	90.91			Mostly Cloudy
17:00	14.6	4.8	52	1	19	24.1	90.94			Mostly Cloudy
18:00	16.1	3.5	43	4	13	24.1	90.91			Mostly Cloudy
19:00	14.1	6.2	59	35	11	24.1	90.91			Mostly Cloudy
20:00	13.8	6.6	62		0	24.1	90.94			Mostly Cloudy
21:00	12.9	5.8	62	3	6	24.1	90.93			Mainly Clear
22:00	10.6	7.4	81	32	4	24.1	90.97			Mostly Cloudy
23:00	9.6	6.3	80	35	7	24.1	90.98			Mostly Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

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Hourly Data Report for June 20, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for June 20, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	12.7	7.7	72	4	19	24.1	91.01			Mostly Cloudy
01:00	11.6	7.9	78	3	15	24.1	91.08			Mainly Clear
02:00	10.6	7.6	82	2	13	24.1	91.14			Mainly Clear
03:00	9.6	7.7	88		0	24.1	91.18			Mostly Cloudy
04:00	7.3	6.2	93	28	6	24.1	91.22			Mostly Cloudy
05:00	7.8	6.7	93	26	6	24.1	91.23			Mostly Cloudy
06:00	9.3	7.9	91		0	24.1	91.27			Mostly Cloudy
07:00	11.5	8.4	81	24	6	24.1	91.31			Mostly Cloudy
08:00	13.7	9.0	73		0	24.1	91.31			Mostly Cloudy
09:00	15.3	9.8	70	12	6	24.1	91.31			Mostly Cloudy
10:00	16.1	9.9	67		0	24.1	91.28			Mostly Cloudy
11:00	17.8	10.1	61	12	6	24.1	91.26			Mostly Cloudy
12:00	19.2	9.5	53	12	11	24.1	91.24			Mostly Cloudy
13:00	20.4	10.9	54	11	15	24.1	91.22			Mostly Cloudy
14:00	21.2	10.7	51	12	19	24.1	91.17			Mostly Cloudy
15:00	21.8	9.9	47	14	19	24.1	91.13			Mostly Cloudy
16:00	22.9	10.2	45	14	19	24.1	91.08			Mainly Clear
17:00	22.8	9.9	44	14	19	24.1	91.05			Mainly Clear
18:00	22.8	9.6	43	15	19	24.1	91.02			Mainly Clear
19:00	22.4	10.5	47	12	22	24.1	91.00			Mainly Clear
20:00	21.0	11.2	53	11	15	24.1	91.00			Mainly Clear
21:00	18.9	11.1	61	12	9	24.1	91.02			Mainly Clear
22:00	17.1	10.8	66	13	7	24.1	91.03			Mainly Clear
23:00	15.8	10.7	72	11	6	24.1	91.02			Mainly Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for June 27, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for June 27, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	12.8	8.4	75	13	19	24.1	91.89			Clear
01:00	12.4	8.9	79	13	19	24.1	91.88			Clear
02:00	11.3	8.5	83	11	19	24.1	91.88			Clear
03:00	10.5	8.2	86	13	7	24.1	91.86			Mainly Clear
04:00	10.2	8.1	87	15	15	24.1	91.84			Mainly Clear
05:00	9.8	8.0	89	13	11	24.1	91.84			Mainly Clear
06:00	10.8	8.5	86	15	19	24.1	91.82			Mainly Clear
07:00	12.9	9.1	78	16	24	24.1	91.80			Mainly Clear
08:00	14.6	9.3	70	16	26	24.1	91.79			Mostly Cloudy
09:00	16.3	9.4	64	15	28	24.1	91.78			Mostly Cloudy
10:00	17.3	9.5	60	15	33	24.1	91.77			Mostly Cloudy
11:00	18.7	9.6	55	15	30	24.1	91.73			Mostly Cloudy
12:00	19.6	9.2	51	15	26	24.1	91.70			Mostly Cloudy
13:00	20.7	10.5	52	16	26	24.1	91.66			Mostly Cloudy
14:00	20.7	9.4	48	15	28	24.1	91.63			Mainly Clear
15:00	21.5	9.2	45	16	37	24.1	91.58			Mainly Clear
16:00	21.7	9.4	45	16	28	24.1	91.54			Mostly Cloudy
17:00	21.3	9.1	46	16	32	24.1	91.51			Mostly Cloudy
18:00	20.7	9.1	47	15	22	24.1	91.49			Mostly Cloudy
19:00	19.7	9.7	52	13	24	24.1	91.47			Mostly Cloudy
20:00	18.5	10.4	59	13	22	24.1	91.44			Mostly Cloudy
21:00	17.2	9.3	60	13	22	24.1	91.45			Mostly Cloudy
22:00	16.5	9.8	65	14	15	24.1	91.46			Mostly Cloudy
23:00	15.7	9.8	68	13	9	24.1	91.43			Mostly Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
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Environment Canada Environnement Canada

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Hourly Data Report for July 04, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for July 4, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	15.2	11.9	81	29	6	24.1	91.67			Mainly Clear
01:00	14.2	11.5	84		0	24.1	91.68			Mainly Clear
02:00	12.9	11.1	89		0	24.1	91.72			Mostly Cloudy
03:00	11.4	10.1	92		0	24.1	91.75			Mostly Cloudy
04:00	11.9	10.3	90		0	16.1	91.80			Mostly Cloudy
05:00	12.2	10.8	91		0	19.3	91.83			Mostly Cloudy
06:00	13.6	11.8	89		0	19.3	91.88			Mostly Cloudy
07:00	15.4	13.0	86	21	4	24.1	91.90			Mostly Cloudy
08:00	18.0	13.4	74	23	7	24.1	91.92			Mostly Cloudy
09:00	19.7	11.1	58	31	7	24.1	91.91			Mostly Cloudy
10:00	20.9	11.2	54		0	24.1	91.91			Mostly Cloudy
11:00	21.6	12.6	57		0	24.1	91.90			Mostly Cloudy
12:00	22.2	11.7	51		0	24.1	91.88			Mainly Clear
13:00	23.5	10.8	45		0	24.1	91.84			Mainly Clear
14:00	24.9	11.1	42		0	24.1	91.79			Mainly Clear
15:00	24.9	10.2	40	5	6	24.1	91.76			Mainly Clear
16:00	26.1	11.0	39		0	24.1	91.72			Mainly Clear
17:00	26.4	11.1	38	17	11	24.1	91.69			Mainly Clear
18:00	25.7	10.6	39	13	9	24.1	91.67			Mainly Clear
19:00	24.8	12.8	47	12	9	24.1	91.66			Mainly Clear
20:00	22.9	13.2	54	11	7	24.1	91.64			Clear
21:00	20.7	12.6	60	10	7	24.1	91.65			Mainly Clear
22:00	18.9	12.2	65	8	7	24.1	91.68			Mainly Clear
23:00	17.6	12.0	70	9	6	24.1	91.71			Mainly Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for July 11, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for July 11, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	16.3	13.2	82		0	24.1	91.65			Mostly Cloudy
01:00	16.2	12.6	79		0	24.1	91.63			Mostly Cloudy
02:00	15.3	12.4	83		0	24.1	91.62			Mostly Cloudy
03:00	15.5	12.9	84		0	24.1	91.61			Mostly Cloudy
04:00	14.6	12.0	84	20	6	24.1	91.60			Mostly Cloudy
05:00	13.0	11.1	88	21	7	24.1	91.60			Mainly Clear
06:00	13.7	11.7	88		0	24.1	91.62			Mostly Cloudy
07:00	16.2	13.3	83	23	7	24.1	91.63			Mainly Clear
08:00	19.2	13.7	70	32	11	24.1	91.64			Mainly Clear
09:00	21.8	12.8	57	29	9	24.1	91.65			Mainly Clear
10:00	22.6	11.4	49	30	7	24.1	91.63			Mainly Clear
11:00	23.4	11.8	48	4	4	24.1	91.60			Mainly Clear
12:00	23.8	11.6	46	35	7	24.1	91.58			Mainly Clear
13:00	24.1	11.9	46	33	9	24.1	91.56			Mainly Clear
14:00	24.5	12.3	47		0	24.1	91.53			Mainly Clear
15:00	25.1	12.7	46		0	24.1	91.51			Mainly Clear
16:00	25.4	13.9	49		0	24.1	91.48			Mainly Clear
17:00	25.2	12.4	45		0	24.1	91.46			Mainly Clear
18:00	25.5	12.7	45		0	24.1	91.44			Mainly Clear
19:00	24.9	13.6	49		0	24.1	91.45			Mainly Clear
20:00	24.0	13.8	53		0	24.1	91.46			Mainly Clear
21:00	22.1	15.4	66		0	24.1	91.47			Mainly Clear
22:00	20.3	15.3	73	15	4	24.1	91.51			Mainly Clear
23:00	17.5	14.5	83	19	4	24.1	91.52			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
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Environment Canada Environnement Canada

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Hourly Data Report for July 18, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N **Longitude**: 113° 53.400' W **Elevation**: 904.60 m

Climate ID: 3025480 **WMO ID**: 71878 **TC ID**: YQF

Hourly Data Report for July 18, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	17.6	15.7	89	34	20	16.1	91.17			Thunderstorms, Rain Showers
01:00	17.0	15.3	90	2	19	16.1	91.15			Thunderstorms, Rain Showers
02:00	17.4	15.6	89		0	24.1	91.14			Thunderstorms, Rain Showers
03:00	16.8	15.4	91	4	7	12.9	91.21			Thunderstorms, Rain Showers
04:00	17.2	15.7	91	9	19	16.1	91.12			Thunderstorms, Rain Showers
05:00	17.9	15.5	86	7	11	16.1	91.05			Cloudy
06:00	18.6	15.4	82		0	16.1	91.09			Cloudy
07:00	18.5	15.4	82	14	11	16.1	91.20			Thunderstorms, Rain Showers
08:00	17.2	15.4	89	7	17	19.3	91.08			Rain Showers
09:00	19.1	15.9	82	19	9	24.1	91.14			Mostly Cloudy
10:00	21.8	17.6	77	15	7	19.3	91.09			Mainly Clear
11:00	22.9	18.0	74	15	20	19.3	91.08			Mostly Cloudy
12:00	24.3	18.4	70	13	24	24.1	91.04	31		Mostly Cloudy
13:00	25.3	18.4	66	14	22	19.3	91.01	32		Cloudy
14:00	25.9	19.1	66	13	19	19.3	90.97	33		Mostly Cloudy
15:00	27.5	20.2	64	12	17	19.3	90.93	35		Mostly Cloudy
16:00	27.5	19.4	61	14	24	19.3	90.84	35		Mostly Cloudy
17:00	28.7	19.3	57	13	20	19.3	90.76	36		Mainly Clear
18:00	28.4	19.5	59	12	19	19.3	90.72	36		Mainly Clear
19:00	27.3	19.5	62	12	19	19.3	90.68	34		Mainly Clear
20:00	25.5	18.7	66	13	19	24.1	90.67	32		Mainly Clear
21:00	24.1	18.0	69	12	19	24.1	90.71	30		Mainly Clear
22:00	23.7	18.3	72	13	19	24.1	90.70	30		Mostly Cloudy
23:00	22.6	18.0	75	15	19	24.1	90.64			Mostly Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

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Hourly Data Report for July 25, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for July 25, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	12.0	10.1	88	23	4	24.1	91.21			Mainly Clear
01:00	11.9	9.9	88		0	24.1	91.24			Clear
02:00	11.4	9.5	88	25	4	24.1	91.27			Mainly Clear
03:00	11.0	9.7	92	26	4	24.1	91.31			Mainly Clear
04:00	10.8	9.5	92		0	24.1	91.35			Mainly Clear
05:00	10.2	8.9	92		0	24.1	91.38			Mainly Clear
06:00	10.6	9.5	93	16	4	24.1	91.38			Mainly Clear
07:00	12.4	10.0	85		0	24.1	91.41			Mainly Clear
08:00	15.0	7.6	61	5	4	24.1	91.44			Mostly Cloudy
09:00	15.4	6.1	54	2	13	24.1	91.43			Mostly Cloudy
10:00	16.6	7.2	54	6	7	24.1	91.46			Mostly Cloudy
11:00	17.9	6.0	46	9	11	24.1	91.46			Mostly Cloudy
12:00	18.8	9.2	54	10	9	24.1	91.42			Mostly Cloudy
13:00	20.0	6.8	42	20	7	24.1	91.44			Mostly Cloudy
14:00	19.3	6.5	43		0	24.1	91.46			Mostly Cloudy
15:00	20.4	7.0	42		0	24.1	91.42			Mainly Clear
16:00	21.0	9.7	48	11	6	24.1	91.41			Mainly Clear
17:00	21.1	7.6	42		0	24.1	91.42			Mainly Clear
18:00	20.7	7.4	42		0	24.1	91.44			Mainly Clear
19:00	20.7	7.1	41		0	24.1	91.46			Clear
20:00	19.5	8.4	49		0	24.1	91.49			Clear
21:00	17.3	9.0	58	9	7	24.1	91.53			Clear
22:00	14.5	8.9	69		0	24.1	91.57			Clear
23:00	13.3	9.3	77		0	24.1	91.60			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for August 01, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for August 1, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	7.6	4.4	80	24	13	24.1	91.68			Clear
01:00	8.4	5.2	80	25	9	24.1	91.72			Clear
02:00	7.7	4.8	82	25	13	24.1	91.77			Clear
03:00	7.8	4.6	80	26	11	24.1	91.79			Clear
04:00	7.3	4.4	82	25	9	24.1	91.85			Mainly Clear
05:00	7.8	4.1	77	25	13	24.1	91.88			Mainly Clear
06:00	7.7	4.6	81		0	24.1	91.90			Mainly Clear
07:00	11.0	5.8	70	30	11	24.1	91.92			Clear
08:00	13.9	6.9	63	27	19	24.1	91.94			Clear
09:00	15.8	6.9	55	30	13	24.1	91.93			Clear
10:00	17.4	8.3	55	29	9	24.1	91.90			Clear
11:00	18.3	9.4	56	30	19	24.1	91.85			Clear
12:00	18.9	8.0	49	36	6	24.1	91.82			Clear
13:00	19.6	8.3	48	26	9	24.1	91.79			Mainly Clear
14:00	20.4	8.3	46	31	4	24.1	91.76			Mainly Clear
15:00	21.1	8.4	44	27	7	24.1	91.73			Mainly Clear
16:00	21.8	8.7	43	6	4	24.1	91.68			Clear
17:00	21.5	8.2	42	23	9	24.1	91.64			Clear
18:00	21.8	8.5	42	21	6	24.1	91.59			Clear
19:00	21.1	9.1	46	14	4	24.1	91.59			Clear
20:00	19.3	10.1	55	12	6	24.1	91.57			Clear
21:00	17.5	9.7	60		0	24.1	91.61			Clear
22:00	14.7	9.3	70		0	24.1	91.61			Clear
23:00	12.8	9.4	80		0	24.1	91.60			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for August 08, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for August 8, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	14.7	12.8	88	22	7	24.1	90.30			Mostly Cloudy
01:00	15.2	12.9	86		0	24.1	90.26			Cloudy
02:00	14.6	12.7	88	27	7	24.1	90.36			Cloudy
03:00	14.7	11.1	79	31	11	16.1	90.47			Rain
04:00	14.1	12.2	88		0	24.1	90.47			Cloudy
05:00	13.9	11.1	83	33	11	16.1	90.54			Rain
06:00	13.4	11.6	89	33	9	24.1	90.63			Rain
07:00	12.3	10.3	88		0	16.1	90.67			Rain
08:00	12.9	10.9	88		0	16.1	90.66			Rain
09:00	13.3	11.1	87		0	16.1	90.73			Cloudy
10:00	14.8	11.2	79	33	6	24.1	90.79			Cloudy
11:00	15.7	12.3	80	32	6	16.1	90.81			Rain Showers
12:00	15.8	11.1	74	35	11	24.1	90.82			Cloudy
13:00	15.3	10.1	71	1	19	24.1	90.85			Cloudy
14:00	14.3	9.5	73	2	15	24.1	90.90			Cloudy
15:00	13.3	8.9	75	36	24	24.1	90.91			Cloudy
16:00	13.3	9.3	77	2	13	24.1	90.94			Cloudy
17:00	12.7	9.7	82	2	9	19.3	90.98			Rain Showers
18:00	12.1	9.9	86	4	13	19.3	91.00			Cloudy
19:00	11.6	9.9	89	3	9	16.1	90.99			Rain Showers
20:00	10.9	9.1	89	1	19	19.3	91.02			Cloudy
21:00	10.2	8.6	90	35	9	16.1	91.13			Rain Showers
22:00	9.9	8.5	91	1	19	24.1	91.11			Rain
23:00	10.1	8.7	91	1	9	24.1	91.14			Rain

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for August 15, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for August 15, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	8.4	6.4	87	20	6	24.1	91.30			Clear
01:00	8.5	6.4	87	25	6	24.1	91.31			Clear
02:00	8.2	6.0	86		0	24.1	91.36			Clear
03:00	6.8	5.1	89		0	24.1	91.39			Mainly Clear
04:00	6.9	5.6	91		0	24.1	91.41			Clear
05:00	5.6	4.3	91		0	24.1	91.43			Clear
06:00	5.6	4.6	93	20	6	24.1	91.45			Clear
07:00	8.4	6.9	90	22	9	24.1	91.47			Clear
08:00	11.7	8.8	82		0	24.1	91.50			Clear
09:00	14.7	9.7	72		0	24.1	91.52			Clear
10:00	17.8	9.7	59	4	7	24.1	91.52			Clear
11:00	18.2	7.2	49		0	24.1	91.51			Clear
12:00	18.7	7.8	49	12	7	24.1	91.48			Mainly Clear
13:00	20.4	7.5	43	23	7	24.1	91.46			Mainly Clear
14:00	21.3	7.6	41		0	24.1	91.46			Mainly Clear
15:00	20.6	8.0	44		0	24.1	91.45			Mainly Clear
16:00	21.1	7.8	42		0	24.1	91.43			Mainly Clear
17:00	20.8	8.6	45	5	13	24.1	91.43			Mainly Clear
18:00	20.6	8.7	46	6	11	24.1	91.40			Clear
19:00	19.7	9.8	53	6	13	24.1	91.41			Mainly Clear
20:00	16.6	10.4	67	5	13	24.1	91.42			Mainly Clear
21:00	14.3	9.7	74	7	9	24.1	91.48			Mainly Clear
22:00	13.8	8.9	72	7	6	24.1	91.50			Mostly Cloudy
23:00	14.2	9.1	71		0	24.1	91.53			Mostly Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

[français] [Back]

Hourly Data Report for August 22, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for August 22, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	11.8	6.2	69	29	19	24.1	91.18			Cloudy
01:00	12.0	8.2	78	28	22	24.1	91.18			Cloudy
02:00	11.3	5.0	65	30	9	24.1	91.19			Mostly Cloudy
03:00	10.8	7.6	81	28	11	24.1	91.19			Mostly Cloudy
04:00	10.6	7.2	79	30	15	24.1	91.21			Mostly Cloudy
05:00	10.2	6.6	78	29	11	24.1	91.24			Mostly Cloudy
06:00	9.8	6.1	78	28	11	24.1	91.28			Mostly Cloudy
07:00	10.6	6.5	76	30	13	24.1	91.29			Mostly Cloudy
08:00	12.3	7.6	73	32	22	24.1	91.31			Mostly Cloudy
09:00	13.3	8.2	71	34	19	24.1	91.30			Mostly Cloudy
10:00	14.2	8.5	69	31	19	24.1	91.32			Mostly Cloudy
11:00	14.5	8.8	69	32	19	24.1	91.33			Mostly Cloudy
12:00	15.4	8.6	64	32	15	24.1	91.32			Mostly Cloudy
13:00	16.1	7.9	58	33	17	24.1	91.30			Mostly Cloudy
14:00	17.0	8.6	58	34	19	24.1	91.29			Mostly Cloudy
15:00	16.6	8.1	57	33	22	24.1	91.29			Mostly Cloudy
16:00	17.3	8.4	56	34	24	24.1	91.26			Mostly Cloudy
17:00	16.1	8.8	62	36	9	24.1	91.27			Mostly Cloudy
18:00	12.9	8.0	72	27	9	24.1	91.28			Mostly Cloudy
19:00	13.5	9.5	77	25	7	24.1	91.27			Mostly Cloudy
20:00	11.1	8.9	86	26	9	24.1	91.29			Mostly Cloudy
21:00	11.0	8.9	87	28	7	24.1	91.31			Mostly Cloudy
22:00	11.0	8.8	86	28	7	24.1	91.32			Mostly Cloudy
23:00	11.4	8.7	83		0	24.1	91.33			Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for August 29, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for August 29, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	8.0	4.5	79	5	4	24.1	91.57			Mainly Clear
01:00	8.7	4.1	73	14	4	24.1	91.53			Mostly Cloudy
02:00	8.2	3.9	74	17	7	24.1	91.50			Mainly Clear
03:00	6.6	4.1	84	17	9	24.1	91.47			Mainly Clear
04:00	6.9	4.1	82	20	6	24.1	91.44			Clear
05:00	6.1	3.7	85	20	6	24.1	91.40			Clear
06:00	4.5	2.5	87	23	6	24.1	91.38			Mainly Clear
07:00	6.9	5.0	88		0	24.1	91.43			Mostly Cloudy
08:00	8.2	6.2	87	21	7	24.1	91.43			Mostly Cloudy
09:00	10.4	7.3	81		0	24.1	91.43			Cloudy
10:00	14.2	8.4	68		0	24.1	91.41			Mostly Cloudy
11:00	16.2	8.3	59		0	24.1	91.40			Mostly Cloudy
12:00	18.8	8.0	49		0	24.1	91.38			Mainly Clear
13:00	20.5	6.4	40		0	24.1	91.34			Mainly Clear
14:00	21.0	6.0	38	27	4	24.1	91.31			Mainly Clear
15:00	22.2	8.9	43	14	4	24.1	91.28			Mainly Clear
16:00	22.0	8.3	41	18	6	24.1	91.26			Mostly Cloudy
17:00	21.7	9.3	45		0	24.1	91.23			Mostly Cloudy
18:00	21.7	9.5	46		0	24.1	91.22			Mostly Cloudy
19:00	19.6	11.1	58	7	7	24.1	91.23			Mainly Clear
20:00	16.5	10.8	69		0	24.1	91.25			Mainly Clear
21:00	13.4	9.3	76		0	24.1	91.27			Clear
22:00	11.9	9.4	85		0	24.1	91.29			Clear
23:00	10.7	8.3	85		0	24.1	91.28			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for September 05, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for September 5, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	9.8	7.7	87		0	24.1	90.86			Mainly Clear
01:00	9.1	7.2	88		0	24.1	90.91			Mostly Cloudy
02:00	9.1	7.1	87		0	24.1	90.90			Mainly Clear
03:00	8.0	6.5	90		0	24.1	90.93			Mainly Clear
04:00	8.0	6.7	91		0	24.1	90.92			Mainly Clear
05:00	8.4	7.2	92	22	6	24.1	90.93			Mostly Cloudy
06:00	9.8	8.4	91	19	4	24.1	90.93			Mostly Cloudy
07:00	10.2	8.8	91	21	4	24.1	90.94			Mostly Cloudy
08:00	11.4	9.5	88	23	4	24.1	90.93			Mostly Cloudy
09:00	13.9	10.7	81	16	4	24.1	90.87			Mainly Clear
10:00	17.5	7.7	53	17	9	24.1	90.83			Mostly Cloudy
11:00	18.7	9.5	55	17	24	24.1	90.75			Mostly Cloudy
12:00	19.6	9.4	52	18	15	24.1	90.68			Mostly Cloudy
13:00	20.4	6.4	40	17	6	24.1	90.61			Mostly Cloudy
14:00	21.5	8.3	43	30	9	24.1	90.54			Mostly Cloudy
15:00	21.3	7.3	40		0	24.1	90.48			Mostly Cloudy
16:00	20.9	8.0	43		0	24.1	90.42			Cloudy
17:00	20.6	8.2	45		0	24.1	90.41			Cloudy
18:00	18.5	11.1	62	2	6	24.1	90.39			Cloudy
19:00	17.8	9.4	58	36	11	24.1	90.39			Cloudy
20:00	13.7	7.4	66	1	43	24.1	90.53			Cloudy
21:00	11.6	7.7	77	2	28	24.1	90.63			Cloudy
22:00	11.1	7.8	80	36	11	24.1	90.70			Cloudy
23:00	11.1	7.4	78	36	7	24.1	90.70			Cloudy

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for September 08, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m

Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for September 8, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	4.0	2.3	89	21	11	24.1	91.95			Clear
01:00	3.6	2.3	91	25	13	24.1	91.98			Clear
02:00	3.8	2.1	89	24	6	24.1	92.00			Mainly Clear
03:00	4.0	1.9	86	25	7	24.1	92.03			Clear
04:00	3.3	1.3	87	24	11	24.1	92.03			Clear
05:00	2.6	0.8	88		0	24.1	92.06			Clear
06:00	1.9	0.4	90		0	24.1	92.10			Mainly Clear
07:00	2.4	1.0	90	18	6	24.1	92.15			Mostly Cloudy
08:00	5.7	3.4	85	24	7	24.1	92.17			Mostly Cloudy
09:00	7.1	4.7	85		0	24.1	92.18			Mainly Clear
10:00	9.9	5.3	73	27	9	24.1	92.18			Mostly Cloudy
11:00	11.7	4.2	60	27	9	24.1	92.18			Mostly Cloudy
12:00	12.0	4.0	58	32	9	24.1	92.16			Mostly Cloudy
13:00	12.7	4.3	57	32	6	24.1	92.13			Mainly Clear
14:00	10.2	3.4	63	2	19	24.1	92.12			Mostly Cloudy
15:00	12.7	3.6	54	5	6	24.1	92.07			Mostly Cloudy
16:00	13.0	4.2	55	33	9	24.1	92.07			Mostly Cloudy
17:00	8.3	5.7	84	32	22	16.1	92.23			Thunderstorms, Rain Showers
18:00	8.3	6.0	85		0	24.1	92.21			Mostly Cloudy
19:00	7.9	5.8	87		0	24.1	92.21			Mostly Cloudy
20:00	5.1	3.8	91	25	9	24.1	92.27			Mostly Cloudy
21:00	7.1	4.5	84		0	24.1	92.29			Mostly Cloudy
22:00	4.1	2.8	91	25	9	24.1	92.27			Mainly Clear
23:00	3.7	2.5	92	24	15	24.1	92.29			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map

Environment Canada Environnement Canada

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Hourly Data Report for September 09, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

RED DEER A
ALBERTA

Latitude: 52° 10.800' N Longitude: 113° 53.400' W Elevation: 904.60 m
Climate ID: 3025480 WMO ID: 71878 TC ID: YQF

Hourly Data Report for September 9, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	3.8	2.4	91	26	15	24.1	92.29			Clear
01:00	3.0	1.7	91	24	9	24.1	92.26			Clear
02:00	2.3	1.0	91	21	4	24.1	92.25			Clear
03:00	1.9	0.9	93	19	4	24.1	92.22			Clear
04:00	1.3	0.2	92	20	4	24.1	92.19			Clear
05:00	0.9	-0.2	92	19	6	24.1	92.18			Clear
06:00	1.1	-0.1	92	20	7	24.1	92.16			Mainly Clear
07:00	1.3	-0.1	90	20	6	24.1	92.14			Mainly Clear
08:00	4.5	2.2	85	20	6	24.1	92.13			Mostly Cloudy
09:00	6.9	3.7	80	18	9	24.1	92.09			Mostly Cloudy
10:00	11.0	5.6	69	19	7	24.1	92.03			Mainly Clear
11:00	13.7	4.0	52	19	15	24.1	91.95			Mainly Clear
12:00	15.0	2.7	44	19	13	24.1	91.89			Mostly Cloudy
13:00	16.0	1.8	38	21	17	24.1	91.80			Mostly Cloudy
14:00	16.8	2.4	38	21	15	24.1	91.73			Mainly Clear
15:00	17.0	2.4	37	24	6	24.1	91.68			Mainly Clear
16:00	17.3	1.2	34	20	9	24.1	91.59			Mainly Clear
17:00	17.7	1.0	32	20	4	24.1	91.55			Mainly Clear
18:00	16.6	4.0	43	21	4	24.1	91.51			Mainly Clear
19:00	15.6	4.4	47		0	24.1	91.51			Mostly Cloudy
20:00	12.8	6.5	65	19	6	24.1	91.51			Mostly Cloudy
21:00	11.6	7.1	74	21	6	24.1	91.51			Mostly Cloudy
22:00	10.0	4.3	68	24	13	24.1	91.51			Mainly Clear
23:00	9.6	3.8	67	25	15	24.1	91.54			Clear

Legend

M = Missing
E = Estimated
NA = Not Available

Navigation Options

Canada Map
Alberta Map






Sylvan Lake Quiet Enjoyment Initiative (QEI) Comments on Report

From:	Lylelanding@aol.com
Sent:	October-29-15 2:56 PM
To:	Ken Wigmore; Keith Stephenson; Info @ lacombecounty.com
Cc:	strathdeeg@shaw.ca; Cajun Paradis; plodemeier@lacombecounty.com; lylelanding@aol.com
Subject:	RE; Recommendation for Sylvan Lake Access Report from Quiet Enjoyment Initiative
Attachments:	QEI REcommendation for Sylvan Lake Access Strategy Report.rtf

To Ken Wigmore, Chairman, Sylvan Lake Access Committee 2015
Keith Stephenson, Chairman, Sylvan Lake Management Committee

Attached is a thoughtful and strategic recommendation from the Sylvan Lake Quiet Enjoyment Initiative (QEI) Committee, an initiative of the Sylvan Lake Watershed Stewardship Society, for the Sylvan Lake Access Strategy Report. Should your committees and the consultants agree, we suggest this recommendation be added to the consultant's Access Report before the final edition is printed or capture it in some alternative and effective manner for future reference.

We have not had the benefit of reading the consultant's report as it is our information that it has not been released to the public yet.

We would be pleased to discuss any/all of the attached recommendations.

Thank you for your consideration.

Kent Lyle Chairman,
Sylvan Lake Quiet Enjoyment Initiative

lylelanding@aol.com
Res: 403 887 5416
Cell: 403 597 5416

Sylvan Lake Watershed Stewardship Society

Quiet Enjoyment Initiative

301 Honeymoon Drive, SV Norglenwold, AB, T4S 1S5

October 29, 2015

Attention:
Ken Wigmore, Chairman, Sylvan Lake Access Study Committee
Keith Stephenson, Chairman, Sylvan Lake Management Committee

Re: Sylvan Lake Boat Launch Access Strategy and Action Plan for Recreational Lake Access Report

As Chairman of the Sylvan Lake Quiet Enjoyment Initiative (QEI), I am writing to you to ask for the inclusion of an important concept for the access study report noted above. The QEI is an initiative of the Sylvan Lake Watershed Stewardship Society (SLWSS).

Apparently, the Access Strategy Report has not been released to the public yet. However, it is my understanding that one of the goals of the report was to identify the suitability of selected and qualified sites, if any, for motorized boat launching, and to provide a template or baseline of how to develope/manage a suitable motorized boat access site should one or more be developed in the future.

Without the benefit of reading the report or a summary, the QEI Committee recommends that any motorized site, existing or new, should be built and managed to be *controlled*. By controlled it is meant that a motorized boat launch site should be controlled by 'gatekeepers' who would control the launching of motorized boats into the lake only during certain community-agreed hours and only after meeting certain requirements. At all other times the site would be closed to boaters launching or landing by gates and appropriate fencing. (This is how the Marina in the Town of Sylvan Lake manages its boat launch.)

The potential advantages of controlled access points are important and numerous and include:

- Enforcement of federal regulations regarding safety issues requiring various items to be on board such as life jackets, paddles, bailers, fire extinguishers, whistles or horns and extra lines
- Invasive species - checking for and identifying a potential problem.
- Ensuring there is no liquor on board
- Recording registration numbers of the hauling vehicle, trailer, and boat and confirming driver's licences and a valid operator's card for the boat driver
- Ensuring that the boat complies with Federal regulations required for on-board noise abatement systems and that a muffler by-pass has not been installed

- The use of moral suasion to keep music levels at reasonable levels so as to not interfere with the quiet enjoyment of the lake by all other lake users and nearby residents. (Currently there are no regulations relating to loud music on the lake - federal, provincial or municipal which allows for significant abuse by playing very loud 'music' on expensive sound systems by some who apparently feel a sense of entitlement.)
- Distribution of printed material to boaters as appropriate from time to time
- Reporting of offenders or bad behavior to appropriate authorities
- Controlling reasonable hours for motorized boating on the lake

A controlled lake access site generally requires a launch fee. The fee should be set at an amount that collectively, over the course of the boating season, will, more or less, cover the annual costs of operating the launch site. It is a user-pay principle. The gatekeeper would collect the launch fee.

If this suggestion could be incorporated into the Access Report it would be captured for future reference as it may be useful in the future at the design stage of any new facility and could also be considered for application to existing facilities. It is understood that many issues and details would have to be resolved by the lake community upon implementation which may be a role for the SLMC.

We are available to expand on these suggestions if asked.

We look forward to reviewing the final Access Report when it is released for the public.

Yours sincerely,

Kent Lyle
Chairman, Sylvan Lake Quiet Enjoyment Initiative
Former President, Sylvan Lake Watershed Stewardship Society
Former Mayor, Summer Village of Norglenwold

cc: Graeme Strathdee, President, Sylvan Lake Watershed Stewardship Society
Cajun Paradis, Access Committee Coordinator and Planner/Development Officer, Lacombe County
Phil Lodermeier, Manager of Operations, Lacombe County

"Those who do not create the future they want must endure the future they get."
Draper Koffman