City of Cold Lake
Highway 28 Functional Design

FINAL REPORT

Volume 2 of 2
Appendices

Prepared for:
City of Cold Lake

Prepared by:
Stantec Consulting Ltd.

December 9, 2015

Appendix A – TAC Figures

to design speed, traffic volume and cut or fill slope values; and Table 3.1.3.2 providing adjustment factors to be applied on the outside of curves where radius values are 900 m or less. The numbers from Table 3.1.3.1 are taken from the 1996 AASHTO Roadside Design Guide, and suggest only the approximate centre of a range to be considered and not a precise distance to be held as absolute since designers must consider site specific conditions and practicality in making their choice.

Adjusted clear zone distance on outside of curvature:

$$CZ_c = (L_c)\ (K_{cz}) \qquad (3.3.2)$$

Where CZ_c = adjusted clear zone distance on outside of curvature (m)

L_c = clear zone distance (m) (from Table 3.1.3.1)

K_{cz} = curve adjustment factor (from Table 3.1.3.2)

Design Domain: Application Heuristics

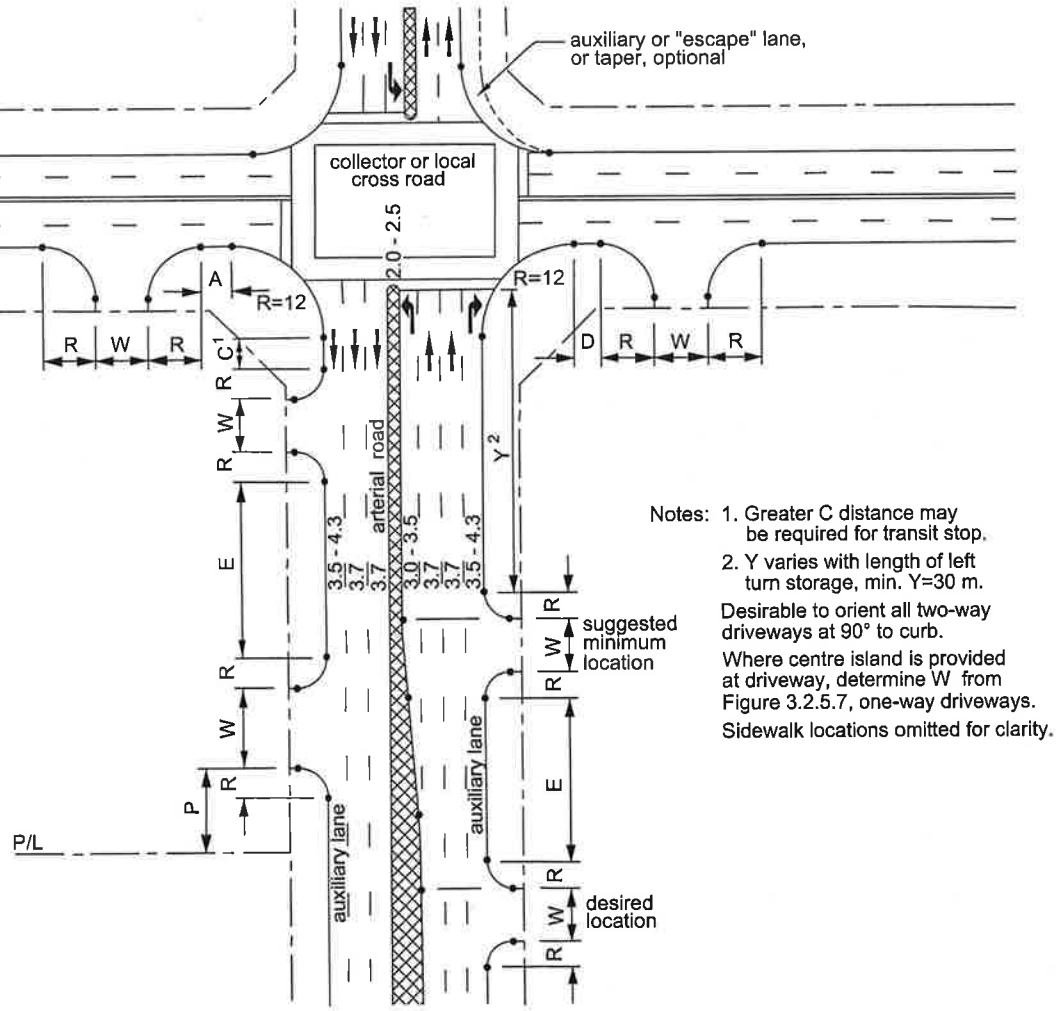
The quantitative elements of the clear zone design must not be used in isolation. As AASHTO stresses, they are neither an absolute nor a precise measure of the degree of safety suggested for a particular roadside. Nor are they

Table 3.1.3.1 Clear Zone Distances (m)

Design Speed (km/h)	Design ADT	Fill Slopes 6:1 or flatter	Fill Slopes 5:1 to 4:1	Fill Slopes 3:1	Cut Slopes 3:1	Cut Slopes 5:1 to 4:1	Cut Slopes 6:1 or flatter
≤60	< 750	2.0 - 3.0	2.0 - 3.0	see note	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
	750 - 1500	3.0 - 3.5	3.5 - 4.5	see note	3.0 - 3.5	3.0 - 3.5	3.0 - 3.5
	1500 - 6000	3.5 - 4.5	4.5 - 5.0	see note	3.5 - 4.5	3.5 - 4.5	3.5 - 4.5
	>6000	4.5 - 5.0	5.0 - 5.5	see note	4.5 - 5.0	4.5 - 5.0	4.5 - 5.0
70 - 80	< 750	3.0 - 3.5	3.5 - 4.5	see note	2.5 - 3.0	2.5 - 3.0	3.0 - 3.5
	750 - 1500	4.5 - 5.0	5.0 - 6.0	see note	3.0 - 3.5	3.5 - 4.5	4.5 - 5.0
	1500 - 6000	5.0 - 5.5	6.0 - 8.0	see note	3.5 - 4.5	4.5 - 5.0	5.0 - 5.5
	>6000	6.0 - 6.5	7.5 - 8.5	see note	4.5 - 5.0	5.5 - 6.0	6.0 - 6.5
90	< 750	3.5 - 4.5	4.5 - 5.5	see note	2.5 - 3.0	3.0 - 3.5	3.0 - 3.5
	750 - 1500	5.0 - 5.5	6.0 - 7.5	see note	3.0 - 3.5	4.5 - 5.0	5.0 - 5.5
	1500 - 6000	6.0 - 6.5	7.5 - 9.0	see note	4.5 - 5.0	5.0 - 5.5	6.0 - 6.5
	>6000	6.5 - 7.5	8.0 - 10.0	see note	5.0 - 5.5	6.0 - 6.5	6.5 - 7.5
100	< 750	5.0 - 5.5	6.0 - 7.5	see note	3.0 - 3.5	3.5 - 4.5	4.5 - 5.0
	750 - 1500	6.0 - 7.5	8.0 - 10.0	see note	3.5 - 4.5	5.0 - 5.5	6.0 - 6.5
	1500 - 6000	8.0 - 9.0	10.0 - 12.0	see note	4.5 - 5.5	5.5 - 6.5	7.5 - 8.0
	>6000	9.0 - 10.0	11.0 - 13.5	see note	6.0 - 6.5	7.5 - 8.0	8.0 - 8.5
≥110	< 750	5.5 - 6.0	6.0 - 8.0	see note	3.0 - 3.5	4.5 - 5.0	4.5 - 4.9
	750 - 1500	7.5 - 8.0	8.5 - 11.0	see note	3.5 - 5.0	5.5 - 6.0	6.0 - 6.5
	1500 - 6000	8.5 - 10.0	10.5 - 13.0	see note	5.0 - 6.0	6.5 - 7.5	8.0 - 8.5
	>6000	9.0 - 10.5	11.5 - 14.0	see note	6.5 - 7.5	8.0 - 9.0	8.5 - 9.0

Note: Since recovery is less likely on the unshielded, traversable 3:1 slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high-speed vehicles that encroach beyond the edge of the shoulder may be expected to occur beyond the toe of slope (see heuristics section for additional discussion).

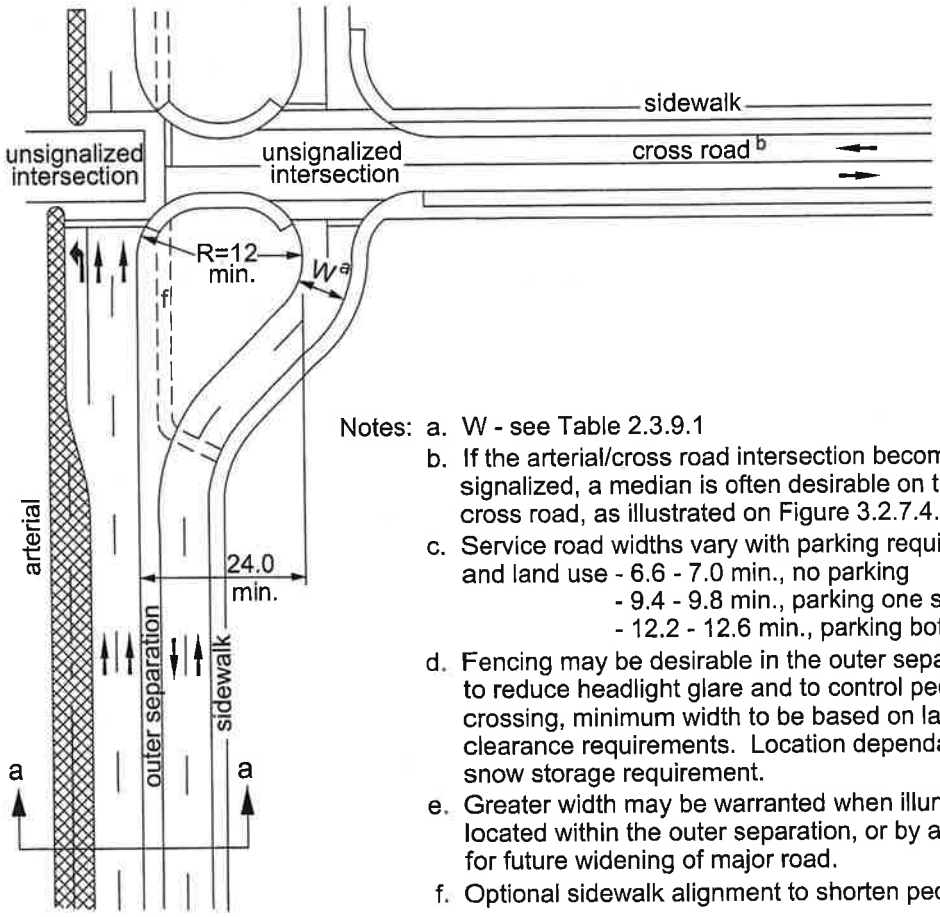
Figure 3.2.5.6 Simple Radius Intersection Arrangement with Two-Way Accesses Along Auxiliary Lane of a Divided Arterial



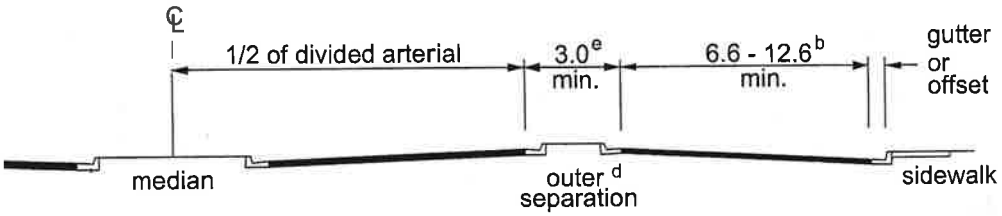
typical dimensions			
criteria	dimension ref.	commercial	industrial
width	W	7.2 to 12.0 m	9.0 to 15.0 m
right-turn radius	R[a]	4.5 to 12.0 m	6.0 to 15.0 m
minimum spacing			
-from property line	P[b]	≥ R	≥ R
-from street corner			
• far side	C	5.0 m	5.0 m
• cross street approach	A[c,d]	5.0 m	5.0 m
• cross street departure	D[d]	5.0 m	5.0 m
-between driveways	E	20.0 m	20.0 m

Notes: a. Values at or near the high end of the range to be used for major generator driveways and where trucks turn.
b. Also established in consideration of the distance to the first driveway on the adjacent property.
c. If the cross road is divided, the driveway is normally located in advance of the cross road left-turn bay.
d. If intersection is signalized, greater dimension suggested- refer to Figure 3.2.8.2

Figure 3.2.7.3 Two-Way Service Road / Cross Road Intersection Treatment, Cross Road Volumes ≤ 2000 veh/d, Unsignalized Intersection



Notes:
a. W - see Table 2.3.9.1
b. If the arterial/cross road intersection becomes signalized, a median is often desirable on the cross road, as illustrated on Figure 3.2.7.4.
c. Service road widths vary with parking requirements and land use - 6.6 - 7.0 min., no parking
- 9.4 - 9.8 min., parking one side
- 12.2 - 12.6 min., parking both sides.
d. Fencing may be desirable in the outer separation to reduce headlight glare and to control pedestrian crossing, minimum width to be based on lateral clearance requirements. Location dependant on snow storage requirement.
e. Greater width may be warranted when illumination located within the outer separation, or by allowance for future widening of major road.
f. Optional sidewalk alignment to shorten pedestrian route.



typical section a-a

Figure 3.2.7.4 Two-Way Service Road / Cross Road Intersection Treatment, Cross Road Volumes > 2000 veh/d, Signalized Intersection

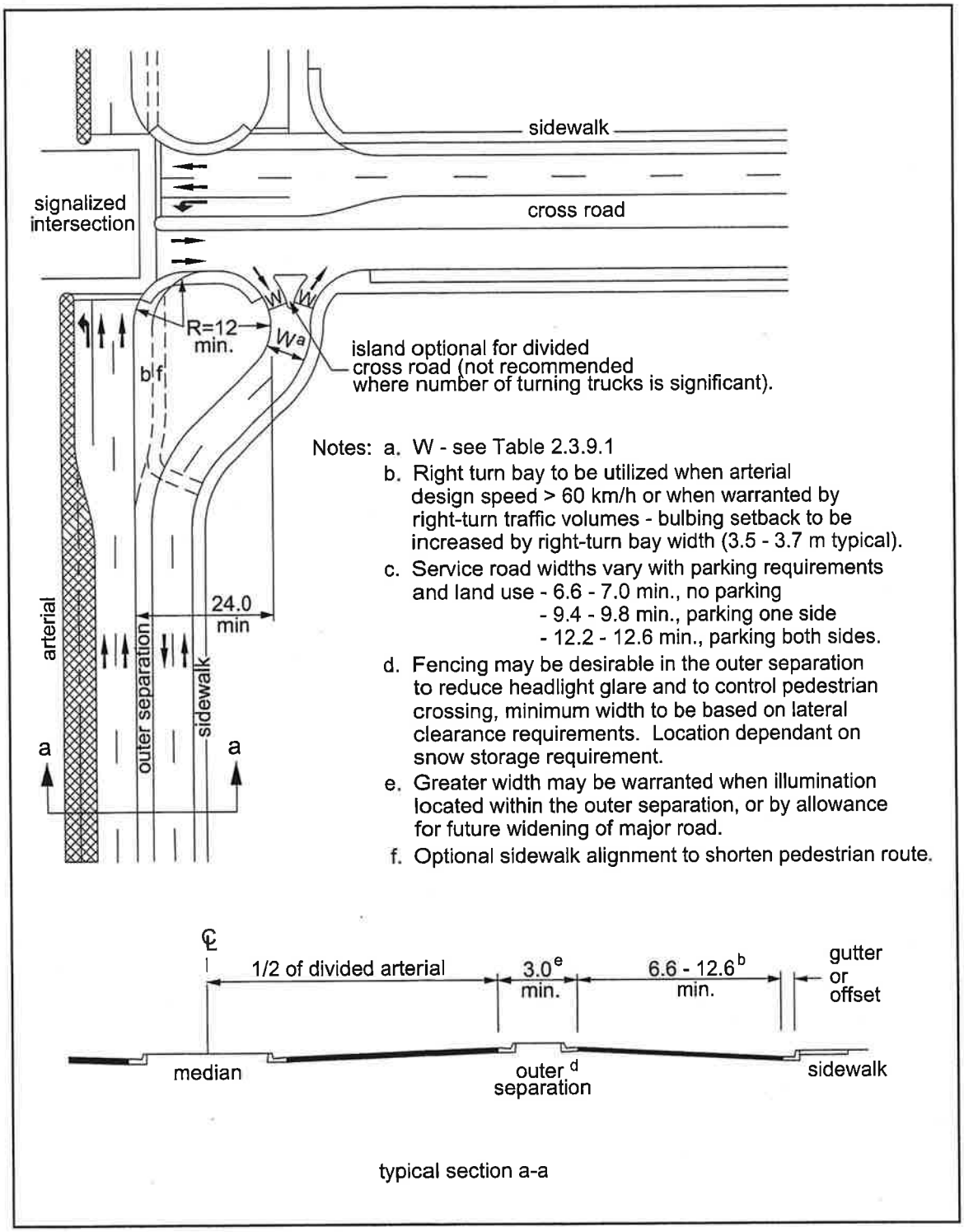
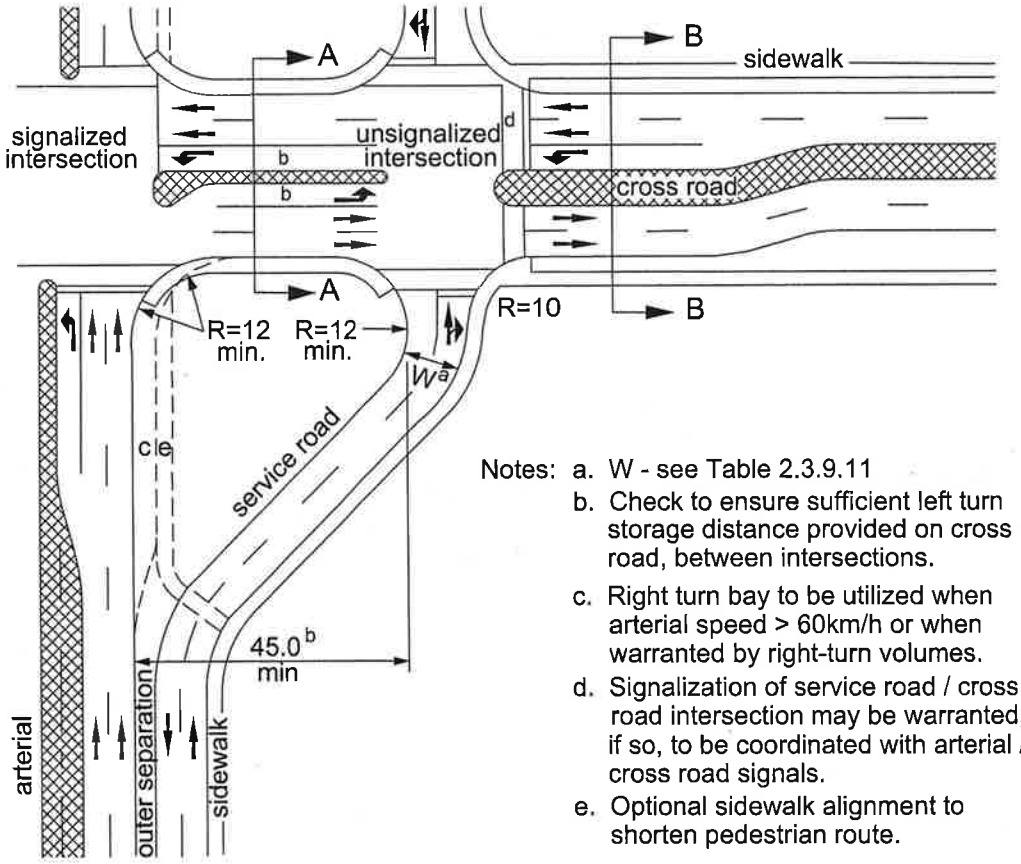
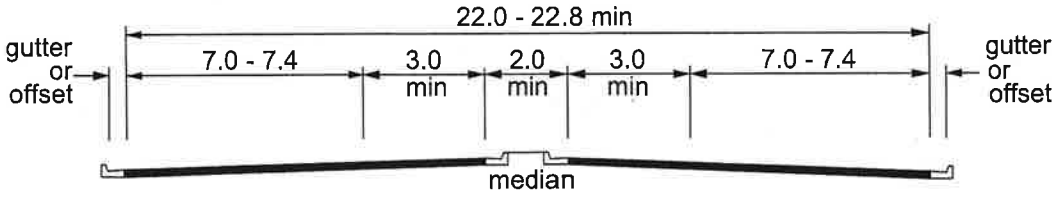


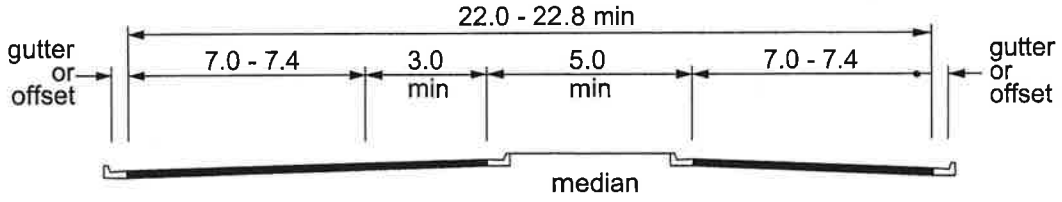
Figure 3.2.7.5 Two-Way Service Road / Cross Road Intersection Treatment, Cross Road Volumes > 5000 veh/d, Signalized Intersection



Notes:
a. W - see Table 2.3.9.11
b. Check to ensure sufficient left turn storage distance provided on cross road, between intersections.
c. Right turn bay to be utilized when arterial speed > 60km/h or when warranted by right-turn volumes.
d. Signalization of service road / cross road intersection may be warranted, if so, to be coordinated with arterial / cross road signals.
e. Optional sidewalk alignment to shorten pedestrian route.



typical section A - A



typical section B - B

typical cross road sections

Appendix B – Historical Resources - Statement of Justification

Statement of Justification for *Historical Resources Act* Requirements for projects other than small-scale oil and gas

This document contains sensitive information about historic resources that are protected under the provisions of the Alberta *Historical Resources Act.* This information is to be used to assist in planning the proposed project only. It is not to be disseminated, and no copies of this document are to be made without written permission of the Historic Resources Management Branch, Alberta Culture.

Project Name or Project Identifier

City of Cold Lake Highway 28 Functional Design (54th Avenue to South City Limits) (the Project)

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Name of client: Amjad Khan
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Fax number: : (780) 594-3480
E-mail address: akhan@coldlake.com

Name of agent: Brad Vander Heyden
Corporate name of agent: Stantec Consulting Ltd.
Address: 1100, 4900-50th St., Red Deer, AB
Phone number: (403) 341-3320
Fax number: (403) 342-0969
E-mail address: Brad.Vanderheyden@Stantec.com

Lands Affected

Legal Description	Land Ownership Type	HRV
SW 26-62-2-W4	Municipal	n/a
NW 26-62-2-W4	Municipal	n/a
SE 27-62-2-W4	Municipal	n/a
NE 27-62-2-W4	Municipal	n/a
SW 35-62-2-W4	Municipal	n/a
NW-35-62-2-W4	Municipal	n/a
SE-34-62-2-W4	Municipal	n/a
NE-34-62-2-W4	Municipal	n/a
SE-3-63-2-W4	Municipal	n/a
NE-3-63-2-W4	Municipal	n/a

Activity type and Anticipated Ground Disturbance

The City of Cold Lake plans to modify the existing Highway 28 into a more functional thoroughfare that will better serve as a major corridor through the growing city. Upgrades to the north end of the highway began in 2009 and are scheduled to be completed this year. This project will improve traffic flow within the remainder of Highway 28, through the City of Cold Lake South, by developing those areas between 54th Avenue to the south city limits into a four-lane standard highway. Anticipated impacts include upgrading those existing sections of undivided two-lane highway into a divided four-lane highway. This expansion will require modifications to the intersection at 50th Avenue and Highway 28, as well as improvements to the service roads paralleling the highway. Anticipated impacts include construction of road beds and related infrastructure, such as sewer lines, facility lines, and parks, along the Highway 28 roadway.

Project size

~4.2 km x 200 m

Existing Disturbance

Road beds, sewer and facility lines, drainage ditches, and parks. A railway line crossed over the existing Highway 28 at the north end of Sections 34 and 35 062-02-W4M, with station grounds originally located within N 34-062-02 W4M, immediately west of the Project area.

Landscape and Environmental Information

The Project is located within the Central Mixedwood Subregion of the Boreal Forest Natural Region (Natural Regions Canada 2006). The Lakeland district has the greatest concentration of lakes in the province. The principal drainage system is the Beaver River, which flows east through the area. Native vegetation varies depending upon soil moisture characteristics. Aspen (*Populus tremuloides*) dominates in most areas with understory plants including bluejoint (*Calamagrostis canadensis*), cream-coloured vetchling (*Lathyrus ochroleucus*), prickly rose (*Rosa acicularis*), bunchberry (*Cornus canadensis*), willows (*Salix* spp.), and saskatoon (*Amelanchier alnifolia*), although in moister areas balsam poplar (*Populus balsamifera*) stands may develop, and in saturated areas black spruce (*Picea mariana*) and Labrador Tea (*Ledum groenlandicum*) forests may develop (Natural Regions Committee 2006). The indigenous fauna in the area includes bison (*Bison bison athabascae*), deer (*Odocoileus* spp.), moose (*Alces alces*), and black bear (*Ursus americanus*) and would have been important to precontact societies. Of the small fur bearing animals, hare (*Lepus americanus*), beaver (*Castor canadensis*), and muskrat (*Ondatra zibethicus*) are the most common. A variety of fish, including northern pike or jackfish (*Esox lucius*), whitefish (*Coregonus* spp.), perch (*Perca flavescens*), burbot (*Lota lota*), and walleye (*Stizostedion vitreum*) are present within the water systems of the area (Natural Resources Canada 2006).

The Project is located north of the Beaver River, through the City of Cold Lake (Photo 1). Over 90% of the Project area has been previously cultivated and/or disturbed. However, portions of undeveloped land exist within the southernmost Project area (Photo 2). Areas within 20 m of the existing Highway 28 have been cleared and modified as ditches; however, aspen/poplar forest exists beyond this buffer in the southern 1.5 km of the Project area. Small seasonal sloughs are identifiable within the low lying lands at the south end of the study area. Where they have not been cleared for agriculture, these sloughs are dominated by alder, surrounded by aspen/poplar forest. Examination of aerial photographs of the region dating back to as early as 1950 show that the lands in the southern portion of the study area were cleared for Highway 28 as of 1950, but surrounding areas have remained largely undisturbed through to the present, especially those on the west side of the highway (AESRD).

An additional drainage was identified immediately beyond the north end of the study area (Photos 3 and 4). The base of this small but deeply incised drainage has been previously modified with a culvert installed for the existing Highway 28, and construction and agriculture have modified the adjacent land within 20 m of the break in slope.

Archaeological Resources

Borden #	HRV	Relationship to activity	Anticipated Impacts
None			

Historic Structure(s)	Anticipated Impacts
None	

Permit Number(s)	Relationship to proposed development footprint
75-022	Overlaps
77-043	Overlaps
79-185	Overlaps
03-070	Overlaps

Illustrative Materials

Figure 1 1:50,000 map showing Palaeontological Resources of the Project area
Figure 2 1:50,000 map showing Archaeological Resources of the Project area
Figure 3 Plan of Township 62, Range 2, West of the Fourth Meridian
Figure 4 Plan of Township 63, Range 2, West of the Fourth Meridian
Photos 1 through 14: Views of the Project area

Evaluation

The Project (Figures 1 and 2) covers portions of five sections of land through the municipal boundary of Cold Lake including Sections 26, 27, 34, and 35-062-02-W4M, and 03-063-02-W4M. Satellite imagery of the Project area from 2011 shows the majority of the proposed development to fall within the area of existing disturbance along Highway 28.

Palaeontology

Bedrock in the development area consists of the Lea Park Formation (Cooper 2000), an upper Cretaceous marine clastic unit of grey shale with minor amounts of silt (Glass 1997). Stringers of very fine grained, light brown sand and clay-ironstone concretions veined with calcite are found throughout the formation. Thin bentonite seams are also interspersed throughout. The Lea Park Formation has yielded abundant foraminiferal and molluscan faunas (Glass 1997). Articulated fish specimens (Wilson 2005, pers. comm.) and other vertebrate material including fish scale debris and disarticulated bones have been collected from the laterally equivalent Labiche Formation (Glass 1997). Invertebrates including ammonites, baculites, inoceramids, oysters, mussels and brackish water clams and snails from the ammonite zones *Dunveganoceras*, *Watinoceras*, *Scaphites* and *Baculites* have also been collected from Smoky Group sediments, a laterally equivalent unit of the Lea Park and Labiche formations (CGKN 2011, Internet site).

Surficial deposits in the development area include glacial till composed of mixed silt, sand and gravel (Fenton and Andriashek 1983). This deposit ranges from 45 to 90 m deep and has low palaeontological potential (Pawlowicz and Fenton 1995). None of the lands within the development area have Historic Resource Values for palaeontology (AC 2012), which indicates low palaeontological potential. Due to thick overlying surficial deposits, bedrock will not be disturbed by construction activities. The potential for impacts to palaeontological resources is considered low. No further palaeontological work or monitoring are recommended.

Archaeology

A desktop review of the development area was conducted, during which the *Listing of Historic Resources* (AC September 2012), historic township plans (Department of the Interior 1912, 1913), aerial photographs (AESRD 1946, 1950, 1952, 1967, 1972, 1977, 1982, 1988, 1993, 1998, 2000, 2011), and survey plans from the development area were consulted to ascertain the Precontact and historic archaeological potential of the location. A field visit to the development area was conducted on October 11, 2012, in order to investigate the extent of existing disturbance and identify any obvious historic resources that may exist within the Project area. This field reconnaissance focused on the lands adjacent to the existing Highway 28, and consisted of a slow-speed drive-by along the existing Highway 28 and adjacent access roads, with a pedestrian transverse of any areas considered to be of high potential due to topography, presence of large trees, or possible historic structures. During the visit it was confirmed that the majority of the Project area is previously disturbed by facilities associated with the existing Highway 28 and associated service roads. Precontact historical resource potential has therefore been largely reduced.

There are no recorded Precontact archaeological sites within one kilometer of the development zone (AC September 2012) (Figure 2). There are some discrete areas of native vegetation remaining within the southern portion of the study area. Topography suitable for camping was noted within the treed areas on the knobby slope within the south end of the study area, in SW-26-062-02-W4M and SE-27-062-02-W4M (Photos 1 and 2). Treed areas were also identified below

this slope; however these lie within the large, wet area identified as a seasonal slough. The archaeological potential for the undisturbed treed areas at the southern end of the Project area is considered to be moderate to high, given the raised landscape and access to water. An HRIA is therefore recommended for any remaining treed areas within SW-26-062-02-W4M and SE-27-062-02-W4M that fall within the development footprint.

All other areas of the Project lie within previously developed lands. There are currently no recorded Historic Structures within the Project area. No trails, settlements or structures are identified directly within the Project area on the early Dominion Land Survey Plans of Townships 062 and 063-02-W4M (Department of the Interior 1912, 1913). However, these maps do show historic trails in proximity to the Project area, reflecting the intensive use of the area during the early Historic Period. A Historic Period trail system leading north from the Beaver River passes through the east half of Sections 26 and 35-062-02-W4M adjacent to the Project area, and crosses though Section 3-063-02-W4M immediately north of the Project area. The close proximity of the development to this early trail network indicates that there is potential for the development area to contain structures from the early Historic Period. In addition, the Canadian National Railway Company's rail line running from St. Walburg to Bonnyville passed through the Project area, crossing what is now Highway 28 between 46 Ave and 47 Ave (CNR 1932). This rail plan was surveyed in 1931 and registered in 1932, with station grounds originally located in N-34-062-02-W4M, west of the Project area. This rail line would also have serviced people in the area.

The local history indicates that the town of Grand Centre was originally established in 1934 (Cherry Grove History Committee 1981:313). According to early air photos of the region, Highway 28 was developed in its current alignment between 1946 and 1950. The original Grand Centre town site, now known as South Cold Lake, was established along what is today 50th Avenue, immediately east of the highway. The majority of the structures within two blocks of the intersection of 50th Avenue and the existing highway were constructed between 1952 and 1967. Of historic concern are the houses on the west side of the highway within the 5100 block of 55th Street and the neighborhood to the north of 47th Avenue on the west side of the highway, which were all constructed prior to 1967, as part of the original expansion of Grand Centre. The Armstrong Heating and Cooling Products building, located at the southwest corner of 51st Avenue and 55A Street (Photo 6), and the original Assumption High School, located south of 50th Avenue, were also constructed by 1967. To the east of the existing Highway 28, the majority of the original construction has been replaced. However, the Electric Services Building, a single house, the fire hall, and the Friendship Centre are exceptions, all of which were constructed prior to 1967 (Photos 8 through 14).

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

The potential for impacts to palaeontological resources is considered low. No further palaeontological work or monitoring are recommended.

An HRIA is recommended for the treed areas within W-26-062-02-W4M and E-27-062-02-W4M. In addition, it is recommended that any structures predating 1965 that are in danger of being impacted by the project be photographed and mapped in detail prior to the commencement of the Project.

Recommendations made by:	**Date:**
Lisa Bohach, Ph.D. (Palaeontology)	November 16, 2012
Andrea DeGagne, M.A. (Archaeology)	

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1950. Aerial Photograph, AS0121-258.

1952. Aerial Photograph, AS0422-173 and AS0424-144.

1967. Aerial Photograph, AS0975-143.

1972. Aerial Photograph, AS1197-266.

1977. Aerial Photograph, AS2972-239.

1982. Aerial Photograph, AS2645-065 and 134.

1988. Aerial Photograph, AS3733-228 and 349.

1993. Aerial Photograph, AS4423-051.

1998. Aerial Photograph, TRSG9803-424.

2000. Aerial Photograph, AS5141-062.

2011. Aerial Photograph, AS5556-177.

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Wilson, M.V.H. 2005. Professor, University of Alberta, Department of Biological Sciences and Laboratory for Vertebrate Paleontology. Email November 29, 2005.

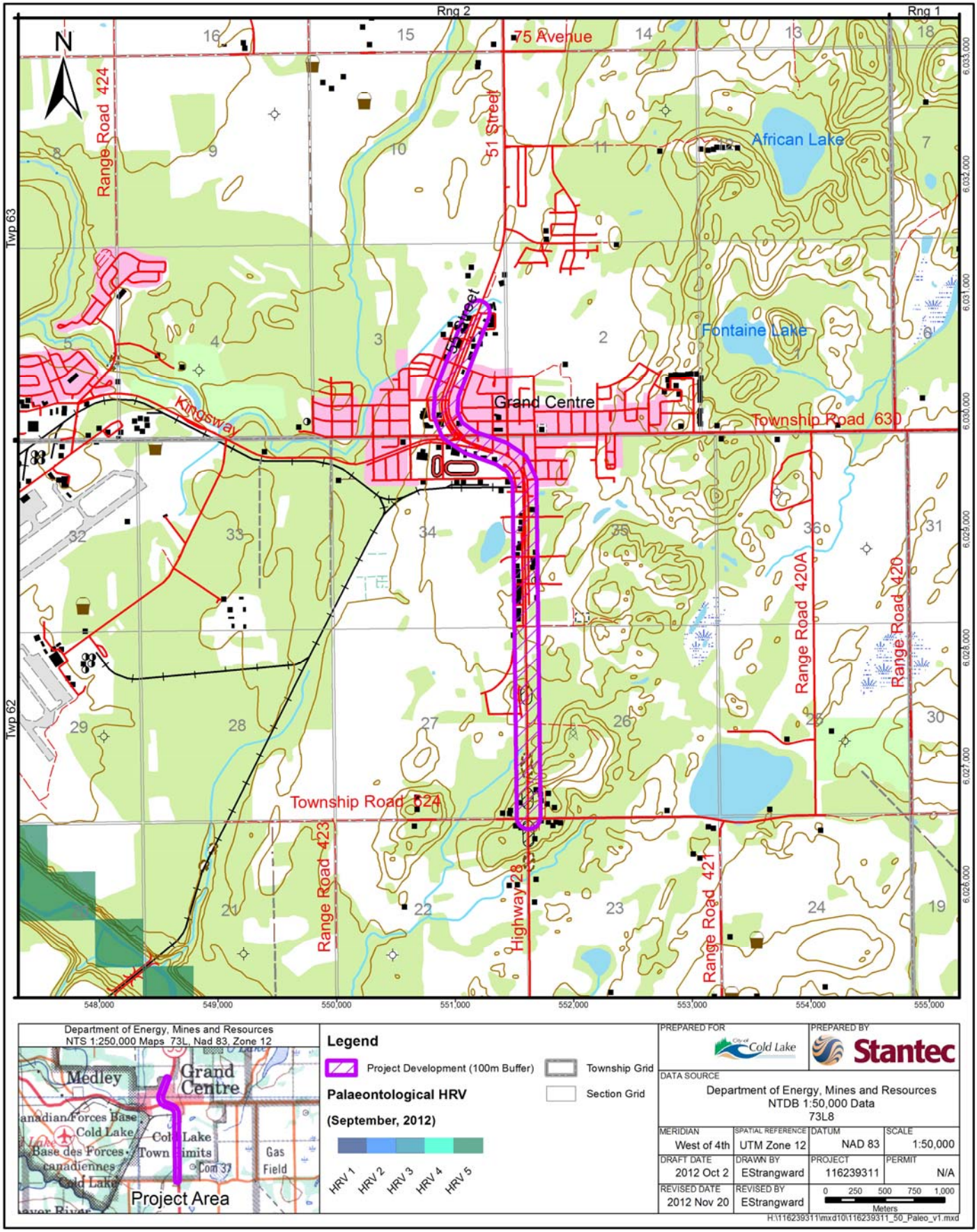


Figure 1 1:50,000 map showing Palaeontological Resources of the Project area.

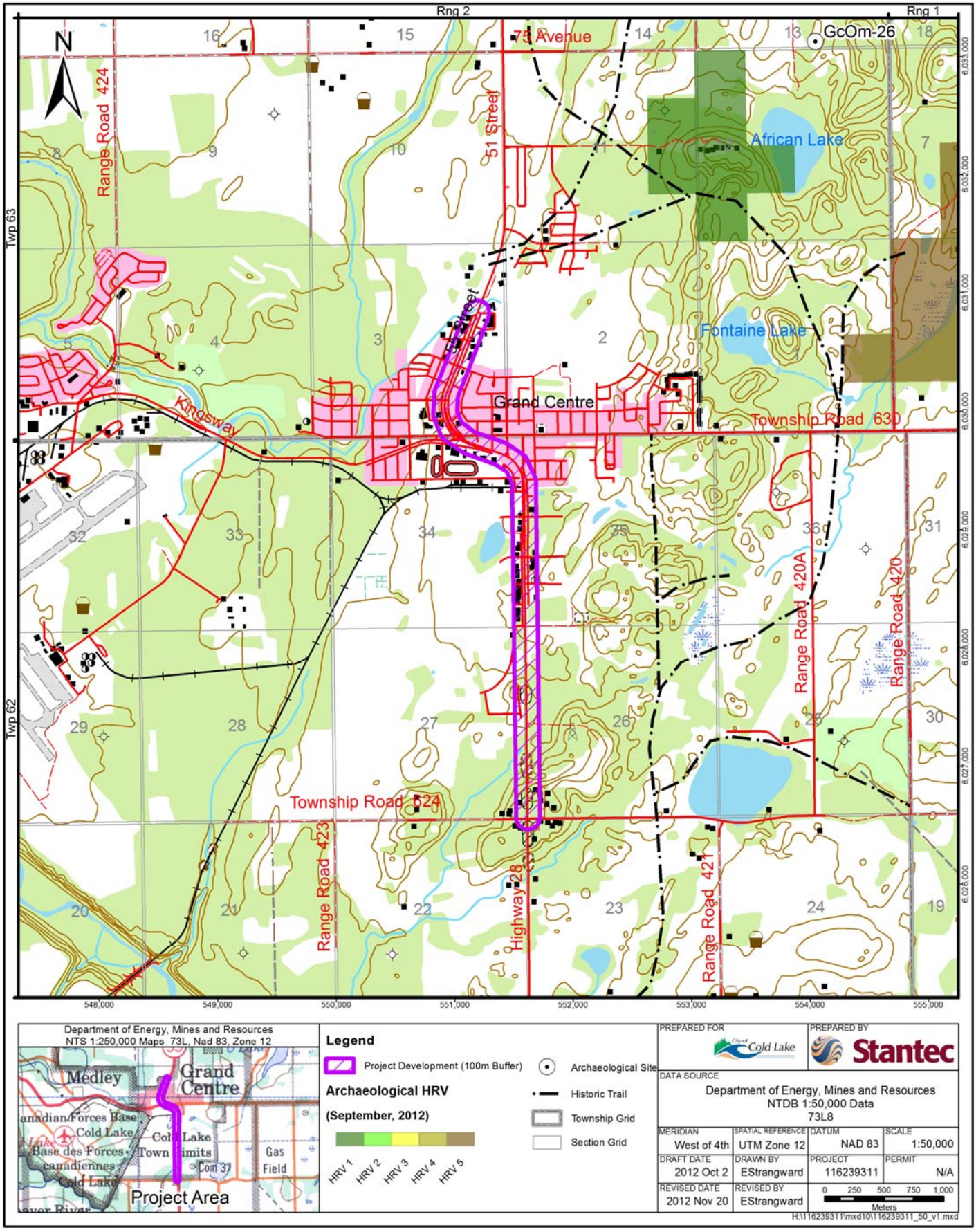
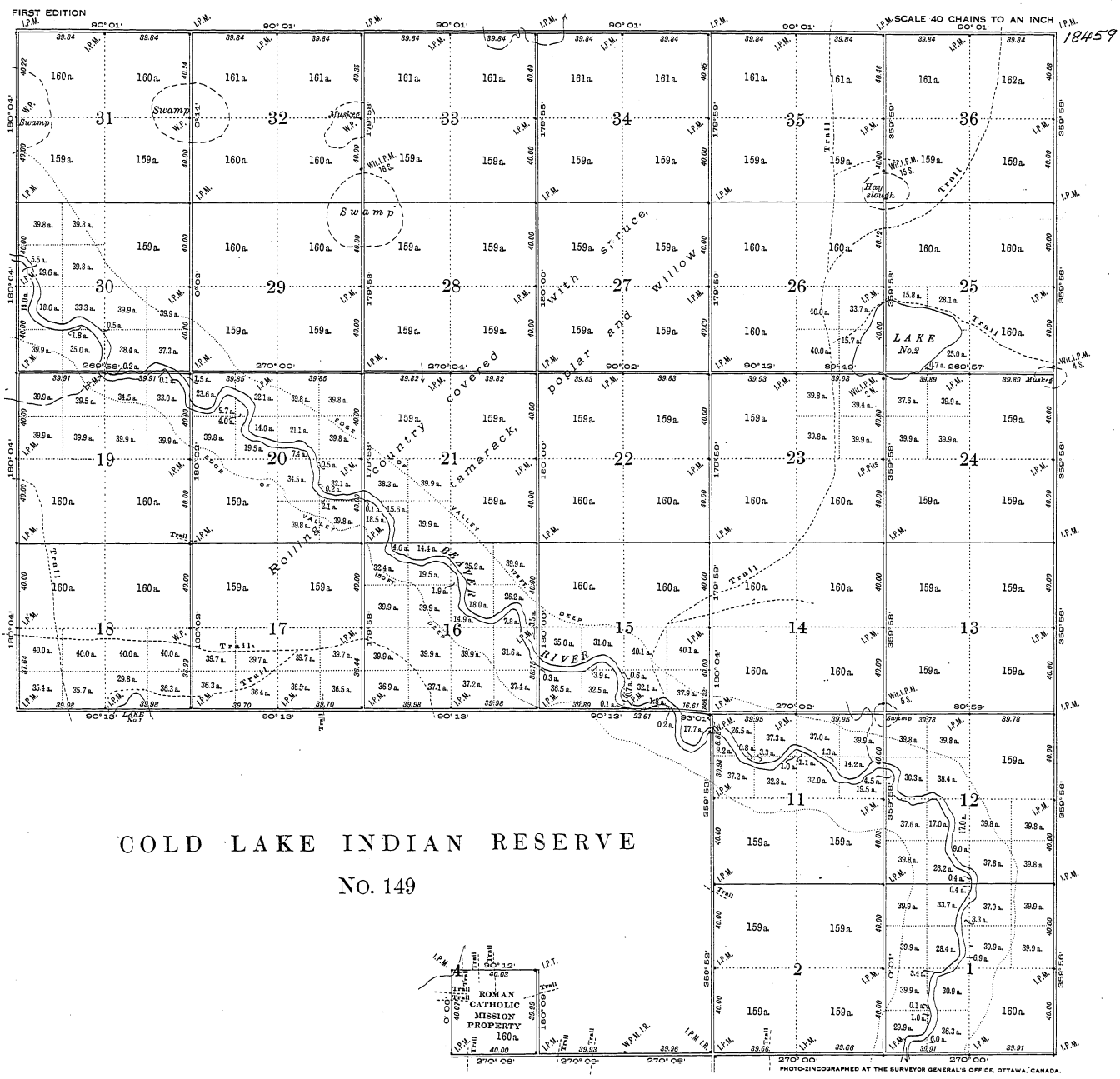


Figure 2 1:50,000 map showing Archaeological Resources of the Project area

Plan of Township 62, Range 2, West of the Fourth Meridian



Compiled from official surveys by

M. W. Hopkins, D.L.S. *4th February, 1909*
G. J. Lonergan, D.L.S. *12th October, 1909*
C. F. Miles, D.L.S. *14th October, 1911*

Areas in acres are marked on all lands surveyed.
Distances are in chains.
Bearings are reckoned from the astronomical meridian through the centre of the township.
Areas are taken to the banks of Beaver river.
Monuments around Roman Catholic Mission property are marked "M"

Department of the Interior, Ottawa, 25th May, 1912.

Approved and Confirmed.

E. Deville

Surveyor General.

Figure 3 Plan of Township 62, Range 2, West of the Fourth Meridian

ALBERTA

Plan of Township 63, Range 2, West of the Fourth Meridian

FIRST EDITION

SCALE 40 CHAINS TO AN INCH

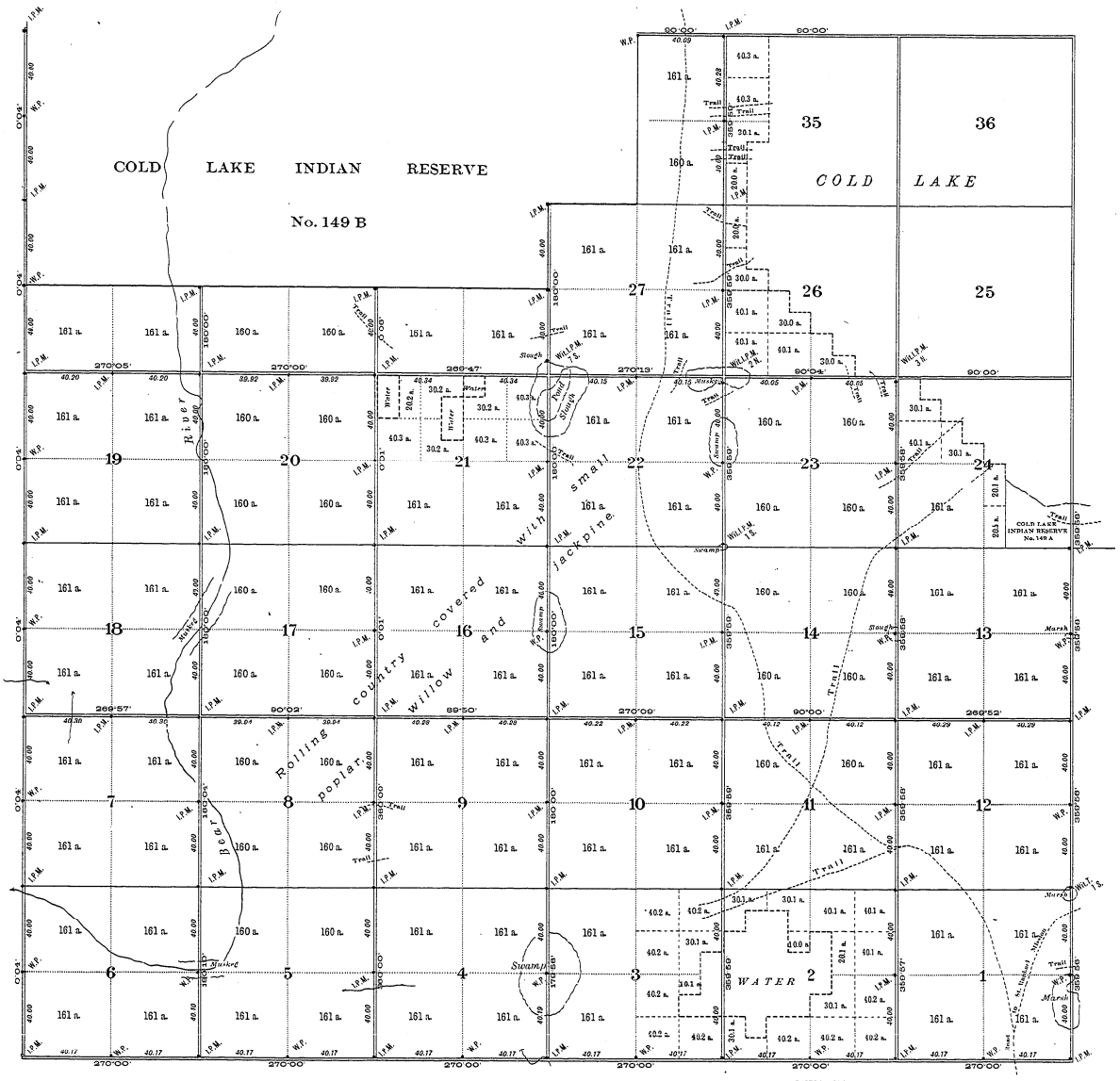


PHOTO-ZINCOGRAPHED AT THE SURVEYOR GENERAL'S OFFICE, OTTAWA, CANADA.

Compiled from official surveys by
L. E. Fontaine, D.L.S. *22nd August,* 1900
M. W. Hopkins, D.L.S. *30th January,* 1909

DIAGRAM SHOWING THE NUMBERING OF LEGAL SUB-DIVISIONS IN A SECTION.

13	14	15	16
12	11	10	9
5	6	7	8
4	3	2	1

NOTE: The subdivisions of quarter sections shown upon this plan are legal subdivisions and quarters of legal subdivisions. Areas in acres are marked on all lands surveyed, except lands of which more than one-half is reported to be permanently under water. Distances are in chains. Bearings are reckoned from the astronomical meridian through the centre of the township.

Department of the Interior, Ottawa, 22nd May, 1913.

Approved and Confirmed.

E. Deville

Surveyor General.

(9969)

Figure 4 Plan of Township 63, Range 2, West of the Fourth Meridian

Photo 1 View of the south end of the Development Area, facing north.

Photo 2 Vegetation and existing disturbance along Highway 28 at the south end of the Development Area, facing north.

Photo 3 Vegetation within the drainage at the northern extent of the Development area, facing west.

Photo 4 Modification to the drainage at the northern extent of the Development area, facing northeast.

Photo 5 Structure within 5300 block of 55A Street, built prior to 1967. Facing west.

Photo 6 Commercial building at 51 Avenue and 55A Street, constructed 1952 – 1967. Facing west.

Photo 7 Southwest corner of Highway 28 and 50th Avenue intersection, facing southwest. Other than for the park, this location was never developed.

Photo 8 Structure along the existing Highway 28, facing southeast. Constructed prior to 1967.

Photo 9 Possible historic structure along Highway 28, facing east. Building constructed prior to 1967.

Photo 10 Fire hall #4 from the existing Highway 28, facing east. Building constructed by 1967.

Photo 11 Mural on the south face of the fire hall, facing northeast.

Photo 12 Fire truck parked behind Fire Hall #8, facing southwest.

Photo 13 Possible historic building – Cold Lake Native Friendship Centre, facing east. Building constructed by 1967.

Photo 14 Possible historic building – Cold Lake Native Friendship Centre, facing south.

Appendix C – Limited Phase 1 Environmental Site Assessment

LIMITED PHASE I ENVIRONMENTAL SITE ASSESSMENT
54TH AVENUE TO TOWNSHIP ROAD 624
COLD LAKE, ALBERTA

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PREPARED FOR:

CITY OF COLD LAKE C/O STANTEC CONSULTING LTD.
RED DEER, ALBERTA

PREPARED BY:

NICHOLS ENVIRONMENTAL (CANADA) LTD.
EDMONTON, ALBERTA

NICHOLS FILE: 12-280-SCL

DATE ISSUED: JANUARY 8, 2013

CITY OF COLD LAKE
C/O STANTEC CONSULTING LTD.
LIMITED PHASE I ESA
54TH AVENUE TO TOWNSHIP ROAD 624
COLD LAKE, ALBERTA

EXECUTIVE SUMMARY

Nichols Environmental (Canada) Ltd. has completed a Limited Phase I ESA of a portion of roadway from 54th Avenue to Township Road 624 in Cold Lake, Alberta. The Limited Phase I ESA was completed as a component of the Highway 28 Functional Study conducted for the City of Cold Lake.

Based on the results of the Limited Phase I ESA to date, Nichols Environmental makes the following conclusions regarding the Property:

- Based on the aerial photograph review, the Property appears to have been developed prior to 1950 with the present-day Highway 28, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs. Based on the aerial photograph review, a rail line also appears to have historically intersected the Property to the south of 47th Avenue in the 1960s and 1970s;

- No significant environmental liabilities were identified directly on the Property at the time of inspection with regards to groundwater monitoring wells (none of which were identified on the Property) or evidence of spills. Evidence of a pipeline ROW was noted at the intersection of 47th Avenue and the Property;

- Based on observations made at the time of inspection, complemented with historical information, there are 21 neighbouring service station or automotive-related operations identified adjacent the Property which may pose a level of environmental risk; and

- Regulatory review of AESRD's ESAR website identified nine locations of concern which are situated within the vicinity of the Property. Of these locations, the former Turbo service station located at 4910 - 52nd Street, the location of a current Subway restaurant, may pose the greatest risk to the roadway due to the lack of information with regards to remedial activities conducted at this location and its close proximity to the roadway.

Based upon the findings of the Phase I ESA to date, Nichols Environmental is of the opinion that the level of environmental risk varies from low to high along the Property, primarily due to the historic surrounding land uses, with the former and current service stations and automotive-related operations posing the greatest risk. Of these, the former Turbo service station may pose a high degree of risk due to the proximity to the Property and relatively unknown status of the current soil/groundwater at this location.

Consideration may be given to completing a subsurface investigation (Phase II ESA) within the vicinity of the former Turbo service station at 4910 - 52nd Avenue. Further investigation should also be considered adjacent the currently active service stations.

The statements made in this Executive Summary are subject to the same limitations included in Section 9.2, and are to be read in conjunction with the remainder of this report.

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APPENDICES

1.0 INTRODUCTION

Nichols Environmental (Canada) Ltd. was retained by City of Cold Lake c/o Stantec Consulting Ltd. to conduct a Limited Phase I Environmental Site Assessment (ESA) on a portion of roadway from 54th Avenue to Township Road 624 in Cold Lake, Alberta, (herein referred to as the "Property"). The Limited Phase I ESA is being completed as a component of the Highway 28 Functional Study for the City of Cold Lake. Figure 1 shows the location of the Property relative to the area within the City of Cold Lake.

The purpose of a Phase I ESA is to identify actual and potential site contamination. This involves the evaluation and reporting of existing information collected through a Records Review, a Site Visit and Interviews. The Phase I ESA may assist in reducing uncertainty about potential liabilities and may be a basis for further investigation of the Property. Phase I ESAs may be used to make informed decisions about property transactions, identify certain baseline environmental conditions, assist in meeting regulatory requirements and as an initial step in site remediation (Canadian Standards Association Z768-01, Phase I Environmental Site Assessment).

2.0 SCOPE AND METHODOLOGY

The following provides the scope of work for the Limited Phase I ESA:

- Obtain and review any previously completed assessment reports for the Property such as environmental audits, environmental site assessments, environmental baseline studies, well drilling, and geotechnical reports (including test pits and borehole logs);

- Obtain and review all pertinent aerial photographs of the Property in question and adjacent properties. The purpose of this is to determine the historical sequence of events that have transpired on the Property since its use as agricultural land or naturally vegetated land. The photographs will also be used to gain further information concerning land use, construction activity, pipeline installations, and to determine if there is any visual evidence of waste disposal pits, open excavations, spills, vegetation stress, or other factors of environmental significance;

- Obtain and review information from online federal and provincial agencies (namely the National Pollutant Release Inventory - NRPI and Alberta Environment and Sustainable Resource Development Environmental Site Assessment Repository - ESAR) regarding any environmental issues, on-site spill events and any remedial activities that may be pertinent to the subject Property;

- Complete an inspection of the Property in question and a cursory inspection of the adjacent lands; and

- Prepare a final report documenting the findings of the Limited Phase I ESA.

Authorization to proceed was provided by the City of Cold Lake c/o Stantec Consulting Ltd. on June 27, 2012.

3.0 PROPERTY DESCRIPTION

3.1 Location and Development Details

Location of Site:	54th Avenue to Township Road 624 Cold Lake, Alberta
Year Developed:	Based on the aerial photographs, the roadway has been present since at least 1950.

3.2 Physical Description

The Property is an approximate 4.2-km section of Highway 28 (Highway 55/50th Street) within Cold Lake, Alberta. Highway 28 provides the main route through the City of Cold Lake, and the portion of the roadway designated as the Property extends south from 54th Avenue to the southern city limits at Township Road 624 (TWP 624). The roadway was comprised of a combination of undivided, two-lane (approximately 42nd Avenue south to TWP 624) and divided four-lane facilities (54th Avenue south to approximately 42nd Avenue).

The Property was bordered by primarily commercial businesses from 54th Avenue south to approximately 34th Avenue, after which the Property was bordered by forested and/or residential land. All portions of the roadway were paved with asphalt and a concrete sidewalk was present from approximately 54th Avenue south to 47th Avenue to the west of the Property within the grassed boulevard. Grass boulevards bordered the majority of the Property on the east/west sides, with the exception of a portion of the Property from approximately 50th Avenue to 51st Street (east side) and from approximately 46th Avenue south to 42nd Avenue (west side).

3.3 Topography and Drainage

The Property was relatively flat with grading away from the centre line to the roadway's curbs and/or ditches. Prominent ditches were present on the east and west sides of the portion of roadway from approximately 43rd Avenue south to TWP 624. Gradual changes in elevation were predominantly noted within the south portion of the Property, from approximately 34th Avenue south to TWP 624.

3.4 Water Wells

A potable water well search was conducted through Alberta Environment and Sustainable Resource Development's Groundwater Information System using Telus Geomatics to identify any water wells in the area. The Property is situated within nine quarter sections. A water well reconnaissance report is provided in Appendix A and the wells are summarized as follows:

54th Avenue to 50th Avenue (SE-3-63-2-W4M)

Ten water wells were registered within this quarter section which encompasses 54th Avenue south to 50th Avenue. The water wells were completed to depths ranging from 4.57 metres below grade (mbg) to 40.23 mbg, one of which was completed for domestic use in 1978, with a water level of approximately 29.66 metres. Water levels within the remaining water wells in this quarter section ranged from 1.49 to 4.27 metres.

50th Avenue to 42nd Avenue (NE-34-62-2-W4M/NW-35-62-2-W4M)

Nine water wells were registered within these two quarter sections which encompass 50th Avenue south to 42nd Avenue. The water wells were completed to depths ranging from 3.66 mbg to 72.24 mbg, two of which were completed for domestic use purposes at unknown dates. Water levels within the water wells in these quarter sections ranged from 1.83 to 4.72 metres.

42nd Avenue to 34th Avenue (SE-34-62-2-W4M/SW-35-62-2-W4M)

Seven water wells were registered within these two quarter sections which encompass 42nd Avenue south to 34th Avenue. The water wells were completed to depths ranging from 4.27 mbg to 18.29 mbg, three of which were completed for domestic use purposes in 1971, 1983 and at an unknown date. Water levels within the water wells in these quarter sections ranged from 2.13 to 7.32 metres.

34th Avenue to Drake Drive (NE-27-62-2-W4M/NW-26-62-2-W4M)

Three water wells were registered within these two quarter sections which encompass 34th Avenue south to approximately Drake Drive. The water wells were completed to depths ranging from 6.1 mbg to 10.67 mbg, none of which were listed as for domestic use purposes. Water levels were only reported within one of the water wells at 4.57 metres.

Drake Drive to TWP 624 (SE-27-62-2-W4M/SW-26-62-2-W4M)

Twenty-three water wells were registered within these two quarter sections which encompass approximately Drake Drive south to TWP 624. The water wells were completed to depths ranging from surface to 81.38 mbg, 17 of which were listed for domestic use purposes, the dates for which ranged from 1970 to 2000. Water levels within the water wells in these quarter sections ranged from 7.01 to 38.10 metres.

4.0 SITE VISIT FINDINGS

4.1 General Site Conditions

Nichols Environmental inspected the Property on August 1, 2012. The inspection consisted of a walk throughout the Property as well as an observation of the adjacent lots. Selected photographs of the Property are provided in Appendix B.

The purpose of the site visit was to observe the current uses of the Property including the possible uses, treatment, storage, disposal, or generation of hazardous materials, landfilling, or the storage of wastewater in impoundments.

4.2 Storage Tanks (non-Petroleum)

No evidence of storage tanks was observed on the Property at the time of the inspection.

4.3 Underground Storage Tanks (USTs - Petroleum or Hydrocarbon Contents)

No evidence of USTs was observed on the Property at the time of inspection. USTs are anticipated to be present on select neighbouring adjacent land uses, as discussed further in Section 5.0.

4.4 Aboveground Storage Tanks (ASTs - Petroleum or Hydrocarbon Contents)

No evidence of ASTs was observed on the Property at the time of inspection.

4.5 Polychlorinated Biphenyls (PCBs)

PCBs were historically used in cooling and insulating fluids for electrical equipment such as transformers, capacitors, hydraulics, voltage regulators, and lamp ballasts as they do not readily burn or conduct electricity. A number of health concerns were found to be associated with the chemicals. As a result of these findings, their use in electrical equipment was prohibited in the early 1980s. PCBs may still be found in equipment manufactured prior to this time.

Transformers

One pad-mounted and four pole-mounted transformers were observed adjacent the road right-of-way. All of the observed transformers appeared to be in good condition.

4.6 Asbestos-Containing Building Materials (ACBMs)

Asbestos is a naturally occurring fibrous mineral primarily used in building materials for its flame retardant and insulation properties. The material is often mixed with cement or woven into fabrics or mats. Asbestos fibres are most commonly found in boiler rooms and piping insulation, cement products, floor coverings, and ceiling tiles.

ACBMs are made up of microscopic asbestos fibres that may become airborne when damaged. The inhalation of asbestos fibres has been known to cause significant health problems. Until the early 1980s asbestos-containing insulation was used in office buildings, public buildings, and schools.

No ACBMs were observed on the Property at the time of inspection.

4.7 Waste Management and Chemicals Handling

No chemicals were observed on the Property at the time of inspection and litter was present within the ditches at the time of inspection. None of the litter present at the time of inspection would be anticipated to pose a significant environmental risk.

4.8 Liquid Waste Generation, Storage and Disposal

No evidence of liquid waste generation, storage, or disposal was observed on the Property at the time of inspection.

4.9 Hazardous Waste Generation, Storage and Disposal

No evidence of hazardous waste generation, storage, or disposal was observed on the Property at the time of inspection.

4.10 Radon Gas

Radon is a colourless, odourless, tasteless gas produced by the natural breakdown of uranium found in concrete, brick, stone and soil. Radon gas can enter buildings through floor cracks, sumps, and joints and accumulate in poorly ventilated areas, such as basements and crawlspaces. Exposure to high levels of radon can be hazardous to human health.

Considering that no poorly ventilated areas were observed on the Property at the time of inspection, the potential for radon gas accumulation would be considered low.

Radon gases were not further investigated on the Property as it would be considered beyond the scope of work.

4.11 Methane Gas

Methane is a colourless, odourless gas formed by the decay and decomposition of organic materials under anaerobic (oxygen-poor) conditions. Methane is commonly found in or near swamps and wetland areas, peat deposits, and landfills.

Methane is nontoxic. However, potential risks associated with methane include explosion hazards in confined areas, and suffocation due to decreased oxygen concentrations. Building on or adjacent to a methane-generating site is dangerous due to the ability of methane to migrate beneath or into structures.

No evidence for methane gas accumulation was noted on the Property at the time of inspection. Methane gases were not further investigated on the Property as it would be considered beyond the scope of work.

4.12 Gas and Oil Wells

No gas or oil wells were observed on the Property at the time of inspection.

4.13 Lead-Based Paint and Lead in Drinking Water

Exposure to lead, a highly toxic substance, can lead to a wide range of adverse health effects in adults and most commonly in children.

Drinking Water

Drinking water may become contaminated through leaching of lead from lead distribution lines and lead soldering in piping joints. Lead distribution lines are particularly common in buildings constructed prior to 1950.

No buildings were present on the Property at the time of inspection, and as such, the Property is not anticipated to be serviced.

Lead-Based Paint

Until 1976, lead was commonly used in industrial paints due to its ability to resist corrosion. Lead-based paints are considered a significant risk to humans, especially children, due to the possibility of ingestion of peeling or flaking lead-based paint. Lead-based paints may also be a risk to humans through inhalation if the paint becomes airborne via sanding or grinding.

The Hazardous Products Act limited the amount of lead in paint to 0.5 percent in 1976. The addition of lead in paint was eliminated in 1990 by the Canadian Paint and Coating Association. Lead-based paint may still be present beneath newer layers of paint on buildings constructed prior to 1990.

No significant sources of lead-based paint were observed on the Property at the time of inspection.

4.14 Mercury

Mercury is a metal that is a liquid at room temperature. Mercury is known to evaporate, or volatilize, easily. In the environment, mercury has the ability to migrate through all media, and is known to bio-accumulate. These characteristics of the element develop environmental and human health issues, including a number of adverse neurological health affects. Mercury is commonly found in thermostats, electrical switches, and fluorescent light bulbs in buildings.

No mercury-containing devices were observed on the Property at the time of inspection.

4.15 Ozone Depleting Substances (ODS)

Ozone-depleting substances (ODS) contain combinations of any substances capable of destroying the ozone in the atmosphere, specifically chlorofluorocarbons (CFCs), hydro chlorofluorocarbons (HCFCs), and halon. ODS are used as foam-blowing agents, solvents, fire extinguishing agents, and refrigerants for air conditioning and refrigeration applications.

HCFCs are used extensively for refrigeration and coolant purposes, the most common of which being HCFC-22 (R-22).

No ODS were observed on the Property at the time of inspection.

4.16 Pesticides and Herbicides

No pesticide or herbicide storage was observed on the Property during the inspection.

4.17 Soil Fill and Land Reclamation

No evidence of soil fill or land reclamation materials was observed on the Property at the time of inspection. However, it should be noted that the roadway is likely built up from the original grade with fill materials. If the source and quality of the fill materials are unknown, the fill may pose a potential environmental risk.

4.18 Urea Formaldehyde Foam Insulation (UFFI)

UFFI is a type of insulation composed of urea-formaldehyde resin, a foaming agent, and compressed air. The mixture was injected into walls and used as an insulating agent in Canada during the 1970s to improve energy efficiency with better insulating materials. Excess formaldehyde was often added to ensure complete curing with the urea to produce the urea-formaldehyde foam. This excess formaldehyde was released to the environment during curing. Present exposure to UFFI is limited as the majority of the excess formaldehyde was released during curing. However, UFFI may break down and release potentially hazardous chemicals when in contact with water or moisture.

No UFFI was observed on the Property at the time of inspection.

4.19 Air Emissions

No dangerous air emissions were observed on or near the Property. To the best of our knowledge, Nichols Environmental is not aware of any licensed air discharges or processes on the Property at the time of inspection.

4.20 Microbial Contamination (Mould)

Moulds are fungi that grow in damp or humid environments. Mould can develop from poor ventilation, flooding, or building leaks. It can grow in damp basements, on bathroom surfaces, against outside walls, or on window frames. Mould spores contain allergens and irritants that can cause humans to have allergic reactions or respiratory disease.

No obvious mould was observed on the Property at the time of inspection.

4.21 Electromagnetic (EM) Frequencies

No high-voltage overhead power lines were observed on or near the Property at the time of inspection.

4.22 Radioactive Materials and Equipment

No radioactive material or equipment was observed on the Property at the time of inspection.

4.23 Spills and Soil Staining

No significant staining was noted on the Property at the time of inspection.

4.24 Unidentified Substances

No unidentified substances were identified on the Property at the time of inspection.

4.25 Storage Containers

No storage containers were observed on the Property at the time of inspection.

4.26 Hydraulics

No hydraulics were observed on the Property at the time of inspection.

4.27 Stressed Vegetation

No obviously stressed vegetation was observed on the Property at the time of inspection.

4.28 Sumps

No sumps were observed on the Property at the time of inspection.

5.0 ADJACENT LAND USE

The following adjacent land uses of concern were observed surrounding the Property:

1. No Frill Gas Bar east of the Property south of 54th Avenue (Figure 2). No off-site groundwater monitoring wells were observed surrounding this location;

2. Former Fas Gas west of the Property and south of 54th Avenue (Figure 2). Further details of environmental assessments for this location are provided in Section 6.2;

3. Invision Automotive Inc. west of the Property and north of 53rd Avenue (Figure 2);

4. Petro-Canada service station west of the Property and north of 52nd Avenue (Figure 2). No off-site groundwater monitoring wells were observed surrounding this location;

5. Cold Lake Fire Rescue east of the Property and north of 52nd Avenue (Figure 2);

6. OK Tire & Auto Services west of the Property and south of 51st Avenue (Figure 2);

7. Former Esso service station east of the Property and north of 50th Avenue (Figure 2). Off-site groundwater monitoring wells were observed extending into 55th Street. Further details regarding environmental assessments for this location are discussed in Section 6.2;

8. Cold Lake Buick Chevrolet GMC Pontiac Dealership north/west of the Property and south of 50th Avenue (Figure 3);

9. Vacant lot formerly occupied by Mercury Sales (Figure 3). Further details regarding environmental assessments for this location are discussed in Section 6.2;

10. Former Turbo Service station (now Subway) north of the Property south of 50th Avenue (Figure 3). No off-site groundwater monitoring wells were observed surrounding this location and further details regarding environmental assessments for this location are discussed in Section 6.2;

11. Cold Lake Chrysler Dodge Jeep Ram north/east of the Property and east of 51st Street (Figure 3);

12. Former Petro-Canada Cardlock west of the Property and south of 47th Avenue (Figure 3). Further details regarding environmental assessments for this location are discussed in Section 6.2;

13. Fas Gas service station west of the Property and north of 46th Avenue (Figure 3). No off-site groundwater monitoring wells were observed surrounding this location;

14. Lube-X east of the Property and south of 46th Avenue (Figure 4);

15. Shell Service Station west of the Property and north of 43rd Avenue (Figure 4). No off-site groundwater monitoring wells were observed surrounding this location and further details regarding environmental assessments for this location are discussed in Section 6.2;

16. KIA Cold Lake west of the Property south of 43rd Avenue (Figure 5);

17. Muscle Automotive west of the Property north of 40th Avenue (Figure 5);

18. Cold Lake Ford east of the Property south of 43rd Avenue (Figure 5);

19. Former Husky Bulk Facility east of the Property north of 40th Avenue (Figure 5). Further details regarding environmental assessments for this location are discussed in Section 6.2;

20. Express Lube west of the Property (Figure 5); and

21. Shell Bar Mechanical west of the Property (Figure 5).

The above-referenced surrounding land uses may pose an environmental risk to the Property based on their former/current operations as service stations and operations in the automotive servicing industry, or the potential for fuel tanks being present on-site.

Evidence of a pipeline right-of-way (ROW), in the form of warning signs, was also noted at the intersection of 47th Avenue with the Property.

None of the other remaining surrounding land uses, as represented on Figures 2 through 6, would be anticipated to pose a significant environmental liability to the Property as based on observations of these lands made at the time of inspection.

6.0 SITE HISTORY AND RECORDS REVIEW

6.1 Aerial Photography

Aerial photographs were reviewed for the following years: 1950, 1952, 1967, 1972, 1977, 1982, 1988, 1993, 1998, 2000 and 2011. The aerial photographs were obtained from Alberta Environment and Sustainable Resource Development (AESRD). Aerial photographs were not available for the Property prior to 1950, between 1952 and 1967 or between 2000 and 2011.

6.1.1 54th to 50th Avenue

The aerial photographs are included in Appendix C, Plates 2-1 through 2-11.

Year: 1950 Source: AESRD Reference: Plate 2-1
Roll: AS0121 Photo No.: 258
Description:

- Present-day Highway 28 is apparent on the Property;
- A possible farmstead is present to the east of the north portion of the Property;
- A roadway, present-day 50th Avenue, intersects the south portion of the Property and a number of possible residential buildings are apparent on the north and south sides of this roadway to the east of the Property;
- An access road is apparent to the south/west of the central portion of the Property and is followed by another farmstead; and
- The surrounding land uses appear to be a mix of agricultural and forested areas.

Year: 1952 Source: AESRD Reference: Plate 2-2
Roll: AS0422 Photo No.: 173
Description:

- The Property appears to remain relatively unchanged;
- The farmstead to the east of the north portion of the Property appears to have increased in size and there appear to be two stockpiles of materials;
- A number of buildings have been constructed to the east and west of the Property;
- Development has increased to the east of the south-central portion of the Property along 50th Avenue;
- A roadway, present-day Centre Avenue, has been constructed to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1967 Source: AESRD Reference: Plate 2-3
Roll: AS0975 Photo No.: 143
Description:

- A number of access points have been constructed along the east and west boundaries of the Property to access new developments;
- A roadway, present-day 55th Street, has been constructed to the east of the Property and along this roadway a number of buildings have been constructed in place of the previous buildings and agricultural lands;
- A roadway, present-day 52nd Avenue, has been constructed to the east of the Property along with a number of additional roadways and presumably residential buildings;
- A number of buildings have been constructed on the north and south side of 50th Avenue to the east of the Property in place of the previous buildings;
- A roadway, present-day 55A Street, has been constructed to the west of the Property and along this roadway a number of buildings have been constructed in place of the previous buildings/agricultural lands, as development has expanded west and northwest; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1972 Source: AESRD Reference: Plate 2-4
Roll: AS1197 Photo No.: 266
Description:

- The Property appears to remain relatively unchanged;
- There appears to be spreading/stockpiling of materials to the east of the north portion of the Property and additional residential development is apparent further east;
- A possible service station with two pump islands (former Esso) appears to have been constructed to the east of the Property north of 50th Avenue;
- A track appears to have been constructed to the south of the Property;
- Additional development is apparent to the west of the Property including the construction of a building north of 50th Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1977 Source: AESRD Reference: Plate 2-5
Roll: AS2972 Photo No.: 239
Description:

- Two access points have been removed from the north portion of the Property and the roadway appears to have been expanded to accommodate additional lanes;
- A large building has been constructed to the northeast of the Property;
- Stockpiling of materials remains present on the lot to the east of the north portion of the Property and further development is apparent in the residential area further east;
- Two buildings have been constructed to the south of the Property; and

- No other significant changes were noted for the Property or surrounding area.

Year: 1982 Source: AESRD Reference: Plate 2-6
Roll: AS2645 Photo No.: 134
Description:

- A median appears to have been constructed separating the north/southbound lanes on the roadway on the Property;
- Further development is apparent to the east of the Property and stockpiling is no longer apparent on the lot immediately east of the north portion of the Property;
- Two buildings have been constructed to the south of the Property;
- New buildings have been constructed to the immediate west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1988 Source: AESRD Reference: Plate 2-7
Roll: AS3733 Photo No.: 349
Description:

- The Property appears to remain relatively unchanged;
- Two buildings have been constructed in place of former buildings to the east of the central portion of the Property;
- A new building has been constructed in place of the former building to the west of the Property north of 50th Avenue (present-day A&W Restaurant);
- A building has been constructed on a previously empty lot to the west of the Property south of 54th Avenue at the location of the former Fas Gas; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1993 Source: AESRD Reference: Plate 2-8
Roll: AS4423 Photo No.: 051
Description:

- The Property appears to remain relatively unchanged;
- A building appears to have been removed to the west of the Property, north of present-day 52nd Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1998 Source: AESRD Reference: Plate 2-9
Roll: TRSG9803 Photo No.: 424
Description:

- The Property appears to remain relatively unchanged;

- A building appears to have been constructed in place of the former building located to the west of the Property, north of present-day 52nd Avenue at the location of the present-day Petro-Canada;
- Further building development is apparent to the northwest of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2000 Source: AESRD Reference: Plate 2-10
Roll: AS5141 Photo No.: 062
Description:

- The Property appears to remain relatively unchanged;
- Two buildings, present-day No Frills grocery store and gas bar, have been constructed on the lot to the east of the north portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2011 Source: AESRD Reference: Plate 2-11
Roll: AS5556 Photo No.: 177
Description:

- The Property appears to remain relatively unchanged;
- The former Esso service station to the east of the Property, north of 50th Avenue appears to have been removed as the lot is now vacant;
- Two buildings have been removed from the lot to the south of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Based on the aerial photograph review, this portion of the Property appears to have been developed prior to 1950, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs.

Of note was the presence of a former service station (Esso) to the east of the Property beginning in the 1972 aerial photograph with a vacant lot at this location noted in the 2011 aerial photograph. Other areas of concern include the development of the present-day Petro-Canada service station to the west of the Property and north of 52nd Avenue, which was first noted in the 1998 aerial photograph, and the presence of the former Fas Gas service station to the west of the Property south of 54th Avenue, first visible in the 1988 aerial photograph. The No Frills Gas Bar to the east of the Property and south of 54th Avenue was noted in the 2000 and 2011 aerial photographs.

6.1.2 50th to 46th Avenue

The aerial photographs are included in Appendix C, Plates 3-1 through 3-11.

Year: 1950 Source: AESRD Reference: Plate 3-1
Roll: AS0121 Photo No.: 258
Description:

- Present-day Highway 28 is apparent on the Property;
- A roadway, present-day 50th Avenue, intersects the north portion of the Property and a number of possible residential buildings are apparent on the north and south sides of this roadway to the east of the Property;
- A roadway, present-day 50th Street, appears to join into the Property to the east, and a number of buildings are apparent on the east side of this roadway;
- A potential rail line intersects the south portion of the Property;
- An access road is apparent to the west of the north portion of the Property; and
- The surrounding land uses appear to be a mix of agricultural and forested area.

Year: 1952 Source: AESRD Reference: Plate 3-2
Roll: AS0422 Photo No.: 173
Description:

- The Property appears to remain relatively unchanged;
- A number of buildings have been constructed to the east and west of the north portion of the Property;
- Development has increased to the east of the Property along 50th Avenue;
- A rail yard, associated with the rail line intersecting the Property, has been constructed to the west of the Property;
- A roadway, present-day Centre Avenue, has been constructed to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1967 Source: AESRD Reference: Plate 3-3
Roll: AS0975 Photo No.: 143
Description:

- A number of access points have been constructed along the east and west boundaries of the Property to access new developments;
- A roadway, present-day 55th Street, has been constructed to the east of the Property up to 50th Avenue and along this roadway a number of buildings have been constructed in place of the previous buildings;
- A roadway, present-day 52nd Avenue, has been constructed to the east of the Property along with a number of additional roadways and presumably residential buildings;
- A number of buildings have been constructed on the north and south side of 50th Avenue to the east of the Property in place of the previous buildings, including the construction of

the former Mercury Sales which appears to contain a possible service station canopy to the west of the building on the lot;
- A roadway, present-day 47th Avenue, has been constructed to the east of the Property along with other roadways and residential developments;
- Two grain elevators appear to have been constructed to the north of the rail line which intersects the south portion of the Property;
- A number of residential dwellings and three larger buildings have been constructed to the south/west of the Property;
- A roadway, present-day 55A Street, has been constructed to the west of the Property north of 50th Avenue and a number of buildings have been constructed in place of the previous buildings and development has expanded west; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1972 Source: AESRD Reference: Plate 3-4
Roll: AS1197 Photo No.: 266
Description:
- The Property appears to remain relatively unchanged;
- A possible service station with two pump islands (former Esso) appears to have been constructed to the east of the Property north of 50th Avenue;
- A large building has been constructed to the east of the Property north of 48th Avenue;
- Storage activities appear to be taking place the south/west of the Property and additional buildings and tanks are apparent associated with the elevators west of the Property;
- A track appears to have been constructed to the west of the central portion of the Property;
- A new building has been constructed to the west of the Property north of 50th Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1977 Source: AESRD Reference: Plate 3-5
Roll: AS2972 Photo No.: 239
Description:
- A number of access points have been removed north and south of 50th Avenue on the Property and the roadway appears to have been expanded to accommodate additional lanes;
- The pump canopy is no longer apparent at the location of the former Mercury Sales to the east of the Property on the south side of 50th Avenue;
- A building has been constructed to the north/east of the Property at the location of the former Turbo service station south of 50th Avenue, and two large buildings and a third smaller building have been constructed to the east of this location;

- There appears to be some stockpiling of soils to the west of the Property south of 47th Avenue and further west of this location appears to be two buildings believed to be associated with the former Petro-Canada Cardlock;
- Three buildings as well as a track have been constructed to the south/west of the Property between Centre Avenue and 47th Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1982 Source: AESRD Reference: Plate 3-6
Roll: AS2645 Photo No.: 134
Description:

- A median appears to have been constructed on the roadway;
- A new building or an addition has been constructed on the former Turbo service station lot east of the Property and south of 50th Avenue and two additional large buildings have been constructed on the lots east of this location;
- A large building has been constructed to the east of the Property south of 47th Avenue;
- Two buildings have been constructed to the west of the Property, south of Centre Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1988 Source: AESRD Reference: Plate 3-7
Roll: AS3733 Photo No.: 349
Description:

- The Property appears to remain relatively unchanged;
- A building has been constructed north/east of the Property, east of 51st Street;
- Two buildings have been constructed to the west of the south portion of the Property, the furthest south of which is the location of a present-day Shell service station;
- A new building has been constructed in place of the former building to the west of the Property north of 50th Avenue (present-day A&W Restaurant); and
- No other significant changes were noted for the Property or surrounding area.

Year: 1993 Source: AESRD Reference: Plate 3-8
Roll: AS4423 Photo No.: 051
Description:

- The Property appears to remain relatively unchanged;
- A portion of trees has been cleared to the east of the south portion of the Property and stockpiling of materials at this location is apparent;
- A building has been constructed to the west of the Property at the location of a present-day Fas Gas service station;

- An addition has been constructed on a building to the west of the Property north of 47th Avenue and another building has been constructed further west. The track is no longer apparent; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1998 Source: AESRD Reference: Plate 3-9
Roll: TRSG9803 Photo No.: 424
Description:

- The Property appears to remain relatively unchanged;
- A new building has been constructed in place of the former Mercury Sales to the east of the Property south of 50th Avenue;
- A building has been constructed to the east of the Property south of 47th Avenue;
- A large building has been constructed to the west of the Property south of the location of the present-day Fas Gas service station;
- Only a tank farm appears to remain at the location of the former elevators to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2000 Source: AESRD Reference: Plate 3-10
Roll: AS5141 Photo No.: 062
Description:

- The Property appears to remain relatively unchanged;
- Further land appears to have been cleared to the east of the south portion of the Property and potential stockpiling of materials is apparent. A building has also been constructed south of the stockpile location; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2011 Source: AESRD Reference: Plate 3-11
Roll: AS5556 Photo No.: 177
Description:

- The Property appears to remain relatively unchanged;
- The former Esso service station to the east of the Property, north of 50th Avenue appears to have been removed as the lot is now vacant;
- A building has been constructed in place of a former building to the north/east of the Property north of 48th Avenue;
- Three buildings and one large building have been constructed to the east of the south portion of the Property;

- Two buildings have been constructed to the west of the south portion of the Property and there no longer appears to be any buildings or infrastructure remaining at the location of the former elevators west of the Property;
- An addition has been constructed on a building to the southwest of the Property north of 47th Avenue, and a number of buildings have been removed to the west of this location; and
- No other significant changes were noted for the Property or surrounding area.

Based on the aerial photograph review, this portion of the Property appears to have been developed prior to 1950, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs.

Of note was the presence of the former service station (Esso) to the east of the Property, as previously discussed. Other areas of concern include the presence of a possible service station canopy at the location of the former Mercury Sales to the east of the Property south of 50th Avenue visible in the 1967 to 1972 aerial photographs, as well as the development of the Turbo service station east of the Property, first visible in the 1977 aerial photograph; the current Fas Gas service station west of the Property, first visible in the 1993 aerial photograph; and the current Shell service station west of the Property, first visible in the 1988 aerial photograph.

6.1.3 47th to 42nd Avenue

The aerial photographs are included in Appendix C, Plates 4-1 through 4-11.

Year: 1950 Source: AESRD Reference: Plate 4-1
Roll: AS0121 Photo No.: 258
Description:

- Present-day Highway 28 is apparent on the Property;
- A roadway, present-day 50th Street, appears to join into the Property to the east, and a number of buildings are apparent on the east side of this roadway;
- A potential rail line intersects the central portion of the Property;
- A possible wetland is apparent to the south/west of the Property; and
- The surrounding land uses appear to be a mix of agricultural and forested area.

Year: 1952 Source: AESRD Reference: Plate 4-2
Roll: AS0422 Photo No.: 173
Description:

- The Property appears to remain relatively unchanged;

- A number of buildings have been constructed to the east and west of the north portion of the Property;
- A rail yard, associated with the rail line intersecting the Property, has been constructed to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1967 Source: AESRD Reference: Plate 4-3
Roll: AS0975 Photo No.: 143
Description:

- A number of access points have been constructed along the east and west boundaries of the Property to access new developments;
- A roadway, present-day 47th Avenue, has been constructed to the east of the Property along with other roadways and residential developments;
- A small building is apparent adjacent an access road to the east of the southern portion of the Property;
- Two grain elevators appear to have been constructed to the north of the rail line which intersects the central portion of the Property;
- A number of residential dwellings and three larger buildings have been constructed to the south/west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1972 Source: AESRD Reference: Plate 4-4
Roll: AS1197 Photo No.: 266
Description:

- The Property appears to remain relatively unchanged;
- A large building has been constructed to the east of the Property north of 48th Avenue;
- Storage activities appear to be taking place to the south/west of the Property and additional buildings and tanks are apparent associated with the elevators west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1977 Source: AESRD Reference: Plate 4-5
Roll: AS2972 Photo No.: 239
Description:

- A number of access points have been removed north of 47th Avenue on the Property and the roadway appears to have been expanded to accommodate additional lanes;
- Two large buildings and a third smaller building have been constructed to the east of the north portion of the Property;

- Two buildings with associated yards appear to have been constructed to the west of the south portion of the Property;
- There appears to be some stockpiling of soils to the west of the Property south of 47th Avenue, and further west of this location appears to be two buildings believed to be associated with the former Petro-Canada Cardlock;
- Three buildings as well as a track have been constructed to the south/west of the Property between Centre Avenue and 47th Avenue; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1982 Source: AESRD Reference: Plate 4-6
Roll: AS2645 Photo No.: 134
Description:

- A median appears to have been constructed on the roadway;
- Two additional large buildings have been constructed on the lots east of the north portion of the Property;
- A large building has been constructed to the east of the Property south of 47th Avenue;
- Two buildings have been constructed in place of a former building to the west of the south portion of the Property;
- A building has been removed to the west of the central portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1988 Source: AESRD Reference: Plate 4-7
Roll: AS3733 Photo No.: 349
Description:

- The Property appears to remain relatively unchanged;
- Three buildings and a roadway have been constructed to the west of the central portion of the Property, the central one of which is the location of a present-day Shell service station; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1993 Source: AESRD Reference: Plate 4-8
Roll: AS4423 Photo No.: 051
Description:

- The Property appears to remain relatively unchanged;
- A portion of trees has been cleared to the east of the central portion of the Property and stockpiling of materials at this location is apparent;
- Two buildings and a track have been constructed to the east of the south portion of the Property;

- A building has been constructed to the west of the Property at the location of a present-day Fas Gas service station;
- An addition has been constructed on a building to the west of the Property north of 47th Avenue and another building has been constructed further west. The track is no longer apparent; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1998 Source: AESRD Reference: Plate 4-9
Roll: TRSG9803 Photo No.: 424
Description:

- The Property appears to remain relatively unchanged;
- A building has been constructed to the east of the Property south of 47th Avenue and development is apparent further south of this location;
- A large building has been constructed to the west of the Property south of the location of the present-day Fas Gas service station;
- Only a tank farm appears to remain at the location of the former elevators to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2000 Source: AESRD Reference: Plate 4-10
Roll: AS5141 Photo No.: 062
Description:

- The Property appears to remain relatively unchanged;
- Further land appears to have been cleared to the east of the Property including present-day 50th Street and 43rd Avenue, and potential stockpiling of materials is apparent. A building has also been constructed south of the stockpile location and a second building is apparent further south; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2011 Source: AESRD Reference: Plate 4-11
Roll: AS5556 Photo No.: 177
Description:

- The Property appears to remain relatively unchanged;
- A building has been constructed in place of a former building to the north/east of the Property north of 48th Avenue;
- Four buildings and one large building have been constructed to the east of the central portion of the Property north of 43rd Avenue, and a building has been constructed south of 43rd Avenue to the east of the Property;

- A building has been constructed to the east of the south portion of the Property;
- Two buildings have been constructed to the west of the Property south of 43rd Avenue;
- Two buildings have been constructed to the west of the central portion of the Property and there no longer appears to be any buildings or infrastructure remaining at the location of the former elevators west of the Property;
- An addition has been constructed on a building to the southwest of the Property north of 47th Avenue, and a number of buildings have been removed to the west of this location; and
- No other significant changes were noted for the Property or surrounding area.

Based on the aerial photograph review, this portion of the Property appears to have been developed prior to 1950, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs.

Areas of concern include the development of the current Fas Gas service station west of the Property, first visible in the 1993 aerial photograph, and the current Shell service station west of the Property, first visible in the 1988 aerial photograph.

6.1.4 42nd to 34th Avenue

The aerial photographs are included in Appendix C, Plates 5-1 through 5-11.

Year: 1950 Source: AESRD Reference: Plate 5-1
Roll: AS0121 Photo No.: 258
Description:

- Present-day Highway 28 is apparent on the Property;
- A roadway, present-day 34th Avenue, is apparent extending east from the south portion of the Property;
- A farmstead is apparent to the west of the south portion of the Property and a possible wetland is apparent to the west of the north portion of the Property; and
- The surrounding land uses appear to be a mix of agricultural and forested area.

Year: 1952 Source: AESRD Reference: Plate 5-2
Roll: AS0422 Photo No.: 173
Description:

- The Property appears to remain relatively unchanged;
- There appear to be two stockpiles of materials to the east of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1967 Source: AESRD Reference: Plate 5-3
Roll: AS0975 Photo No.: 143
Description:

- A number of access points have been constructed along the east and west boundaries of the Property to access new developments;
- Four buildings and a tank farm (former Husky bulk facility) have been constructed to the east of the central portion of the Property and the stockpiles of materials are no longer present;
- Three buildings have been constructed to the west of the south portion of the Property along present-day 50th Street;
- At least eight buildings with associated yards have been constructed to the west of the central portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1972 Source: AESRD Reference: Plate 5-4
Roll: AS1197 Photo No.: 266
Description:

- The Property appears to remain relatively unchanged;
- A road has been constructed extending west away from the south portion of the Property and two additional buildings appear to have been constructed to the west of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1977 Source: AESRD Reference: Plate 5-5
Roll: AS2972 Photo No.: 239
Description:

- The Property appears to remain relatively unchanged;
- A building appears to have been constructed to the east of the central portion of the Property and development has expanded to the south on the east side of the Property;
- A number of buildings have been constructed to the west of the central to north portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1982 Source: AESRD Reference: Plate 5-6
Roll: AS2645 Photo No.: 134
Description:

- A median appears to have been constructed on the north portion of the roadway;

- One small building and a larger building have been constructed to the east of the central portion of the Property;
- Two buildings have been constructed in place of a former building to the west of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1988 Source: AESRD Reference: Plate 5-7
Roll: AS3733 Photo No.: 349
Description:

- The Property appears to remain relatively unchanged;
- A lot to the east of the central portion of the Property appears to have been redeveloped with a larger building;
- Storage generally appears to have increased on the lots to the west of the Property and 42nd Avenue has been constructed to the west of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1993 Source: AESRD Reference: Plate 5-8
Roll: AS4423 Photo No.: 051
Description:

- The Property appears to remain relatively unchanged;
- A roadway, present-day 43rd Avenue, has been constructed to the east of the Property and a building has been constructed north of the roadway. Present-day 40th Avenue has also been constructed east of the Property to access new buildings and a track. The tank farm north of 40th Avenue appears to have decreased in size and an additional building has been constructed south of 40th Avenue;
- The buildings to the west of the south portion of the Property are no longer apparent; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1998 Source: AESRD Reference: Plate 5-9
Roll: TRSG9803 Photo No.: 424
Description:

- The Property appears to remain relatively unchanged;
- A small building has been constructed to the east of the central portion of the Property south of 40th Avenue;
- A portion of land appears to have been cleared for development to the east of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2000 Source: AESRD Reference: Plate 5-10
Roll: AS5141 Photo No.: 062
Description:

- The Property appears to remain relatively unchanged;
- A small building has been constructed to the east of the north portion of the Property and 50th Street has been expanded north;
- A large building has been constructed to the west of the central portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2011 Source: AESRD Reference: Plate 5-11
Roll: AS5556 Photo No.: 177
Description:

- The Property appears to remain relatively unchanged;
- A large building has been constructed to the east of the north portion of the Property and the tank farm is no longer apparent east of the Property. Two buildings and an addition have also been constructed to the east of the central and south portion of the Property;
- Two buildings have been constructed to the west of the south portion of the Property, and three more to the west of the central and north portions of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Based on the aerial photograph review, this portion of the Property appears to have been developed prior to 1950, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs.

Areas of concern include the development of a tank farm to the north of 40th Avenue, visible beginning in the 1967 aerial photograph up until the 2011 aerial photograph, at which time this location appears to have been repurposed as a parking lot.

6.1.5 34th Avenue to TWP 624

The aerial photographs are included in Appendix C, Plates 6-1 through 6-11.

Year: 1950 Source: AESRD Reference: Plate 6-1
Roll: AS0121 Photo No.: 258
Description:

- Present-day Highway 28 is apparent on the Property;
- A roadway, present-day 34th Avenue, is apparent extending east from the north portion of the Property;

- Two additional roads extend east from the Property;
- A roadway, present-day TWP 624, extends west from the south portion of the Property;
- Two farmsteads and two road turnouts are apparent to the west of the Property; and
- The surrounding land uses appear to be a mix of agricultural and forested area.

Year: 1952 Source: AESRD Reference: Plate 6-2
Roll: AS0424 Photo No.: 144
Description:

- The Property appears to remain relatively unchanged;
- There appear to be two stockpiles of materials to the east of the north portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1967 Source: AESRD Reference: Plate 6-3
Roll: AS0975 Photo No.: 143
Description:

- The Property appears to remain relatively unchanged;
- A number of buildings have been constructed to the east of the north portion of the Property including a tank farm;
- There appears to be stockpiling of materials to the east of the south portion of the Property and a number of buildings, presumably residential, have been constructed to the east, south and west of the south portion of the Property along TWP 624, which has been expanded east;
- A number of buildings have been constructed to the west of the north portion of the Property along present-day 50th Street; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1972 Source: AESRD Reference: Plate 6-4
Roll: AS1197 Photo No.: 266
Description:

- The Property appears to remain relatively unchanged;
- Development appears to continue to the east of the south portion of the Property;
- A road has been constructed extending west away from the north portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1977 Source: AESRD Reference: Plate 6-5
Roll: AS2972 Photo No.: 239
Description:

- The Property appears to remain relatively unchanged;
- Additional buildings are apparent to the east of the north portion of the Property;
- There appear to be two new areas where materials are being stockpiled to the east of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1982 Source: AESRD Reference: Plate 6-6
Roll: AS2645 Photo No.: 065
Description:

- The Property appears to remain relatively unchanged;
- A large building has been constructed to the east of the north portion of the Property;
- The two stockpiling areas to the east of the Property have expanded in size and a track has been constructed. TWP 624 has also been expanded further east; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1988 Source: AESRD Reference: Plate 6-7
Roll: AS3733 Photo No.: 228
Description:

- The Property appears to remain relatively unchanged;
- The stockpiling areas appear to have been joined and have increased in size; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1993 Source: AESRD Reference: Plate 6-8
Roll: AS4423 Photo No.: 051
Description:

- The Property appears to remain relatively unchanged;
- A roadway, present-day 40th Avenue has also been constructed east of the Property to access new buildings and a track. The tank farm north of 40th Avenue appears to have decreased in size and an additional building has been constructed south of 40th Avenue;
- The operation to the east of the south portion of the Property appears to have expanded further;
- The buildings to the west of the north portion of the Property, south of 34th Avenue, are no longer apparent; and
- No other significant changes were noted for the Property or surrounding area.

Year: 1998 Source: AESRD Reference: Plate 6-9
Roll: TRSG9803 Photo No.: 424
Description:

- The Property appears to remain relatively unchanged;
- A portion of land appears to have been cleared for development to the east of the north portion of the Property;
- The operation to the east of the south portion of the Property continues to expand; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2000 Source: AESRD Reference: Plate 6-10
Roll: AS5141 Photo No.: 062
Description:

- The Property appears to remain relatively unchanged;
- There appear to be two smaller stockpiles of materials extending south from the operation to the east of the south portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Year: 2011 Source: AESRD Reference: Plate 6-11
Roll: AS5556 Photo No.: 177
Description:

- The Property appears to remain relatively unchanged;
- The tank farm is no longer apparent east of the north portion of the Property. A building has also been constructed to the east of the Property north of 34th Avenue;
- The operations to the east of the south portion of the Property have expanded and a building is now apparent;
- A residential subdivision has been constructed to the west of the central portion of the Property;
- Two buildings have been constructed to the west of the north portion of the Property; and
- No other significant changes were noted for the Property or surrounding area.

Based on the aerial photograph review, this portion of the Property appears to have been developed prior to 1950, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs.

Areas of concern include the development of a tank farm to the north of 40th Avenue beginning in the 1967 aerial photograph up until the 2011 aerial photograph in which this location appears to have been repurposed as a parking lot.

It should be noted that the scale and resolution of some of the aerial photographs made it difficult to determine land use or to discern changes on the Property or the surrounding area.

6.2 Regulatory Review

Correspondence with provincial and municipal regulatory agencies is presented in Appendix D, and is summarized below.

6.2.1 Federal

A search was conducted using Environment Canada's National Pollutant Release Inventory (NPRI) to determine whether there have been any significant releases in the vicinity of the Property, or whether there are any facilities which may pose an environmental risk to the Property. One facility was identified within a 1.0-km radius of the Property and is summarized below.

> Husky Oil Limited - Cold Lake Pipeline Terminal: this facility, as based on the information provided by the NPRI, was located approximately 200 metres north of the Property and has reported to the NPRI, from 2003 to 2010, the handling of 22 chemicals. Of these, the largest release was of 1.4 tonnes of volatile organic compounds to the air in 2003 and 2004, followed by 0.081 tonnes of benzene to the air in 2007. Considering the distance of the facility from the Property and nature of the release, this facility would not be anticipated to pose a significant environmental risk.

6.2.2 Provincial

A search was completed of AESRD's Environmental Site Assessment Repository (ESAR) for scientific and technical information pertaining to the Property and/or assessed sites within the vicinity of the Property. Due to the number of reports and correspondence identified, and the fact that they are freely available at www.esar.alberta.ca, copies are not included in this report. The identified correspondence is summarized below:

> Husky Truck/Car Wash (ESAR #1340856)
>
> In August 2002, a Phase II ESA was conducted by Butler Krebes and Associates for a Husky Truck/Car Wash at 5426 - 55th Street, approximately 200 metres north of the Property. The results of the investigation identified slightly elevated hydrocarbon levels in the vicinity of the UST nests, but nothing that exceeded the then-applicable 2001 Risk Management Guidelines for Petroleum Storage Tank Sites (2001 PST Guidelines). Laboratory data from 2002 indicates that the levels of contamination would not exceed today's most stringent standards.

Fas Gas Tank Pull (ESAR #1337851)

A former Fas Gas service station was situated at 5318 - 55A Street, west adjacent to the northern extent of the Property. In September 1994, four USTs were removed from this location under the supervision of Bovar-Concord Environmental. The USTs were 22,800-L in size, dated 1984, and reported to be in good condition upon removal. The surrounding fill was deemed to be moderately contaminated and approximately 600 m^3 of soil were excavated and landfilled. The remaining soil was determined to meet the Alberta MUST 1991 Level II soil and Level III water standards. The soil was described as a silty to sandy glacial till to a depth of 5 mbg. Laboratory data from 1994 indicated that the clean-up levels achieved would still meet today's most stringent standards.

Decommissioned Esso (ESAR #1338892 and 1340549)

A former Esso service station was situated at 5312 - 50th Avenue, east adjacent to the Property at 50th Avenue. In September 1993, Morrow Environmental Consultants Inc. (Morrow), supervised the removal of USTs from this site. Hydrocarbon-impacted soil from the vicinity of the UST nest was excavated and a soil vapour extraction (SVE) system was installed. Replacement fibreglass USTs were subsequently installed, which included one 22,000-L and one 31,000-L gasoline tank, a 31,000-L diesel tank, and a 2,200-L waste-oil tank.

Groundwater monitoring reports by O'Connor Associates Environmental Inc. (O'Connor) from 1995 to 1999 indicated fluctuating free product levels up to 364 mm. From 1995 to 1999 an estimated 633 L of free product was removed by the SVE system. From 1999 to 2001 the groundwater monitoring reports, conducted by AquaTerre Biological Consulting (AquaTerre), indicated fluctuating free products levels up to 40 mm. The SVE system continued to operate and was estimated to remove an additional 403 L of free product.

In October 2002, the site was decommissioned, and the USTs installed in 1993 were removed and the surrounding soil was excavated. Supervision during the decommissioning by Clifton Associates Ltd. (Clifton) indicated that closure samples from the walls of the excavation met the 2001 PST Guidelines. In November 2002, Clifton installed monitoring wells and conducted test pitting which indicated that hydrocarbon impacts remained. In 2004, Seacor Environmental Inc. (Seacor) advanced a total of 19 boreholes on and off the site, completing 14 of them as monitoring wells, and found 4 of 22 soil samples and 3 of 30 groundwater samples analysed exceeded the 2001 PST Guidelines for fine-grained soils. In November 2006, groundwater monitoring by Seacor indicated free product levels of up to 145 mm and exceedances in 3 of 12 monitored wells based on modified guidelines.

Laboratory data from 2004 indicates that soil samples from two locations on-site would be in exceedance of today's most stringent standards. Laboratory data from November 2006 indicates that groundwater samples from eight monitoring wells on-site would be in exceedance of today's most stringent standards. Groundwater flow has historically been calculated to the northeast at this site away from the roadway (Property).

Site contaminated by adjacent Former Esso (ESAR #1340206)

In October 2002, EBA Engineering Consultants Ltd. (EBA) was retained by TJB Holdings to complete a Phase II ESA of a site at 5308 - 50th Avenue, east adjacent the former Esso service station. The results of the investigation discovered contamination in the soil and groundwater in the northwest portion of the lot, believed to be the result of the former nearby by Esso Gas Station (ESAR 1338892 and 1340549). Laboratory analysis indicated that the two soil and two groundwater samples submitted from the northwest portion of the lot for analysis exceeded both the 2001 PST Guidelines and today's most stringent standards. EBA recommended further investigation to delineate the extent of the impacts as well as vapour sampling from beneath the floor slab of the building on-site. However, no further documentation was provided.

Mercury Sales Historical Gas Station ESAR #1340202

In October of 2002, AMEC Earth and Environmental Ltd. completed a Phase II ESA of a Woodland Ford Mercury Sales Ltd. site at 5207 - 50th Avenue and discovered hydrocarbon contamination in the soil and groundwater resulting from a UST removal which occurred at some unknown point in time. The site was utilized as a service station from 1959 to 1971. The contaminated soil volume was estimated to be up to 5,170 m^3 and present on and off-site to the north across and beyond 50th Avenue.

In February 2005, Parkland Geo-Environmental Ltd. was retained by Double D Bobcat Services & Contracting Ltd. to monitor and supervise the remediation of the impacted soil. The impacted soil was excavated until the extent of the property line, or to the maximum depth of excavation, or until the extent hydrocarbon impacted soil was reached. During the excavation approximately 2,225 m^3 of soil was removed and two abandoned USTs were discovered. The excavation extended to the property line adjacent to 50th Avenue and to a maximum depth of 4 metres as limited by a sloughing sand layer. A high nitrogen fertilizer was spread out at the base of the excavation and a geo-membrane was installed along the north wall. Laboratory analysis indicated that soil samples from the north and south walls as well as the base of the excavation had hydrocarbon concentrations in exceedance of the 2001 PST Guidelines using residential criteria for coarse-grained soils.

Canadian Turbo Decommissioning ESAR #1338739

Decommissioning of a Canadian Turbo (1993) Inc. service station, including removal of the USTs was conducted at 4910 - 52nd Street in July 1994. The decommissioning was supervised by Seacor and involved the removal of one 22,700 L diesel UST and three 22,700 L gasoline USTs, which were dated 1973 and reported to be in good condition. One sample from the walls of the excavation exceeded the 1991 MUST Level II soil standards. The contaminated soil, estimated to be 30 m^3, was spread out on-site overnight and returned back to the excavation the following day. No confirmatory samples of the aerated soils were collected prior to backfilling with these materials. Laboratory data from the 1994 excavation work indicated that two of the five confirmatory excavation samples analysed would exceed today's most stringent standards and one would exceed the less stringent commercial criteria.

Decommissioned Petro-Canada Cardlock ESAR #1340118

In April 1994, Morrow completed a Phase II ESA for a Petro-Canada Cardlock facility at 5011 - 47th Avenue which identified hydrocarbon contamination above the MUST Level II standards. Decommissioning of the site commenced in December 1996 and included the removal of eight 22,700-L and two 13,000-L USTs containing gasoline and diesel. Following the decommissioning program, contamination in excess of the MUST Level II standards remained.

In August 2001, Morrow completed another Phase II ESA advancing seven boreholes, six of which were completed as monitoring wells, and identified soil samples from three of the seven boreholes which had concentrations of petroleum hydrocarbons in excess of the 1994 Alberta Remediation Guidelines for Petroleum Storage Tank Sites Level II standards. Groundwater samples from all monitoring wells were found below the Level II standards. In September 2002 Morrow conducted a Phase II ESA of the adjacent 47th Avenue road allowance and found no evidence of contamination. In October 2004, Komex International Ltd. (Komex) monitored four wells and found that one of three submitted groundwater samples from on-site had hydrocarbon concentrations in excess of the 2001 PST Guidelines for residential land use. Laboratory data from 2004 indicates that two of the three submitted groundwater samples from on-site would exceed today's most stringent standards.

Shell Canada Phase II ESA ESAR #1338759

A Phase II ESA, supervised by Morrow, was conducted in July 2002 at a Shell Canada Products service station at 4504 - 50th Street. The ESA was requested by Alberta Environment as followup to a fuel supply line leak discovered in 1996 and a soil sample

from 1998 that indicated the presence of hydrocarbon impacts. Five boreholes were advanced and completed as monitoring wells through a coarse-grained soil matrix. The soil and groundwater analytical results were reported to be below the coarse-grained, commercial 2001 PST Guidelines. Laboratory data from 2002 indicates that one of the five groundwater samples from 2002 would exceed today's most stringent standards. The location of this monitoring well was between the USTs and building on-site.

Former Husky Bulk Site ESAR #1340211

An Alberta Record of Site Condition dated January 2010 indicates hydrocarbon contamination present on-site at a Former Husky Bulk Facility located at 3805 - 50th Street. The Record of Site condition was completed for a 2009 Site Remedial Activities Report by Stantec Consulting Ltd. The contamination appears to have initially been discovered in 1999 and an estimated 1,000 m^2 exceeding the applicable guidelines (2010 Alberta Tier 2 Guidelines) remain. It was also indicated that non-aqueous phase liquid product was present on-site but that a remediation plan had been developed and the site was under active remediation. Groundwater flow was also reported to the north-northeast and no off-site contamination was noted.

7.0 LIMITED PHASE I ESA CONCLUSIONS AND RECOMMENDATIONS

Nichols Environmental (Canada) Ltd. has completed a Limited Phase I ESA of a portion of roadway from 54th Avenue to Township Road 624 in Cold Lake, Alberta. The Limited Phase I ESA was completed as a component of the Highway 28 Functional Study conducted for the City of Cold Lake.

Based on the results of the Limited Phase I ESA to date, Nichols Environmental makes the following conclusions regarding the Property:

- Based on the aerial photograph review, the Property appears to have been developed prior to 1950 with the present-day Highway 28, with an expansion of the lanes noted between the 1972 and 1977 aerial photographs. Based on the aerial photograph review, a rail line also appears to have historically intersected the Property to the south of 47th Avenue in the 1960s and 1970s;

- No significant environmental liabilities were identified directly on the Property at the time of inspection with regards to groundwater monitoring wells (none of which were identified on the Property) or evidence of spills. Evidence of a pipeline ROW was noted at the intersection of 47th Avenue and the Property;

- Based on observations made at the time of inspection, complemented with historical information, there are 21 neighbouring service station or automotive-related operations identified adjacent the Property which may pose a level of environmental risk; and

- Regulatory review of AESRD's ESAR website identified nine locations of concern which are situated within the vicinity of the Property. Of these locations, the former Turbo service station located at 4910 - 52nd Street, the location of a current Subway restaurant, may pose the greatest risk to the roadway due to the lack of information with regards to remedial activities conducted at this location and its close proximity to the roadway.

Based upon the findings of the Phase I ESA to date, Nichols Environmental is of the opinion that the level of environmental risk varies from low to high along the Property, primarily due to the historic surrounding land uses, with the former and current service stations and automotive-related operations posing the greatest risk. Of these, the former Turbo service station may pose a high degree of risk due to the proximity to the Property and relatively unknown status of the current soil/groundwater at this location.

Consideration may be given to completing a subsurface investigation (Phase II ESA) within the vicinity of the former Turbo service station at 4910 - 52nd Avenue. Further investigation should also be considered adjacent the currently active service stations.

8.0 REFERENCES

Throughout this project, the following resources were used:

- Alberta Environment and Sustainable Resource Development (aerial photographs);
- Alberta Environment and Sustainable Resource Development (ESAR);
- Environment Canada (NPRI); and
- Google Earth.

9.0 QUALIFICATIONS AND LIMITATIONS

9.1 Qualifications

Mrs. Tawnya Anderson, B.Sc., EPt, co-ordinated all aspects of the Phase I ESA. Mrs. Anderson has a B.Sc. in Environmental Science from the University of Alberta, Augustana Faculty.

Mr. Rob Dickie, P.Geol., R.E.T., EP, provided the senior project management and peer review of the entire project and specifically the final report. Mr. Dickie has more than 25 years of consulting and industry experience.

9.2 Limitations

In conducting the Limited Phase I ESA of the Property and in rendering our conclusions on the potential presence or level of contamination, Nichols Environmental gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of investigation. Our conclusions are limited by the following:

- Nichols Environmental spent only a limited amount of time on the Property. Thus, any activities conducted on the Property following the site inspection that Nichols Environmental is not aware of may have an impact on the conclusions and recommendations presented;
- Nichols Environmental has assumed the genuineness of the documents and that the information provided in documents or statements is true and accurate;
- A hazardous building materials survey was not completed as it was beyond the scope of work; and
- The study area was limited to the areas indicated in Section 3.0.

This report is intended to provide information to reduce, but not necessarily eliminate, uncertainty regarding the potential for contamination of a property. This report has been prepared for the exclusive use of the City of Cold Lake c/o Stantec Consulting Ltd. for the purpose of assessing the current environmental conditions that may be present at the location identified in Section 3.0. Any uses which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Nichols Environmental (Canada) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

10.0 CLOSURE

We trust this report meets with your present requirements. Should you have any questions or if we could be of further assistance, please contact the undersigned at your convenience.

Respectfully submitted,
NICHOLS ENVIRONMENTAL (CANADA) LTD.
APEGA PERMIT TO PRACTICE NUMBER: P6730

Tawnya Anderson, B.Sc., EPt
Environmental Scientist

Reviewed by:

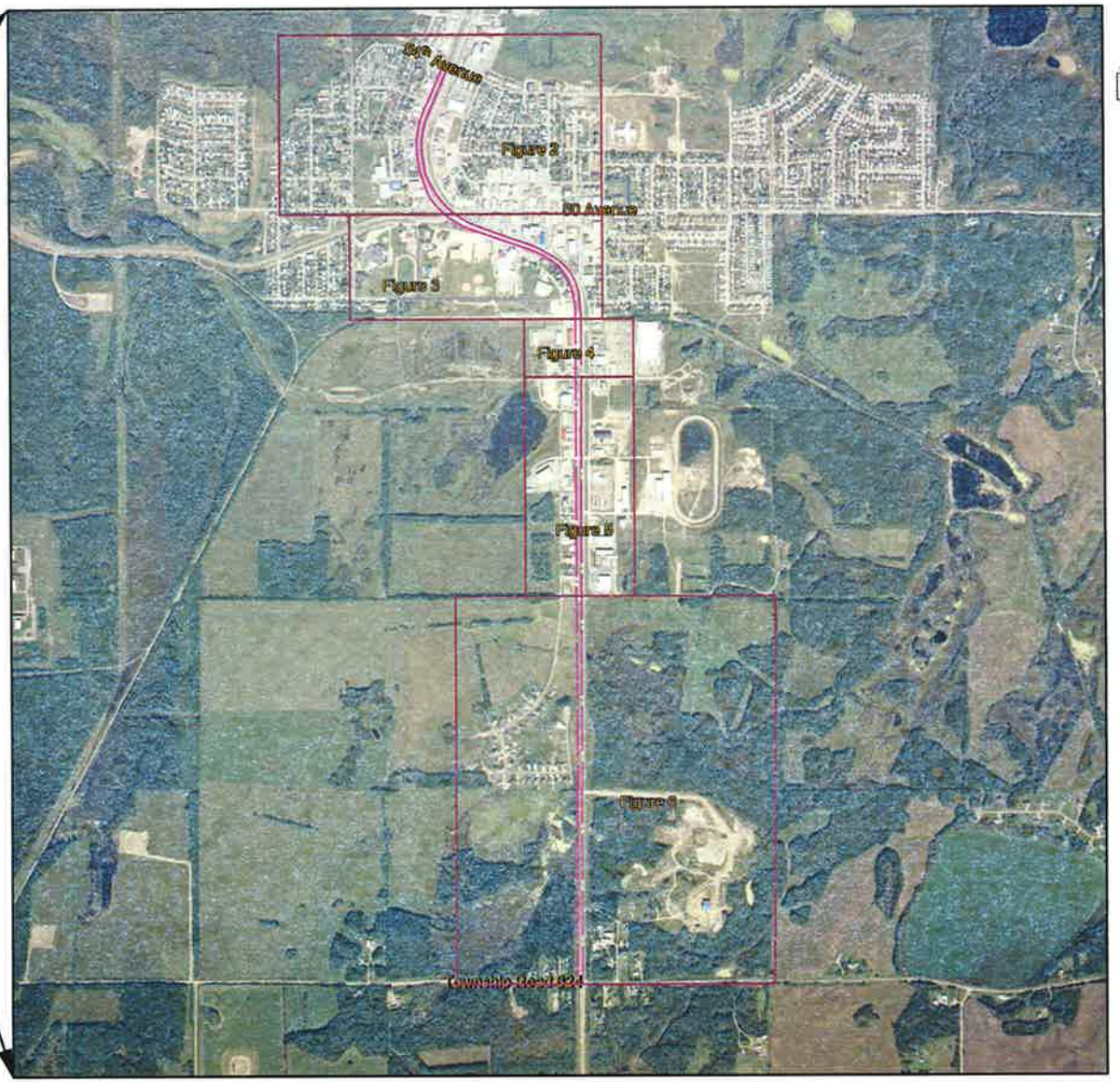
PROFESSIONAL GEOLOGIST ALBERTA
ROBERT W. DICKIE

1/8/13

R.W. (Rob) Dickie, P. Geol., R.E.T., EP
President

FIGURES

Reference image scale 1:88,500



Legend:

- Approximate Property Boundary
- Site Locations

Figure 2: 54th to 50th Avenue

Figure 3: 50th to 46th Avenue

Figure 4: 47th to 42nd Avenue

Figure 5: 42nd to 34th Avenue

Figure 6: 34th Avenue to TWP 624

Air Photo Source: 2004 Google Earth

NICHOLS ENVIRONMENTAL (CANADA) LTD

-112 0 112 224 336 448 560m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd

REVISION DATE
January 2013

SCALE	APPROVED
1:18,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 1

\\nichols\vancl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Reference image scale 1:88,500

Legend:

- Approximate Property Boundary
- Automotive/Potential for Fuel Tanks
- Current/Former Service Stations

1. No Frills Gas Bar
2. Former Fas Gas (ESAR #1337851)
3. Invision Automotive Inc.
4. Petro-Canada Service Station
5. Cold Lake Fire Rescue
6. OK Tire & Auto Services
7. Former Esso Service Station (ESAR #1338892, 1340549, 1340206)

Air Photo Source: 2004 Google Earth

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-17 0 17 34 51 68 85m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location: 54th to 50th Avenue

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

REVISION DATE
January 2013

SCALE	APPROVED
1:3,000	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 2

Reference image scale 1:88,500

Legend:

- Approximate Property Boundary
- Automotive/Potential for Fuel Tanks
- Current/Former Service Stations

7. Former Esso Service Station

8. Cold Lake Buick Chevrolet GMC Pontiac Dealership

9. Former Mercury Sales (ESAR #1340202)

10. Former Turbo Service Station (ESAR #1338739)

11. Cold Lake Chrysler Dodge Jeep Ram

12. Former Petro-Canada Cardlock (ESAR #1340118)

13. Fas Gas Service Station

Air Photo Source: 2004 Google Earth

NICHOLS ENVIRONMENTAL (CANADA) LTD

-18 0 18 36 54 72 90m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location: 50th to 46th Avenue

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd

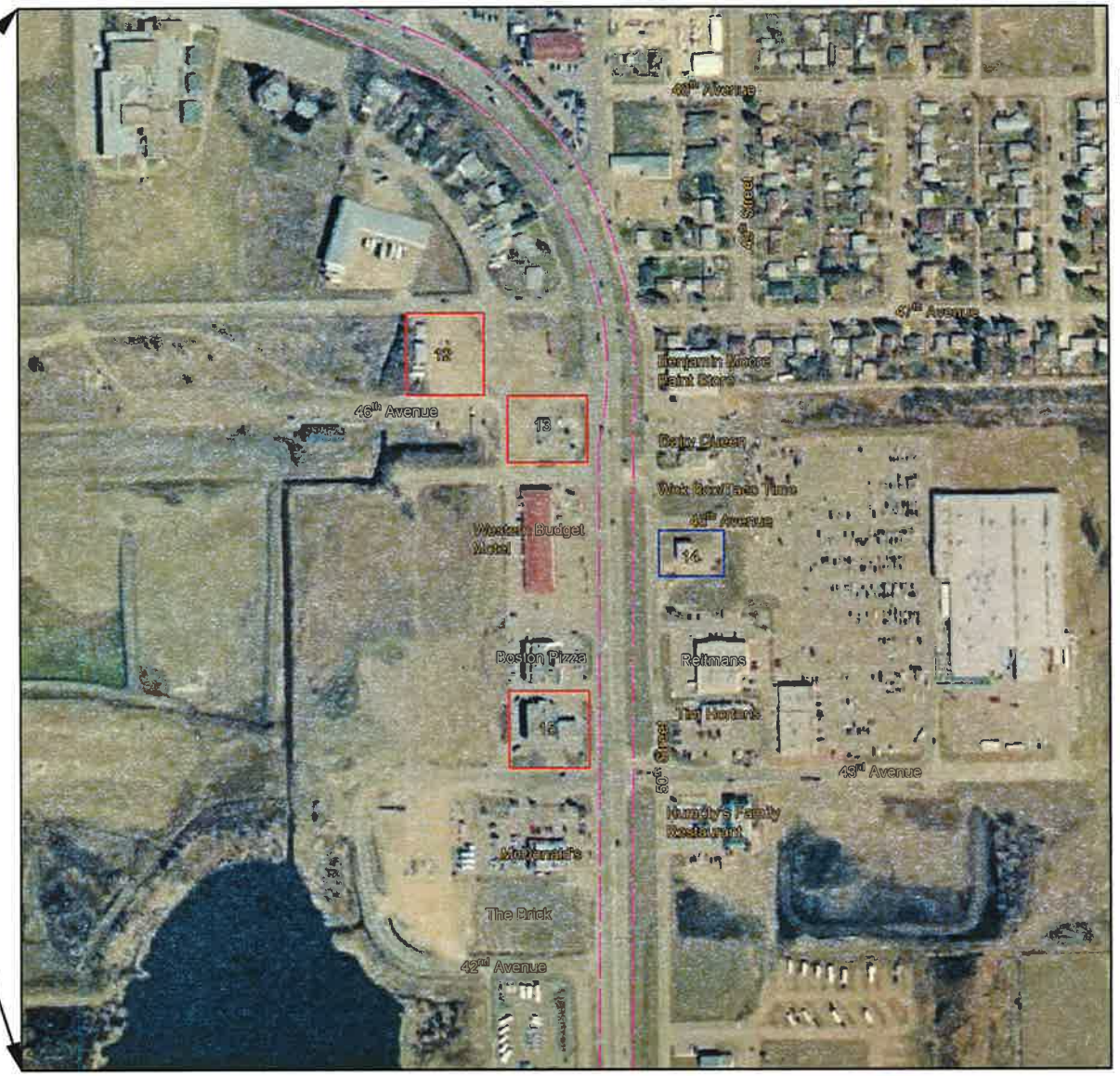
REVISION DATE
January 2013

SCALE: 1:3,000 | APPROVED: TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 3

Reference image scale 1:88,500



Air Photo Source: 2004 Google Earth

Legend:

- Approximate Property Boundary
- Automotive/Potential for Fuel Tanks
- Current/Former Service Stations

12. Former Petro-Canada Cardlock (ESAR #130118)

13. Fas Gas Service Station

14. Lube-X

15. Shell Service Station (ESAR #1339759)

NICHOLS ENVIRONMENTAL (CANADA) LTD

-18 0 18 36 54 72 90m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location 47th to 42nd Avenue

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd

REVISION DATE
January 2013

SCALE: 1:3,000
APPROVED: TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 4

Original drawing in colour. Black and white copies may not interpret properly.

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Reference image scale 1:86,500

Air Photo Source: 2004 Google Earth

Legend:

- Approximate Property Boundary
- Automotive/Potential for Fuel Tanks
- Current/Former Service Stations

16. KIA Cold Lake

17. Muscle Automotive

18. Cold Lake Ford

19. Former Husky Bulk Facility (ESAR #1340211)

20. Express Lube

21. Sheil Bar Mechanical

NICHOLS ENVIRONMENTAL (CANADA) LTD

-18 0 18 36 54 72 90m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location: 42nd to 34th Avenue

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd

REVISION DATE
January 2013

SCALE: 1:3,000 | APPROVED: TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 5

Reference image scale 1:85,500

Legend:

Approximate Property Boundary

Air Photo Source: 2004 Google Earth

NICHOLS ENVIRONMENTAL (CANADA) LTD

-47 0 47 94 141 188 235m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
Site Location: 34th Avenue to TWP 624

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd

REVISION DATE
January 2013

SCALE	APPROVED
1:7,800	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Figure 6

APPENDIX A

Government of Alberta

Reconnaissance Report

View in Imperial

Export to Excel

You have selected more than one water well.
Please click the water well ID to generate Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)
SE-3-63-2-W4M																
215486	SE	03	063	02	4	UNKNOWN DRILLER		16.46	Chemistry	Unknown	1			GRAND CENTRE, TOWN OF #1	1.49	
215488	SE	03	063	02	4	UNKNOWN DRILLER		14.02	Chemistry	Dewatering	1			GRAND CENTRE, TOWN OF #5	2.41	
215489	SE	03	063	02	4	CABAY DRLG SERVICE	1978-05-15	40.23	New Well	Domestic	1	10	39	CARSON, PRICE	29.66	11.37
215489	SE	03	063	02	4	CABAY DRLG SERVICE	1978-05-15	40.23	New Well	Domestic	1	10		CARSON, PRICE	29.66	9.09
215500	01	03	063	02	4	UNKNOWN DRILLER		4.57	Federal Well Survey	Unknown						
215501	02	03	063	02	4	UNKNOWN DRILLER		18.29	Unknown	Unknown		6		GRAND CENTRE, TOWN OF #9-74		
215504	08	03	063	02	4	UNKNOWN DRILLER		18.29	Unknown	Unknown		3		GRAND CENTRE, TOWN OF #24-		
215506	08	03	063	02	4	UNKNOWN DRILLER		12.19	Unknown	Unknown		4		GRAND CENTRE, TOWN OF #25-		
215507	08	03	063	02	4	UNKNOWN DRILLER		4.57	Unknown	Unknown		2		GRAND CENTRE, TOWN OF #24A-		
215509	08	03	063	02	4	UNKNOWN DRILLER		18.29	Unknown	Observation		4	38	GRAND CENTRE, TOWN OF #8-74	3.26	385.96
234618	07	03	063	02	4	UNKNOWN DRILLER	1974-12-11	12.19	Old Well-Test	Municipal		4	22	GRAND CENTRE, TOWN OF #6-74	4.27	321.41
NE-34-62-2-W4M																
214112	09	34	062	02	4	UNKNOWN DRILLER		3.66	Chemistry	Domestic	1			BIRNS, PETER		
214113	09	34	62	2	4	ALBERTA ENVIRONMENT/EARTH SCIENCES DIVISION	1971-10-03	72.24	Test Hole - Abandoned	Investigation		9		ALTA ENV		
214114	09	34	062	02	4	UNKNOWN DRILLER		12.19	New Well	Unknown		4	28	GRAND CENTRE, TOWN OF #14A-	3.54	90.92
214115	09	34	062	02	4	UNKNOWN DRILLER		9.75	New Well	Unknown		6	24	GRAND CENTRE, TOWN OF #14C-	3.08	90.92
214116	09	34	062	02	4	UNKNOWN DRILLER		12.19	New Well	Unknown		4		GRAND CENTRE, TOWN OF #14B-		
NW-35-62-2-W4M																
214120	NW	35	062	02	4	UNKNOWN DRILLER		4.57	Chemistry	Domestic	1			ANDERSON, KEN	1.83	
214121	13	35	062	02	4	UNKNOWN DRILLER		12.19	New Well	Unknown		5	6	GRAND CENTRE, TOWN OF #11-	3.02	386.42
214122	14	35	062	02	4	UNKNOWN DRILLER		12.19	New Well	Unknown		4		GRAND CENTRE, TOWN OF #2		
214159	14	35	062	02	4	UNKNOWN DRILLER		8.23	New Well	Unknown			14	GRAND CENTRE, TOWN OF	4.72	33.19
SE-34-62-2-W4M																
214101	01	34	062	02	4	R&D WW BORING	1971-07-01	9.75	New Well	Domestic	1	3		BROWN, FRANK	7.32	31.82
214101	01	34	062	02	4	R&D WW BORING	1971-07-01	9.75	New Well	Domestic	1	3		BROWN, FRANK	7.32	
214102	01	34	062	02	4	UNKNOWN DRILLER		7.32	Chemistry	Unknown	1			BROWN, GEORGE W.	6.71	
214103	08	34	062	02	4	UNKNOWN DRILLER		4.27	Chemistry	Domestic	1			DENNIG, ROY	3.35	
214103	08	34	062	02	4	UNKNOWN DRILLER		4.27	Chemistry	Domestic	1			DENNIG, ROY	3.66	
214104	01	34	062	02	4	UNKNOWN DRILLER		7.92	Federal Well Survey	Unknown					6.40	
214105	08	34	062	02	4	TIZZARD DRILLING LTD.	1983-10-05	6.10	New Well	Domestic		2		NORTH WEST TRUST	2.13	136.38
SW-35-62-2-W4M																
214118	04	35	062	02	4	UNKNOWN DRILLER		10.67	Unknown	Unknown	1			HUSKY SVC CENTRE	3.66	
214119	04	35	062	02	4	UNKNOWN DRILLER		18.29	New Well-Abandoned	Unknown		4		GRAND CENTRE, TOWN OF #16-74		
NE-27-62-2-W4M																
214095	NE	27	062	02	4	UNKNOWN DRILLER		6.1	Chemistry	Unknown				DRAKE, WM	4.57	

Government of Alberta

Reconnaissance Report

View in Imperial

Export to Excel

You have selected more than one water well.
Please click the water well ID to generate Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)
NW-26-62-2-W4M																
214083	13	26	062	02	4	RONDEAU PAUL	1965-12-03	9.14	New Well	Unknown		5		PATTERSON, BOB		
214085	NW	26	062	02	4	UNKNOWN DRILLER		10.67	Chemistry	Unknown	1			GRAHAM, JAMES		
SE-27-62-2-W4M																
166690	SE	27	062	02	4	UNKNOWN DRILLER		48.77	Chemistry	Domestic				STEELE, BETHANY		
214088	01	27	062	02	4	CHORNEY WATER WELL DRILLING LTD.	1977-02-26	81.38	New Well	Domestic	1	12		FOLKS, LORY	28.13	47.73
214088	01	27	062	02	4	CHORNEY WATER WELL DRILLING LTD.	1977-02-26	81.38	New Well	Domestic	1	12		FOLKS, LORY	28.65	
214089	08	27	062	02	4	UNKNOWN DRILLER		4.57	Federal Well Survey	Unknown						
214090	SE	27	062	02	4	UNKNOWN DRILLER		0.00	Chemistry	Unknown	1			LONSDALE, MORRIS		
214091	SE	27	062	02	4	UNKNOWN DRILLER		0.00	Chemistry	Domestic				DUMONT, CLINT		
238771	01	27	062	02	4	A&C WATER WELL DRILLING	1994-05-26	38.71	New Well	Domestic		5	25	ANDERSON, KEN	31.46	36.37
295195	01	27	062	02	4	PARKLAND DRILLING LTD.	2000-09-21	35.05	New Well	Domestic		5	9	LABONTE, ALAIN/SHEILA	28.04	45.46
SW-26-62-2-W4M																
167298	SW	26	062	02	4	A&C WATER WELL DRILLING	1992-05-07	42.06	New Well	Domestic		10		BURGE, GRAHAM	34.44	31.82
214054	SW	26	062	02	4	RONDEAU & DENOYER	1970-03-10	15.54	New Well	Domestic		11		MAH & BELL ENT	8.84	15.91
214057	06	26	062	02	4	RONDEAU & DENOYER	1970-03-03	19.20	Dry Hole	Unknown		8		MAH & BELL ENT		
214059	SW	26	062	02	4	RONDEAU & DENOYER	1970-03-02	23.16	Dry Hole	Unknown		8		MAH & BELL ENT		
214062	SW	26	062	02	4	R&D WW BORING	1971-05-01	16.46	New Well	Domestic		7		MOIR, JAMES	9.14	11.37
214065	SW	26	062	02	4	R&D DRLG	1973-12-01	15.24	Dry Hole	Domestic		3		TAYLOR, EDWARD		
214067	04	26	062	02	4	CABAY DRLG SERVICE	1979-04-18	79.25	New Well	Domestic		11		LUGER, AL	30.48	18.18
214073	04	26	062	02	4	A&C WATER WELL DRILLING	1979-07-10	43.89	New Well	Domestic		5		STACY, R.	7.01	13.64
214075	SW	26	062	02	4	UNKNOWN DRILLER		30.48	Chemistry	Unknown	1			DISJARLAIS, LINDA		
214076	SW	26	062	02	4	R&D WW BORING	1974-03-05	12.50	New Well	Domestic		4		TAYLOR, EDWARD	7.01	
214079	SW	26	062	02	4	A&C WATER WELL DRILLING	1987-09-11	43.59	New Well	Domestic		7		A. LUGER HLDG	38.10	36.37
214082	06	26	062	02	4	ALBERTA ENVIRONMENT/EARTH SCIENCES DIVISION	1987-09-16	15.24	Cathodic Protection	Other		4		ALTA ENV		
214086	04	26	062	02	4	RONDEAU & DENOYER	1972-03-01	14.33	New Well	Domestic		6		WINTERBURN, FRED	9.30	29.55
238558	SW	26	062	02	4	TIZZARD DRILLING LTD.	1993-10-15	34.44	New Well	Domestic		6		AMA HOUSING DIV	18.90	36.37
296156	SW	26	062	02	4	A&C WATER WELL DRILLING	2000-07-13	48.77	New Well	Domestic		7	25	A. LUGER HLDG	34.59	45.46
1015082	SW	26	062	02	4	A&C WATER WELL DRILLING	2004-07-06	43.59	New Well	Domestic		7	4	OREILLY, JUDY	35.36	45.46

APPENDIX B

Photograph 1: The No Frills Gas Bar located to the east of the Property, south of 54th Avenue.

Photograph 2: The former Fas Gas located west of the Property, south of 54th Avenue.

Photograph 3: West side of Highway 28 between 52nd and 53rd Avenue.

Photograph 4: Petro-Canada service station west of the Property, north of 52nd Avenue.

Photograph 5: The Property, looking south from the west side at approximately 53rd Avenue.

Photograph 6: Former Esso service station located east of the Property and 55th Street, north of 50th Avenue.

Photograph 7: Groundwater monitoring well extending off-site from the former Esso service station toward 55th Street, east adjacent the Property.

Photograph 8: Former Turbo service station at the intersection of 52nd Street and Highway 28, looking north.

Photograph 9: Fas Gas service station to the west of the Property, north of 46th Avenue.

Photograph 10: Lube-X to the east of the Property, south of 46th Avenue.

Photograph 11: Shell service station at the intersection of 43rd Avenue and Highway 28.

Photograph 12: Ditch along the east portion of the Property north of 40th Avenue. Neighbouring land uses to the west are also visible.

Photograph 13: Vapour extraction system (right background of photo) and monitoring wells located on the Cold Lake Ford site to the east of the Property, north of 38th Avenue (former Husky bulk facility).

Photograph 14: Residential development east of the Property, south of 34th Avenue.

Photograph 15: East side of Highway 28, looking north along the ditch.

Photograph 16: Highway 28, looking north from TWP 624.

APPENDIX C

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0121-258

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1950 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-1

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0422-173

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1952 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

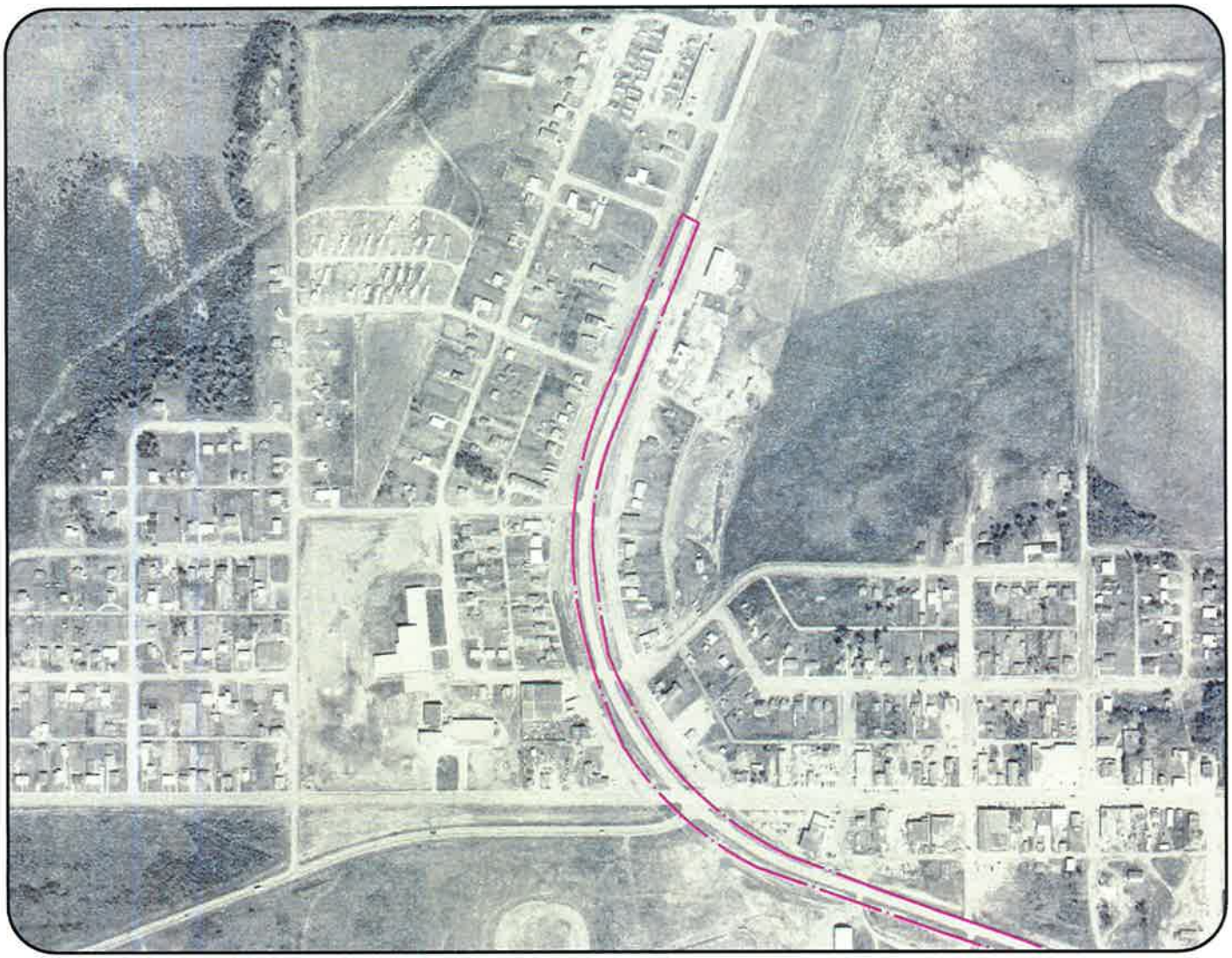
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-2

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0975-143

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1967 Aerial Photograph

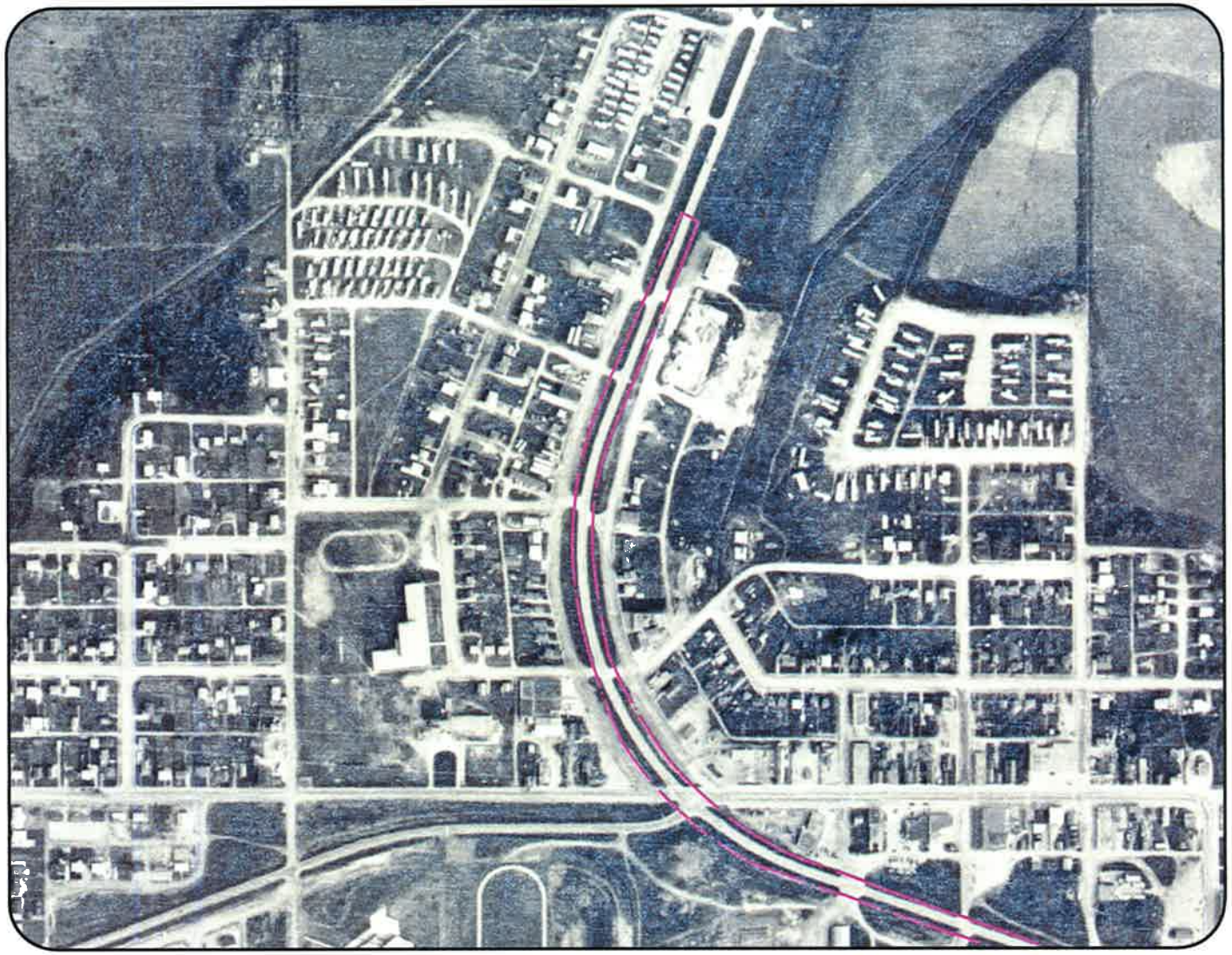
BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 2-3



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS1197-266

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1972 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

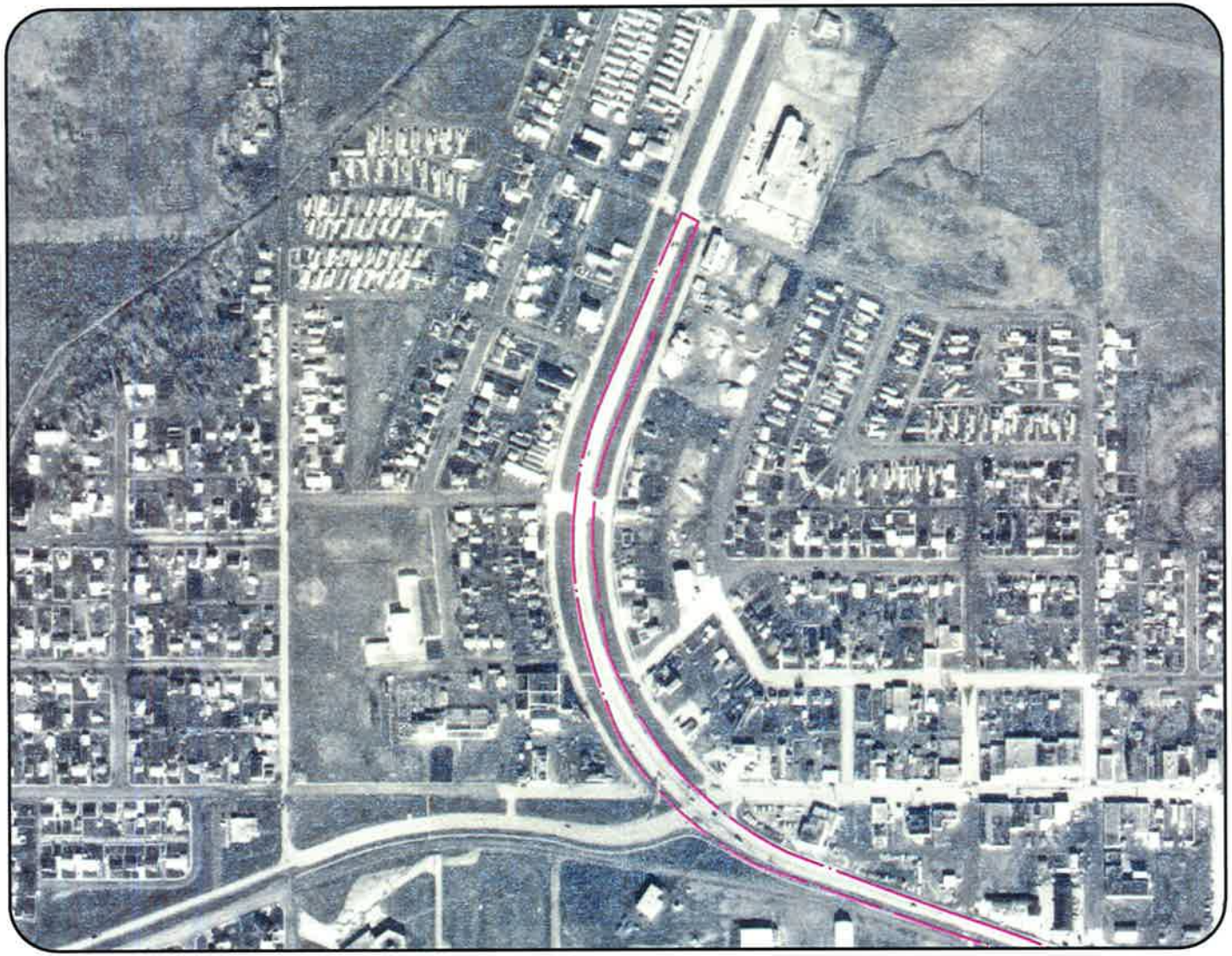
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-4

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2972-239

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1977 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-5

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2645-134

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1982 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

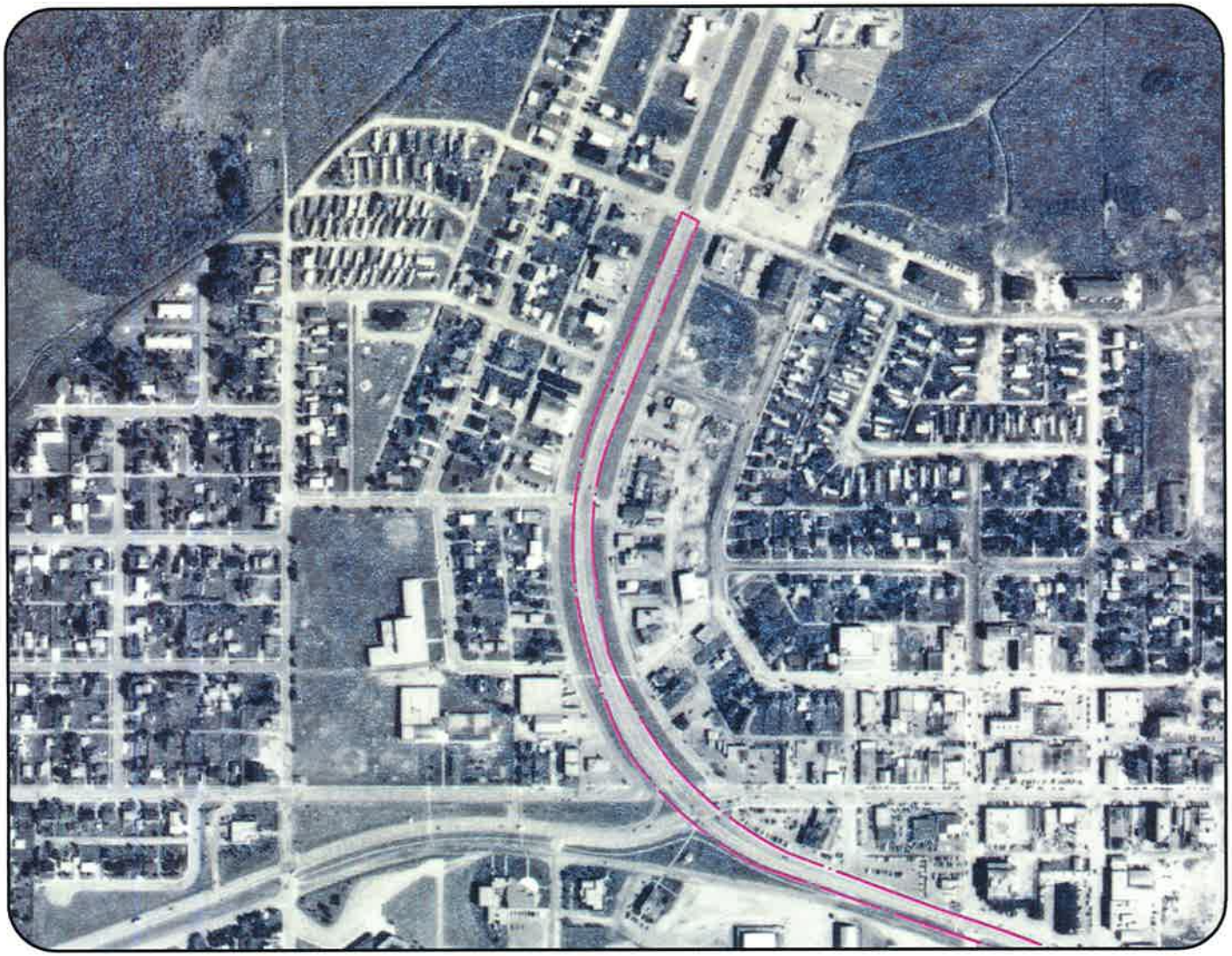
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-6

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret property.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS3733-349

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1988 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

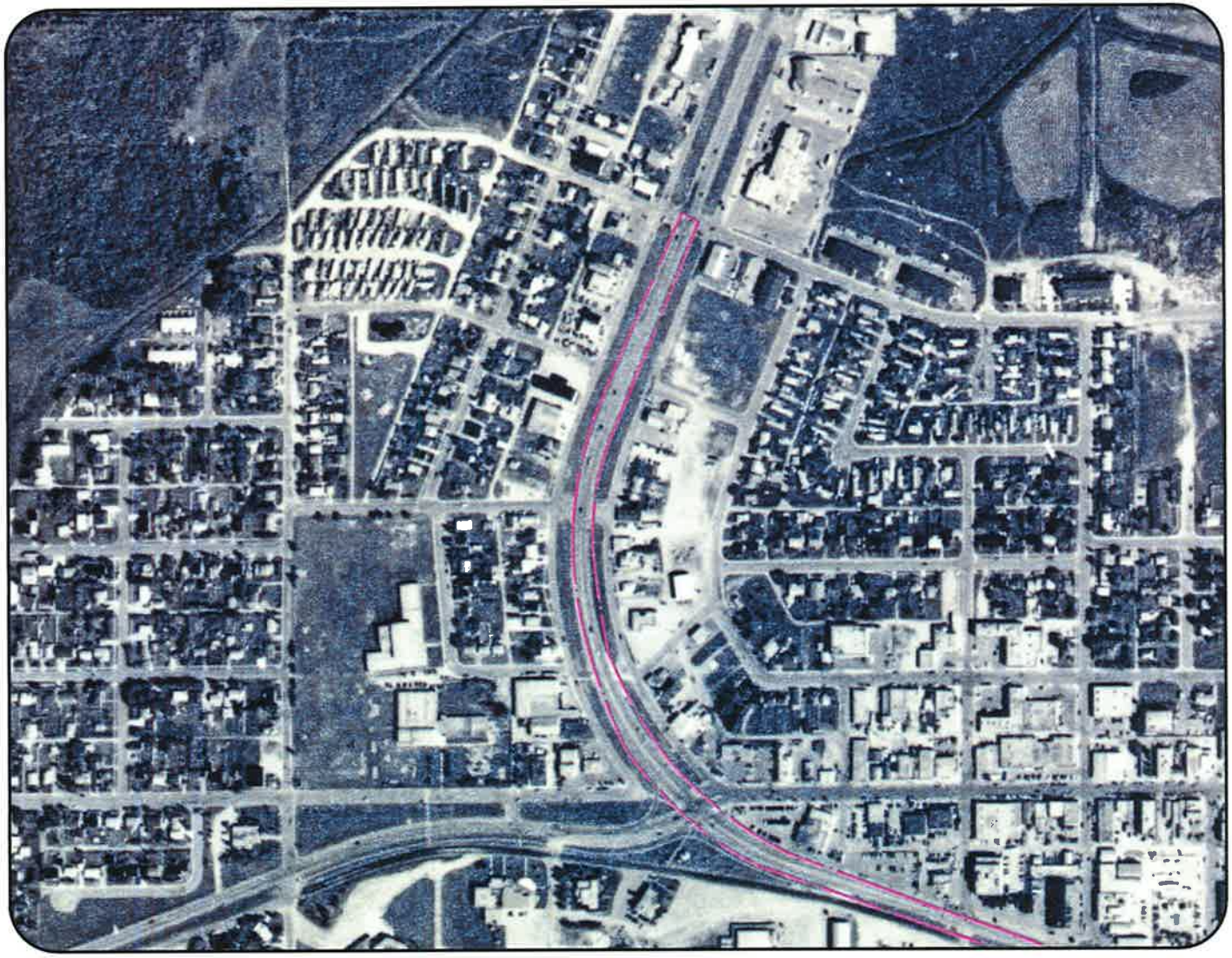
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-7



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS4423-051

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1993 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

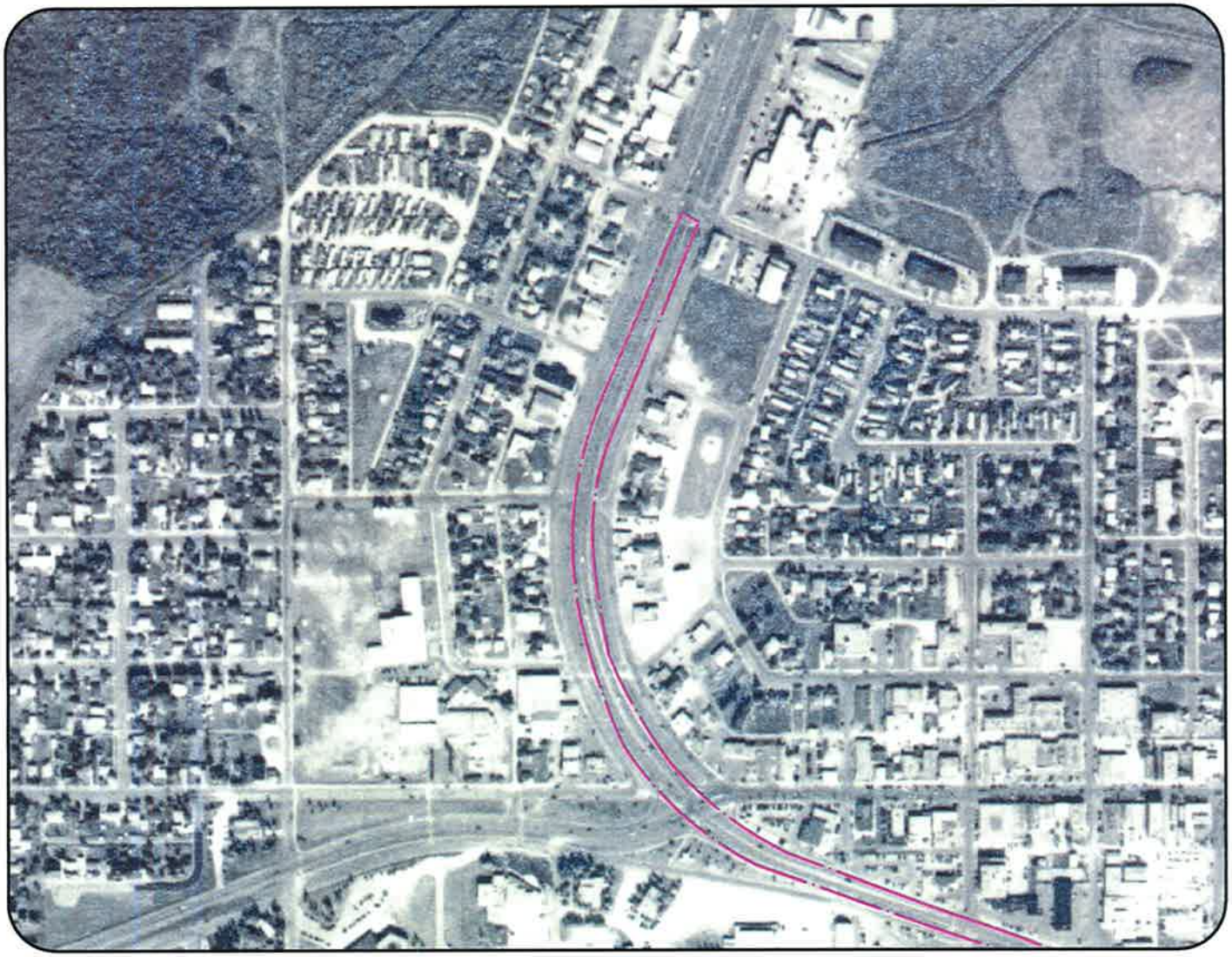
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-8

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/TRSG9803-424

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1998 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-9

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5141-062

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2000 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

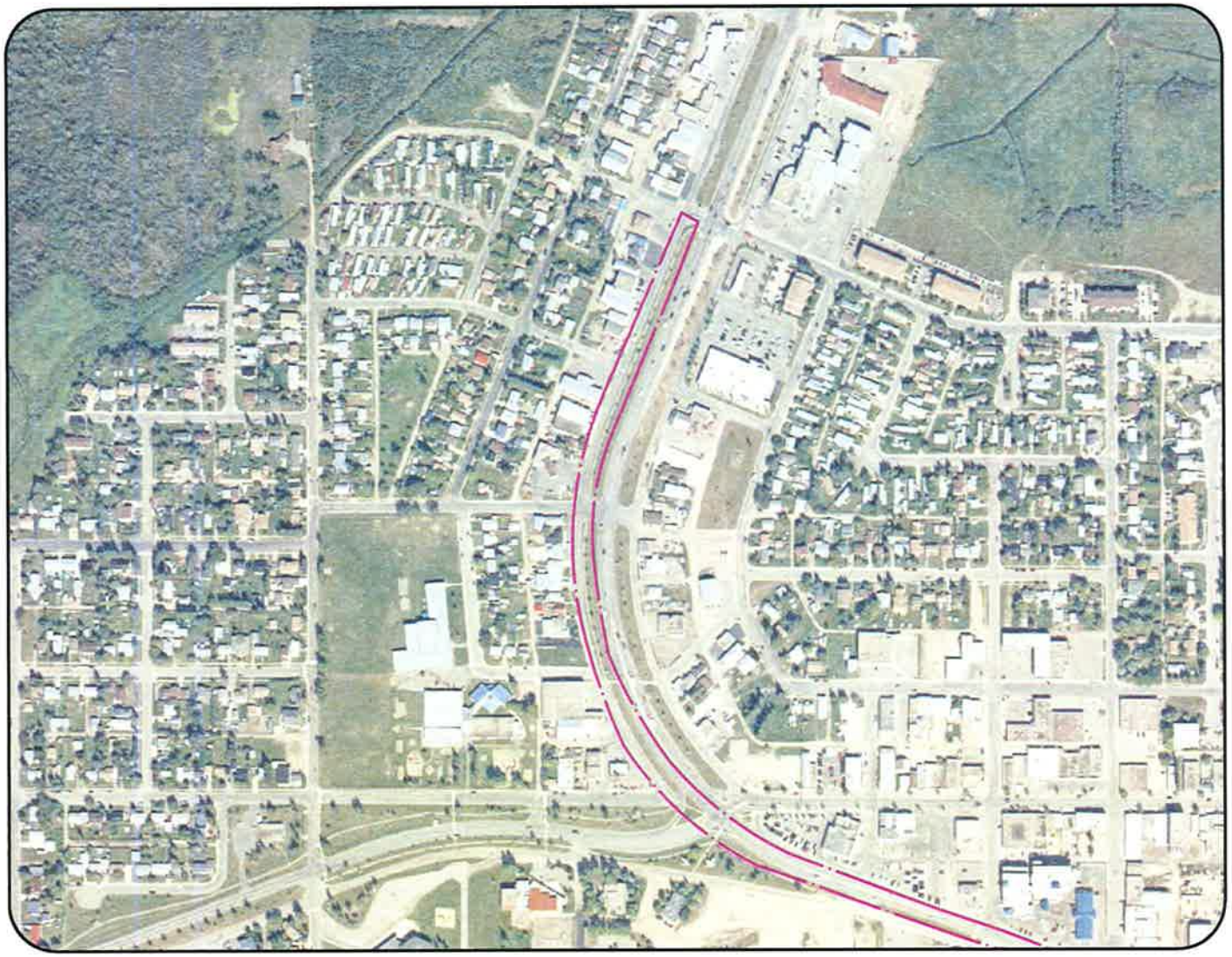
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 2-10



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5556-177

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
2011 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 2-11

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0121-258

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1950 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

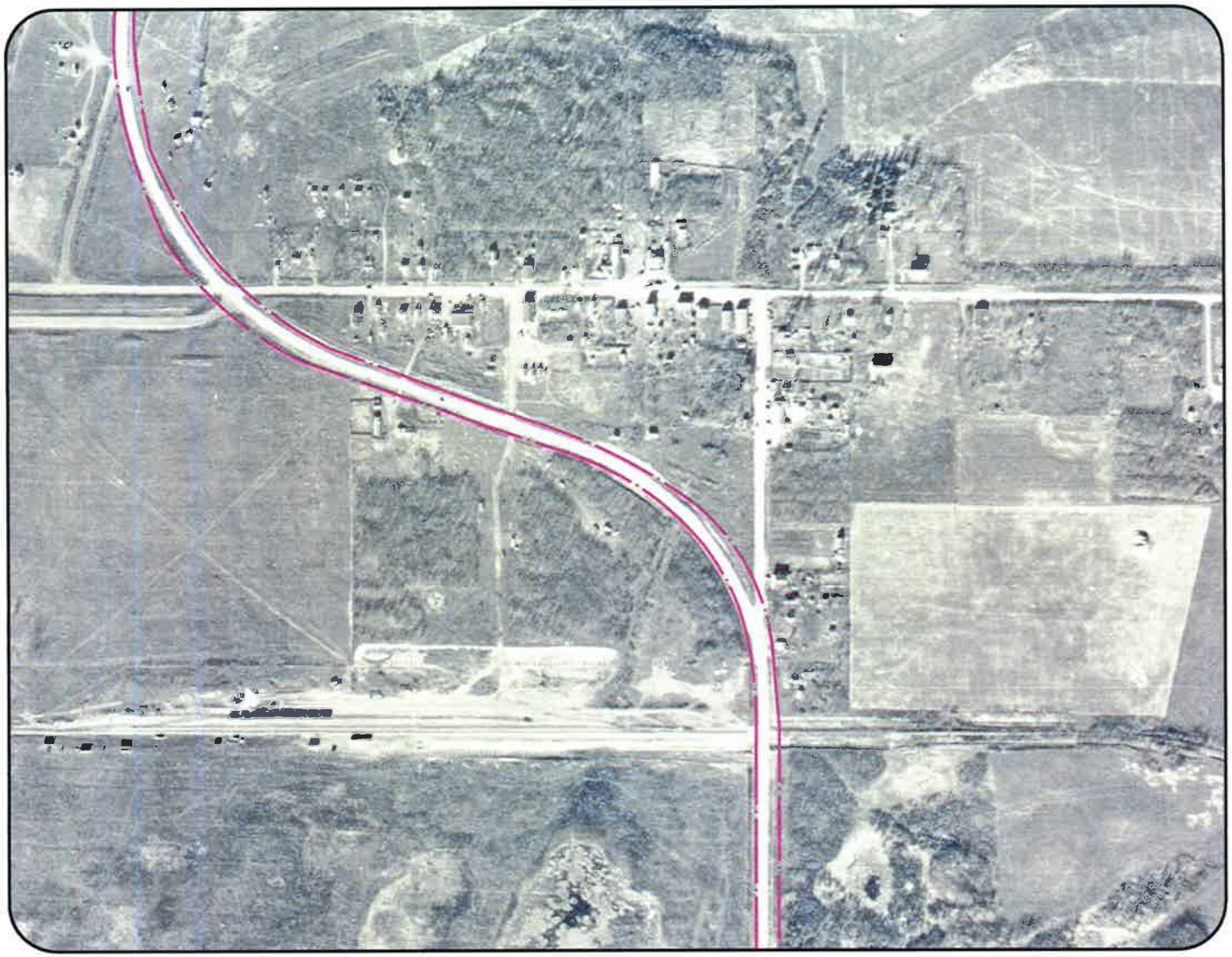
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-1

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0422-173

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1952 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

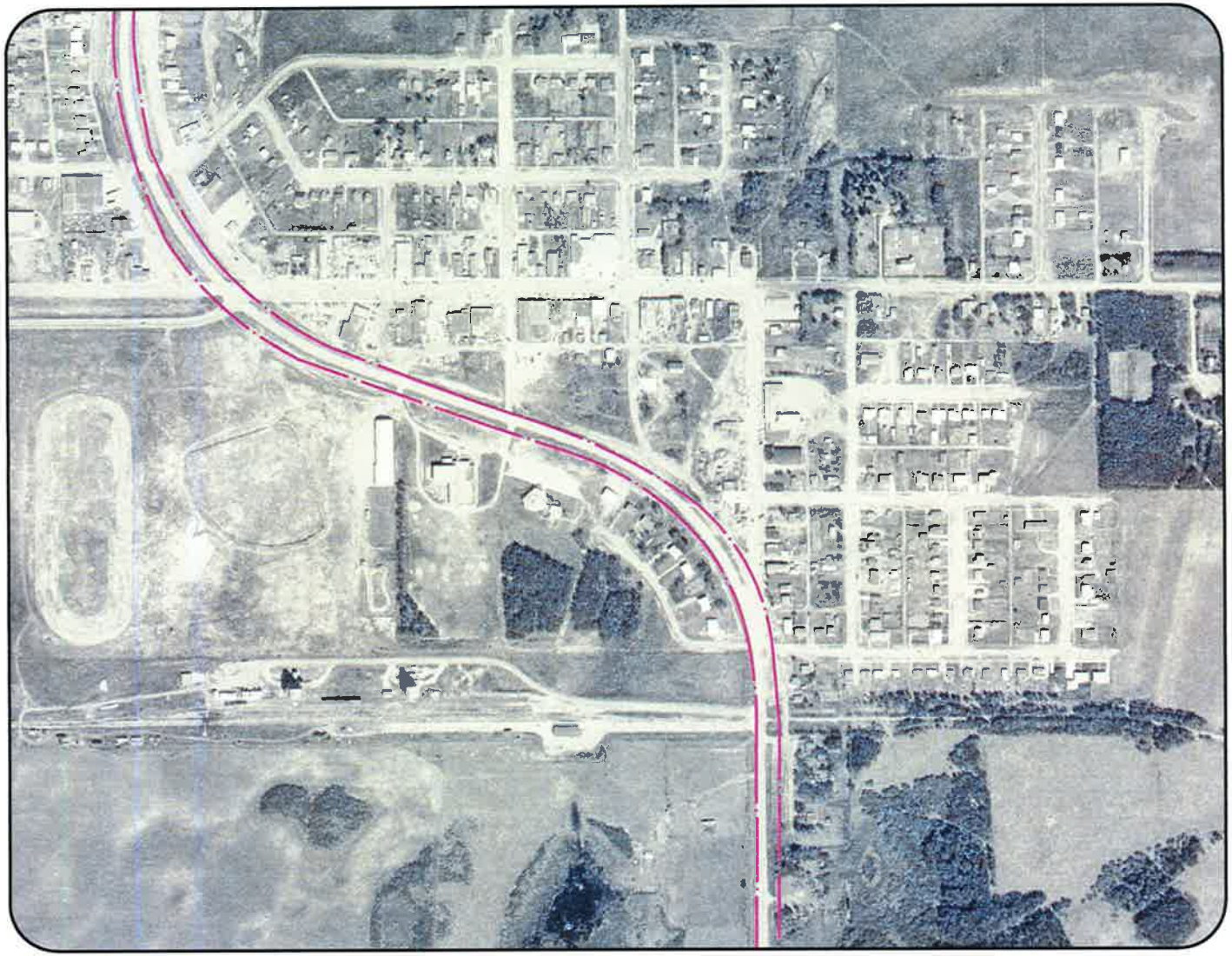
REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 3-2

\\nichols\vecl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0975-143

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1967 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

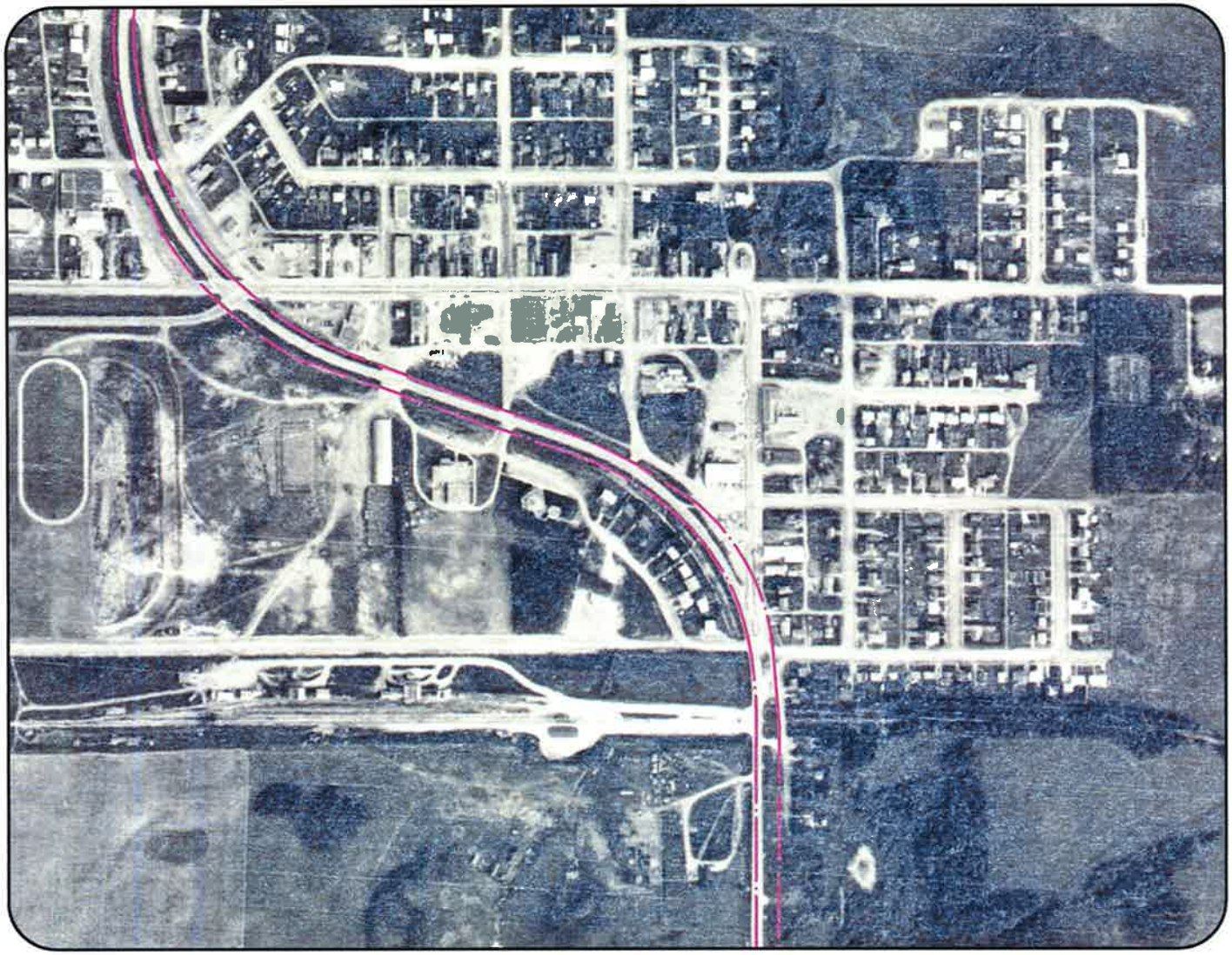
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-3

\\nichols\vec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS1197-266

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1972 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

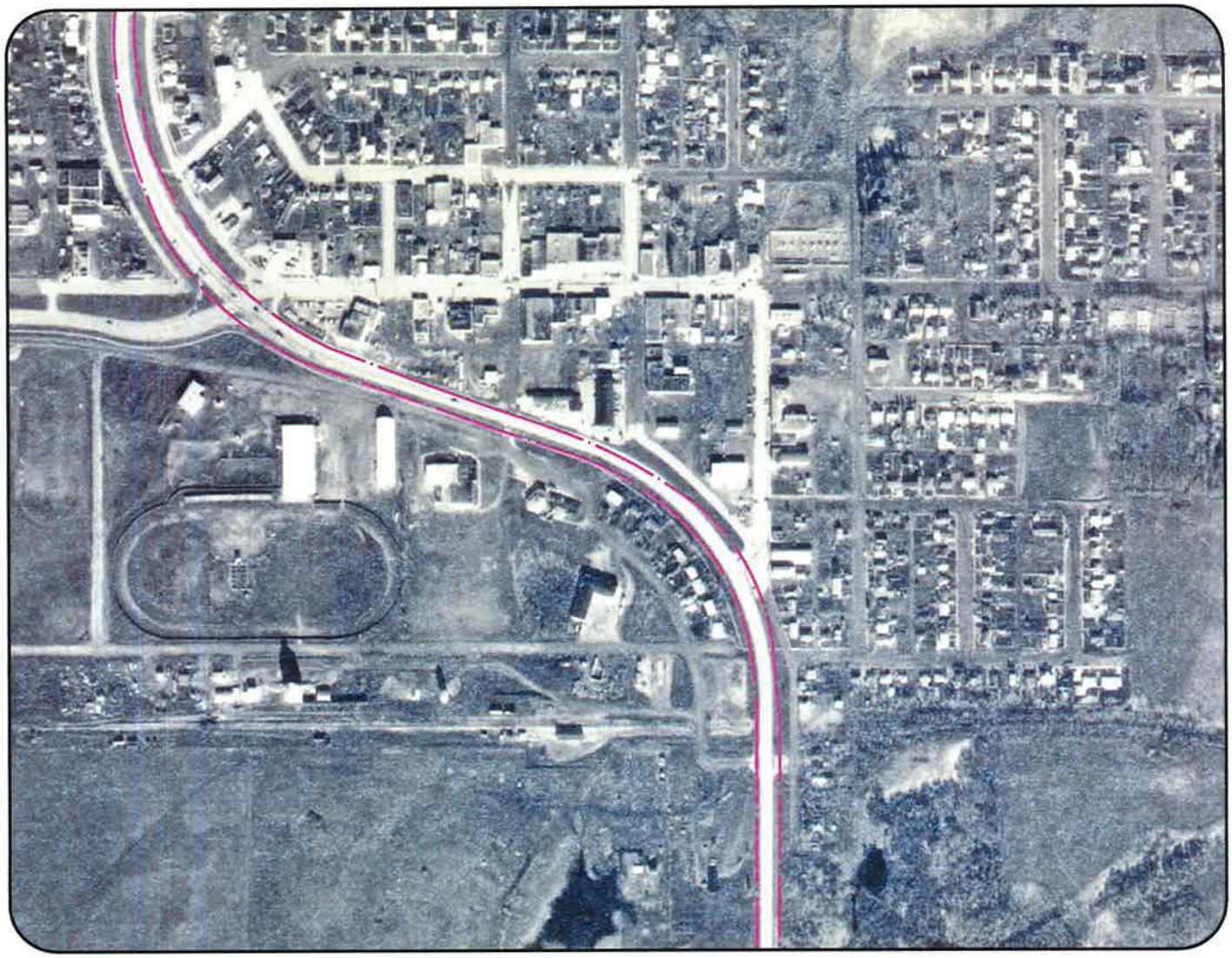
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-4

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2972-239

NICHOLS ENVIRONMENTAL
(CANADA) LTD

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1977 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

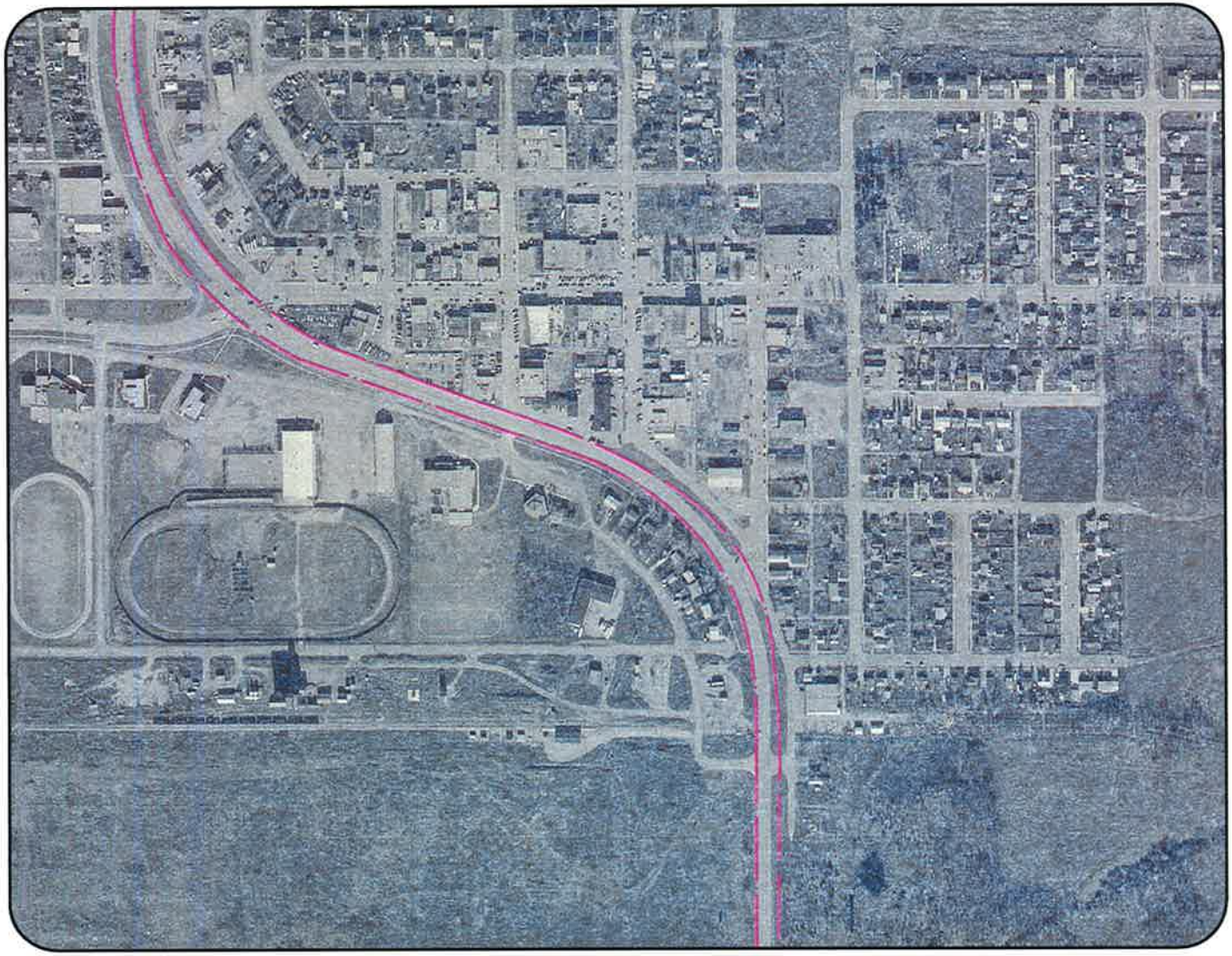
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-5

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2645-134

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1982 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

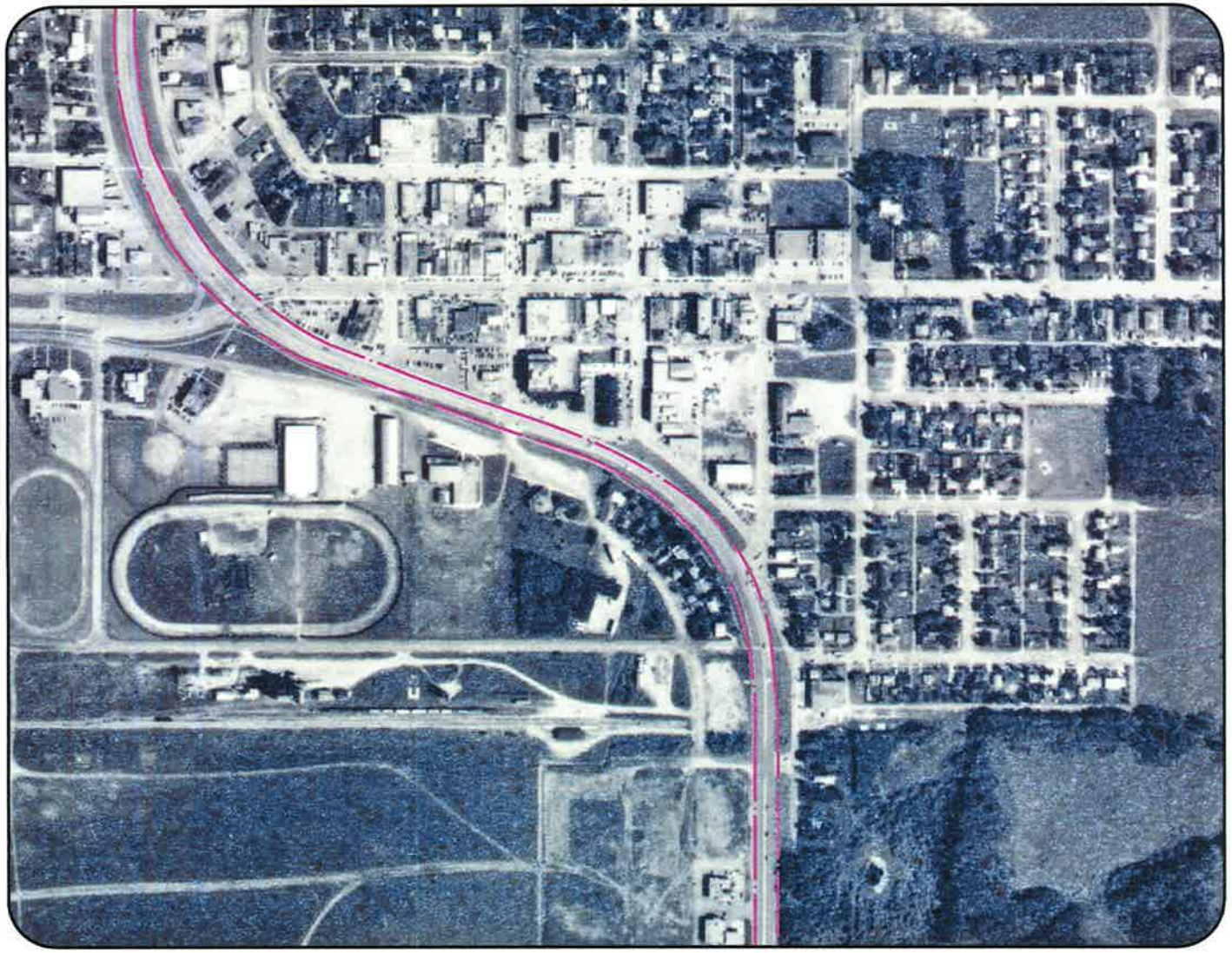
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-6



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS3733-349

-38 0 38 76 114 152 190m

NICHOLS ENVIRONMENTAL (CANADA) LTD.

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1988 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

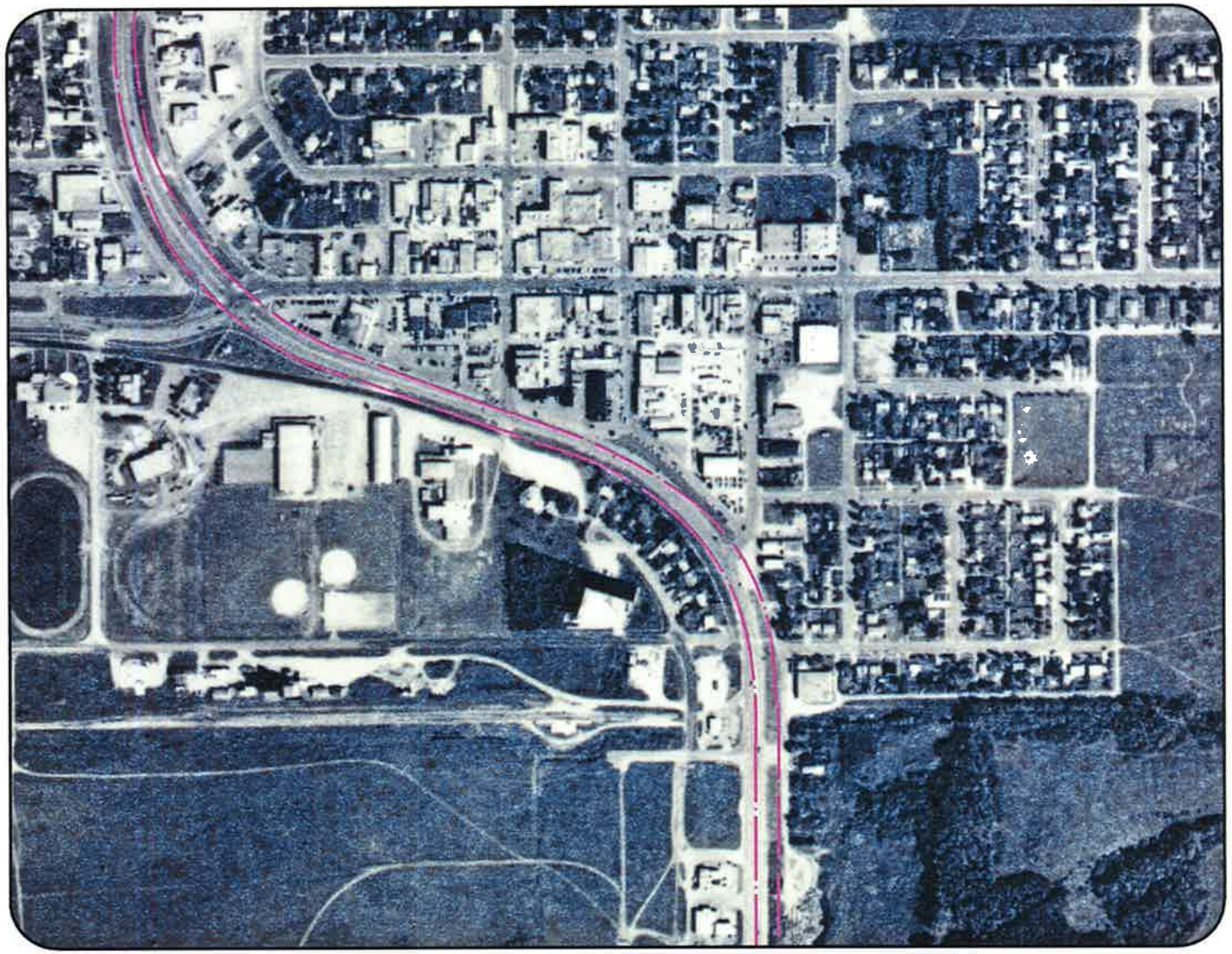
REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 3-7

\\nichols\net\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS4423-051

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1993 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

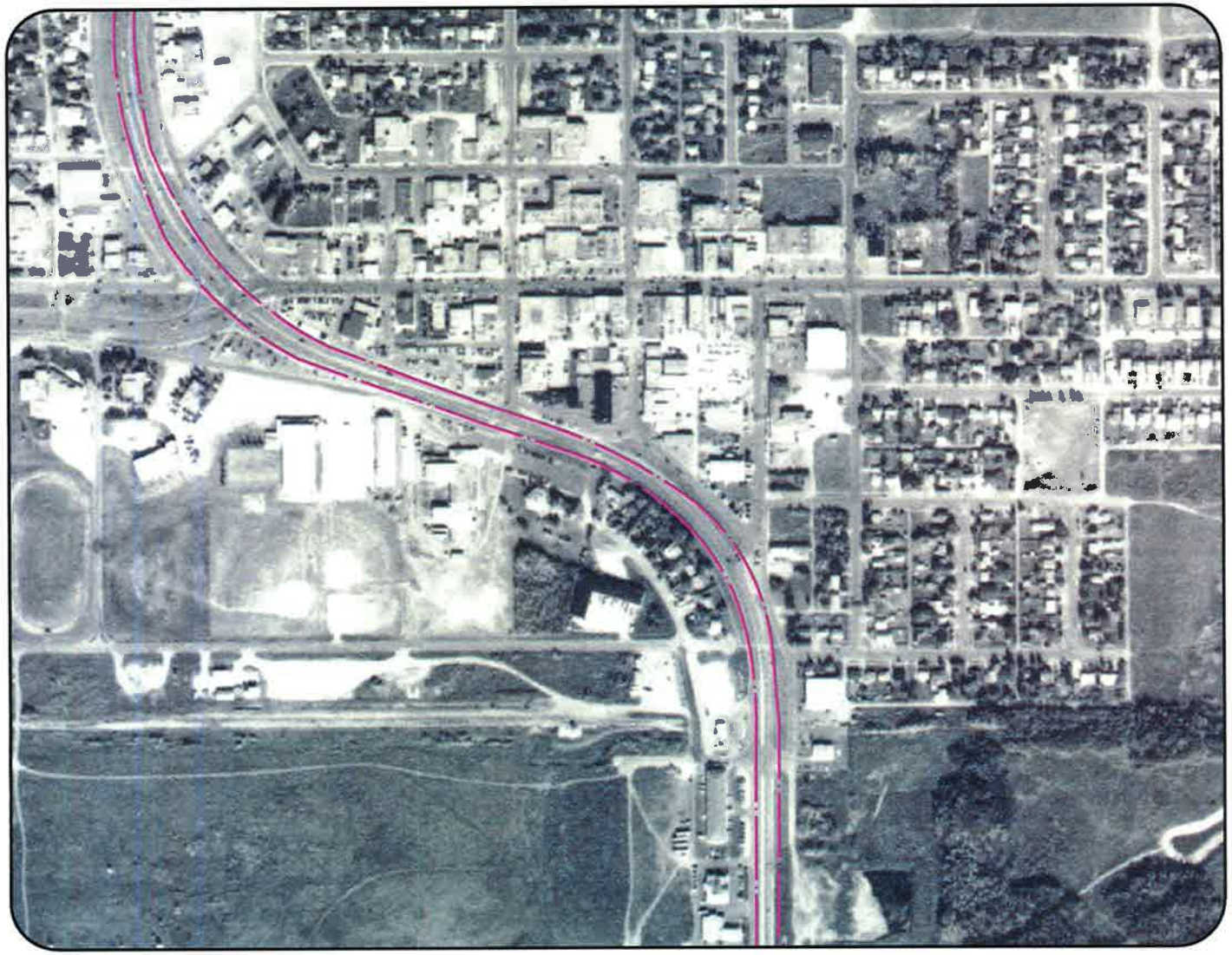
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-8

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/TRSG9803-424

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1998 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

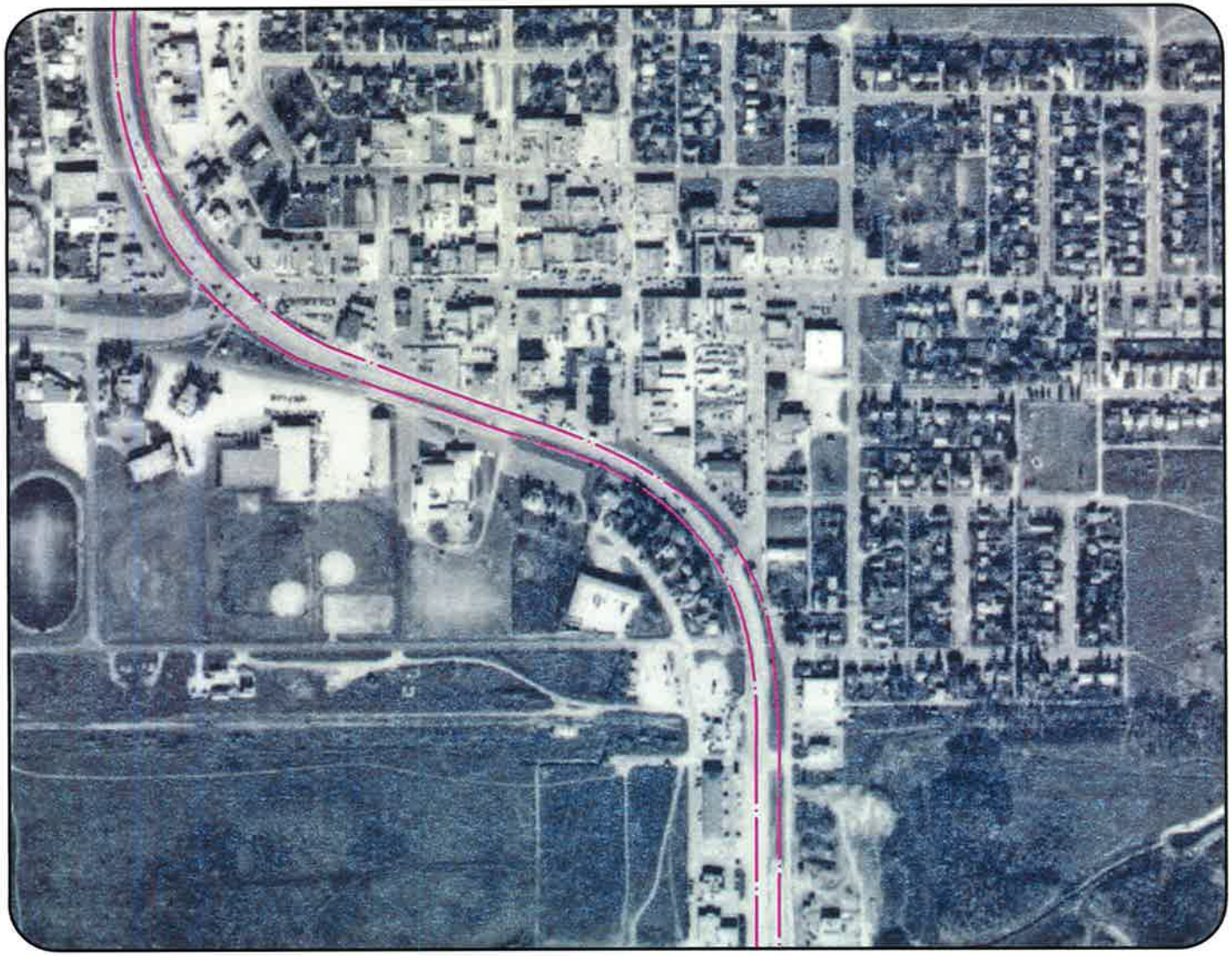
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-9

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5141-062

-38 0 38 76 114 152 190m

NICHOLS ENVIRONMENTAL (CANADA) LTD.

CLIENT	City of Cold Lake c/o Stantec Consulting Ltd.
PROJECT	Limited Phase I ESA City of Cold Lake Highway 28 Functional Study Cold Lake, Alberta
DRAWING TITLE	2000 Aerial Photograph
BASE/SITE PLAN PROVIDED BY	Nichols Environmental (Canada) Ltd.
REVISION DATE	January 2013
SCALE	1:6,300
APPROVED	TA/LL
PROJECT NO.	12-280-SCL
DRAWING NO.	Plate 3-10

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5559-177

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2011 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 3-11

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0121-258

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1950 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-1

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret property.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0422-173

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1952 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-2

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0975-143

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1967 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

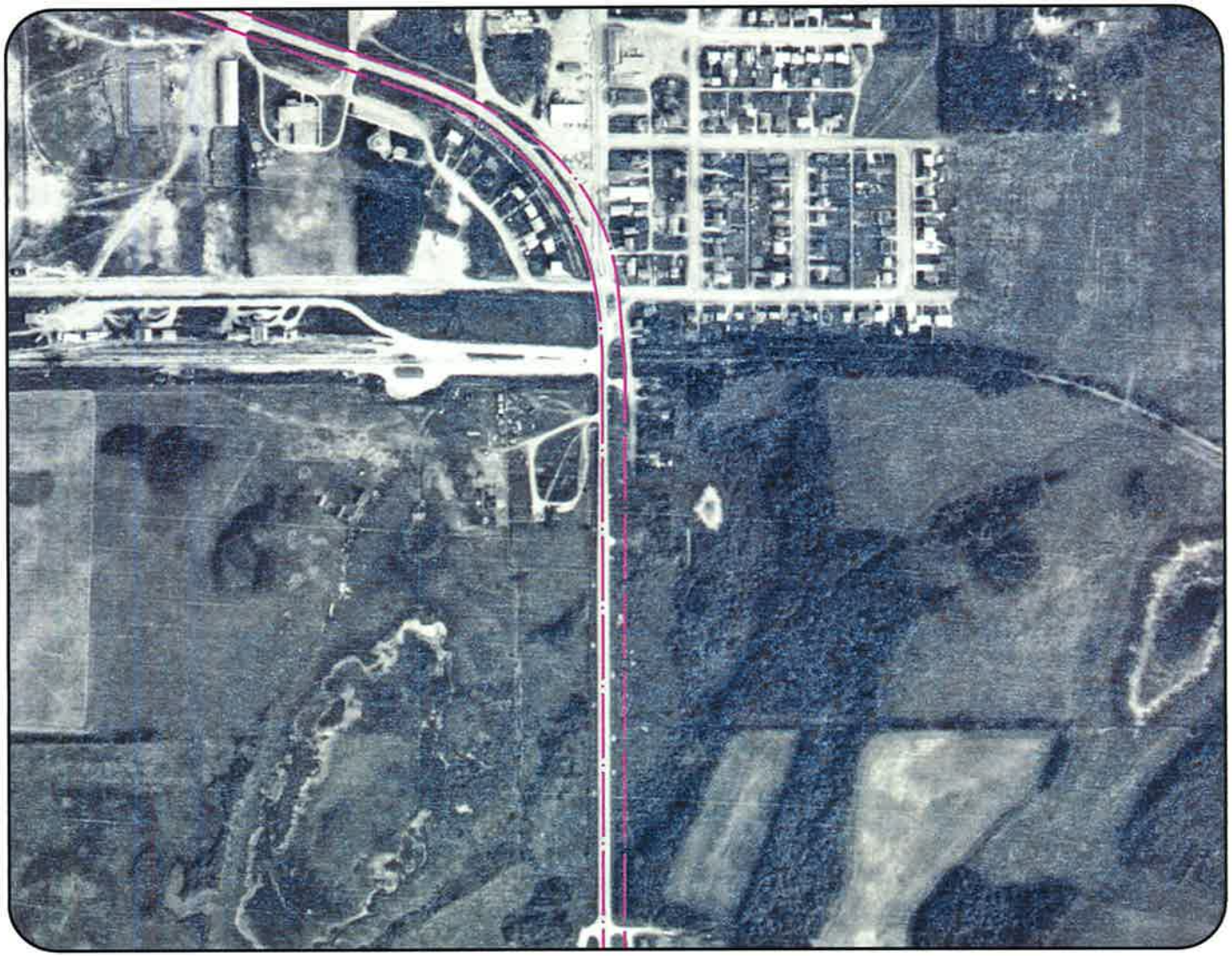
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-3



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS1197-266

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1972 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

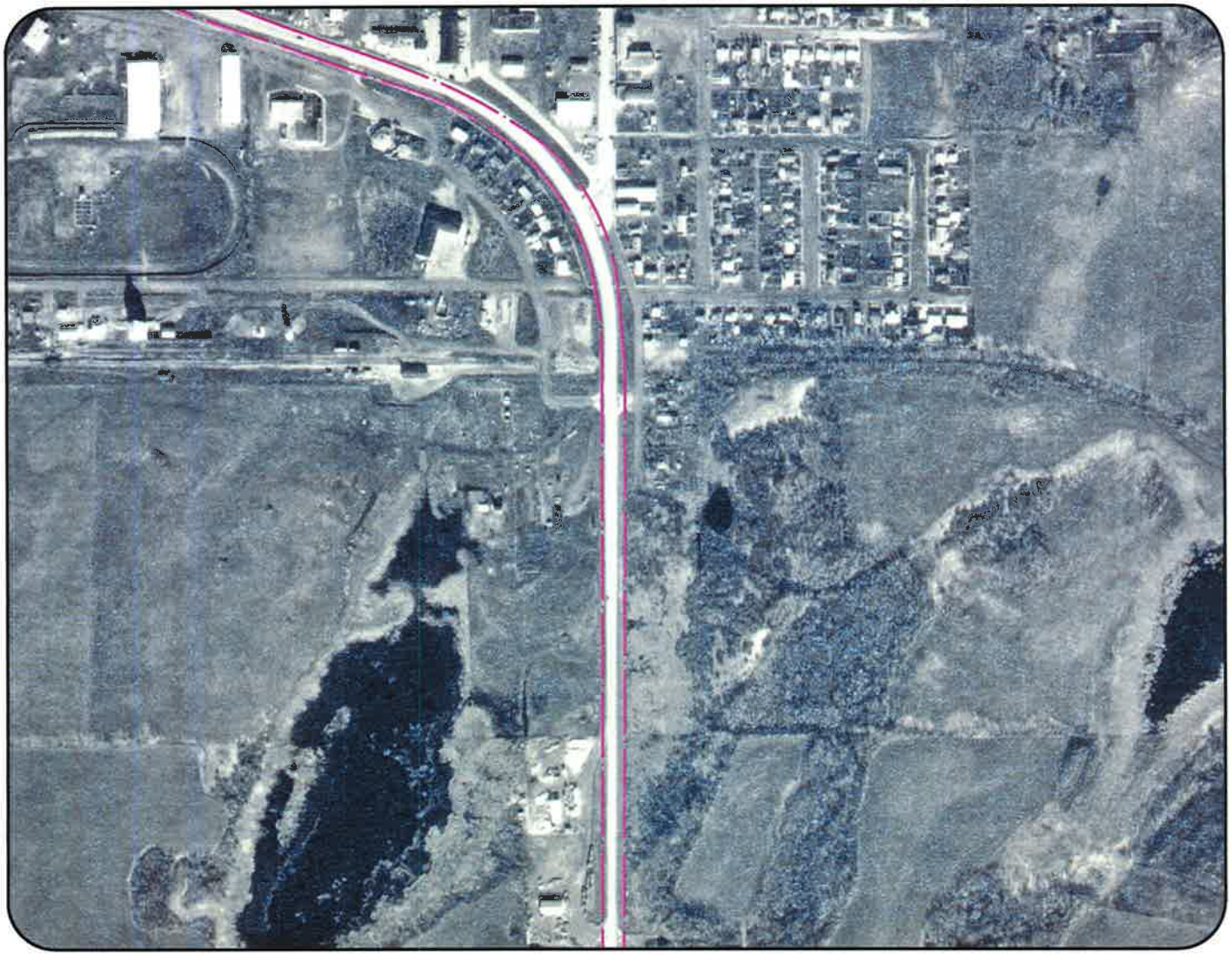
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-4

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2972-239

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1977 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

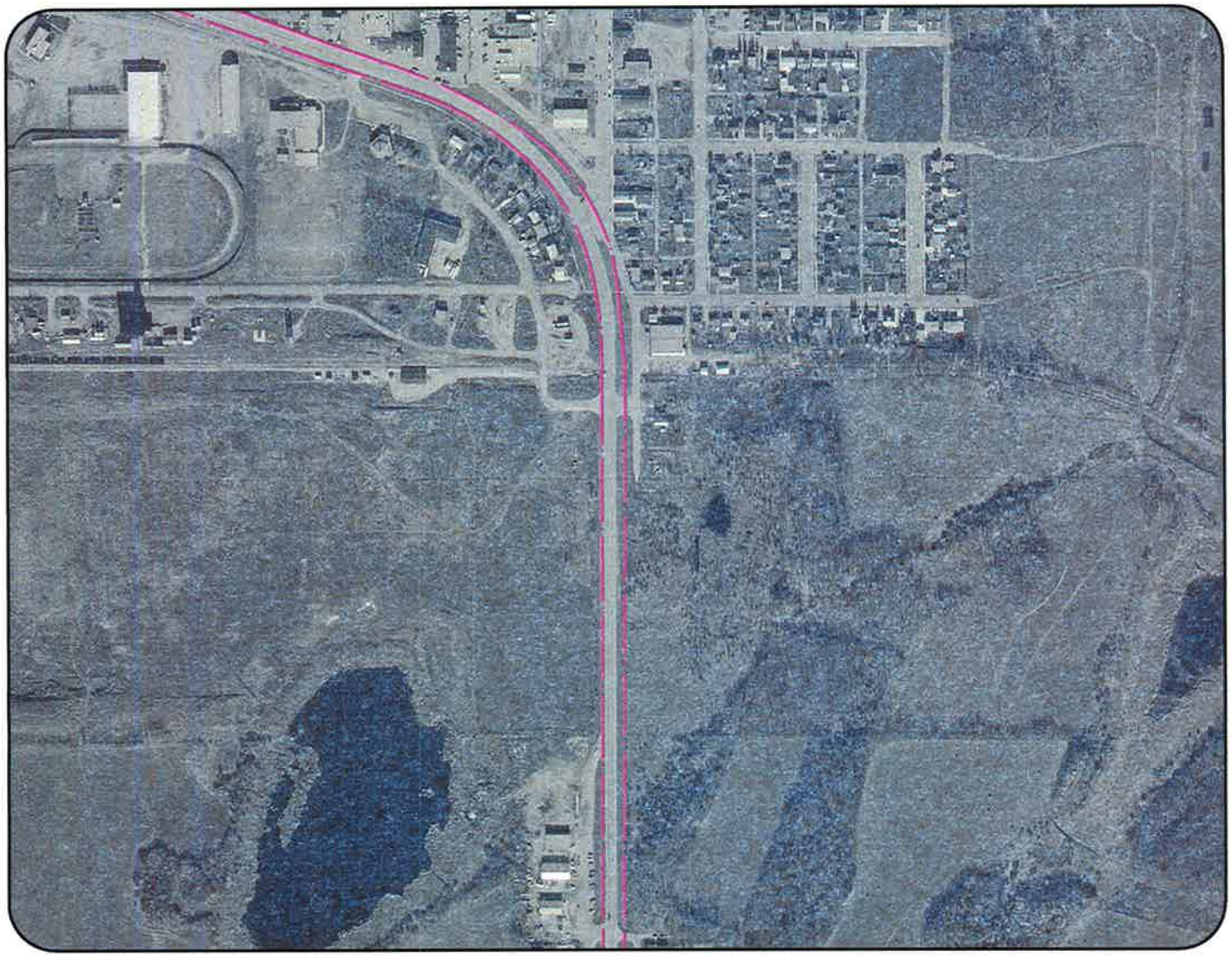
12-280-SCL

DRAWING NO.

Plate 4-5

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2645-134

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1982 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

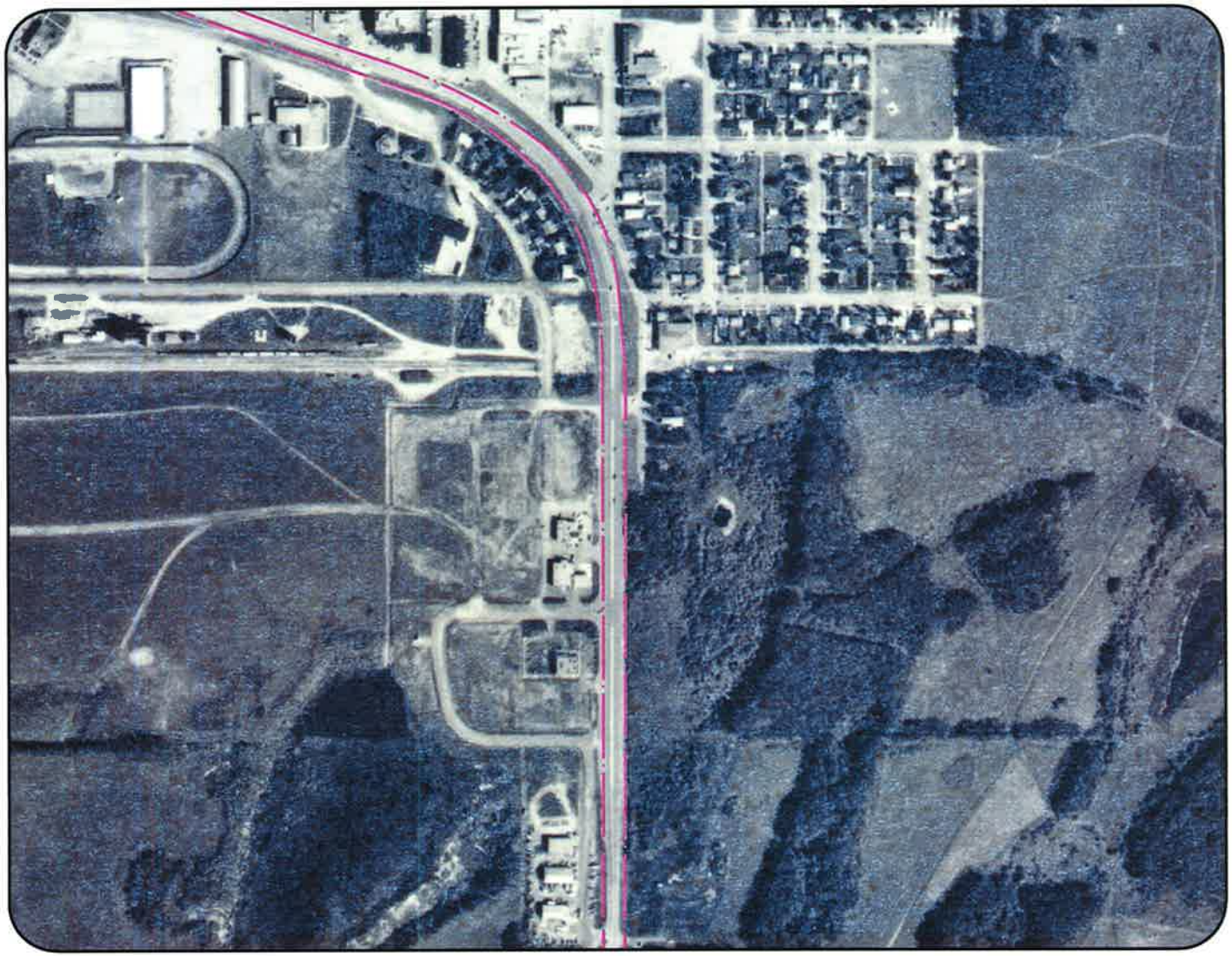
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-6



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS3733-349

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1988 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

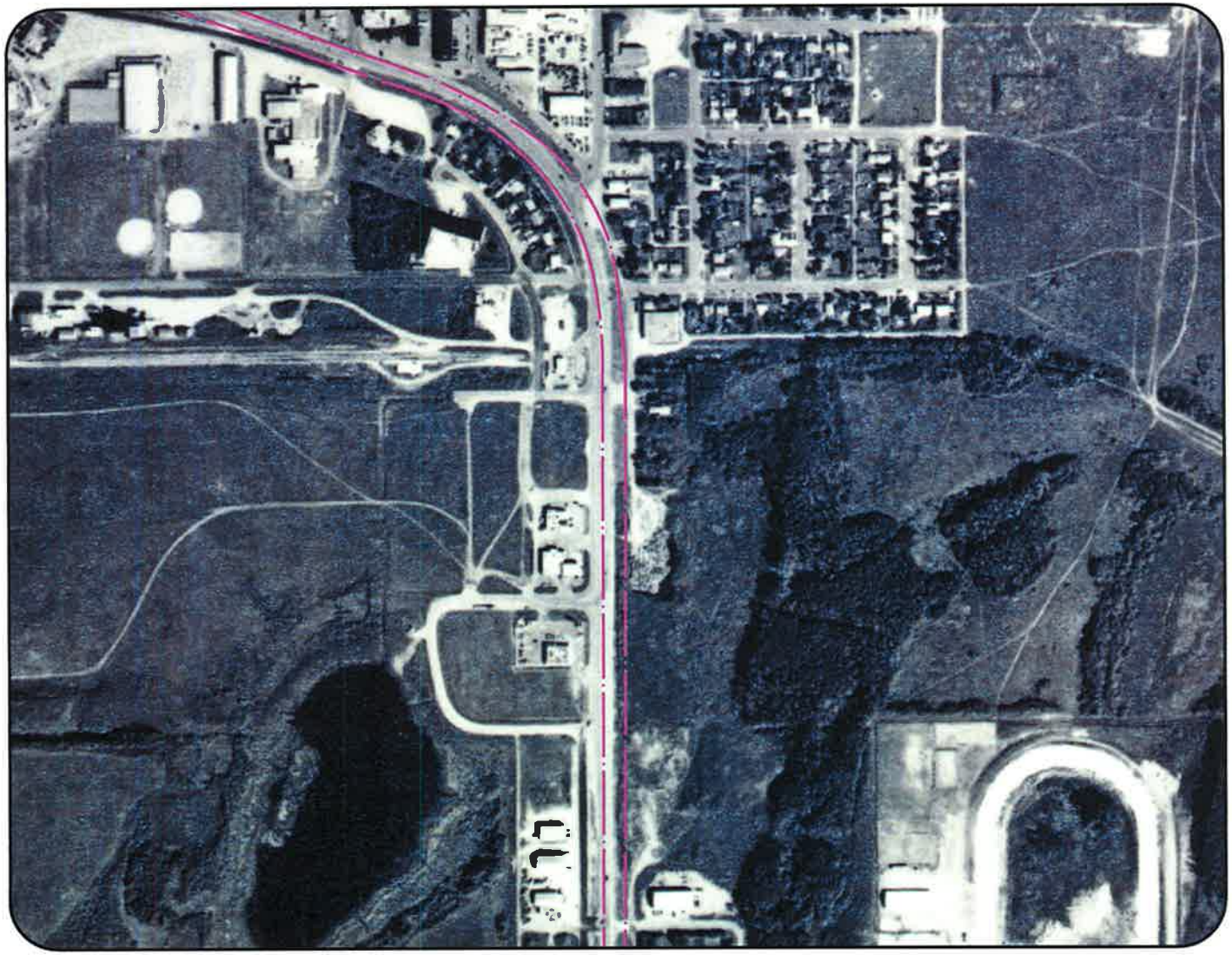
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-7



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS4423-051

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1993 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

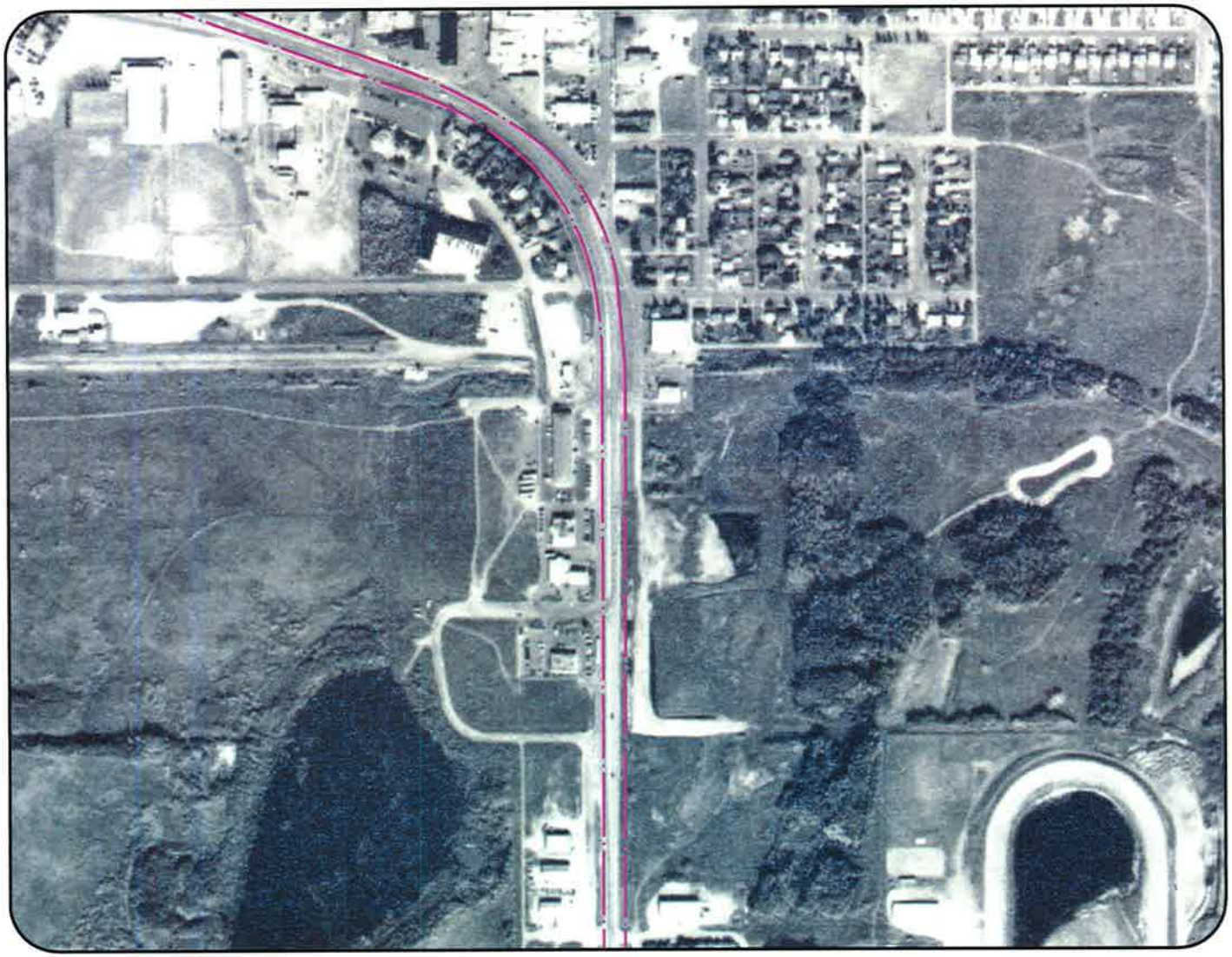
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-8



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/TRSG9803-424

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1998 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

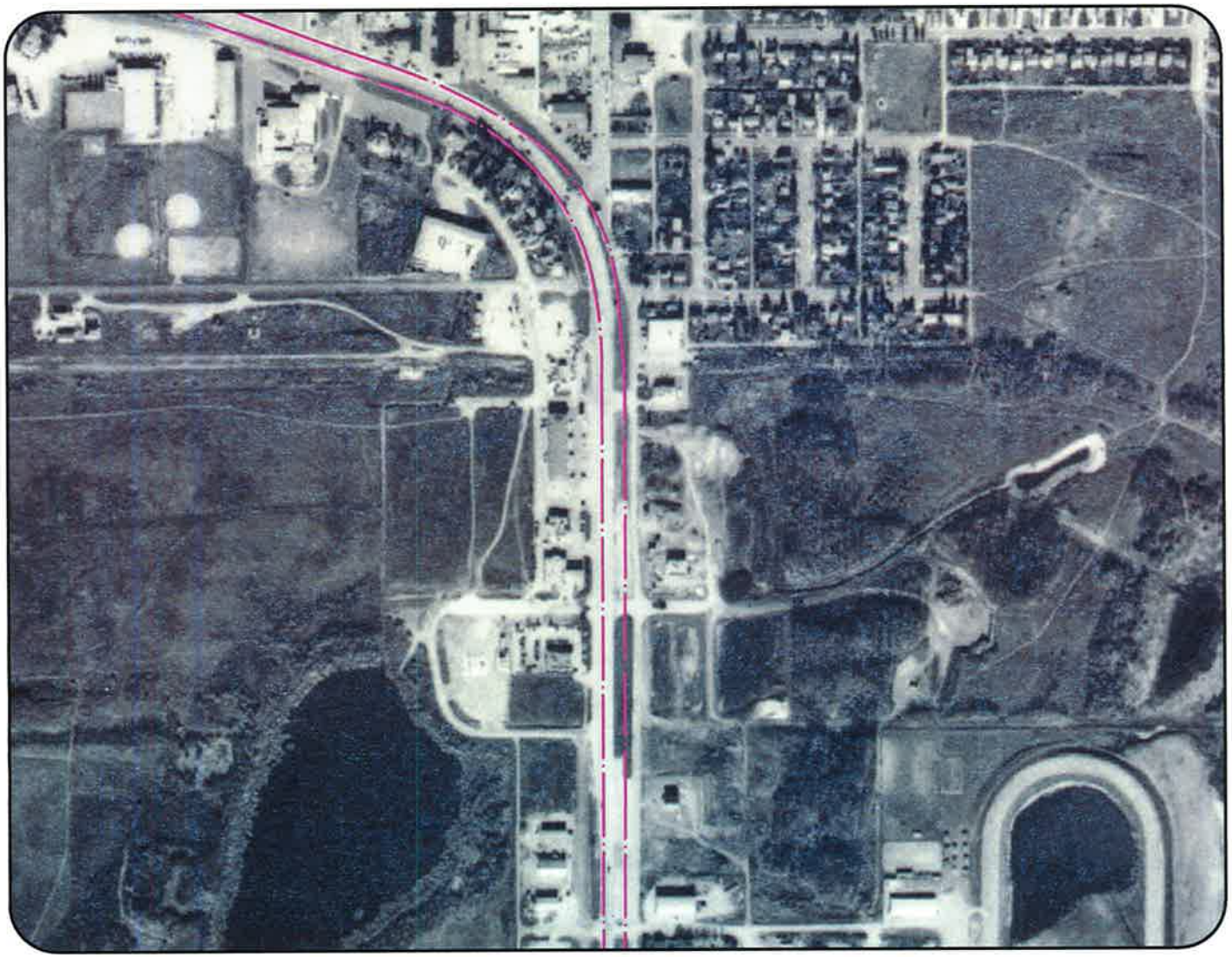
12-280-SCL

DRAWING NO.

Plate 4-9

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5141-062

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2000 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

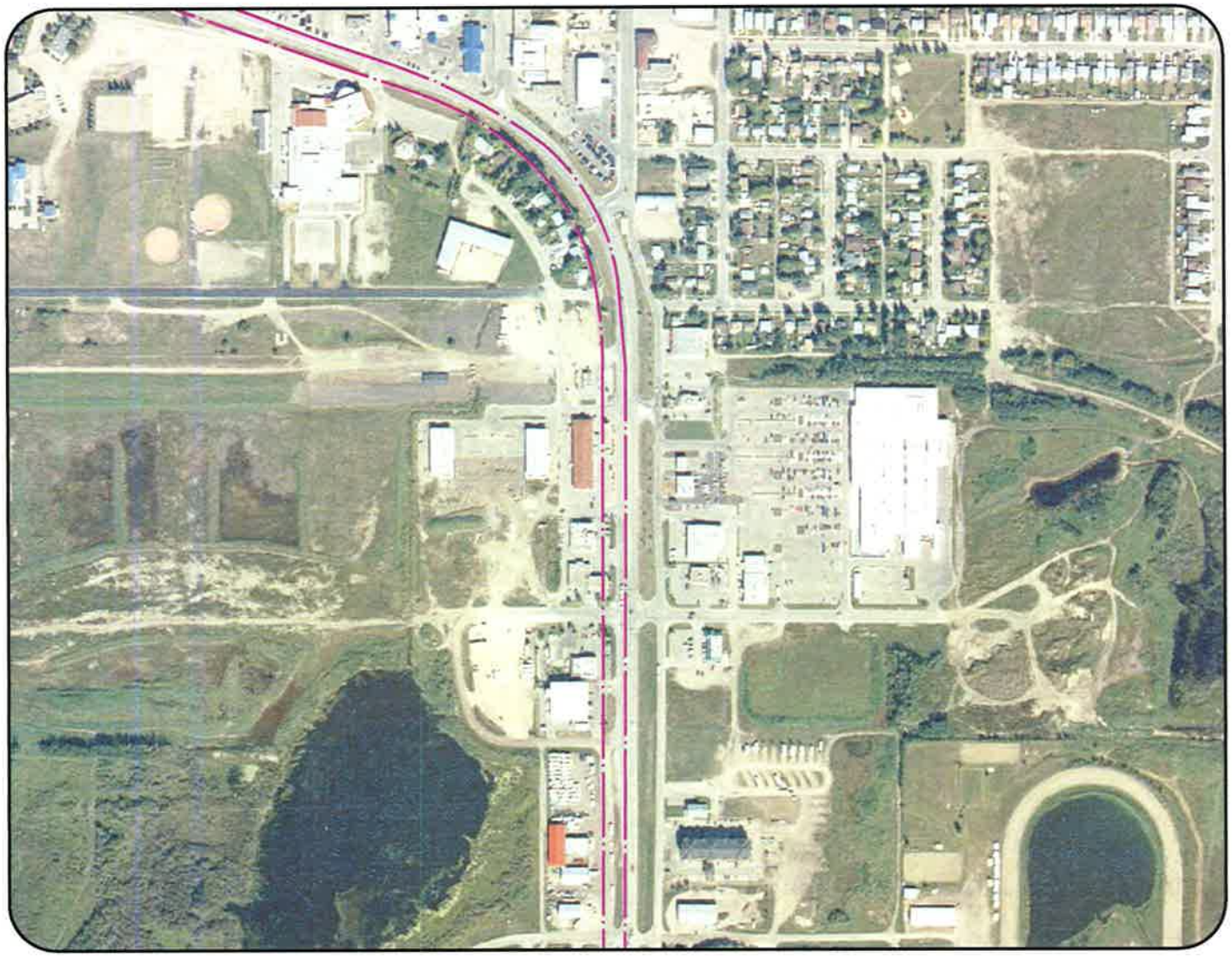
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-10



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5556-177

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2011 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 4-11

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0121-258

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1950 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

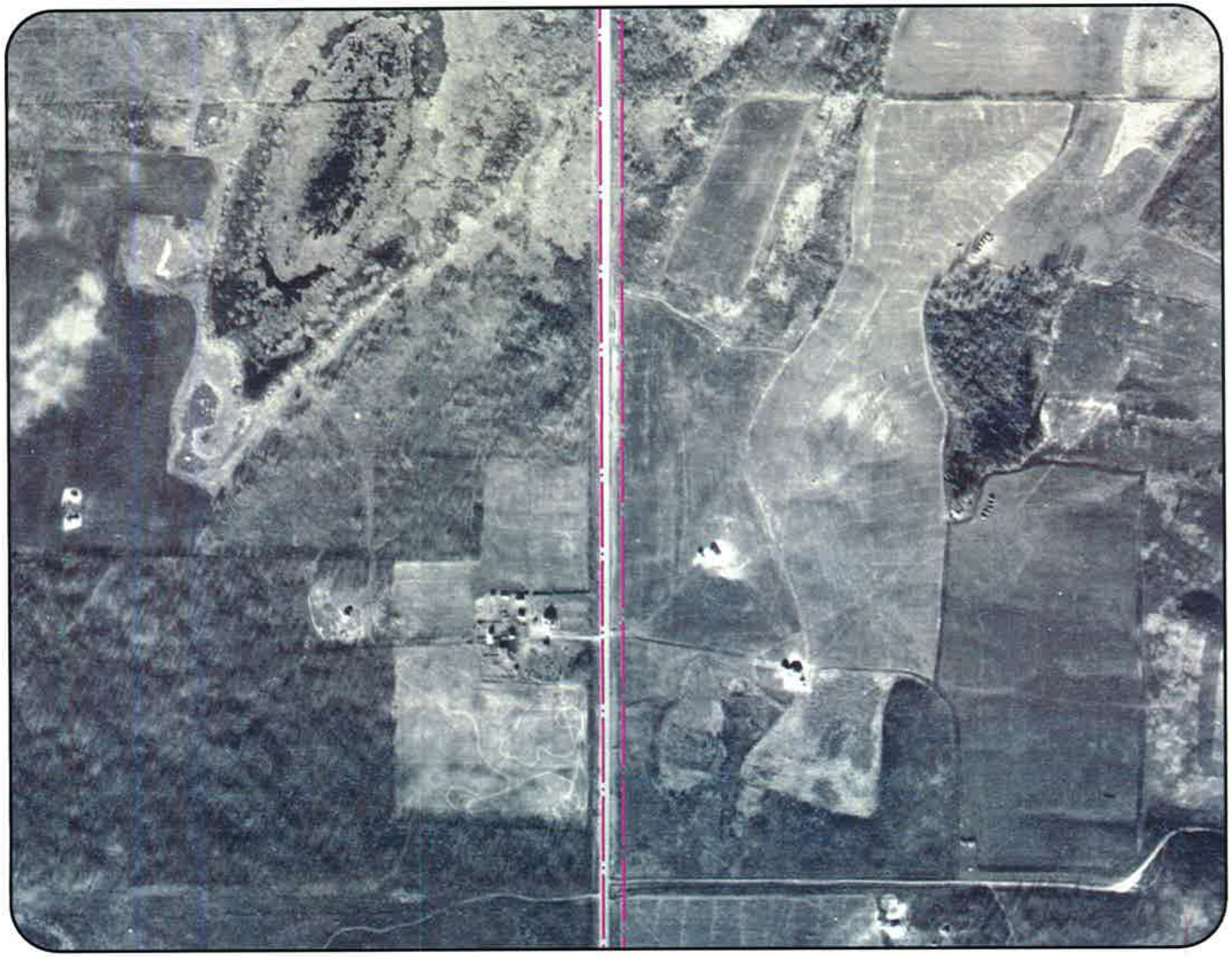
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-1

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0422-173

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1952 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

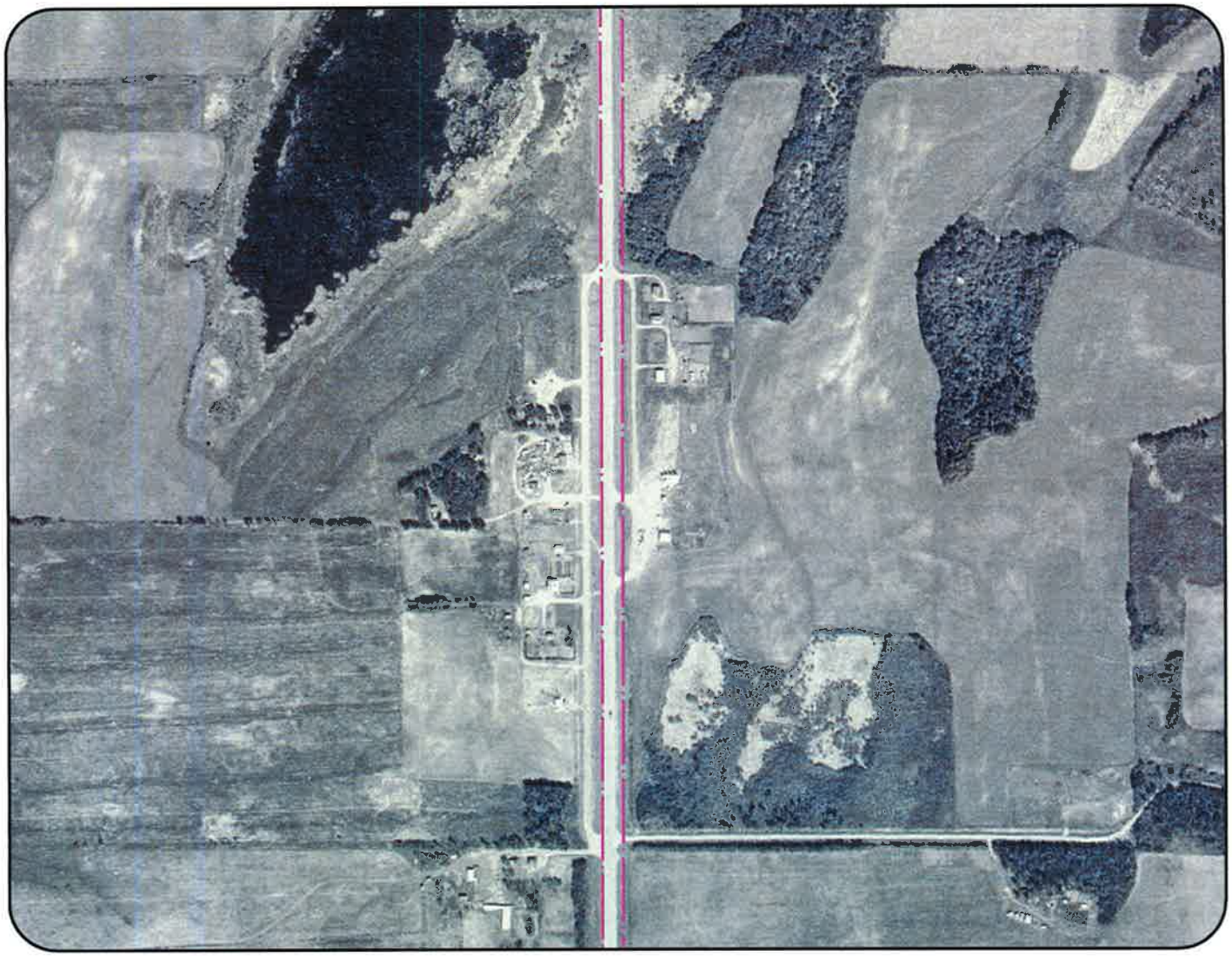
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-2

\\nichols\ned\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0975-143

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1967 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

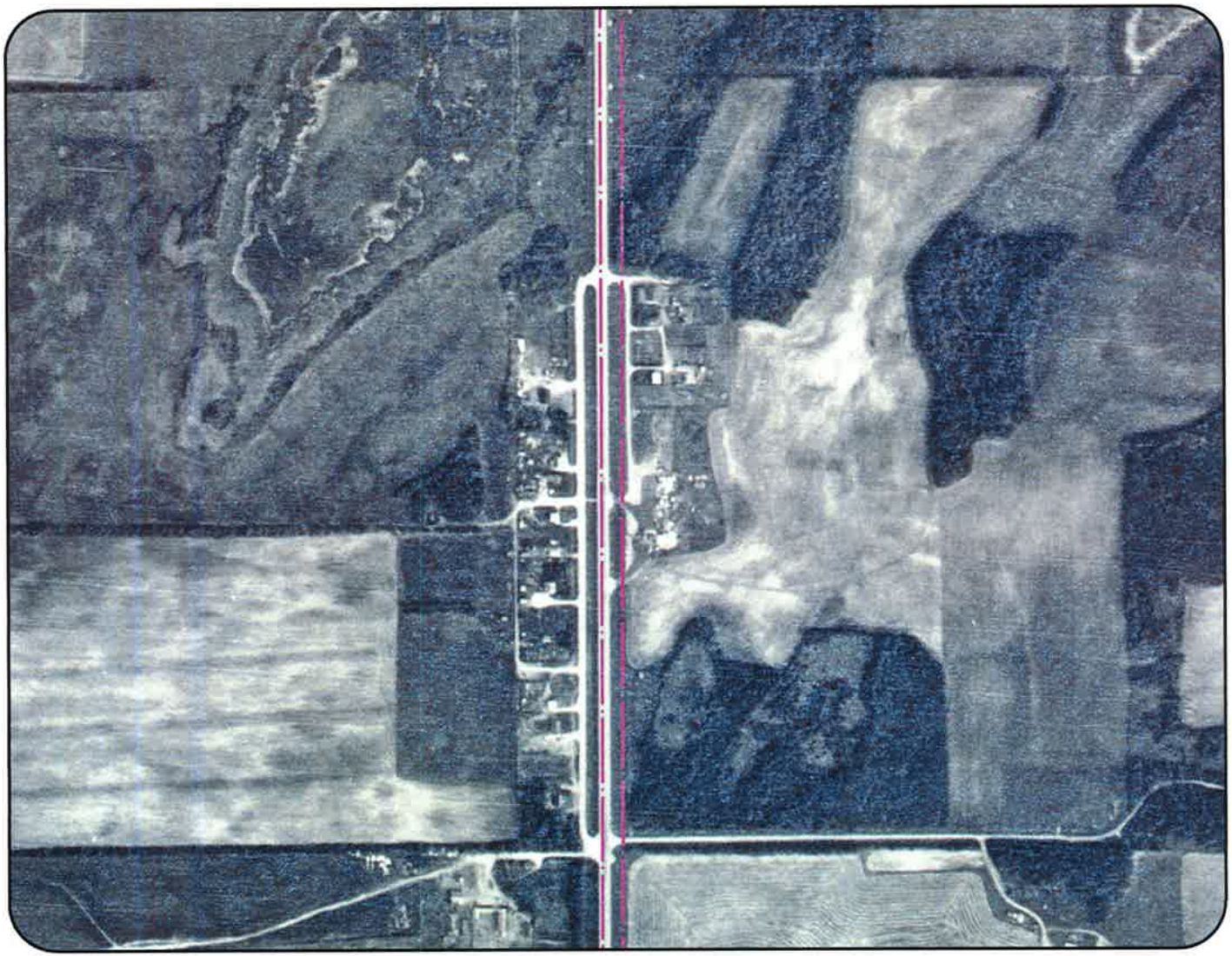
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-3

\\nichols\net\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS1197-266

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1972 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

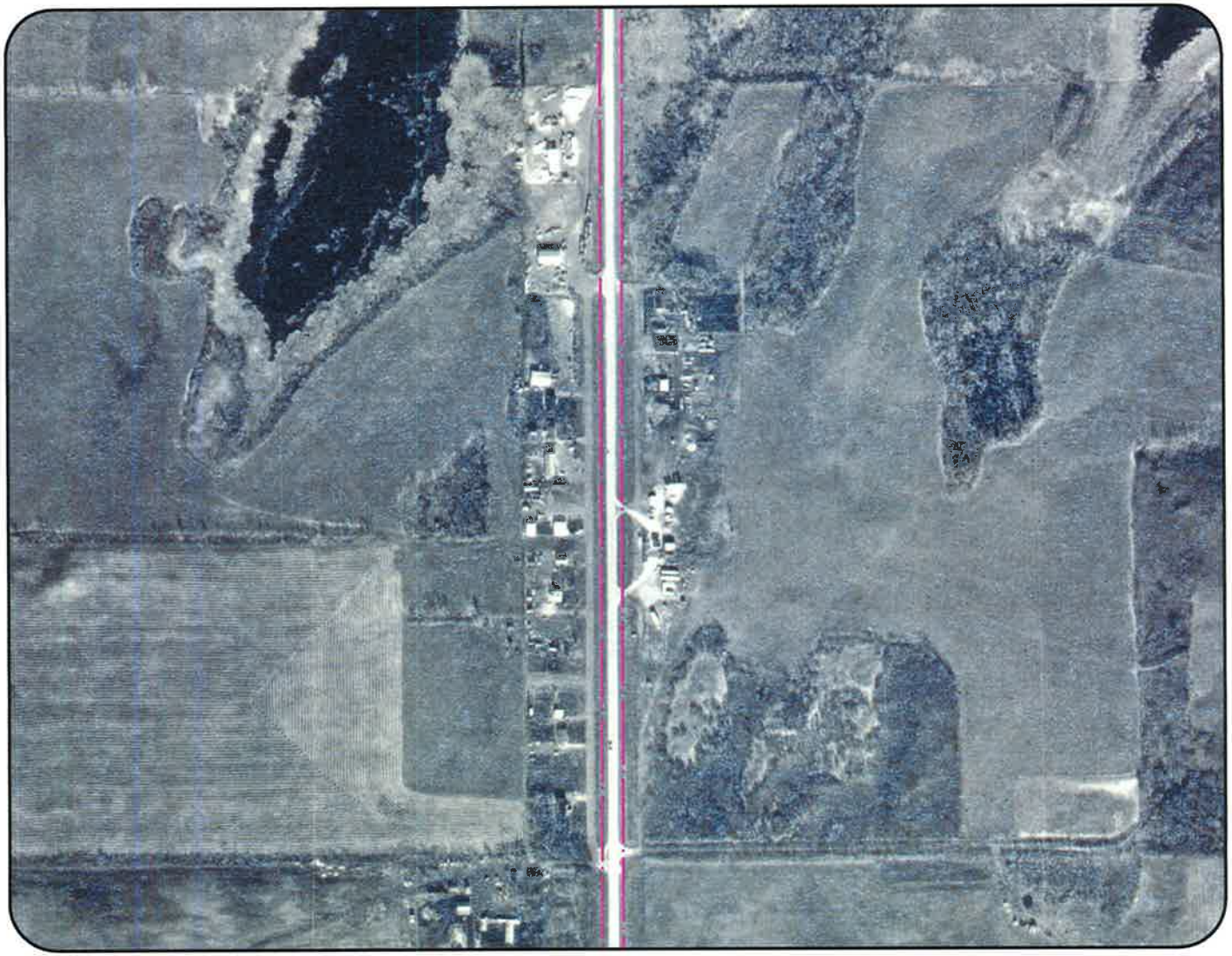
REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 5-4

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2972-239

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1977 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

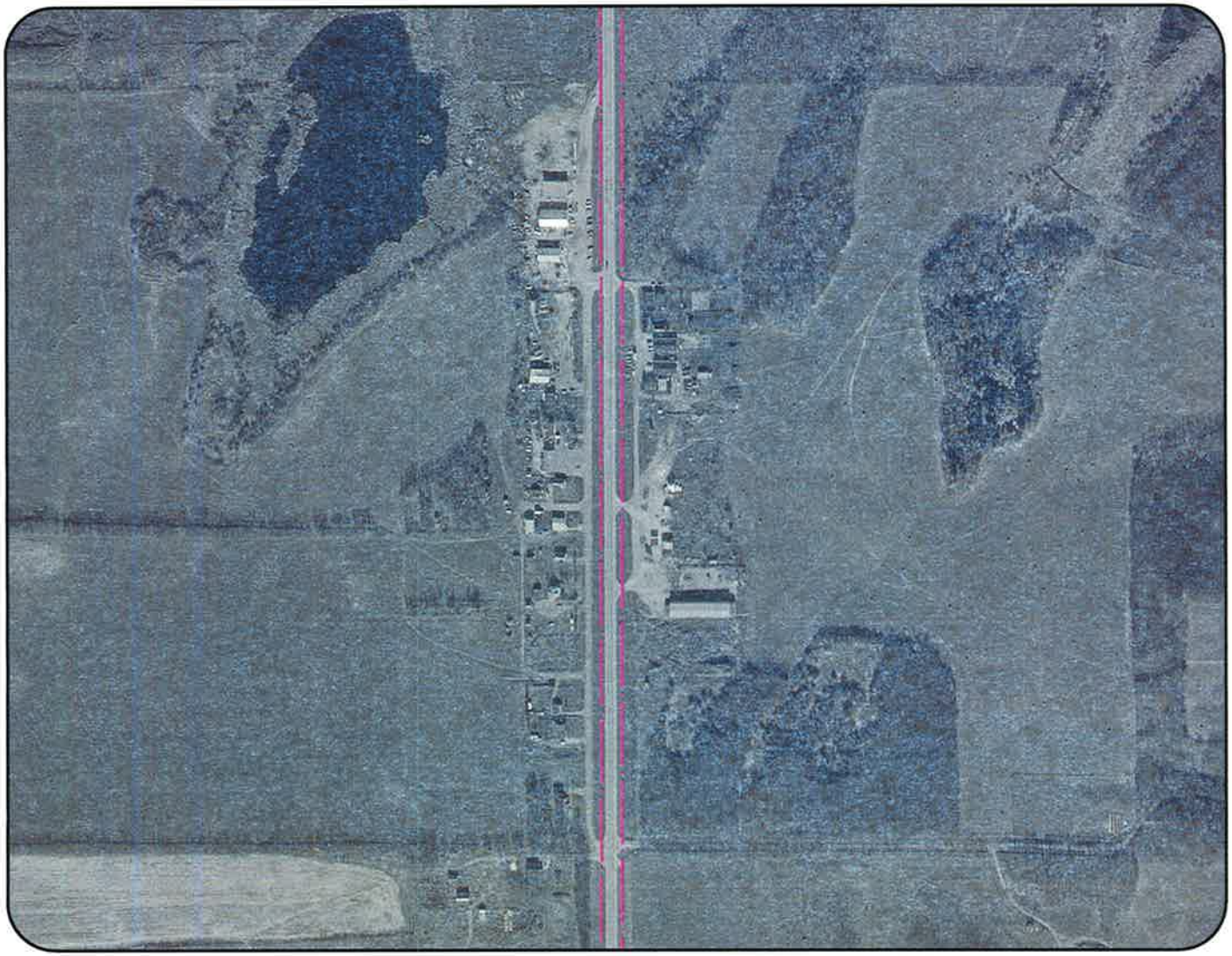
REVISION DATE
January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 5-5

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2645-134

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1982 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-6

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret property.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS3733-349

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1988 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

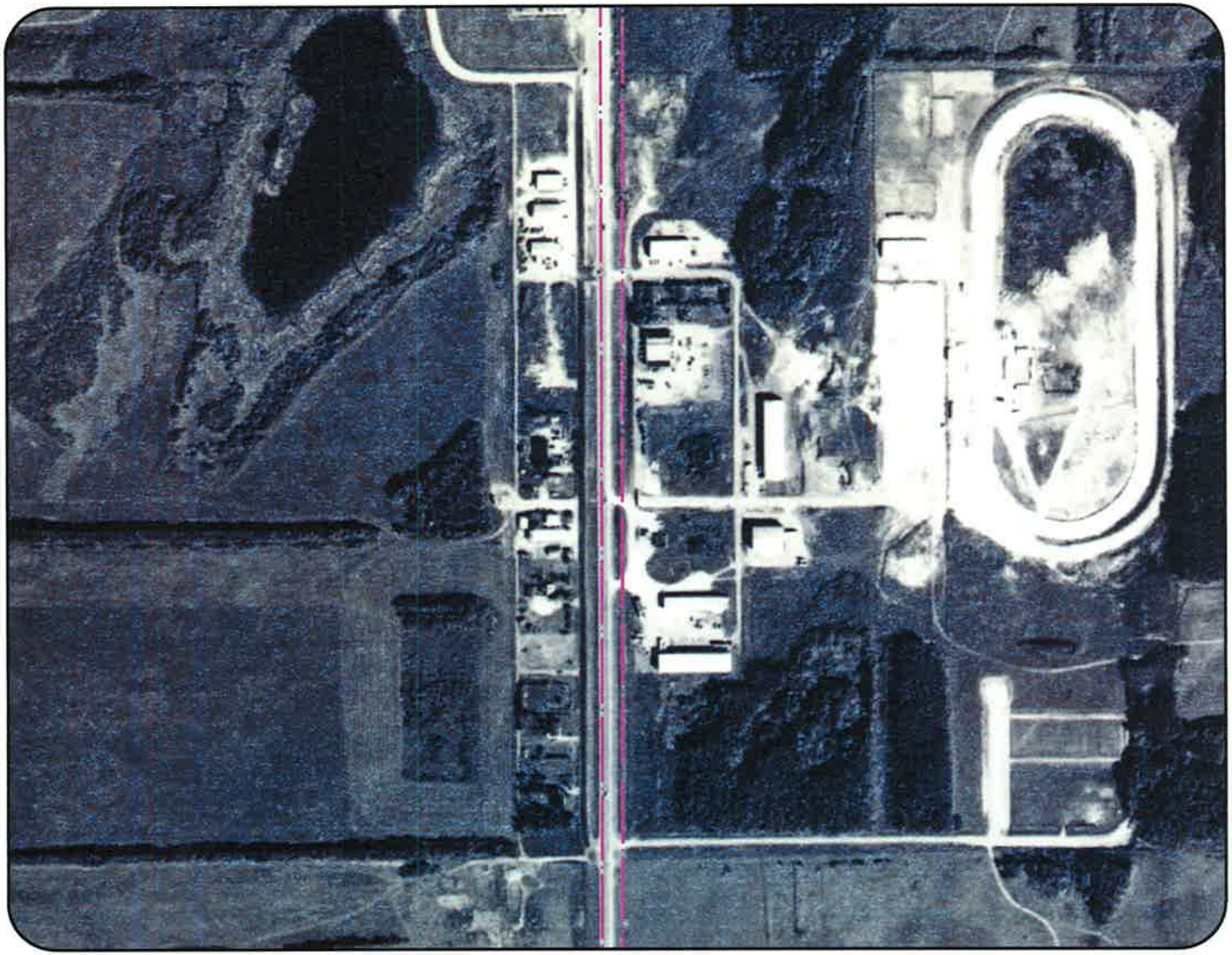
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-7

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS4423-051

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1993 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-8

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/TRSG9603-424

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1998 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

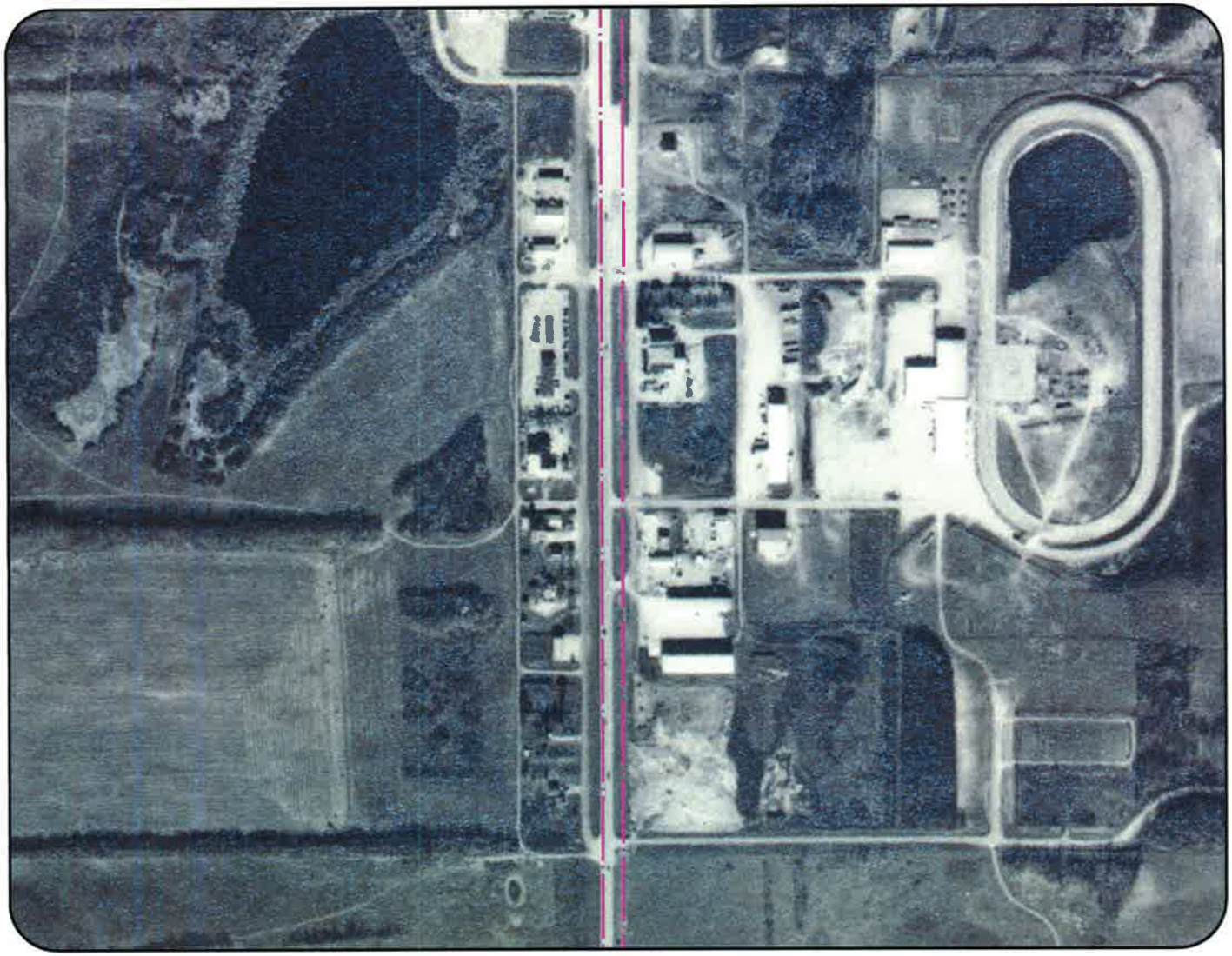
SCALE	APPROVED
1:6,300	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-9



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5141-062

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2000 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

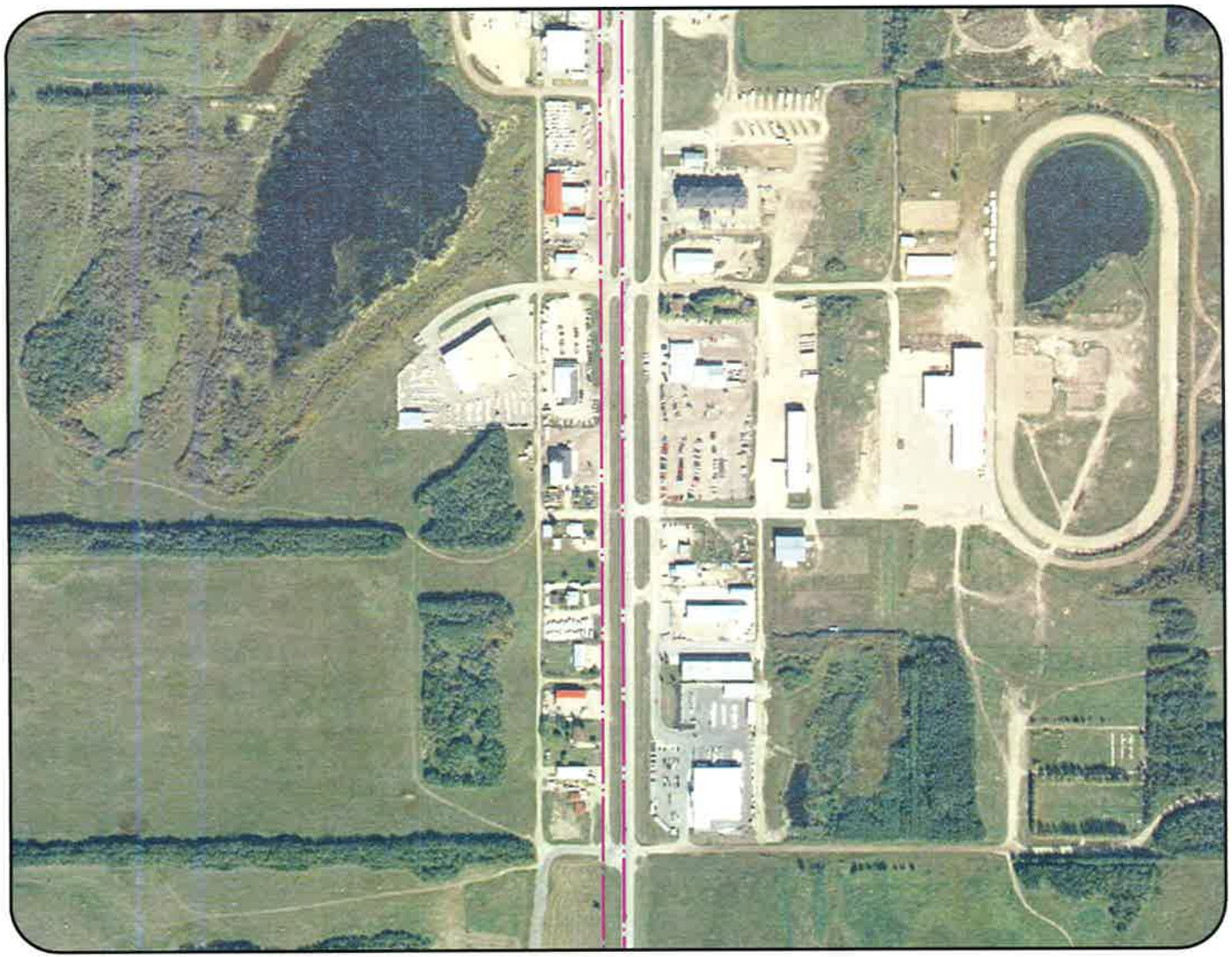
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-10

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5556-177

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-38 0 38 76 114 152 190m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2011 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:6,300	TA/LL

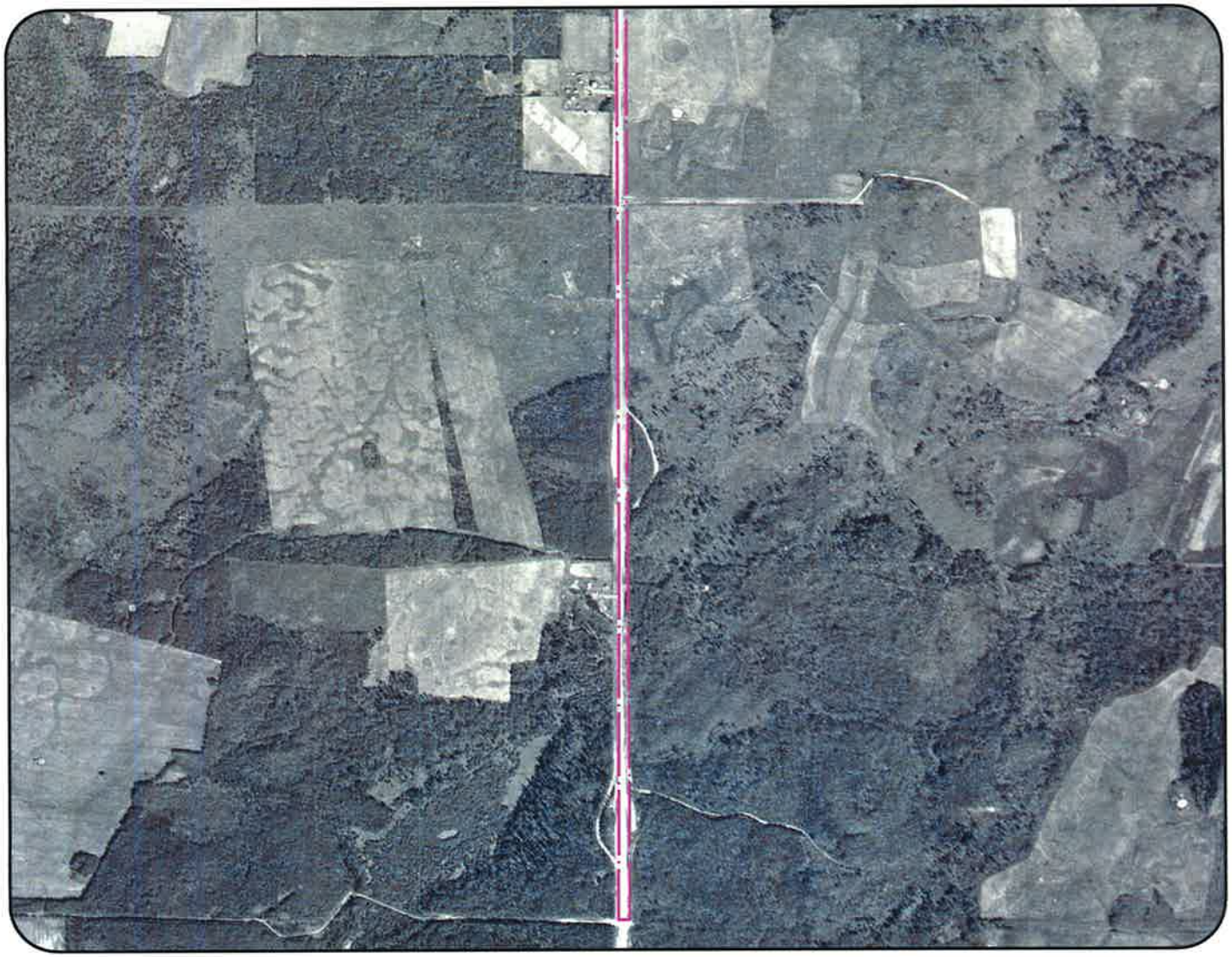
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 5-11

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0121-258

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1950 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

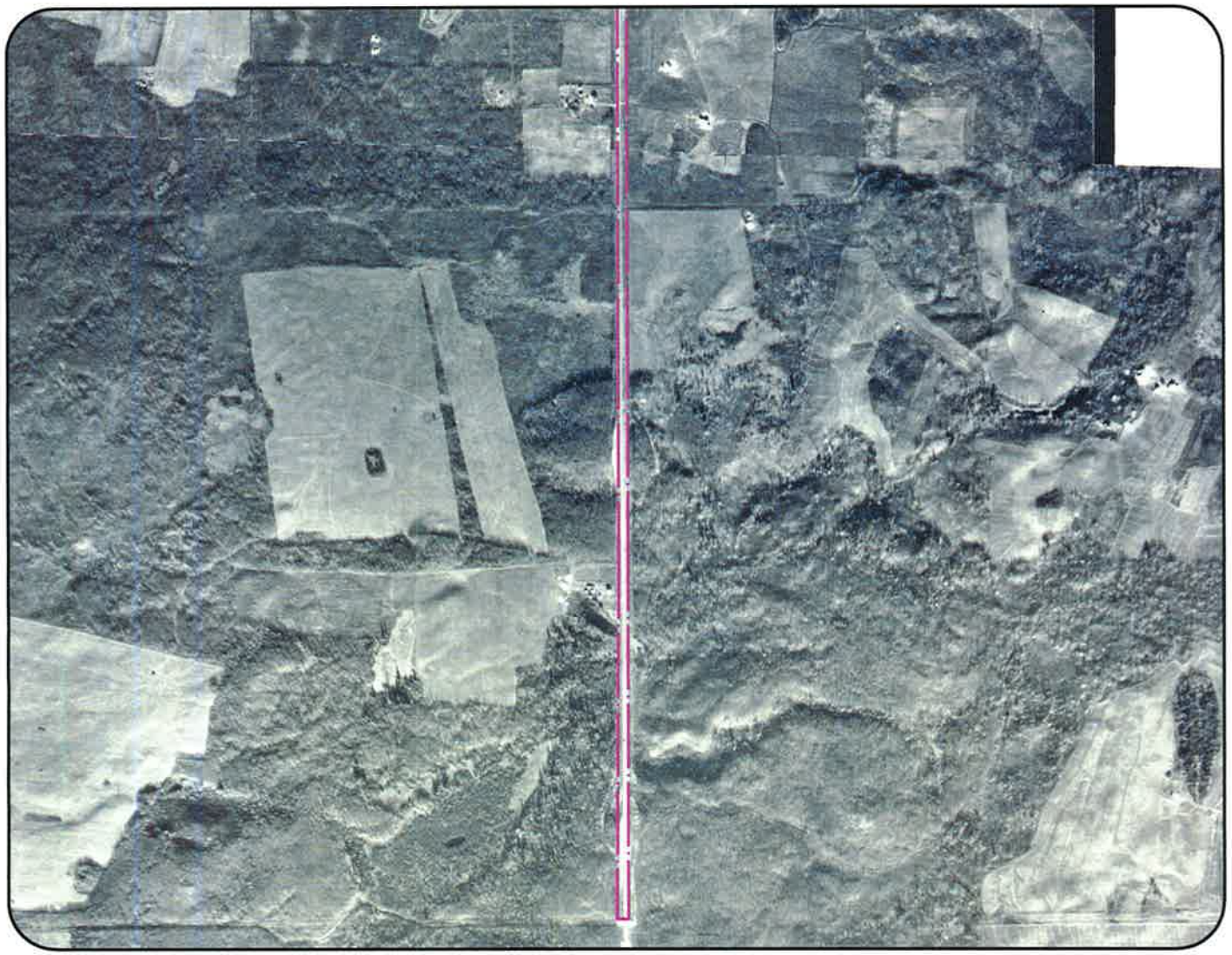
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-1

\\nichols\nec1\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0424-144

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1952 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

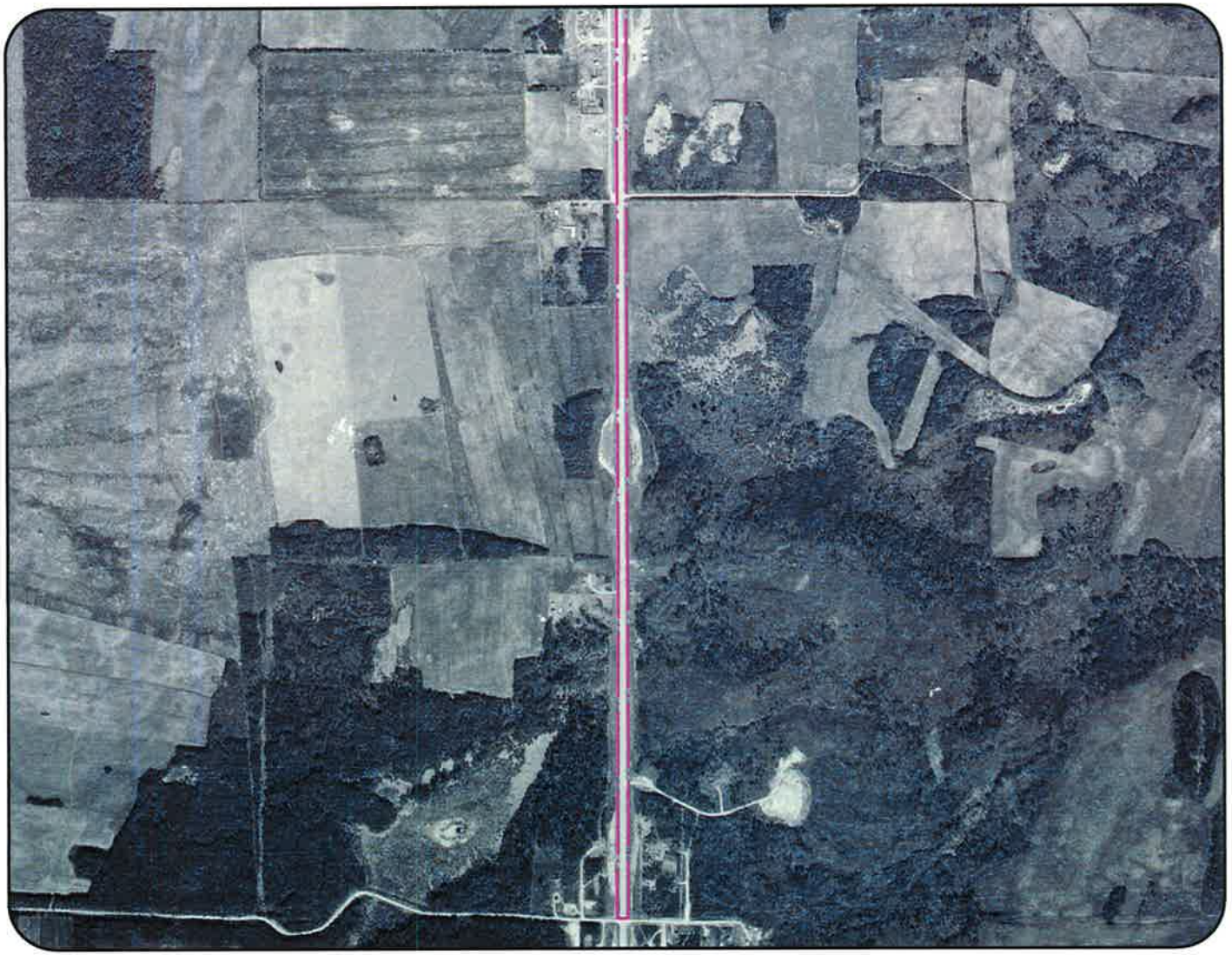
12-280-SCL

DRAWING NO.

Plate 6-2

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS0975-143

NICHOLS ENVIRONMENTAL
(CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1967 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-3

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS1197-266

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT
City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT
Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE
1972 Aerial Photograph

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

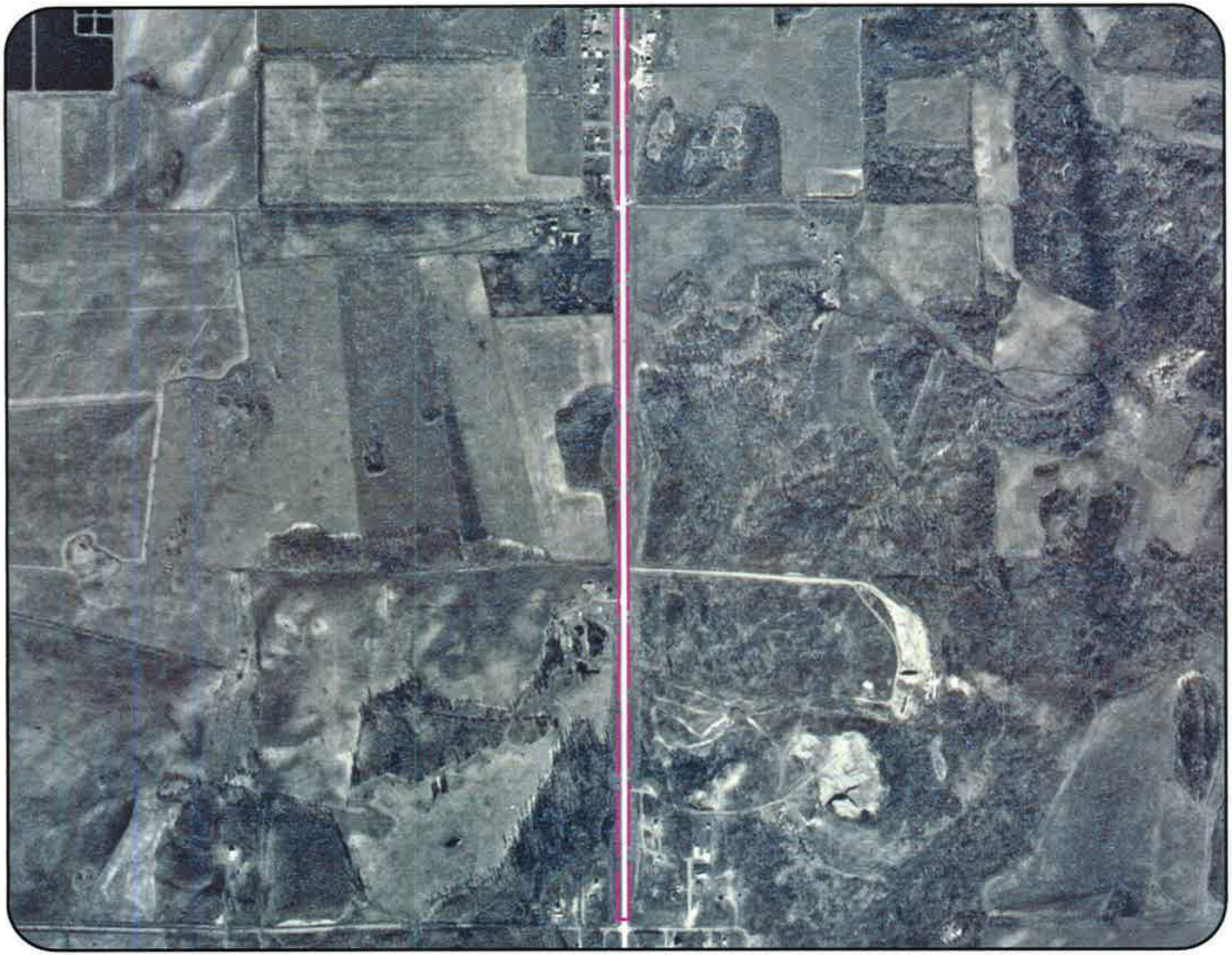
REVISION DATE
January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.
12-280-SCL

DRAWING NO.
Plate 6-4

\\nichols\vrecl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2972-239

-84 0 84 168 252 336 420m

NICHOLS ENVIRONMENTAL (CANADA) LTD.

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1977 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

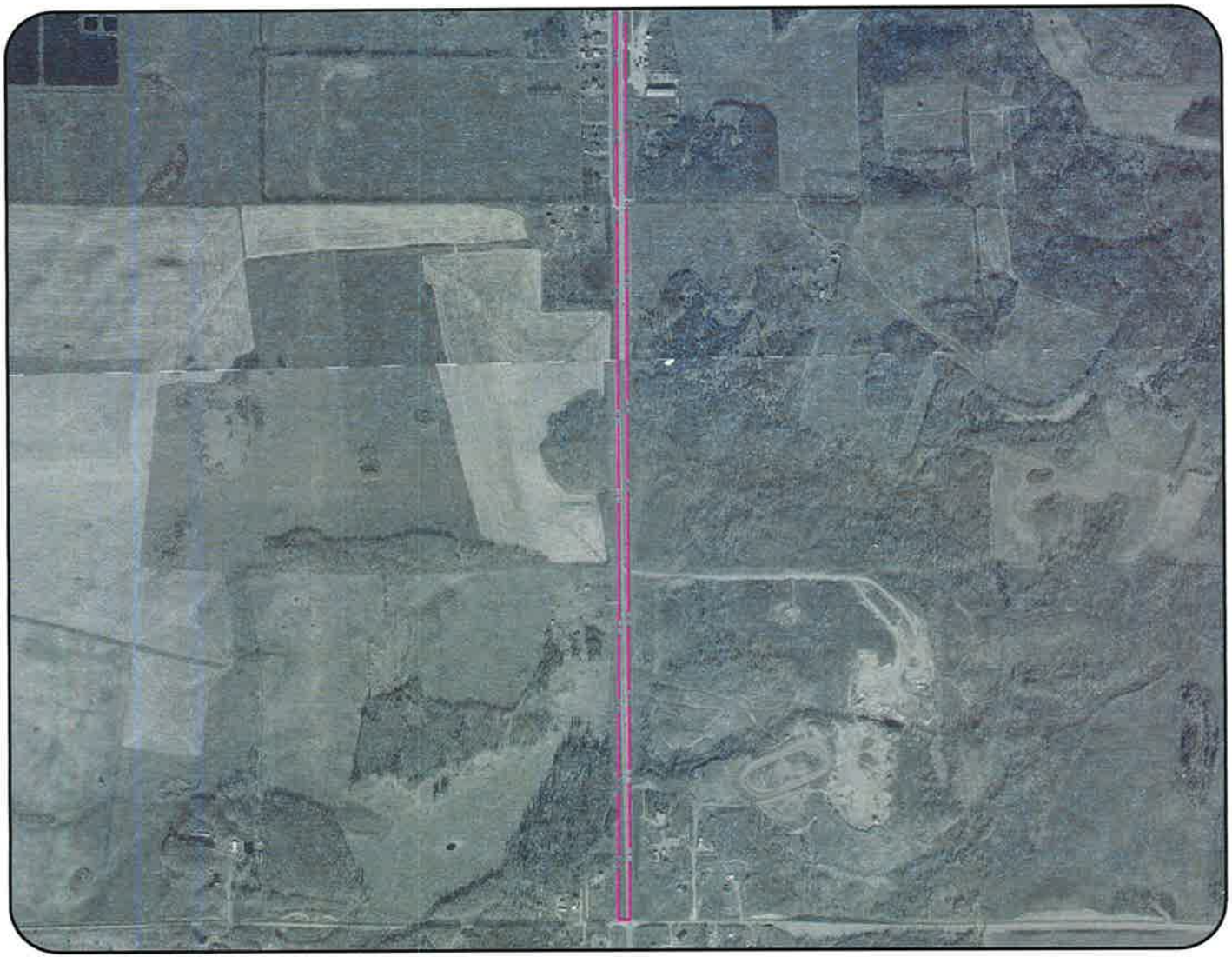
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-5

\\nichols\ncel\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS2645-065

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1982 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

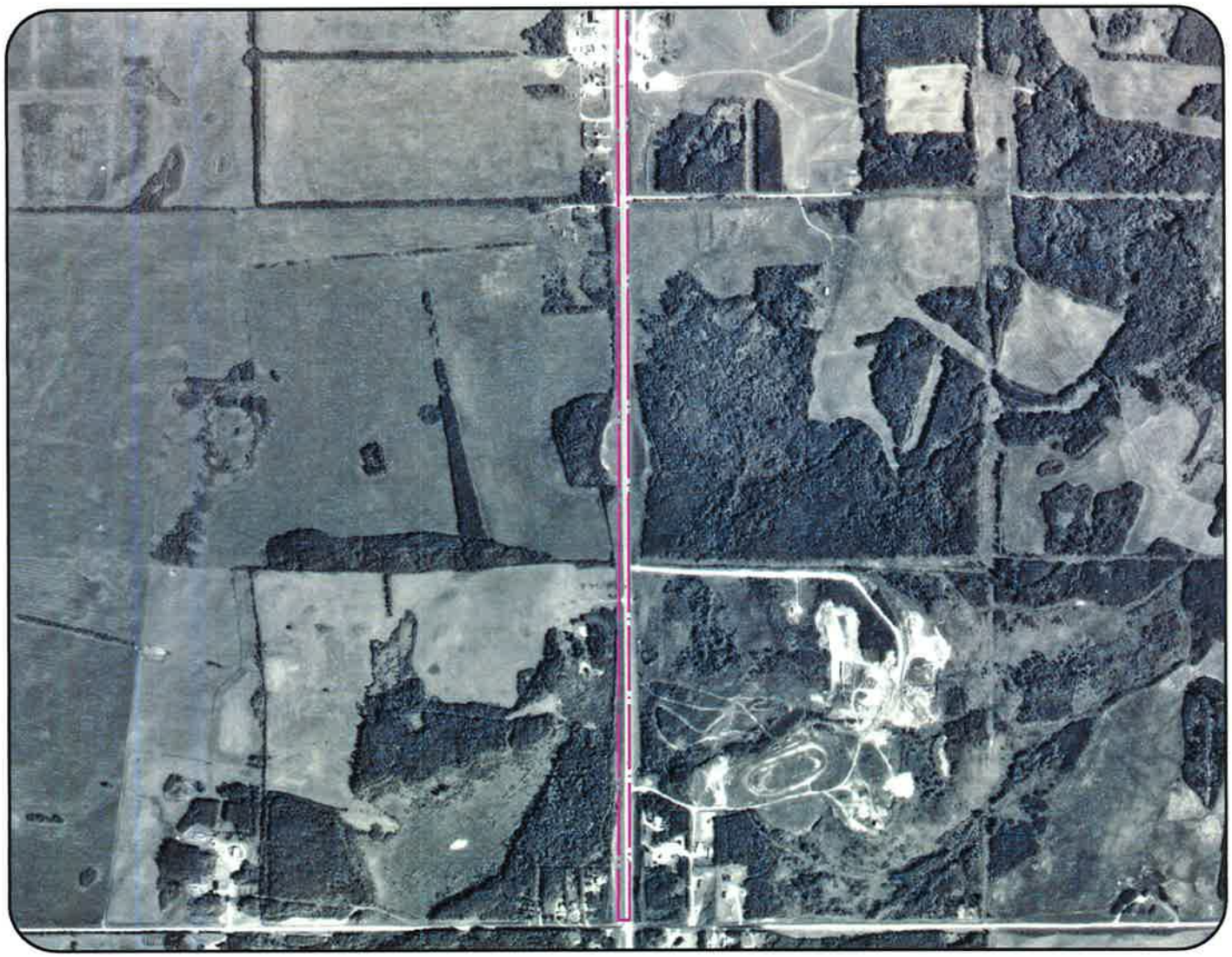
PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-6

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS3733-228

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1988 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-7

\\nichols\necl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS4423-051

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1993 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-8

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/TRSG9803-424

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

1998 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-9

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

\\nichols\nec\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5141-062

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2000 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION · DATE

January 2013

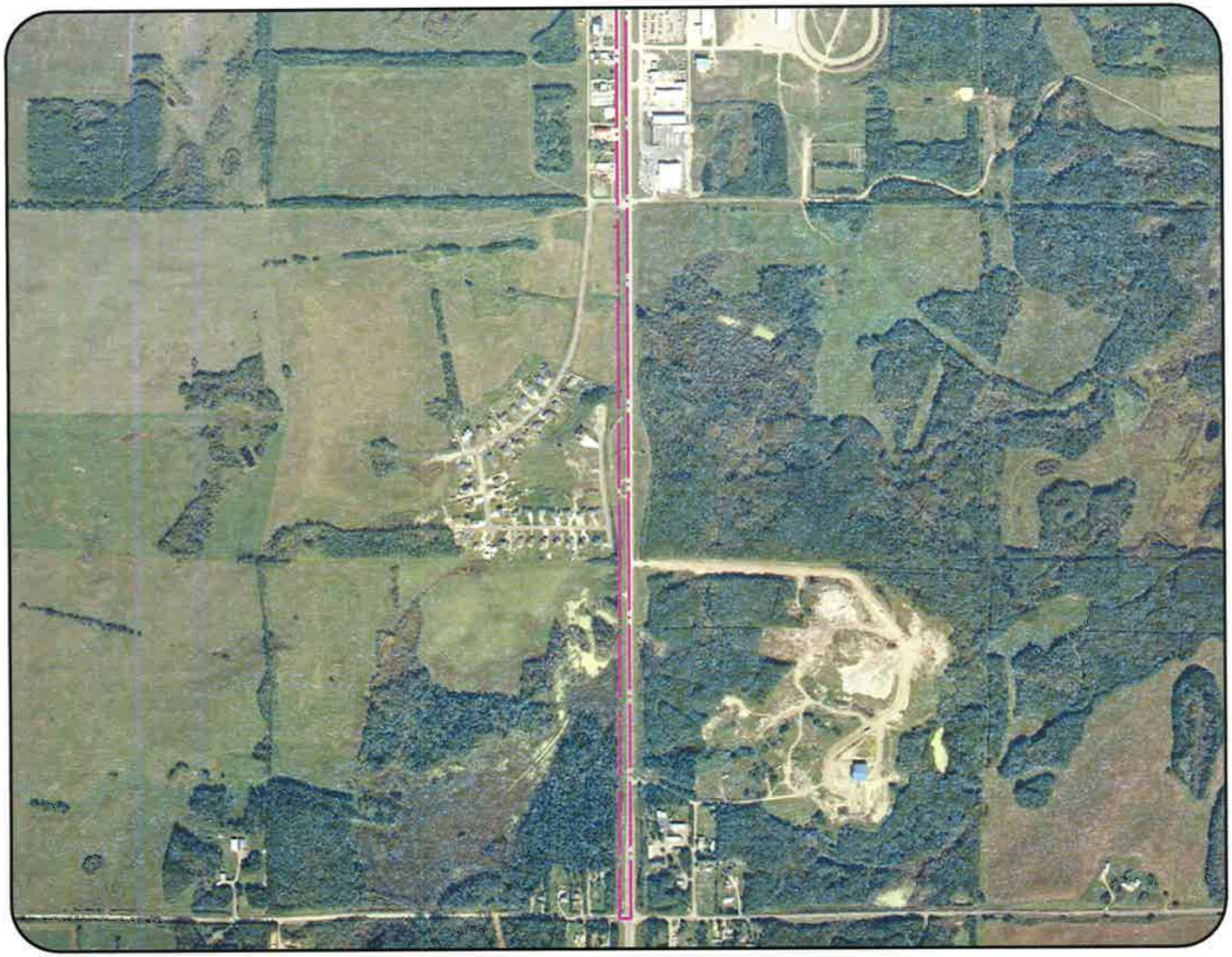
SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-10



Legend:

Approximate Property Boundary

Air Photo Source: Alberta Environment and Sustainable Resource Development/AS5556-177

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-84 0 84 168 252 336 420m

CLIENT

City of Cold Lake
c/o Stantec Consulting Ltd.

PROJECT

Limited Phase I ESA
City of Cold Lake
Highway 28 Functional Study
Cold Lake, Alberta

DRAWING TITLE

2011 Aerial Photograph

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

January 2013

SCALE	APPROVED
1:13,800	TA/LL

PROJECT NO.

12-280-SCL

DRAWING NO.

Plate 6-11

\\nichols\vnecl\Data2\Jobs\2012\12-280-SCL\Drawings\12-280-SCL.dwg Original drawing in colour. Black and white copies may not interpret properly.

APPENDIX D

Environment Canada Environnement Canada Canada

Home > Pollution Data and Reports > NPRI Data Search

> Return to NPRI Data Search

Data as of: March 27, 2012

Return to 2010 Facility & Substance Information for Husky Oil Limited - Cold Lake Pipeline Terminal

Historical Substance Reports for Husky Oil Limited - Cold Lake Pipeline Terminal

Husky Oil Limited - Cold Lake Pipeline Terminal

NPRI ID: 6607
5426 55th Street
Cold Lake, AB
T9M1R5
Canada

** NOTE: as of the 2006 reporting year, the Disposal columns include information on tailings and waste rock disposals. Negative numbers are possible for on-site disposal of tailings and waste rock, which would reflect a net removal of the substances from the tailings or waste rock management area.*

*** NOTE: Off-site column under Disposal in this table includes 'Off-site Disposal' and 'Off-Site Treatment Prior to Final Disposal'*

Benzene (71-43-2)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2010	0.050	-	-	-	tonnes
2009	0.056	-	-	-	tonnes
2008	0.078	-	-	-	tonnes
2007	0.081	-	-	-	tonnes
2006	0.064	-	0.008	-	tonnes
2005	0.058	-	0.015	-	tonnes
2004	0.001	-	-	-	tonnes
2003	0	-	-	-	tonnes
2002	0	-	-	-	tonnes

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Benzo(a)anthracene - PAH (56-55-3)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Benzo(a)pyrene - PAH (50-32-8)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg

2003	0	-	-	-	kg
2002	0	-	-	-	kg

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Benzo(b)fluoranthene - PAH (205-99-2)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

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Benzo(e)pyrene - PAH (192-97-2)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Benzo(g,h,i)perylene - PAH (191-24-2)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Benzo(k)fluoranthene - PAH (207-08-9)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Carbonyl sulphide (463-58-1)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		

2010	0	-	-	-	tonnes
2009	0	-	-	-	tonnes
2008	0	-	-	-	tonnes
2007	0	-	-	-	tonnes

[Back to top]

Cyclohexane (110-82-7)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	tonnes
2003	0.010	-	-	-	tonnes
2002	0.010	-	-	-	tonnes

[Back to top]

Fluoranthene - PAH (206-44-0)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

n-Hexane (110-54-3)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	tonnes
2003	0.006	-	-	-	tonnes
2002	0.006	-	-	-	tonnes

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Hydrogen sulphide (7783-06-4)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2010	0	-	-	-	tonnes
2009	0	-	-	-	tonnes
2008	0	-	-	-	tonnes
2007	0	-	-	-	tonnes

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Indeno(1,2,3-CD)pyrene - PAH (193-39-5)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

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Perylene - PAH (198-55-0)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

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Phenanthrene - PAH (85-01-8)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Pyrene - PAH (129-00-0)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	kg
2003	0	-	-	-	kg
2002	0	-	-	-	kg

[Back to top]

Toluene (108-88-3)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2010	0.045	-	-	-	tonnes
2009	0.048	-	-	-	tonnes
2008	0.058	-	-	-	tonnes
2007	0.060	-	-	-	tonnes
2006	0.072	-	0.019	-	tonnes
2005	0.066	-	0.037	-	tonnes

2004	0.001	-	-	-	tonnes
2003	0	-	-	-	tonnes
2002	0	-	-	-	tonnes

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Total Reduced Sulphur (TRS) (NA - M14) ***

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2010	0	-	-	-	tonnes
2009	0	-	-	-	tonnes
2008	0	-	-	-	tonnes
2007	0	-	-	-	tonnes

****NOTE: Total reduced sulphur consists of 6 substances. Three of these substances (hydrogen sulphide [H2S], carbon disulphide [CS2] and carbonyl sulfide [COS]) are also listed individually in the NPRI substance list. If a facility meets the 10 tonne reporting threshold for any of H2S, CS2 or COS, it should report total reduced sulphur and the individual substance(s). Therefore, there is a potential for "double counting" of total reduced sulphur and the individual substance(s).*

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1,2,4-Trimethylbenzene (95-63-6)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	tonnes
2003	0.004	-	-	-	tonnes
2002	0.004	-	-	-	tonnes

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Volatile Organic Compounds (VOCs) (NA - M16)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2004	-	-	-	-	tonnes
2003	1.4	-	-	-	tonnes
2002	1.4	-	-	-	tonnes

[Back to top]

Xylene (all isomers) (1330-20-7)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2010	0.002	-	-	-	tonnes
2009	0.002	-	-	-	tonnes
2008	0.003	-	-	-	tonnes
2007	0.003	-	-	-	tonnes
2006	0.034	-	0.025	-	tonnes

2005	0.031	-	0.048	-	tonnes
2004	0.001	-	-	-	tonnes
2003	0	-	-	-	tonnes

[Back to top]

Xylene (mixed isomers) (1330-20-7)

Year	On-Site Releases	Disposal*		Off-Site Recycling	Units
		On-Site	Off-Site**		
2002	0	-	-	-	tonnes

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Units

tonnes - 1000 kilograms
g - grams
kg - kilograms
g TEQ - grams of Toxic Equivalents

Date Modified: 2012-03-27

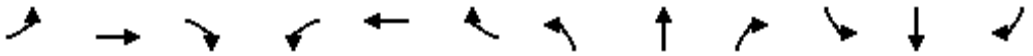
Appendix D – Traffic Modeling Analysis

Table 6.6 - Alternative 1 - Auxilary Lane - Level of Service Summary for 2015 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
54 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	1	1	1	1	1	2	1	1	2	SH	16.4
			Volumes (vph)	70	70	42	88	76	191	51	992	101	314	1120	118	
			Level of Service	D	C	A	D	C	A	C	C	A	D	A	-	
			V/C Ratio by Movement	0.36	0.25	0.15	0.44	0.27	0.48	0.30	0.63	0.14	0.72	0.56	-	
			95% Queue Length (m)	28.2	26.5	16.5	33.6	27.6	29.5	26.6	74.8	33.1	57.2	65.0	-	
			Storage Bay Length (m)	60.0	-	60.0	60.0	-	60.0	60.0	-	60.0	60.0	-	-	
52 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	SH	1	1	SH	1	1	1	2	SH	1	2	SH	16.4
			Volumes (vph)	72	72	24	46	28	50	110	963	125	263	958	75	
			Level of Service	-	D	A	-	D	A	C	B	-	C	A	-	
			V/C Ratio by Movement	-	0.60	0.08	-	0.36	0.17	0.50	0.67	-	0.70	0.47	-	
			95% Queue Length (m)	-	44.9	20.1	-	26.2	20.4	54.1	94.7	-	50.9	41.8	-	
			Storage Bay Length (m)	-	-	20.0	-	-	20.0	60.0	-	-	60.0	-	-	
Centre Ave and Highway 28	Signals 105s Cycle	PM Peak	Number of Lanes	1+SH	2	SH	-	2	SH	2	2	-	2	2	1	41.2
			Volumes (vph)	493	432	177	-	180	174	170	340	-	267	552	325	
			Level of Service	E	D	-	-	C	-	D	C	-	A	D	C	
			V/C Ratio by Movement	0.95	0.91	-	-	0.65	-	0.58	0.38	-	0.67	0.55	0.49	
			95% Queue Length (m)	73.8	124.2	-	-	34.1	-	28.2	49.1	-	52.4	74.7	13.7	
			Storage Bay Length (m)	60.0	-	-	-	-	-	80.0	-	-	60.0	-	60.0	
Highway 28 and 50 Street	Signals 90s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	1	1	2	-	14.6
			Volumes (vph)	-	-	-	283	-	170	-	541	266	220	428	-	
			Level of Service	-	-	-	D	-	A	-	B	A	A	A	-	
			V/C Ratio by Movement	-	-	-	0.74	-	0.37	-	0.35	0.33	0.43	0.21	-	
			95% Queue Length (m)	-	-	-	71.4	-	48.9	-	51.2	-	48.8	47.7	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 75s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	3	SH	1	3	SH	11.6
			Volumes (vph)	71	27	32	150	64	96	23	550	79	190	655	99	
			Level of Service	C	B	-	D	C	A	B	B	-	A	A	-	
			V/C Ratio by Movement	0.29	0.17	-	0.60	0.18	0.26	0.08	0.28	-	0.38	0.26	-	
			95% Queue Length (m)	26.1	18.2	-	40.3	35.8	18.8	12.2	32.3	-	32.6	26.4	-	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

Table 6.7 - Alternative 2 - Service Road - Level of Service Summary for 2015 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Highway 28 and 50 Street	Signals 75s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	SH	1	2	-	18.7
			Volumes (vph)	-	-	-	283	-	170	-	541	266	220	428	-	
			Level of Service	-	-	-	C	-	A	-	C	-	B	A	-	
			V/C Ratio by Movement	-	-	-	0.71	-	0.36	-	0.59	-	0.57	0.22	-	
			95% Queue Length (m)	-	-	-	60.2	-	30.6	-	80.8	-	40.1	33.7	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 75s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	2	SH	1	2	1	11.6
			Volumes (vph)	71	27	32	150	64	96	23	550	79	190	655	99	
			Level of Service	C	B	-	C	C	A	B	B	-	A	A	A	
			V/C Ratio by Movement	0.28	0.17	-	0.59	0.18	0.25	0.07	0.41	-	0.40	0.32	0.11	
			95% Queue Length (m)	22.4	16.7	-	43.9	26.4	18.7	16.6	46.5	-	33.2	31.4	13.7	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

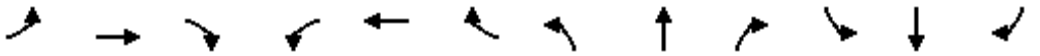


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	70	42	88	76	191	51	992	101	314	1120	118
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor	0.99		0.98	0.99		0.98	1.00		0.97	1.00	1.00	
Frt			0.850			0.850			0.850		0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1834	1559	1742	1834	1559	1692	3385	1514	1692	3328	0
Flt Permitted	0.703			0.708			0.203			0.165		
Satd. Flow (perm)	1283	1834	1531	1292	1834	1531	361	3385	1470	294	3328	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			61			208			110		23	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		217.6			262.9			174.5			824.6	
Travel Time (s)		15.7			18.9			12.6			59.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	76	76	46	96	83	208	55	1078	110	341	1217	128
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	76	46	96	83	208	55	1078	110	341	1345	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	15.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	10.0	29.0	
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	40.0	40.0	40.0	21.0	61.0	
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	44.4%	44.4%	44.4%	23.3%	67.8%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	15.0	15.0	15.0	15.0	15.0	15.0	45.6	45.6	45.6	67.0	65.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17	0.17	0.51	0.51	0.51	0.74	0.72	
v/c Ratio	0.36	0.25	0.15	0.44	0.27	0.48	0.30	0.63	0.14	0.72	0.56	
Control Delay	36.4	33.0	6.2	39.2	33.4	8.4	28.3	22.4	9.9	19.9	7.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	36.4	33.0	6.2	39.2	33.4	8.4	28.3	22.4	9.9	19.9	7.5	
LOS	D	C	A	D	C	A	C	C	A	B	A	
Approach Delay		28.1			21.4			21.5			10.0	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	12.3	12.1	0.0	15.8	13.2	0.0	4.5	47.8	0.0	19.1	39.2	
Queue Length 95th (m)	21.5	20.7	5.8	26.2	22.2	15.6	m11.8	93.0	m12.7	#61.7	89.2	
Internal Link Dist (m)		193.6			238.9			150.5			800.6	
Turn Bay Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		
Base Capacity (vph)	342	489	453	344	489	560	182	1714	798	510	2408	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.22	0.16	0.10	0.28	0.17	0.37	0.30	0.63	0.14	0.67	0.56	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 16.4		Intersection LOS: B	
Intersection Capacity Utilization 73.7%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: HWY 28 & 54 Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	72	24	46	28	50	110	963	125	263	958	75
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		20.0	0.0		20.0	60.0		60.0	60.0		60.0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		1.00	0.98				1.00				1.00	
Frt			0.850			0.850		0.983			0.989	
Flt Protected		0.976			0.970		0.950			0.950		
Satd. Flow (prot)	0	1790	1559	0	1779	1559	1692	3338	0	1742	3340	0
Flt Permitted		0.801			0.688		0.254			0.142		
Satd. Flow (perm)	0	1463	1531	0	1262	1559	452	3338	0	260	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			61			61		20			17	
Link Speed (k/h)		30			50			30			50	
Link Distance (m)		152.9			37.1			198.2			142.4	
Travel Time (s)		18.3			2.7			23.8			10.3	
Confl. Peds. (#/hr)	5		5				5					5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	2%	2%	5%	5%
Adj. Flow (vph)	78	78	26	50	30	54	120	1047	136	286	1041	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	26	0	80	54	120	1183	0	286	1123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	15.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	21.0	21.0	21.0	29.0	29.0		10.0	29.0	
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	45.0	45.0		16.0	61.0	
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	50.0%	50.0%		17.8%	67.8%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	5.0		3.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)		16.0	16.0		16.0	16.0	47.6	47.6		66.0	64.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.53	0.53		0.73	0.71	
v/c Ratio		0.60	0.08		0.36	0.17	0.50	0.67		0.70	0.47	
Control Delay		43.0	1.5		35.5	7.7	26.2	18.9		30.1	4.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		43.0	1.5		35.5	7.7	26.2	18.9		30.1	4.9	
LOS		D	A		D	A	C	B		C	A	
Approach Delay		37.1			24.3			19.6			10.0	
Approach LOS		D			C			B			B	
Queue Length 50th (m)		25.6	0.0		12.5	0.0	12.7	73.5		22.2	23.7	
Queue Length 95th (m)		39.5	1.3		22.6	7.4	#40.2	114.1		#60.5	35.1	
Internal Link Dist (m)		128.9			13.1			174.2			118.4	
Turn Bay Length (m)			20.0			20.0	60.0			60.0		
Base Capacity (vph)		390	453		336	460	238	1774		428	2379	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.40	0.06		0.24	0.12	0.50	0.67		0.67	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 16.4		Intersection LOS: B	
Intersection Capacity Utilization 73.5%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

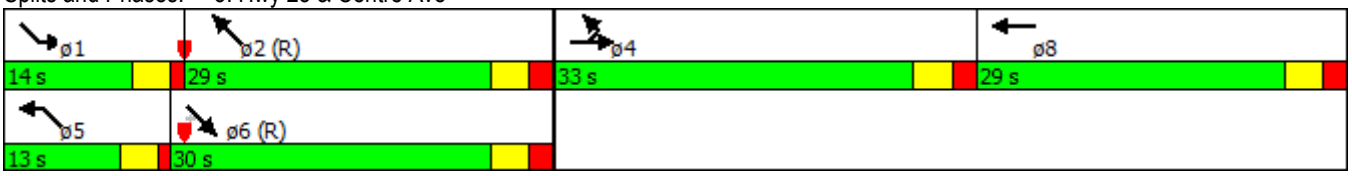
Splits and Phases: 2: HWY 28 & 52 Ave

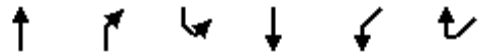
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	493	432	177	0	180	174	267	552	325	170	340	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	80.0		60.0
Storage Lanes	1		0	0		0	2		1	2		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.91	0.91	0.95	1.00	0.95	0.95	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00	0.99			0.99		0.99		0.98	1.00		
Frt		0.964			0.926				0.850			
Flt Protected	0.950	0.992					0.950			0.950		
Satd. Flow (prot)	1585	3178	0	0	3197	0	3283	3385	1514	3283	3385	0
Flt Permitted	0.950	0.992					0.950			0.950		
Satd. Flow (perm)	1579	3176	0	0	3197	0	3262	3385	1486	3268	3385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		37			189				353			
Link Speed (k/h)		30			50			30			30	
Link Distance (m)		137.4			128.1			158.3			98.2	
Travel Time (s)		16.5			9.2			19.0			11.8	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	536	470	192	0	196	189	290	600	353	185	370	0
Shared Lane Traffic (%)	25%											
Lane Group Flow (vph)	402	796	0	0	385	0	290	600	353	185	370	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4			8		1	6		5	2	
Permitted Phases									6			
Detector Phase	4	4			8		1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0		7.0	20.0	20.0	7.0	20.0	
Minimum Split (s)	29.0	29.0			29.0		11.0	29.0	29.0	11.0	29.0	
Total Split (s)	33.0	33.0			29.0		14.0	30.0	30.0	13.0	29.0	
Total Split (%)	31.4%	31.4%			27.6%		13.3%	28.6%	28.6%	12.4%	27.6%	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0			2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None			None		None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	28.0	28.0			14.1		13.9	33.8	33.8	10.1	30.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Actuated g/C Ratio	0.27	0.27			0.13		0.13	0.32	0.32	0.10	0.29	
v/c Ratio	0.95	0.91			0.65		0.67	0.55	0.49	0.58	0.38	
Control Delay	72.5	51.4			26.2		52.2	33.0	6.1	53.3	32.6	
Queue Delay	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	72.5	51.4			26.2		52.2	33.0	6.1	53.3	32.6	
LOS	E	D			C		D	C	A	D	C	
Approach Delay		58.5			26.2			29.8			39.5	
Approach LOS		E			C			C			D	
Queue Length 50th (m)	88.7	83.0			20.1		28.7	52.1	0.0	18.7	31.9	
Queue Length 95th (m)	#152.1	#119.8			31.1		#55.5	79.5	23.0	#30.7	48.9	
Internal Link Dist (m)		113.4			104.1			134.3			74.2	
Turn Bay Length (m)	60.0						60.0		60.0	80.0		
Base Capacity (vph)	422	874			876		435	1088	717	322	966	
Starvation Cap Reductn	0	0			0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0		0	0	0	0	0	
Storage Cap Reductn	0	0			0		0	0	0	0	0	
Reduced v/c Ratio	0.95	0.91			0.44		0.67	0.55	0.49	0.57	0.38	

Intersection Summary			
Area Type:	Other		
Cycle Length: 105			
Actuated Cycle Length: 105			
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 41.2		Intersection LOS: D	
Intersection Capacity Utilization 78.1%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Hwy 28 & Centre Ave



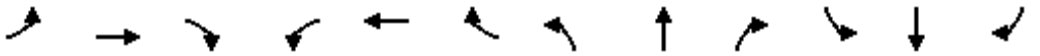


Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	541	266	220	428	283	170
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		1	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00		1.00	0.98
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3385	1514	1692	3385	1742	1559
Flt Permitted			0.364		0.950	
Satd. Flow (perm)	3385	1488	647	3385	1736	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		289				185
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	588	289	239	465	308	185
Shared Lane Traffic (%)						
Lane Group Flow (vph)	588	289	239	465	308	185
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	20.0	20.0	7.0	20.0	7.0	7.0
Minimum Split (s)	29.0	29.0	10.0	29.0	29.0	29.0
Total Split (s)	35.0	35.0	18.0	53.0	37.0	37.0
Total Split (%)	38.9%	38.9%	20.0%	58.9%	41.1%	41.1%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	44.8	44.8	60.6	58.6	21.4	21.4

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.50	0.50	0.67	0.65	0.24	0.24
v/c Ratio	0.35	0.33	0.43	0.21	0.74	0.37
Control Delay	16.3	3.5	9.1	7.4	42.4	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	3.5	9.1	7.4	42.4	5.9
LOS	B	A	A	A	D	A
Approach Delay	12.1			8.0	28.7	
Approach LOS	B			A	C	
Queue Length 50th (m)	30.6	0.0	13.7	15.2	49.5	0.0
Queue Length 95th (m)	55.8	15.6	30.1	27.9	68.7	13.6
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1686	886	611	2203	619	663
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.33	0.39	0.21	0.50	0.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 14.6		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Hwy 28 & 50 St

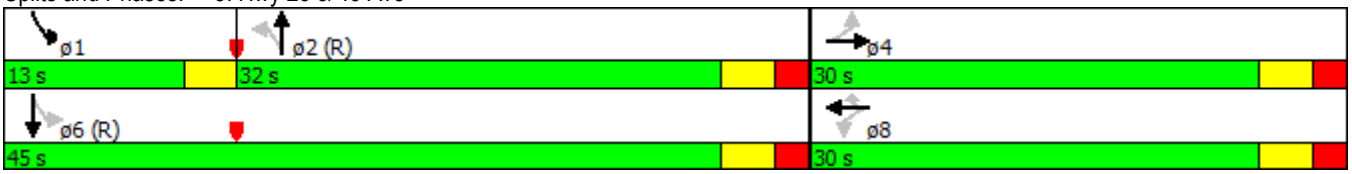


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	27	32	150	64	96	23	550	79	190	655	99
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor	1.00	0.99		1.00		0.98	1.00	1.00		1.00	1.00	
Frt		0.918				0.850		0.981			0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1668	0	1742	1834	1559	1692	4754	0	1692	4749	0
Flt Permitted	0.711			0.715			0.331			0.343		
Satd. Flow (perm)	1298	1668	0	1306	1834	1533	588	4754	0	609	4749	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35				104		39			58	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	77	29	35	163	70	104	25	598	86	207	712	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	64	0	163	70	104	25	684	0	207	820	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		4.0	20.0	
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		9.0	29.0	
Total Split (s)	30.0	30.0		30.0	30.0	30.0	32.0	32.0		13.0	45.0	
Total Split (%)	40.0%	40.0%		40.0%	40.0%	40.0%	42.7%	42.7%		17.3%	60.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	15.6	15.6		15.6	15.6	15.6	37.7	37.7		51.4	49.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.21	0.21		0.21	0.21	0.21	0.50	0.50		0.69	0.66	
v/c Ratio	0.29	0.17		0.60	0.18	0.26	0.08	0.28		0.38	0.26	
Control Delay	25.7	12.9		35.2	23.4	6.4	14.3	11.9		7.4	5.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.7	12.9		35.2	23.4	6.4	14.3	11.9		7.4	5.8	
LOS	C	B		D	C	A	B	B		A	A	
Approach Delay		19.9			23.9			11.9			6.1	
Approach LOS		B			C			B			A	
Queue Length 50th (m)	9.4	3.4		21.3	8.3	0.0	1.7	17.4		8.3	13.1	
Queue Length 95th (m)	17.2	10.7		33.6	15.4	9.5	7.5	33.5		22.9	26.5	
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	432	579		435	611	580	295	2410		564	3147	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.18	0.11		0.37	0.11	0.18	0.08	0.28		0.37	0.26	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 11.6		Intersection LOS: B	
Intersection Capacity Utilization 65.1%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: Hwy 28 & 43 Ave



Intersection: 1: HWY 28 & 54 Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (m)	33.1	30.4	19.7	42.7	33.2	34.1	44.8	85.9	86.2	62.4	60.4	75.4
Average Queue (m)	14.3	13.5	7.0	16.5	13.5	16.2	10.3	45.2	46.9	10.2	33.7	36.9
95th Queue (m)	28.2	26.5	16.5	33.6	27.6	29.5	26.6	74.2	75.3	33.1	57.2	62.8
Link Distance (m)		206.6			248.3			158.3	158.3			813.8
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0	60.0		60.0	60.0			60.0	60.0	
Storage Blk Time (%)								3	4	0	1	0
Queuing Penalty (veh)								1	4	0	4	1

Intersection: 1: HWY 28 & 54 Ave

Movement	SB
Directions Served	TR
Maximum Queue (m)	78.4
Average Queue (m)	39.6
95th Queue (m)	67.2
Link Distance (m)	813.8
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: HWY 28 & 52 Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	B23
Directions Served	LT	R	LT	R	L	T	TR	L	T	TR	T
Maximum Queue (m)	52.4	22.4	28.3	21.8	62.3	103.8	103.9	57.6	50.2	50.6	1.8
Average Queue (m)	25.6	6.8	12.2	9.0	25.3	49.2	54.9	29.0	20.4	23.4	0.1
95th Queue (m)	44.9	20.1	26.2	20.4	54.1	92.4	96.9	50.9	40.1	43.4	1.4
Link Distance (m)	140.9		21.8			182.0	182.0		123.3	123.3	158.3
Upstream Blk Time (%)			3	0							
Queuing Penalty (veh)			0	0							
Storage Bay Dist (m)		20.0		20.0	60.0			60.0			
Storage Blk Time (%)	21	0	6	0	0	5		0	0		
Queuing Penalty (veh)	5	0	3	0	1	5		2	0		

Intersection: 3: Hwy 28 & Centre Ave

Movement	EB	EB	EB	B14	B14	WB	WB	SE	SE	SE	SE	SE
Directions Served	L	LT	TR	T	T	T	TR	L	L	T	T	R
Maximum Queue (m)	62.4	126.5	127.1	38.5	23.7	43.2	37.8	56.1	62.3	88.5	89.8	62.5
Average Queue (m)	56.0	81.5	82.2	3.1	2.0	19.3	14.6	22.3	35.1	48.6	45.4	13.7
95th Queue (m)	73.8	125.2	123.1	21.6	15.4	35.9	32.2	43.4	61.4	75.7	73.7	55.6
Link Distance (m)		112.9	112.9	548.6	548.6	98.4	98.4			135.8	135.8	
Upstream Blk Time (%)		3	3									
Queuing Penalty (veh)		0	0									
Storage Bay Dist (m)	60.0							60.0	60.0			60.0
Storage Blk Time (%)	1	15						0	0	2	1	0
Queuing Penalty (veh)	6	38						0	1	6	4	1

Intersection: 3: Hwy 28 & Centre Ave

Movement	B6	B6	NW	NW	NW	NW	B28
Directions Served	T	T	L	L	T	T	T
Maximum Queue (m)	1.9	2.0	36.6	42.2	62.6	62.9	1.0
Average Queue (m)	0.1	0.1	8.0	15.9	24.8	29.0	0.0
95th Queue (m)	1.5	1.5	24.6	31.7	47.8	50.4	0.8
Link Distance (m)	182.0	182.0			67.5	67.5	144.0
Upstream Blk Time (%)				0	0	0	
Queuing Penalty (veh)				0	0	0	
Storage Bay Dist (m)			80.0	80.0			
Storage Blk Time (%)				0	0		
Queuing Penalty (veh)				0	0		

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	B9	SB	SB	SB	B8	B8	SW	SW	B17
Directions Served	T	T	T	L	T	T	T	T	L	R	T
Maximum Queue (m)	58.4	59.2	2.6	51.6	69.5	56.3	2.8	5.4	77.4	62.5	27.7
Average Queue (m)	30.2	27.9	0.1	27.5	18.8	21.0	0.2	0.2	43.0	20.1	1.4
95th Queue (m)	51.7	50.7	1.4	48.8	49.6	45.7	2.7	3.4	71.4	48.9	12.1
Link Distance (m)	109.6	109.6	167.2		76.3	76.3	230.3	230.3	66.7		90.1
Upstream Blk Time (%)					0				2	0	
Queuing Penalty (veh)					1				0	0	
Storage Bay Dist (m)				50.0						60.0	
Storage Blk Time (%)				1	0				2	0	
Queuing Penalty (veh)				3	0				4	0	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	TR	L	T	T
Maximum Queue (m)	31.6	21.8	47.4	21.9	23.4	13.2	37.5	42.7	38.9	40.0	33.6	29.2
Average Queue (m)	14.3	8.5	23.8	10.2	10.3	4.1	18.5	18.3	15.9	17.4	13.7	12.5
95th Queue (m)	26.1	18.2	40.3	20.8	18.8	12.2	30.7	33.8	31.1	32.6	27.0	25.7
Link Distance (m)		120.0		287.8			589.0	589.0	589.0		99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0				60.0		
Storage Blk Time (%)			0									
Queuing Penalty (veh)			0									

Intersection: 5: Hwy 28 & 43 Ave

Movement	SB	B9
Directions Served	TR	T
Maximum Queue (m)	46.9	1.5
Average Queue (m)	14.3	0.1
95th Queue (m)	31.3	1.2
Link Distance (m)	99.7	109.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

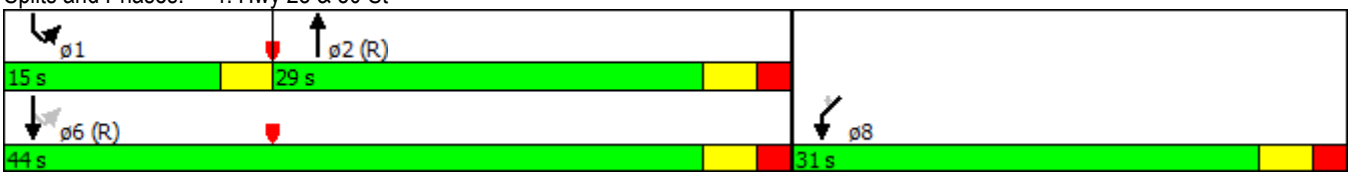
Zone wide Queuing Penalty: 92

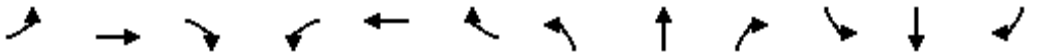
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	541	266	220	428	283	170
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		0	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Ped Bike Factor	0.99		1.00		1.00	0.98
Frt	0.951					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3190	0	1692	3385	1742	1559
Flt Permitted			0.213		0.950	
Satd. Flow (perm)	3190	0	379	3385	1734	1533
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	118					185
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	588	289	239	465	308	185
Shared Lane Traffic (%)						
Lane Group Flow (vph)	877	0	239	465	308	185
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Detector Phase	2		1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0		7.0	15.0	12.0	12.0
Minimum Split (s)	29.0		10.0	29.0	29.0	29.0
Total Split (s)	29.0		15.0	44.0	31.0	31.0
Total Split (%)	38.7%		20.0%	58.7%	41.3%	41.3%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Max		None	C-Max	None	None
Act Effct Green (s)	33.3		48.4	46.4	18.6	18.6

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.44		0.65	0.62	0.25	0.25
v/c Ratio	0.59		0.57	0.22	0.71	0.36
Control Delay	23.6		12.2	7.5	34.6	5.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.6		12.2	7.5	34.6	5.3
LOS	C		B	A	C	A
Approach Delay	23.6			9.1	23.6	
Approach LOS	C			A	C	
Queue Length 50th (m)	55.3		12.1	13.5	39.8	0.0
Queue Length 95th (m)	81.7		27.9	25.8	57.0	12.1
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1483		458	2093	603	652
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.59		0.52	0.22	0.51	0.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 65.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 4: Hwy 28 & 50 St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	27	32	150	64	96	23	550	79	190	655	99
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		1.00		0.98	1.00	1.00		1.00		0.97
Frt		0.918				0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1668	0	1742	1834	1559	1692	3309	0	1692	3385	1514
Flt Permitted	0.711			0.715			0.381			0.319		
Satd. Flow (perm)	1298	1668	0	1306	1834	1533	677	3309	0	567	3385	1472
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35				104		24				108
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	77	29	35	163	70	104	25	598	86	207	712	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	64	0	163	70	104	25	684	0	207	712	108
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		6
Detector Phase	4	4		8	8	8	2	2		1	6	6
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	15.0
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		10.0	29.0	29.0
Total Split (s)	30.0	30.0		30.0	30.0	30.0	32.0	32.0		13.0	45.0	45.0
Total Split (%)	40.0%	40.0%		40.0%	40.0%	40.0%	42.7%	42.7%		17.3%	60.0%	60.0%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	5.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	16.0	16.0		16.0	16.0	16.0	37.2	37.2		51.0	49.0	49.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.21	0.21		0.21	0.21	0.21	0.50	0.50		0.68	0.65	0.65
v/c Ratio	0.28	0.17		0.59	0.18	0.25	0.07	0.41		0.40	0.32	0.11
Control Delay	25.6	12.8		34.4	23.3	6.4	14.0	13.9		7.2	4.9	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	25.6	12.8		34.4	23.3	6.4	14.0	13.9		7.2	4.9	1.1
LOS	C	B		C	C	A	B	B		A	A	A
Approach Delay		19.8			23.4			13.9			5.0	
Approach LOS		B			C			B			A	
Queue Length 50th (m)	9.4	3.4		21.3	8.3	0.0	1.7	27.8		5.6	12.2	0.0
Queue Length 95th (m)	17.2	10.7		33.6	15.4	9.5	7.4	54.5		20.0	25.9	2.9
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	432	579		435	611	580	335	1652		538	2211	998
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.18	0.11		0.37	0.11	0.18	0.07	0.41		0.38	0.32	0.11

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 11.6		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 5: Hwy 28 & 43 Ave

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	B9	SB	SB	SB	SW	SW
Directions Served	T	TR	T	L	T	T	L	R
Maximum Queue (m)	90.3	100.0	7.8	44.5	43.4	30.5	68.4	47.0
Average Queue (m)	45.9	57.8	0.4	24.1	24.7	9.8	36.2	14.6
95th Queue (m)	75.0	86.5	3.8	40.1	43.1	24.3	60.2	30.6
Link Distance (m)	109.4	109.4	167.2				69.4	
Upstream Blk Time (%)	0	0					1	
Queuing Penalty (veh)	0	0					0	
Storage Bay Dist (m)				50.0				60.0
Storage Blk Time (%)				0	0		1	0
Queuing Penalty (veh)				0	0		2	0

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	R
Maximum Queue (m)	27.2	22.7	53.2	37.2	21.6	25.0	49.2	55.6	41.5	37.6	34.7	20.6
Average Queue (m)	10.9	7.1	25.2	11.8	10.6	5.1	24.6	30.0	18.1	17.0	14.9	4.9
95th Queue (m)	22.4	16.7	43.9	26.4	18.7	16.6	42.3	50.6	33.2	31.7	31.0	13.7
Link Distance (m)		120.0		291.4			589.1	589.1		99.7	99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0			60.0			
Storage Blk Time (%)			0	0			0					
Queuing Penalty (veh)			0	0			0					

Zone Summary

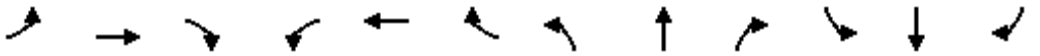
Zone wide Queuing Penalty: 2

Table 6.8 - Alternative 1 - Auxilary Lane - Level of Service Summary for 2020 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
54 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	1	1	1	1	1	2	1	1	2	SH	27.9
			Volumes (vph)	90	90	55	107	92	230	64	1237	126	409	1463	154	
			Level of Service	D	C	A	D	C	A	B	C	B	D	C	-	
			V/C Ratio by Movement	0.43	0.30	0.17	0.58	0.30	0.52	0.33	0.92	0.19	0.90	0.85	-	
			95% Queue Length (m)	30.6	30.6	21.0	37.0	31.1	42.3	53.8	106.5	77.5	63.9	927.3	-	
			Storage Bay Length (m)	60.0	-	60.0	60.0	-	60.0	60.0	-	60.0	60.0	-	-	
52 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	SH	1	1	SH	1	1	1	2	SH	1	2	SH	34.2
			Volumes (vph)	111	111	37	50	30	55	134	1173	152	360	1310		
			Level of Service	-	D	A	-	C	A	C	D	-	D	B	-	
			V/C Ratio by Movement	-	0.78	0.10	-	0.40	0.15	0.64	0.99	-	0.88	0.82	-	
			95% Queue Length (m)	-	65.6	30.9	-	22.0	17.0	77.4	147.5	-	75.5	130.0	-	
			Storage Bay Length (m)	-	-	20.0	-	-	20.0	60.0	-	-	60.0	-	-	
Centre Ave and Highway 28	Signals 105s Cycle	PM Peak	Number of Lanes	1+SH	2	SH	-	2	SH	2	2		2	2	1	46.1
			Volumes (vph)	498	437	179	-	240	231	238	474	-	370	765	451	
			Level of Service	E	D	-	-	C	-	D	D	-	D	D	B	
			V/C Ratio by Movement	0.96	0.92	-	-	0.74	-	0.66	0.67	-	0.76	0.91	0.67	
			95% Queue Length (m)	74.7	137.8	-	-	44.8	-	43.5	75.2	-	70.0	173.3	90.6	
			Storage Bay Length (m)	60.0	-	-	-	-	-	80.0	-	-	60.0	-	60.0	
Highway 28 and 50 Street	Signals 90s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	1	1	2	-	21.6
			Volumes (vph)	-	-	-	327	-	197	-	695	341	314	613	-	
			Level of Service	-	-	-	D	-	A	-	C	B	B	A	-	
			V/C Ratio by Movement	-	-	-	0.78	-	0.38	-	0.53	0.44	0.68	0.31	-	
			95% Queue Length (m)	-	-	-	73.3	-	53.8	-	75.6	7.6	59.3	74.8	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-		50.0	-	-	
43 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	3	SH	1	3	SH	14.2
			Volumes (vph)	78	30	35	190	82	121	27	650	93	252	871	132	
			Level of Service	C	B	-	D	C	A	A	B	-	B	A	-	
			V/C Ratio by Movement	0.30	0.18	-	0.71	0.22	0.30	0.08	0.34	-	0.54	0.37	-	
			95% Queue Length (m)	31.4	21.4	-	53.4	35.8	19.1	13.6	42.7	-	40.9	35.6	-	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

Table 6.9 - Alternative 2 - Service Road - Level of Service Summary for 2020 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Highway 28 and 50 Street	Signals 90s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	SH	1	2	-	24.8
			Volumes (vph)	-	-	-	327	-	197	-	695	341	314	613	-	
			Level of Service	-	-	-	D	-	A	-	C	-	D	A	-	
			V/C Ratio by Movement	-	-	-	0.84	-	0.40	-	0.78	-	0.84	0.30	-	
			95% Queue Length (m)	-	-	-	80.1	-	62.2	-	100.6	-	38.1	22.6	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 75s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	2	SH	1	2	1	14.4
			Volumes (vph)	78	30	35	190	82	121	27	650	93	252	871	132	
			Level of Service	C	B	-	D	C	A	B	B	-	B	A	A	
			V/C Ratio by Movement	0.28	0.17	-	0.67	0.20	0.28	0.12	0.54	-	0.60	0.45	0.15	
			95% Queue Length (m)	24.8	17.1	-	45.7	26.2	23.5	17.3	56.6	-	41.9	47.3	16.4	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

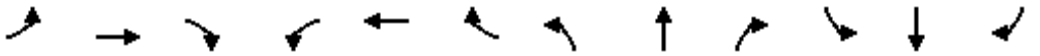


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	90	55	107	92	230	64	1237	126	409	1463	154
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	0.87		0.98			0.97		1.00	
Frt			0.850			0.850			0.850		0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1834	1559	1742	1834	1559	1692	3385	1514	1692	3328	0
Flt Permitted	0.692			0.694			0.103			0.095		
Satd. Flow (perm)	1263	1834	1531	1113	1834	1531	183	3385	1470	169	3328	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			97			250			121		18	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		217.6			262.9			174.5			824.6	
Travel Time (s)		15.7			18.9			12.6			59.4	
Confl. Peds. (#/hr)	5		5	128		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	98	98	60	116	100	250	70	1345	137	445	1590	167
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	98	60	116	100	250	70	1345	137	445	1757	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	29.0	29.0	10.0	29.0	
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	44.0	44.0	17.0	51.0	
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	11.1%	48.9%	48.9%	18.9%	56.7%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	16.2	16.2	16.2	16.2	16.2	16.2	48.0	39.0	39.0	65.8	55.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18	0.18	0.53	0.43	0.43	0.73	0.62	
v/c Ratio	0.43	0.30	0.17	0.58	0.30	0.52	0.33	0.92	0.19	0.90	0.85	
Control Delay	37.4	32.8	3.1	44.5	32.9	8.0	13.7	34.3	10.6	48.8	21.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.4	32.8	3.1	44.5	32.9	8.0	13.7	34.3	10.6	48.8	21.1	
LOS	D	C	A	D	C	A	B	C	B	D	C	
Approach Delay		27.6			22.4			31.3			26.7	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	15.6	15.2	0.0	18.9	15.5	0.0	5.4	85.2	6.1	56.1	117.3	
Queue Length 95th (m)	26.8	25.4	3.9	31.9	25.9	17.0	m7.4	m89.5	m7.5	#140.9	#214.2	
Internal Link Dist (m)		193.6			238.9			150.5			800.6	
Turn Bay Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		
Base Capacity (vph)	336	489	479	296	489	591	214	1466	705	492	2069	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.20	0.13	0.39	0.20	0.42	0.33	0.92	0.19	0.90	0.85	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 27.9		Intersection LOS: C	
Intersection Capacity Utilization 83.9%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: HWY 28 & 54 Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	111	37	50	30	55	134	1173	152	360	1310	103
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		50.0	0.0		50.0	60.0		60.0	60.0		60.0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		1.00	0.98				1.00				1.00	
Frt			0.850			0.850		0.983			0.989	
Flt Protected		0.976			0.970		0.950			0.950		
Satd. Flow (prot)	0	1790	1559	0	1779	1559	1692	3338	0	1742	3340	0
Flt Permitted		0.797			0.561		0.103			0.095		
Satd. Flow (perm)	0	1456	1531	0	1029	1559	183	3338	0	174	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			97			97		20			13	
Link Speed (k/h)		30			50			30			50	
Link Distance (m)		310.9			30.9			198.2			142.4	
Travel Time (s)		37.3			2.2			23.8			10.3	
Confl. Peds. (#/hr)	5		5				5					5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	2%	2%	5%	5%
Adj. Flow (vph)	121	121	40	54	33	60	146	1275	165	391	1424	112
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	242	40	0	87	60	146	1440	0	391	1536	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	21.0	21.0	21.0	10.0	29.0		10.0	29.0	
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	44.0		17.0	51.0	
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	11.1%	48.9%		18.9%	56.7%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	3.0	5.0		3.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)		19.3	19.3		19.3	19.3	48.7	39.0		62.7	50.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.21	0.21		0.21	0.21	0.54	0.43		0.70	0.56	
v/c Ratio		0.78	0.10		0.40	0.15	0.64	0.99		0.88	0.82	
Control Delay		49.8	0.5		34.4	2.9	28.8	47.1		48.4	18.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		49.8	0.5		34.4	2.9	28.8	47.1		48.4	18.6	
LOS		D	A		C	A	C	D		D	B	
Approach Delay		42.8			21.5			45.4			24.7	
Approach LOS		D			C			D			C	
Queue Length 50th (m)		39.2	0.0		12.8	0.0	7.9	124.7		59.8	59.0	
Queue Length 95th (m)		61.5	0.0		25.1	3.9	#34.4	#176.2		m#96.0	#100.6	
Internal Link Dist (m)		286.9			6.9			174.2			118.4	
Turn Bay Length (m)			50.0			50.0	60.0			60.0		
Base Capacity (vph)		388	479		274	486	227	1457		446	1862	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.62	0.08		0.32	0.12	0.64	0.99		0.88	0.82	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.99			
Intersection Signal Delay: 34.2		Intersection LOS: C	
Intersection Capacity Utilization 89.6%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

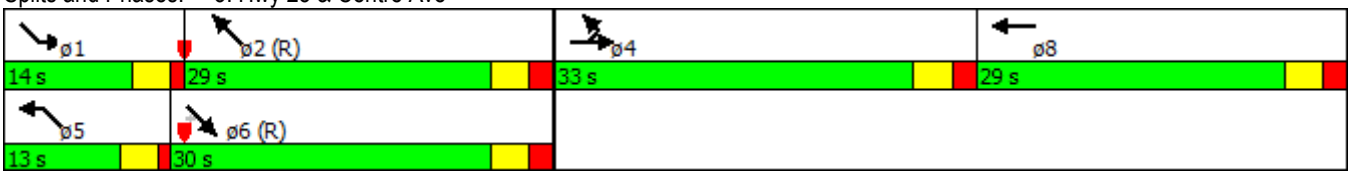
Splits and Phases: 2: HWY 28 & 52 Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	498	437	179	0	240	231	370	765	451	238	474	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	80.0		60.0
Storage Lanes	1		0	0		0	2		1	2		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.91	0.91	0.95	1.00	0.95	0.95	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00	0.99			0.99		0.99		0.98	1.00		
Frt		0.964			0.926				0.850			
Flt Protected	0.950	0.992					0.950			0.950		
Satd. Flow (prot)	1585	3178	0	0	3197	0	3283	3385	1514	3283	3385	0
Flt Permitted	0.950	0.992					0.950			0.950		
Satd. Flow (perm)	1580	3176	0	0	3197	0	3266	3385	1486	3272	3385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		37			212				448			
Link Speed (k/h)		30			50			30			30	
Link Distance (m)		137.4			128.1			158.3			98.2	
Travel Time (s)		16.5			9.2			19.0			11.8	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	541	475	195	0	261	251	402	832	490	259	515	0
Shared Lane Traffic (%)	25%											
Lane Group Flow (vph)	406	805	0	0	512	0	402	832	490	259	515	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4			8		1	6		5	2	
Permitted Phases									6			
Detector Phase	4	4			8		1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0			12.0		7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0			29.0		11.0	29.0	29.0	11.0	29.0	
Total Split (s)	33.0	33.0			29.0		14.0	30.0	30.0	13.0	29.0	
Total Split (%)	31.4%	31.4%			27.6%		13.3%	28.6%	28.6%	12.4%	27.6%	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0			2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None			None		None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	28.0	28.0			17.0		17.0	28.4	28.4	12.5	24.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Actuated g/C Ratio	0.27	0.27			0.16		0.16	0.27	0.27	0.12	0.23	
v/c Ratio	0.96	0.92			0.74		0.76	0.91	0.67	0.66	0.67	
Control Delay	74.5	52.8			30.3		53.9	53.1	10.2	53.8	41.7	
Queue Delay	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	74.5	52.8			30.3		53.9	53.1	10.2	53.8	41.7	
LOS	E	D			C		D	D	B	D	D	
Approach Delay		60.1			30.3			41.1			45.8	
Approach LOS		E			C			D			D	
Queue Length 50th (m)	90.0	84.4			31.0		40.7	88.8	6.6	25.7	50.6	
Queue Length 95th (m)	#154.0	#122.0			44.8		#83.5	#133.8	40.5	#51.0	68.4	
Internal Link Dist (m)		113.4			104.1			134.3			74.2	
Turn Bay Length (m)	60.0						60.0		60.0	80.0		
Base Capacity (vph)	422	874			894		530	916	729	392	773	
Starvation Cap Reductn	0	0			0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0		0	0	0	0	0	
Storage Cap Reductn	0	0			0		0	0	0	0	0	
Reduced v/c Ratio	0.96	0.92			0.57		0.76	0.91	0.67	0.66	0.67	

Intersection Summary			
Area Type:	Other		
Cycle Length: 105			
Actuated Cycle Length: 105			
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 46.1		Intersection LOS: D	
Intersection Capacity Utilization 84.4%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Hwy 28 & Centre Ave

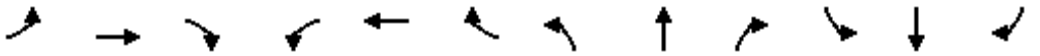


Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	695	341	314	613	327	197
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		1	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00		1.00	0.98
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3385	1514	1692	3385	1742	1559
Flt Permitted			0.251		0.950	
Satd. Flow (perm)	3385	1488	447	3385	1736	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		371				214
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	755	371	341	666	355	214
Shared Lane Traffic (%)						
Lane Group Flow (vph)	755	371	341	666	355	214
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	12.0	12.0
Minimum Split (s)	29.0	29.0	10.0	29.0	29.0	29.0
Total Split (s)	30.0	30.0	24.0	54.0	36.0	36.0
Total Split (%)	33.3%	33.3%	26.7%	60.0%	40.0%	40.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	37.9	37.9	58.4	56.4	23.6	23.6

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.42	0.42	0.65	0.63	0.26	0.26
v/c Ratio	0.53	0.44	0.68	0.31	0.78	0.38
Control Delay	33.0	15.3	15.9	9.1	42.5	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	15.3	15.9	9.1	42.5	5.4
LOS	C	B	B	A	D	A
Approach Delay	27.2			11.4	28.5	
Approach LOS	C			B	C	
Queue Length 50th (m)	68.3	20.4	23.2	25.5	56.8	0.0
Queue Length 95th (m)	91.8	55.7	49.6	43.5	77.6	13.9
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1423	840	580	2122	600	667
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.44	0.59	0.31	0.59	0.32

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 21.6		Intersection LOS: C	
Intersection Capacity Utilization 68.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 4: Hwy 28 & 50 St

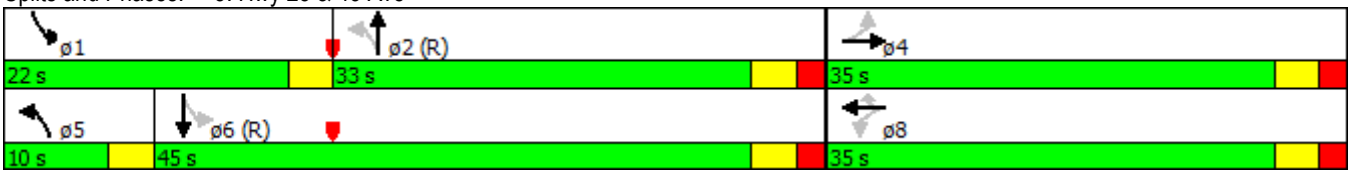


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	30	35	190	82	121	27	650	93	252	871	132
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor	1.00	0.99		0.99		0.98	1.00	1.00		1.00	1.00	
Frt		0.920				0.850		0.981			0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1671	0	1742	1834	1559	1692	4754	0	1692	4748	0
Flt Permitted	0.699			0.711			0.250			0.288		
Satd. Flow (perm)	1276	1671	0	1297	1834	1531	444	4754	0	512	4748	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38				132		30			40	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	85	33	38	207	89	132	29	707	101	274	947	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	85	71	0	207	89	132	29	808	0	274	1090	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	7.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	10.0	29.0		10.0	29.0	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	10.0	33.0		22.0	45.0	
Total Split (%)	38.9%	38.9%		38.9%	38.9%	38.9%	11.1%	36.7%		24.4%	50.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	0.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0		3.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	20.1	20.1		20.1	20.1	20.1	54.3	45.3		61.9	55.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.60	0.50		0.69	0.62	
v/c Ratio	0.30	0.18		0.71	0.22	0.30	0.08	0.34		0.54	0.37	
Control Delay	29.6	14.6		45.1	27.5	6.3	7.4	15.1		11.0	7.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	29.6	14.6		45.1	27.5	6.3	7.4	15.1		11.0	7.3	
LOS	C	B		D	C	A	A	B		B	A	
Approach Delay		22.8			29.5			14.9			8.1	
Approach LOS		C			C			B			A	
Queue Length 50th (m)	12.4	4.6		33.5	12.7	0.0	1.4	27.0		10.6	16.7	
Queue Length 95th (m)	21.8	13.1		49.7	21.5	11.8	5.2	49.9		33.2	43.6	
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	425	582		432	611	598	365	2408		601	2960	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.20	0.12		0.48	0.15	0.22	0.08	0.34		0.46	0.37	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 14.2		Intersection LOS: B	
Intersection Capacity Utilization 63.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 5: Hwy 28 & 43 Ave



Intersection: 1: HWY 28 & 54 Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (m)	35.6	39.0	24.5	43.6	38.4	50.4	62.3	104.0	107.4	62.5	62.4	793.8
Average Queue (m)	16.7	15.6	10.4	19.8	14.3	23.2	19.9	76.0	78.4	33.9	62.1	484.4
95th Queue (m)	30.6	30.6	21.0	37.0	31.1	42.3	53.8	104.1	108.8	77.5	63.9	929.6
Link Distance (m)		206.6			248.3			158.3	158.3			813.8
Upstream Blk Time (%)												23
Queuing Penalty (veh)												0
Storage Bay Dist (m)	60.0		60.0	60.0		60.0	60.0			60.0	60.0	
Storage Blk Time (%)				0	0	0	0	25	28	1	49	17
Queuing Penalty (veh)				1	0	0	0	16	35	4	359	69

Intersection: 1: HWY 28 & 54 Ave

Movement	SB
Directions Served	TR
Maximum Queue (m)	793.6
Average Queue (m)	477.1
95th Queue (m)	924.9
Link Distance (m)	813.8
Upstream Blk Time (%)	15
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: HWY 28 & 52 Ave

Movement	EB	EB	WB	WB	NB	NB	NB	B6	SB	SB	SB	B23
Directions Served	LT	R	LT	R	L	T	TR	T	L	T	TR	T
Maximum Queue (m)	75.9	49.1	21.8	19.2	62.4	155.8	162.2	3.4	62.5	136.2	129.3	29.9
Average Queue (m)	38.6	9.4	12.3	9.0	42.3	96.1	101.2	0.2	54.9	82.1	76.3	2.4
95th Queue (m)	65.6	30.9	22.0	17.0	77.4	144.4	150.6	2.2	75.5	136.9	123.0	17.3
Link Distance (m)	298.5		14.6			181.5	181.5	135.8		122.2	122.2	158.3
Upstream Blk Time (%)			17	3		0	0			5	1	
Queuing Penalty (veh)			0	0		0	0			38	7	
Storage Bay Dist (m)		50.0		50.0	60.0				60.0			
Storage Blk Time (%)	5	0	17	3	1	23			19	13		
Queuing Penalty (veh)	2	0	10	3	4	31			125	49		

Intersection: 2: HWY 28 & 52 Ave

Movement	B23
Directions Served	T
Maximum Queue (m)	21.4
Average Queue (m)	1.2
95th Queue (m)	11.6
Link Distance (m)	158.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Hwy 28 & Centre Ave

Movement	EB	EB	EB	B14	B14	WB	WB	SE	SE	SE	SE	SE
Directions Served	L	LT	TR	T	T	T	TR	L	L	T	T	R
Maximum Queue (m)	62.4	130.4	133.0	90.2	77.1	49.4	56.2	59.8	62.4	158.5	158.6	62.5
Average Queue (m)	56.6	88.1	88.0	13.5	12.1	24.7	24.3	40.4	57.0	109.3	108.3	49.6
95th Queue (m)	74.7	139.5	136.1	64.5	60.9	42.3	47.2	64.8	75.2	172.5	174.1	90.6
Link Distance (m)		112.9	112.9	548.6	548.6	98.4	98.4			135.8	135.8	
Upstream Blk Time (%)		11	11							11	11	
Queuing Penalty (veh)		0	0							80	74	
Storage Bay Dist (m)	60.0							60.0	60.0			60.0
Storage Blk Time (%)	2	22						1	8	29	28	2
Queuing Penalty (veh)	10	54						4	29	108	126	9

Intersection: 3: Hwy 28 & Centre Ave

Movement	B6	B6	NW	NW	NW	NW	B28	B28	B8
Directions Served	T	T	L	L	T	T	T	T	T
Maximum Queue (m)	64.4	68.1	43.9	65.1	78.2	82.0	12.6	7.7	2.8
Average Queue (m)	15.4	16.6	17.4	26.6	43.0	47.8	0.5	0.5	0.2
95th Queue (m)	71.6	74.1	35.8	51.2	72.6	77.7	6.1	4.8	3.1
Link Distance (m)	181.5	181.5			67.5	67.5	144.0	144.0	76.3
Upstream Blk Time (%)				0	1	2			
Queuing Penalty (veh)				0	4	11			
Storage Bay Dist (m)			80.0	80.0					
Storage Blk Time (%)				0	1				
Queuing Penalty (veh)				0	2				

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	NB	B9	B9	B9	B18	SB	SB	SB	B8	B8
Directions Served	T	T	R	T	T	T	T	L	T	T	T	T
Maximum Queue (m)	79.4	81.2	9.9	20.5	23.6	5.5	1.4	52.6	87.4	74.7	8.9	7.2
Average Queue (m)	51.9	51.1	0.3	0.7	0.8	0.2	0.0	37.3	33.2	32.0	0.3	0.2
95th Queue (m)	75.0	76.2	7.6	15.8	16.3	2.8	1.1	59.3	79.0	70.6	3.9	4.2
Link Distance (m)	109.6	109.6	109.6	167.2	167.2	167.2	99.7		76.3	76.3	230.3	230.3
Upstream Blk Time (%)									1	0		
Queuing Penalty (veh)									4	1		
Storage Bay Dist (m)								50.0				
Storage Blk Time (%)								3	2			
Queuing Penalty (veh)								10	6			

Intersection: 4: Hwy 28 & 50 St

Movement	B7	B7	SW	SW	B17
Directions Served	T	T	L	R	T
Maximum Queue (m)	6.7	2.0	76.7	62.4	29.8
Average Queue (m)	0.3	0.1	45.8	23.5	1.3
95th Queue (m)	3.3	1.6	73.3	53.8	13.1
Link Distance (m)	144.0	144.0	66.7		90.1
Upstream Blk Time (%)			2	0	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (m)				60.0	
Storage Blk Time (%)			3	0	
Queuing Penalty (veh)			6	1	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	TR	L	T	T
Maximum Queue (m)	37.3	25.4	58.2	45.4	22.1	14.6	50.2	49.9	48.5	50.2	38.3	36.1
Average Queue (m)	16.4	10.4	33.0	16.4	11.5	5.2	24.5	25.2	23.9	23.1	18.1	15.1
95th Queue (m)	31.4	21.4	53.4	35.8	19.1	13.6	42.0	43.4	43.1	40.9	34.6	32.2
Link Distance (m)		120.0		287.8			589.0	589.0	589.0		99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0				60.0		
Storage Blk Time (%)	0		0	0			0			0		
Queuing Penalty (veh)	0		1	0			0			0		

Intersection: 5: Hwy 28 & 43 Ave

Movement	SB	B9
Directions Served	TR	T
Maximum Queue (m)	47.6	1.7
Average Queue (m)	19.5	0.1
95th Queue (m)	39.9	1.3
Link Distance (m)	99.7	109.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

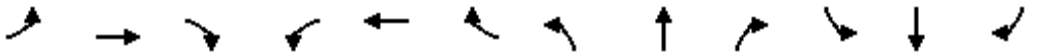
Zone wide Queuing Penalty: 1290

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	695	341	314	613	327	197
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		0	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Ped Bike Factor	0.99				0.99	0.98
Frt	0.951					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3188	0	1692	3385	1742	1559
Flt Permitted			0.114		0.950	
Satd. Flow (perm)	3188	0	203	3385	1732	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	107					214
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	755	371	341	666	355	214
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1126	0	341	666	355	214
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Detector Phase	2		1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0		7.0	15.0	12.0	12.0
Minimum Split (s)	29.0		10.0	29.0	29.0	29.0
Total Split (s)	39.0		22.0	61.0	29.0	29.0
Total Split (%)	43.3%		24.4%	67.8%	32.2%	32.2%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Max		None	C-Max	None	None
Act Effct Green (s)	39.0		60.2	58.2	21.8	21.8

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.43		0.67	0.65	0.24	0.24
v/c Ratio	0.78		0.84	0.30	0.84	0.40
Control Delay	26.1		37.9	7.8	51.2	6.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	26.1		37.9	7.8	51.2	6.4
LOS	C		D	A	D	A
Approach Delay	26.1			18.0	34.3	
Approach LOS	C			B	C	
Queue Length 50th (m)	85.8		37.6	25.6	56.7	0.0
Queue Length 95th (m)	#126.0		#77.1	34.7	#95.8	15.8
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1441		450	2190	464	565
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.78		0.76	0.30	0.77	0.38

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 24.8		Intersection LOS: C	
Intersection Capacity Utilization 79.5%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 4: Hwy 28 & 50 St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	30	35	190	82	121	27	650	93	252	871	132
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		1.00		0.98	1.00	1.00		1.00		0.97
Frt		0.920				0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1672	0	1742	1834	1559	1692	3309	0	1692	3385	1514
Flt Permitted	0.699			0.711			0.302			0.245		
Satd. Flow (perm)	1277	1672	0	1298	1834	1533	537	3309	0	436	3385	1472
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38				132		22				143
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	85	33	38	207	89	132	29	707	101	274	947	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	85	71	0	207	89	132	29	808	0	274	947	143
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		6
Detector Phase	4	4		8	8	8	2	2		1	6	6
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	15.0
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		10.0	29.0	29.0
Total Split (s)	30.0	30.0		30.0	30.0	30.0	30.0	30.0		15.0	45.0	45.0
Total Split (%)	40.0%	40.0%		40.0%	40.0%	40.0%	40.0%	40.0%		20.0%	60.0%	60.0%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	5.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	17.9	17.9		17.9	17.9	17.9	33.7	33.7		49.1	47.1	47.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.24	0.24		0.24	0.24	0.24	0.45	0.45		0.65	0.63	0.63
v/c Ratio	0.28	0.17		0.67	0.20	0.28	0.12	0.54		0.60	0.45	0.15
Control Delay	23.9	12.0		36.0	22.1	5.6	17.6	17.9		12.1	8.9	2.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	23.9	12.0		36.0	22.1	5.6	17.6	17.9		12.1	8.9	2.0
LOS	C	B		D	C	A	B	B		B	A	A
Approach Delay		18.5			23.7			17.9			8.8	
Approach LOS		B			C			B			A	
Queue Length 50th (m)	10.0	3.7		27.0	10.2	0.0	2.3	40.0		13.3	31.0	0.0
Queue Length 95th (m)	18.4	11.2		41.9	18.2	10.5	8.8	70.1		31.6	57.5	7.1
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	425	582		432	611	599	241	1498		490	2126	978
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.20	0.12		0.48	0.15	0.22	0.12	0.54		0.56	0.45	0.15

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 14.4		Intersection LOS: B	
Intersection Capacity Utilization 67.6%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: Hwy 28 & 43 Ave

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	B9	B18	SB	SB	SB	SW	SW	B17
Directions Served	T	TR	T	T	L	T	T	L	R	T
Maximum Queue (m)	102.2	110.2	5.1	2.8	51.4	47.3	38.6	78.7	62.5	54.5
Average Queue (m)	59.4	70.9	0.3	0.1	38.1	29.8	15.4	50.6	27.7	5.7
95th Queue (m)	95.5	105.7	3.1	2.2	51.4	50.4	34.4	80.1	62.2	30.4
Link Distance (m)	109.4	109.4	167.2	99.7				66.7		90.1
Upstream Blk Time (%)	0	0						5	0	0
Queuing Penalty (veh)	0	2						0	0	0
Storage Bay Dist (m)					50.0				60.0	
Storage Blk Time (%)					0	0		6	0	
Queuing Penalty (veh)					1	0		12	1	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	R
Maximum Queue (m)	30.2	25.9	50.5	30.7	29.3	24.4	61.2	68.8	52.8	54.1	53.2	19.1
Average Queue (m)	12.5	7.0	29.2	13.6	12.5	6.0	32.2	38.0	24.5	25.3	26.0	7.1
95th Queue (m)	24.8	17.1	45.7	26.2	23.5	17.3	52.8	60.4	41.9	46.0	48.5	16.4
Link Distance (m)		120.0		291.4			589.1	589.1		99.7	99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0			60.0			
Storage Blk Time (%)			0				0		0	0		
Queuing Penalty (veh)			0				0		1	0		

Zone Summary

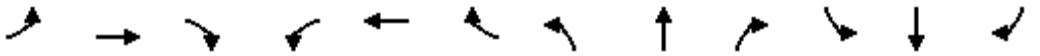
Zone wide Queuing Penalty: 18

Table 6.10 - Alternative 1 - Auxilary Lane - Level of Service Summary for 2025 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
54 Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	1	1	1	1	1	1	1	2	1	1	2	SH	47
			Volumes (vph)	121	121	74	115	98	247	81	1568	159	504	1800	189	
			Level of Service	E	D	B	E	D	B	B	E	B	F	C	-	
			V/C Ratio by Movement	0.73	0.46	0.26	0.77	0.37	0.58	0.54	1.06	0.23	1.10	0.96	-	
			95% Queue Length (m)	55.1	49.9	26.4	57.5	90.4	57.1	57.6	118.4	78.2	65.0	1027.8	-	
			Storage Bay Length (m)	60.0	-	60.0	60.0	-	60.0	60.0	-	60.0	60.0	-	-	
52 Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	SH	1	1	SH	1	1	1	2	SH	1	2	SH	73.6
			Volumes (vph)	153	153	51	55	33	60	167	1462	189	437	1591	125	
			Level of Service	-	F	A	-	E	A	E	F	-	F	C	-	
			V/C Ratio by Movement	-	0.99	0.13	-	0.62	0.16	0.91	1.15	-	1.20	0.97	-	
			95% Queue Length (m)	-	188.5	27.1	-	25.9	19.3	77.2	196.6	-	67.6	166.2	-	
			Storage Bay Length (m)	-	-	20.0	-	-	20.0	60.0	-	-	60.0	-	-	
Centre Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	1+SH	2	SH	-	2	SH	2	2		2	2	1	71.5
			Volumes (vph)	602	528	217	-	260	251	299	597	-	452	936	551	
			Level of Service	E	E	-	-	D	-	E	F	-	D	F	E	
			V/C Ratio by Movement	0.98	0.95	-	-	0.81	-	1.09	0.92	-	0.95	1.09	0.85	
			95% Queue Length (m)	67.2	145.6	-	-	61.2	-	79.8	104.0	-	70.0	171.6	84.3	
			Storage Bay Length (m)	60.0	-	-	-	-	-	80.0	-	-	60.0	-	60.0	
Highway 28 and 50 Street	Signals 90s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	1	1	2	-	27.4
			Volumes (vph)	-	-	-	374	-	225	-	837	410	383	747	-	
			Level of Service	-	-	-	D	-	A	-	D	B	D	A	-	
			V/C Ratio by Movement	-	-	-	0.86	-	0.41	-	0.73	0.54	0.87	0.39	-	
			95% Queue Length (m)	-	-	-	83.4	-	70.1	-	87.8	7.8	61.5	80.5	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-		50.0	-	-	
43 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	3	SH	1	3	SH	15.5
			Volumes (vph)	83	31	37	218	94	139	32	761	109	302	1041	158	
			Level of Service	C	B	-	D	C	A	C	B	-	B	A	-	
			V/C Ratio by Movement	0.30	0.17	-	0.77	0.24	0.32	0.21	0.43	-	0.69	0.42	-	
			95% Queue Length (m)	32.1	23.4	-	57.7	35.8	24.0	17.7	48.0	-	49.9	41.0	-	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

Table 6.11 - Alternative 2 - Service Road - Level of Service Summary for 2025 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Highway 28 and 50 Street	Signals 120s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	SH	1	2	-	42.2
			Volumes (vph)	-	-	-	374	-	225	-	837	410	383	747	-	
			Level of Service	-	-	-	E	-	B	-	D	-	E	A	-	
			V/C Ratio by Movement	-	-	-	0.95	-	0.46	-	0.96	-	0.96	0.36	-	
			95% Queue Length (m)	-	-	-	85.8	-	83.4	-	137.6	-	48.1	36.5	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	2	SH	1	2	1	18.1
			Volumes (vph)	83	31	37	218	94	139	32	761	109	302	1041	158	
			Level of Service	C	B	-	D	C	A	C	C	-	C	A	A	
			V/C Ratio by Movement	0.31	0.18	-	0.78	0.24	0.32	0.17	0.62	-	0.73	0.51	0.17	
			95% Queue Length (m)	29.5	18.8	-	59.1	49.1	23.6	25.7	74.2	-	57.8	59.2	18.1	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

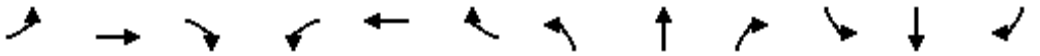


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	121	121	74	115	98	247	81	1568	159	504	1800	189
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor	0.99		0.98	0.99		0.98			0.97		1.00	
Frt			0.850			0.850			0.850		0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1834	1559	1742	1834	1559	1692	3385	1514	1692	3327	0
Flt Permitted	0.637			0.566			0.070			0.067		
Satd. Flow (perm)	1161	1834	1529	1032	1834	1529	125	3385	1465	119	3327	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			80			268			98		18	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		217.6			262.9			174.5			824.6	
Travel Time (s)		15.7			18.9			12.6			59.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	132	132	80	125	107	268	88	1704	173	548	1957	205
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	132	80	125	107	268	88	1704	173	548	2162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	29.0	29.0	10.0	29.0	
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	62.0	62.0	29.0	81.0	
Total Split (%)	24.2%	24.2%	24.2%	24.2%	24.2%	24.2%	8.3%	51.7%	51.7%	24.2%	67.5%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	18.9	18.9	18.9	18.9	18.9	18.9	66.2	57.0	57.0	93.1	80.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.55	0.48	0.48	0.78	0.67	
v/c Ratio	0.73	0.46	0.26	0.77	0.37	0.58	0.54	1.06	0.23	1.10	0.96	
Control Delay	69.4	50.0	11.0	77.1	47.7	10.1	19.5	56.8	11.4	103.9	31.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	69.4	50.0	11.0	77.1	47.7	10.1	19.5	56.8	11.4	103.9	31.3	
LOS	E	D	B	E	D	B	B	E	B	F	C	
Approach Delay		48.4			34.9			51.2			46.0	
Approach LOS		D			C			D			D	
Queue Length 50th (m)	29.6	28.3	0.0	28.3	22.6	0.0	9.6	~226.4	8.7	~134.1	231.1	
Queue Length 95th (m)	49.3	45.5	12.9	48.0	38.0	22.2	m9.6	m99.4	m7.8	#216.4	#326.5	
Internal Link Dist (m)		193.6			238.9			150.5			800.6	
Turn Bay Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		
Base Capacity (vph)	232	366	369	206	366	520	163	1607	747	500	2248	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.57	0.36	0.22	0.61	0.29	0.52	0.54	1.06	0.23	1.10	0.96	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.10			
Intersection Signal Delay: 47.0		Intersection LOS: D	
Intersection Capacity Utilization 110.6%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: HWY 28 & 54 Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	153	51	55	33	60	167	1462	189	437	1591	125
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		20.0	0.0		20.0	60.0		60.0	60.0		60.0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		1.00	0.98								1.00	
Frt			0.850			0.850		0.983			0.989	
Flt Protected		0.976			0.970		0.950			0.950		
Satd. Flow (prot)	0	1790	1559	0	1779	1559	1692	3338	0	1742	3340	0
Flt Permitted		0.787			0.360		0.071			0.068		
Satd. Flow (perm)	0	1436	1529	0	660	1559	126	3338	0	125	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			73			73		16			11	
Link Speed (k/h)		30			50			30			50	
Link Distance (m)		310.9			32.5			198.2			142.4	
Travel Time (s)		37.3			2.3			23.8			10.3	
Confl. Peds. (#/hr)	5		5				5					5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	2%	2%	5%	5%
Adj. Flow (vph)	166	166	55	60	36	65	182	1589	205	475	1729	136
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	332	55	0	96	65	182	1794	0	475	1865	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	21.0	21.0	21.0	10.0	29.0		10.0	29.0	
Total Split (s)	33.0	33.0	33.0	33.0	33.0	33.0	13.0	61.0		26.0	74.0	
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%	10.8%	50.8%		21.7%	61.7%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	3.0	5.0		3.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)		28.0	28.0		28.0	28.0	68.0	56.0		84.0	69.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.57	0.47		0.70	0.58	
v/c Ratio		0.99	0.13		0.62	0.16	0.91	1.15		1.20	0.97	
Control Delay		93.4	5.5		60.8	7.9	58.9	106.0		143.1	27.5	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		93.4	5.5		60.8	7.9	58.9	106.0		143.1	27.5	
LOS		F	A		E	A	E	F		F	C	
Approach Delay		80.9			39.4			101.7			51.0	
Approach LOS		F			D			F			D	
Queue Length 50th (m)		78.4	0.0		20.4	0.0	26.3	~253.1		~123.5	141.7	
Queue Length 95th (m)		#136.5	6.9		#43.6	9.6	m#41.9	m#287.1		m#142.5	m#197.7	
Internal Link Dist (m)		286.9			8.5			174.2			118.4	
Turn Bay Length (m)			20.0			20.0	60.0			60.0		
Base Capacity (vph)		335	412		154	419	201	1566		397	1925	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.99	0.13		0.62	0.16	0.91	1.15		1.20	0.97	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.20			
Intersection Signal Delay: 73.6		Intersection LOS: E	
Intersection Capacity Utilization 115.8%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 2: HWY 28 & 52 Ave

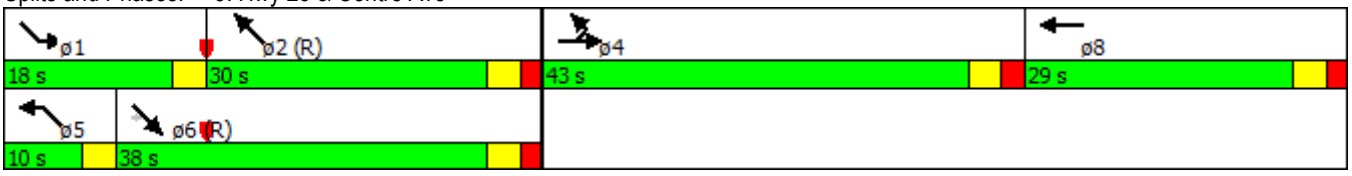
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	602	528	217	0	260	251	452	936	551	299	597	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	80.0		60.0
Storage Lanes	1		0	0		0	2		1	2		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.91	0.91	0.95	1.00	0.95	0.95	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00	0.99			0.99		0.99		0.98	1.00		
Frt		0.964			0.926				0.850			
Flt Protected	0.950	0.992					0.950			0.950		
Satd. Flow (prot)	1585	3177	0	0	3196	0	3283	3385	1514	3283	3385	0
Flt Permitted	0.950	0.992					0.950			0.950		
Satd. Flow (perm)	1580	3175	0	0	3196	0	3267	3385	1485	3273	3385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35			183				412			
Link Speed (k/h)		30			50			30			30	
Link Distance (m)		137.4			128.1			158.3			98.2	
Travel Time (s)		16.5			9.2			19.0			11.8	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	654	574	236	0	283	273	491	1017	599	325	649	0
Shared Lane Traffic (%)	25%											
Lane Group Flow (vph)	490	974	0	0	556	0	491	1017	599	325	649	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4			8		1	6		5	2	
Permitted Phases									6			
Detector Phase	4	4			8		1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0			12.0		7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0			29.0		10.0	29.0	29.0	10.0	29.0	
Total Split (s)	43.0	43.0			29.0		18.0	38.0	38.0	10.0	30.0	
Total Split (%)	35.8%	35.8%			24.2%		15.0%	31.7%	31.7%	8.3%	25.0%	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0			2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0			5.0		3.0	5.0	5.0	3.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None			None		None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	38.0	38.0			20.1		18.9	33.0	33.0	10.9	25.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Actuated g/C Ratio	0.32	0.32			0.17		0.16	0.28	0.28	0.09	0.21	
v/c Ratio	0.98	0.95			0.81		0.95	1.09	0.85	1.09	0.92	
Control Delay	76.3	56.7			41.6		65.5	107.4	38.6	128.1	66.1	
Queue Delay	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	76.3	56.7			41.6		65.5	107.4	38.6	128.1	66.1	
LOS	E	E			D		E	F	D	F	E	
Approach Delay		63.3			41.6			78.0			86.8	
Approach LOS		E			D			E			F	
Queue Length 50th (m)	125.1	119.0			45.2		62.9	~146.7	85.7	~47.2	79.4	
Queue Length 95th (m)	#198.6	#162.6			63.3		m#83.7	m#161.1	m95.2	#86.4	#113.0	
Internal Link Dist (m)		113.4			104.1			134.3			74.2	
Turn Bay Length (m)	60.0						60.0		60.0	80.0		
Base Capacity (vph)	501	1029			785		518	930	707	299	705	
Starvation Cap Reductn	0	0			0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0		0	0	0	0	0	
Storage Cap Reductn	0	0			0		0	0	0	0	0	
Reduced v/c Ratio	0.98	0.95			0.71		0.95	1.09	0.85	1.09	0.92	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 71.5 Intersection LOS: E
Intersection Capacity Utilization 94.5% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Hwy 28 & Centre Ave



Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	837	410	383	747	374	225
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		1	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00		1.00	0.98
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3385	1514	1692	3385	1742	1559
Flt Permitted			0.152		0.950	
Satd. Flow (perm)	3385	1488	271	3385	1737	1531
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		446				245
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	910	446	416	812	407	245
Shared Lane Traffic (%)						
Lane Group Flow (vph)	910	446	416	812	407	245
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	12.0	12.0
Minimum Split (s)	29.0	29.0	10.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	24.0	58.0	32.0	32.0
Total Split (%)	37.8%	37.8%	26.7%	64.4%	35.6%	35.6%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	33.2	33.2	57.5	55.5	24.5	24.5

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.37	0.37	0.64	0.62	0.27	0.27
v/c Ratio	0.73	0.54	0.87	0.39	0.86	0.41
Control Delay	39.7	16.2	37.5	9.8	49.7	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.7	16.2	37.5	9.8	49.7	5.6
LOS	D	B	D	A	D	A
Approach Delay	32.0			19.2	33.1	
Approach LOS	C			B	C	
Queue Length 50th (m)	86.9	29.4	47.1	36.2	64.5	0.0
Queue Length 95th (m)	#110.1	67.3	#96.1	48.6	#106.7	16.0
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1247	830	506	2089	522	630
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.54	0.82	0.39	0.78	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 27.4		Intersection LOS: C	
Intersection Capacity Utilization 78.5%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 4: Hwy 28 & 50 St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	31	37	218	94	139	32	761	109	302	1041	158
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor	1.00	0.99		0.99		0.98	1.00	1.00		1.00	1.00	
Frt		0.919				0.850		0.981			0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1669	0	1742	1834	1559	1692	4754	0	1692	4748	0
Flt Permitted	0.691			0.709			0.200			0.228		
Satd. Flow (perm)	1261	1669	0	1294	1834	1531	356	4754	0	405	4748	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		40				151		31			55	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	90	34	40	237	102	151	35	827	118	328	1132	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	74	0	237	102	151	35	945	0	328	1304	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		12.0	29.0	
Total Split (s)	32.0	32.0		32.0	32.0	32.0	34.0	34.0		24.0	58.0	
Total Split (%)	35.6%	35.6%		35.6%	35.6%	35.6%	37.8%	37.8%		26.7%	64.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	21.3	21.3		21.3	21.3	21.3	41.6	41.6		60.7	58.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.24	0.24		0.24	0.24	0.24	0.46	0.46		0.67	0.65	
v/c Ratio	0.30	0.17		0.77	0.24	0.32	0.21	0.43		0.69	0.42	
Control Delay	29.2	14.3		48.7	27.3	6.2	24.5	18.4		18.8	5.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	29.2	14.3		48.7	27.3	6.2	24.5	18.4		18.8	5.6	
LOS	C	B		D	C	A	C	B		B	A	
Approach Delay		22.5			31.1			18.6			8.2	
Approach LOS		C			C			B			A	
Queue Length 50th (m)	12.6	4.5		37.7	14.0	0.0	3.5	37.6		21.1	23.5	
Queue Length 95th (m)	23.7	13.8		59.4	24.9	12.9	13.4	61.7		m43.0	30.6	
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	378	528		388	550	565	164	2214		573	3115	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.24	0.14		0.61	0.19	0.27	0.21	0.43		0.57	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 15.5		Intersection LOS: B	
Intersection Capacity Utilization 68.6%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 5: Hwy 28 & 43 Ave

Intersection: 1: HWY 28 & 54 Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (m)	58.1	55.5	35.3	58.7	130.7	59.6	62.3	120.5	127.6	62.5	62.4	833.0
Average Queue (m)	33.1	29.2	13.2	33.2	34.8	34.8	23.1	85.5	88.9	34.0	62.1	756.7
95th Queue (m)	55.1	49.9	26.4	57.5	90.4	57.1	57.6	114.8	122.0	78.2	65.0	1023.6
Link Distance (m)		206.6			248.3			158.3	158.3			813.8
Upstream Blk Time (%)												61
Queuing Penalty (veh)												0
Storage Bay Dist (m)	60.0		60.0	60.0		60.0	60.0			60.0	60.0	
Storage Blk Time (%)	2	0		5	0	1	0	34	35	1	51	13
Queuing Penalty (veh)	3	0		18	1	3	1	27	56	5	458	64

Intersection: 1: HWY 28 & 54 Ave

Movement	SB
Directions Served	TR
Maximum Queue (m)	831.3
Average Queue (m)	748.0
95th Queue (m)	1032.0
Link Distance (m)	813.8
Upstream Blk Time (%)	38
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: HWY 28 & 52 Ave

Movement	EB	EB	WB	WB	NB	NB	NB	B6	B6	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	T	T	L	T	TR
Maximum Queue (m)	199.2	22.6	22.3	19.6	62.4	196.9	199.4	29.5	33.4	62.4	148.0	144.4
Average Queue (m)	107.9	10.6	16.4	9.9	47.8	156.2	160.9	2.0	3.4	61.0	115.9	106.3
95th Queue (m)	188.5	27.1	25.9	19.3	77.2	193.0	200.1	15.4	20.3	67.6	170.4	162.0
Link Distance (m)	298.5		17.3			181.5	181.5	135.8	135.8		123.3	123.3
Upstream Blk Time (%)	0		23	2		3	7				32	9
Queuing Penalty (veh)	0		0	0		19	52				321	90
Storage Bay Dist (m)		20.0		20.0	60.0					60.0		
Storage Blk Time (%)	70	1	23	2	3	47				46	14	
Queuing Penalty (veh)	36	3	14	2	23	78				363	62	

Intersection: 2: HWY 28 & 52 Ave

Movement	B23	B23
Directions Served	T	T
Maximum Queue (m)	116.7	118.6
Average Queue (m)	34.7	30.1
95th Queue (m)	111.6	105.2
Link Distance (m)	158.3	158.3
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	4	2
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Hwy 28 & Centre Ave

Movement	EB	EB	EB	B14	B14	WB	WB	SE	SE	SE	SE	SE
Directions Served	L	LT	TR	T	T	T	TR	L	L	T	T	R
Maximum Queue (m)	62.4	137.5	140.2	159.0	161.4	65.1	79.5	60.0	62.4	161.5	162.6	62.5
Average Queue (m)	61.4	125.9	123.5	76.5	73.2	35.1	39.0	47.4	60.3	138.5	139.0	57.7
95th Queue (m)	67.2	144.3	146.9	171.1	171.3	55.8	66.6	68.3	71.7	170.4	172.8	84.3
Link Distance (m)		112.9	112.9	548.6	548.6	98.4	98.4			135.8	135.8	
Upstream Blk Time (%)		40	39				0			29	28	
Queuing Penalty (veh)		0	0				0			249	236	
Storage Bay Dist (m)	60.0							60.0	60.0			60.0
Storage Blk Time (%)	4	46						1	14	46	47	3
Queuing Penalty (veh)	25	139						7	67	210	260	12

Intersection: 3: Hwy 28 & Centre Ave

Movement	B6	B6	NW	NW	NW	NW	B28	B28	B7	B7	B8	B8
Directions Served	T	T	L	L	T	T	T	T	T	T	T	T
Maximum Queue (m)	131.7	141.9	66.5	67.5	95.7	92.4	160.0	155.0	67.2	65.8	4.9	2.8
Average Queue (m)	29.4	30.3	51.8	61.3	76.8	74.6	72.5	67.9	9.3	8.3	0.3	0.1
95th Queue (m)	112.0	115.0	78.2	81.3	106.0	102.0	179.8	173.2	50.2	48.1	3.3	2.1
Link Distance (m)	181.5	181.5			67.5	67.5	144.0	144.0	230.3	230.3	76.3	76.3
Upstream Blk Time (%)	0	0	1	16	44	28	12	5				
Queuing Penalty (veh)	0	1	0	0	236	147	64	27				
Storage Bay Dist (m)			80.0	80.0								
Storage Blk Time (%)			1	16	44							
Queuing Penalty (veh)			2	48	132							

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	NB	B9	B9	B9	B18	SB	SB	SB	B8	B8
Directions Served	T	T	R	T	T	T	T	L	T	T	T	T
Maximum Queue (m)	90.5	93.4	10.2	25.3	27.7	10.2	2.1	52.3	91.2	81.9	10.0	12.9
Average Queue (m)	62.6	62.5	0.3	0.8	0.9	0.5	0.1	41.3	43.2	36.8	0.6	0.6
95th Queue (m)	86.2	89.3	7.8	19.4	19.6	4.6	1.6	61.5	87.8	73.1	5.1	7.0
Link Distance (m)	109.6	109.6	109.6	167.2	167.2	167.2	99.7		76.3	76.3	230.3	230.3
Upstream Blk Time (%)									1	0		
Queuing Penalty (veh)									6	2		
Storage Bay Dist (m)								50.0				
Storage Blk Time (%)								5	2			
Queuing Penalty (veh)								17	7			

Intersection: 4: Hwy 28 & 50 St

Movement	B7	B7	SW	SW	B17
Directions Served	T	T	L	R	T
Maximum Queue (m)	14.5	5.4	83.4	62.5	49.7
Average Queue (m)	0.6	0.2	55.6	34.7	5.5
95th Queue (m)	5.6	3.0	83.4	70.1	27.9
Link Distance (m)	144.0	144.0	66.7		90.1
Upstream Blk Time (%)			6	0	0
Queuing Penalty (veh)			0	0	0
Storage Bay Dist (m)				60.0	
Storage Blk Time (%)			7	1	
Queuing Penalty (veh)			16	2	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	TR	L	T	T
Maximum Queue (m)	39.6	29.7	60.6	68.7	30.8	22.6	51.8	51.0	51.9	56.8	48.5	45.8
Average Queue (m)	17.0	10.8	36.1	19.4	13.4	7.4	27.5	30.2	29.2	27.8	19.6	17.1
95th Queue (m)	32.1	23.4	57.7	50.2	24.0	17.7	47.3	48.3	48.5	49.9	39.0	38.1
Link Distance (m)		120.0		287.8			589.0	589.0	589.0		99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0				60.0		
Storage Blk Time (%)			1	0			0			0	0	
Queuing Penalty (veh)			3	0			0			0	0	

Intersection: 5: Hwy 28 & 43 Ave

Movement	SB
Directions Served	TR
Maximum Queue (m)	54.3
Average Queue (m)	21.6
95th Queue (m)	45.9
Link Distance (m)	99.7
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

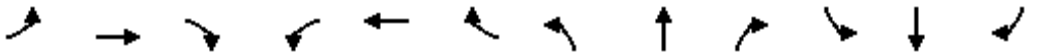
Zone wide Queuing Penalty: 3619

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	837	410	383	747	374	225
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		0	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Ped Bike Factor	0.99				0.99	0.98
Frt	0.951					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3185	0	1692	3385	1742	1559
Flt Permitted			0.074		0.950	
Satd. Flow (perm)	3185	0	132	3385	1729	1529
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	86					214
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	910	446	416	812	407	245
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1356	0	416	812	407	245
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Detector Phase	2		1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0		7.0	15.0	12.0	12.0
Minimum Split (s)	29.0		10.0	29.0	29.0	29.0
Total Split (s)	55.0		30.0	85.0	35.0	35.0
Total Split (%)	45.8%		25.0%	70.8%	29.2%	29.2%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Max		None	C-Max	None	None
Act Effct Green (s)	51.2		82.5	80.5	29.5	29.5

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.43		0.69	0.67	0.25	0.25
v/c Ratio	0.96		0.96	0.36	0.95	0.46
Control Delay	48.7		69.5	9.1	78.2	10.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	48.7		69.5	9.1	78.2	10.2
LOS	D		E	A	E	B
Approach Delay	48.7			29.6	52.6	
Approach LOS	D			C	D	
Queue Length 50th (m)	156.4		81.1	40.3	94.2	5.6
Queue Length 95th (m)	#208.0		#142.0	50.7	#153.0	27.1
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1408		442	2271	435	542
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.96		0.94	0.36	0.94	0.45

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 42.2		Intersection LOS: D	
Intersection Capacity Utilization 92.2%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 4: Hwy 28 & 50 St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	31	37	218	94	139	32	761	109	302	1041	158
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		0.99		0.98	1.00	1.00		1.00		0.97
Frt		0.919				0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1669	0	1742	1834	1559	1692	3308	0	1692	3385	1514
Flt Permitted	0.691			0.709			0.251			0.189		
Satd. Flow (perm)	1261	1669	0	1294	1834	1531	446	3308	0	336	3385	1470
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		40				151		20				172
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	90	34	40	237	102	151	35	827	118	328	1132	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	74	0	237	102	151	35	945	0	328	1132	172
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		6
Detector Phase	4	4		8	8	8	2	2		1	6	6
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	15.0
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		10.0	29.0	29.0
Total Split (s)	31.0	31.0		31.0	31.0	31.0	38.0	38.0		21.0	59.0	59.0
Total Split (%)	34.4%	34.4%		34.4%	34.4%	34.4%	42.2%	42.2%		23.3%	65.6%	65.6%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	5.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	21.1	21.1		21.1	21.1	21.1	41.4	41.4		60.9	58.9	58.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.23	0.23		0.23	0.23	0.23	0.46	0.46		0.68	0.65	0.65
v/c Ratio	0.31	0.18		0.78	0.24	0.32	0.17	0.62		0.73	0.51	0.17
Control Delay	29.6	14.6		49.9	27.7	6.3	21.4	22.2		20.4	9.8	1.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	29.6	14.6		49.9	27.7	6.3	21.4	22.2		20.4	9.8	1.7
LOS	C	B		D	C	A	C	C		C	A	A
Approach Delay		22.8			31.8			22.1			11.1	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	12.6	4.5		37.8	14.1	0.0	3.7	65.4		21.0	49.8	0.0
Queue Length 95th (m)	24.1	14.0		60.4	25.4	13.1	11.7	96.6		52.0	73.4	7.2
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	364	510		373	529	549	204	1530		499	2217	1021
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.25	0.15		0.64	0.19	0.28	0.17	0.62		0.66	0.51	0.17

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 18.1		Intersection LOS: B	
Intersection Capacity Utilization 73.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: Hwy 28 & 43 Ave

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	B9	B9	B18	SB	SB	SB	SW	SW	B17
Directions Served	T	TR	T	T	T	L	T	T	L	R	T
Maximum Queue (m)	126.9	132.8	51.3	62.4	1.8	50.5	43.7	39.6	80.7	62.5	100.9
Average Queue (m)	93.0	104.4	4.5	9.3	0.1	43.4	15.0	10.6	73.6	49.2	48.4
95th Queue (m)	132.3	142.8	26.9	37.1	1.4	48.1	40.9	32.1	85.8	83.4	104.2
Link Distance (m)	109.4	109.4	167.2	167.2	99.7				66.7		90.1
Upstream Blk Time (%)	5	13							32	1	10
Queuing Penalty (veh)	24	65							0	0	0
Storage Bay Dist (m)						50.0				60.0	
Storage Blk Time (%)						1	0		34	1	
Queuing Penalty (veh)						5	0		76	5	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	R
Maximum Queue (m)	37.7	23.0	61.4	75.3	29.0	44.3	79.2	84.9	60.2	63.5	66.6	26.7
Average Queue (m)	14.7	8.4	37.7	19.5	13.5	8.4	43.3	48.5	35.0	35.9	36.1	7.4
95th Queue (m)	29.5	18.8	59.1	49.1	23.6	25.7	71.1	77.3	57.8	58.1	60.3	18.1
Link Distance (m)		120.0		291.4			589.1	589.1		99.7	99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0			60.0			
Storage Blk Time (%)			2	0		0	1		0	0		
Queuing Penalty (veh)			5	0		0	0		2	1		

Zone Summary

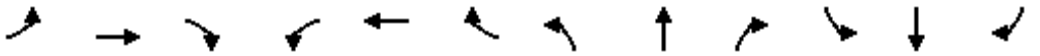
Zone wide Queuing Penalty: 183

Table 6.12 - Alternative 1 - Auxilary Lane - Level of Service Summary for 2030 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
54 Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	1	1	1	1	1	1	1	2	1	1	2	SH	110.4
			Volumes (vph)	148	148	90	117	101	253	94	1418	184	584	2088	220	
			Level of Service	E	D	A	E	D	A	C	F	B	F	F	-	
			V/C Ratio by Movement	0.80	0.51	0.28	0.79	0.35	0.56	0.61	1.30	0.28	1.23	1.15	-	
			95% Queue Length (m)	61.7	91.1	35.6	56.9	83.1	61.3	58.6	151.2	83.6	63.5	961.4	-	
			Storage Bay Length (m)	60.0	-	60.0	60.0	-	60.0	60.0	-	60.0	60.0	-	-	
52 Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	SH	1	1	SH	1	1	1	2	SH	1	2	SH	117.3
			Volumes (vph)	168	168	56	59	35	64	189	1651	214	500	1819	143	
			Level of Service	-	F	A	-	F	A	F	F	-	F	D	-	
			V/C Ratio by Movement	-	1.15	0.15	-	0.99	0.17	1.10	1.30	-	1.32	1.08	-	
			95% Queue Length (m)	-	361.6	28.6	-	27.1	21.6	79.2	209.6	-	67.1	165.8	-	
			Storage Bay Length (m)	-	-	20.0	-	-	20.0	60.0	-	-	60.0	-	-	
Centre Ave and Highway 28	Signals 120s Cycle	PM Peak	Number of Lanes	1+SH	2	SH	-	2	SH	2	2		2	2	1	118.2
			Volumes (vph)	695	609	250	-	276	266	352	703	-	511	1058	623	
			Level of Service	F	F	-	-	D	-	F	F	-	E	E	E	
			V/C Ratio by Movement	1.19	1.15	-	-	0.83	-	0.99	0.97	-	1.26	1.36	1.01	
			95% Queue Length (m)	65.6	136.2	-	-	63.7	-	76.7	97.1	-	73.2	178.8	86.4	
			Storage Bay Length (m)	60.0	-	-	-	-	-	80.0		-	60.0	-	60.0	
Highway 28 and 50 Street	Signals 120s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	1	1	2	-	29.9
			Volumes (vph)	-	-	-	425	-	256	-	974	478	442	861	-	
			Level of Service	-	-	-	E	-	A	-	D	A	C	B	-	
			V/C Ratio by Movement	-	-	-	0.93	-	0.46	-	0.89	0.63	0.97	0.44	-	
			95% Queue Length (m)	-	-	-	88.3	-	80.3	-	62.1	13.9	58.0	66.3	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 75s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	3	SH	1	3	SH	18.7
			Volumes (vph)	91	34	41	242	104	155	36	872	125	353	1218	184	
			Level of Service	C	B	-	D	C	A	C	C	-	C	A	-	
			V/C Ratio by Movement	0.30	0.18	-	0.78	0.23	0.32	0.38	0.61	-	0.85	0.53	-	
			95% Queue Length (m)	30.6	21.4	-	55.1	35.8	25.7	19.7	54.3	-	59.4	48.2	-	
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

Table 6.13 - Alternative 2 - Service Road - Level of Service Summary for 2030 Total Traffic Volumes

Intersection	Intersection Control Device	Interval	Measure	Eastbound			Westbound			Northbound			Southbound			Intersection Delay (sec / veh)
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
Highway 28 and 50 Street	Signals 120s Cycle	PM Peak	Number of Lanes	-	-	-	1	-	1	-	2	SH	1	2	-	72.5
			Volumes (vph)	-	-	-	425	-	256	-	974	478	442	861	-	
			Level of Service	-	-	-	F	-	B	-	F	-	F	A	-	
			V/C Ratio by Movement	-	-	-	1.06	-	0.51	-	1.13	-	1.12	0.41	-	
			95% Queue Length (m)	-	-	-	81.1	-	82.3	-	141.1	-	48.8	29.3	-	
			Storage Bay Length (m)	-	-	-	-	-	60.0	-	-	-	50.0	-	-	
43 Ave and Highway 28	Signals 90s Cycle	PM Peak	Number of Lanes	1	1	SH	1	1	1	1	2	SH	1	2	1	24.1
			Volumes (vph)	91	34	41	242	104	155	36	872	125	353	1218	184	
			Level of Service	C	B	-	D	C	A	C	C	-	D	B	A	
			V/C Ratio by Movement	0.32	0.18	-	0.82	0.25	0.33	0.26	0.80	-	0.89	0.61	0.20	
			95% Queue Length (m)	31.4	19.8	-	58.6	40.6	20.5	35.3	93.1	-	68.5	76.5		
			Storage Bay Length (m)	60.0	-	-	60.0	-	60.0	60.0	-	-	60.0	-	-	

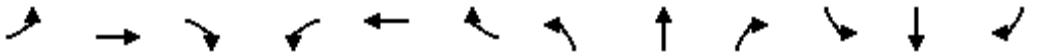


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	148	148	90	117	101	253	94	1815	184	584	2088	220
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor	0.99		0.98	0.99		0.98			0.97		1.00	
Frt			0.850			0.850			0.850		0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1834	1559	1742	1834	1559	1692	3385	1514	1692	3327	0
Flt Permitted	0.638			0.506			0.074			0.070		
Satd. Flow (perm)	1163	1834	1529	923	1834	1529	132	3385	1465	125	3327	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98			275			93		17	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		217.6			262.9			174.5			824.6	
Travel Time (s)		15.7			18.9			12.6			59.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	161	161	98	127	110	275	102	1973	200	635	2270	239
Shared Lane Traffic (%)												
Lane Group Flow (vph)	161	161	98	127	110	275	102	1973	200	635	2509	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	10.0	29.0	29.0	10.0	29.0	
Total Split (s)	32.0	32.0	32.0	32.0	32.0	32.0	10.0	59.0	59.0	29.0	78.0	
Total Split (%)	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%	8.3%	49.2%	49.2%	24.2%	65.0%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	20.8	20.8	20.8	20.8	20.8	20.8	63.6	54.0	54.0	91.2	78.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17	0.17	0.53	0.45	0.45	0.76	0.66	
v/c Ratio	0.80	0.51	0.28	0.79	0.35	0.56	0.61	1.30	0.28	1.23	1.15	
Control Delay	74.1	49.4	9.6	79.3	45.1	9.2	22.2	162.9	15.5	153.4	95.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	74.1	49.4	9.6	79.3	45.1	9.2	22.2	162.9	15.5	153.4	95.1	
LOS	E	D	A	E	D	A	C	F	B	F	F	
Approach Delay		49.6			34.3			143.6			106.9	
Approach LOS		D			C			F			F	
Queue Length 50th (m)	36.6	34.5	0.0	28.9	22.9	0.0	12.8	~307.4	13.2	~172.1	~370.6	
Queue Length 95th (m)	57.9	52.7	13.5	48.7	37.6	21.6	m10.9	m#215.4	m10.3	#262.7	#427.0	
Internal Link Dist (m)		193.6			238.9			150.5			800.6	
Turn Bay Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		
Base Capacity (vph)	261	412	419	207	412	557	168	1523	710	515	2185	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.62	0.39	0.23	0.61	0.27	0.49	0.61	1.30	0.28	1.23	1.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.30			
Intersection Signal Delay: 110.4		Intersection LOS: F	
Intersection Capacity Utilization 122.1%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: HWY 28 & 54 Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	168	168	56	59	35	64	189	1651	214	500	1819	143
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		20.0	0.0		20.0	60.0		60.0	60.0		60.0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		1.00	0.98								1.00	
Frt			0.850			0.850		0.983			0.989	
Flt Protected		0.976			0.970		0.950			0.950		
Satd. Flow (prot)	0	1790	1559	0	1779	1559	1692	3338	0	1742	3340	0
Flt Permitted		0.772			0.252		0.071			0.068		
Satd. Flow (perm)	0	1409	1529	0	462	1559	126	3338	0	125	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			73			73		16			12	
Link Speed (k/h)		30			50			30			50	
Link Distance (m)		310.9			33.4			198.2			142.4	
Travel Time (s)		37.3			2.4			23.8			10.3	
Confl. Peds. (#/hr)	5		5				5					5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	2%	2%	5%	5%
Adj. Flow (vph)	183	183	61	64	38	70	205	1795	233	543	1977	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	366	61	0	102	70	205	2028	0	543	2132	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	7.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0	29.0	21.0	21.0	21.0	10.0	29.0		10.0	29.0	
Total Split (s)	32.0	32.0	32.0	32.0	32.0	32.0	12.0	61.0		27.0	76.0	
Total Split (%)	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%	10.0%	50.8%		22.5%	63.3%	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	3.0	5.0		3.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)		27.0	27.0		27.0	27.0	67.0	56.0		85.0	71.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.56	0.47		0.71	0.59	
v/c Ratio		1.15	0.15		0.99	0.17	1.10	1.30		1.32	1.08	
Control Delay		141.3	7.2		134.1	9.1	104.0	168.6		185.4	54.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		141.3	7.2		134.1	9.1	104.0	168.6		185.4	54.3	
LOS		F	A		F	A	F	F		F	D	
Approach Delay		122.1			83.2			162.7			80.9	
Approach LOS		F			F			F			F	
Queue Length 50th (m)		~101.7	0.0		24.0	0.0	~38.6	~315.7		~154.7	~290.4	
Queue Length 95th (m)		#159.5	8.5		#59.8	11.1	m#48.4	m#309.3		m#134.9	m91.0	
Internal Link Dist (m)		286.9			9.4			174.2			118.4	
Turn Bay Length (m)			20.0			20.0	60.0			60.0		
Base Capacity (vph)		317	400		103	407	187	1566		411	1981	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		1.15	0.15		0.99	0.17	1.10	1.30		1.32	1.08	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.32	
Intersection Signal Delay: 117.3	Intersection LOS: F
Intersection Capacity Utilization 127.0%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

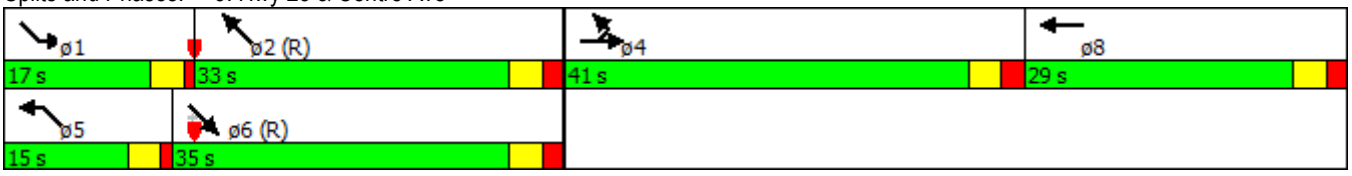
Splits and Phases: 2: HWY 28 & 52 Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	695	609	250	0	276	266	511	1058	623	352	703	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	80.0		60.0
Storage Lanes	1		0	0		0	2		1	2		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.91	0.91	0.95	1.00	0.95	0.95	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00	0.99			0.99		1.00		0.98	1.00		
Frt		0.964			0.926				0.850			
Flt Protected	0.950	0.992					0.950			0.950		
Satd. Flow (prot)	1585	3177	0	0	3196	0	3283	3385	1514	3283	3385	0
Flt Permitted	0.950	0.992					0.950			0.950		
Satd. Flow (perm)	1580	3175	0	0	3196	0	3269	3385	1485	3275	3385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		34			181				398			
Link Speed (k/h)		30			50			30			30	
Link Distance (m)		137.4			128.1			158.3			98.2	
Travel Time (s)		16.5			9.2			19.0			11.8	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	755	662	272	0	300	289	555	1150	677	383	764	0
Shared Lane Traffic (%)	25%											
Lane Group Flow (vph)	566	1123	0	0	589	0	555	1150	677	383	764	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			7.4			7.4	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4			8		1	6		5	2	
Permitted Phases									6			
Detector Phase	4	4			8		1	6	6	5	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0			12.0		7.0	15.0	15.0	7.0	15.0	
Minimum Split (s)	29.0	29.0			29.0		11.0	29.0	29.0	11.0	29.0	
Total Split (s)	41.0	41.0			29.0		17.0	35.0	35.0	15.0	33.0	
Total Split (%)	34.2%	34.2%			24.2%		14.2%	29.2%	29.2%	12.5%	27.5%	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0			2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None			None		None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	36.0	36.0			20.9		16.1	30.0	30.0	14.1	28.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Actuated g/C Ratio	0.30	0.30			0.17		0.13	0.25	0.25	0.12	0.23	
v/c Ratio	1.19	1.15			0.83		1.26	1.36	1.01	0.99	0.97	
Control Delay	143.2	117.2			43.8		164.0	211.4	61.0	66.3	61.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	143.2	117.2			43.8		164.0	211.4	61.0	66.3	61.5	
LOS	F	F			D		F	F	E	E	E	
Approach Delay		125.9			43.8			157.6			63.1	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	~176.7	~168.1			49.6		~91.3	~192.7	~108.8	~53.5	100.5	
Queue Length 95th (m)	#250.0	#212.0			69.1		m#94.7	m#181.6	m101.4	m#74.4	m#125.2	
Internal Link Dist (m)		113.4			104.1			134.3			74.2	
Turn Bay Length (m)	60.0						60.0		60.0	80.0		
Base Capacity (vph)	475	976			784		440	846	669	385	789	
Starvation Cap Reductn	0	0			0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0		0	0	0	0	0	
Storage Cap Reductn	0	0			0		0	0	0	0	0	
Reduced v/c Ratio	1.19	1.15			0.75		1.26	1.36	1.01	0.99	0.97	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.36			
Intersection Signal Delay: 118.2		Intersection LOS: F	
Intersection Capacity Utilization 104.5%		ICU Level of Service G	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Hwy 28 & Centre Ave

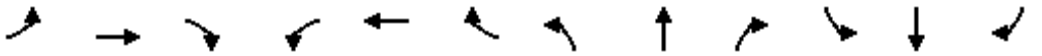


Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	974	478	442	861	425	256
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		1	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98			1.00	0.98
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3385	1514	1692	3385	1742	1559
Flt Permitted			0.089		0.950	
Satd. Flow (perm)	3385	1485	159	3385	1736	1529
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		462				229
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	1059	520	480	936	462	278
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1059	520	480	936	462	278
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	12.0	12.0
Minimum Split (s)	29.0	29.0	10.0	29.0	29.0	29.0
Total Split (s)	45.0	45.0	34.0	79.0	41.0	41.0
Total Split (%)	37.5%	37.5%	28.3%	65.8%	34.2%	34.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effct Green (s)	42.0	42.0	77.7	75.7	34.3	34.3

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.35	0.35	0.65	0.63	0.29	0.29
v/c Ratio	0.89	0.63	0.97	0.44	0.93	0.46
Control Delay	48.4	8.6	22.9	11.4	68.0	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	8.6	22.9	11.4	68.0	9.9
LOS	D	A	C	B	E	A
Approach Delay	35.3			15.3	46.2	
Approach LOS	D			B	D	
Queue Length 50th (m)	126.7	9.4	101.1	103.1	103.5	8.3
Queue Length 95th (m)	#168.3	43.0	m75.3	m77.2	#161.1	30.5
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1185	820	502	2135	522	619
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.63	0.96	0.44	0.89	0.45

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 29.9		Intersection LOS: C	
Intersection Capacity Utilization 88.6%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 4: Hwy 28 & 50 St

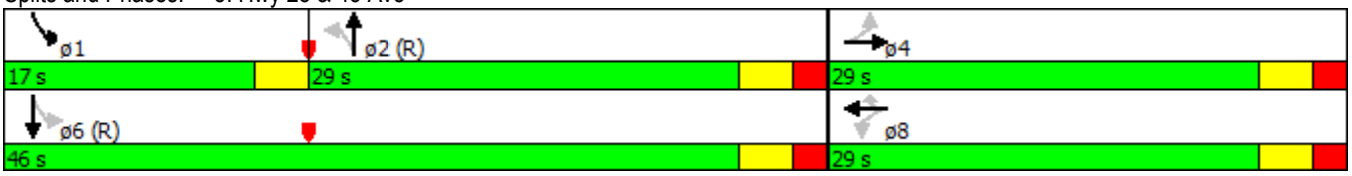


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	34	41	242	104	155	36	872	125	353	1218	184
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		60.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor	1.00	0.99		1.00		0.98	1.00	1.00		1.00	1.00	
Frt		0.918				0.850		0.981			0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1668	0	1742	1834	1559	1692	4754	0	1692	4749	0
Flt Permitted	0.684			0.704			0.158			0.158		
Satd. Flow (perm)	1249	1668	0	1286	1834	1533	281	4754	0	281	4749	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		41				168		37			59	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	99	37	45	263	113	168	39	948	136	384	1324	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	82	0	263	113	168	39	1084	0	384	1524	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		10.0	29.0	
Total Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		17.0	46.0	
Total Split (%)	38.7%	38.7%		38.7%	38.7%	38.7%	38.7%	38.7%		22.7%	61.3%	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	19.7	19.7		19.7	19.7	19.7	27.7	27.7		47.3	45.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.26	0.26		0.26	0.26	0.26	0.37	0.37		0.63	0.60	
v/c Ratio	0.30	0.18		0.78	0.23	0.32	0.38	0.61		0.85	0.53	
Control Delay	23.1	12.0		41.4	21.4	5.2	33.9	21.4		34.4	9.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	23.1	12.0		41.4	21.4	5.2	33.9	21.4		34.4	9.8	
LOS	C	B		D	C	A	C	C		C	A	
Approach Delay		18.1			26.1			21.8			14.7	
Approach LOS		B			C			C			B	
Queue Length 50th (m)	10.9	4.2		33.4	12.2	0.0	4.3	46.9		32.5	41.6	
Queue Length 95th (m)	21.4	13.0		55.8	22.7	11.9	#16.2	61.1		#83.9	58.8	
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	399	561		411	586	604	103	1777		460	2892	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.25	0.15		0.64	0.19	0.28	0.38	0.61		0.83	0.53	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 73.9%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 5: Hwy 28 & 43 Ave



Intersection: 1: HWY 28 & 54 Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	B23	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	T	L
Maximum Queue (m)	62.1	113.1	52.6	59.0	121.5	61.4	62.3	153.7	163.6	62.5	5.9	62.4
Average Queue (m)	38.6	40.5	15.8	34.1	31.8	38.1	24.3	110.8	115.7	40.1	0.2	62.2
95th Queue (m)	61.7	91.1	35.6	56.9	83.1	61.3	58.6	147.7	154.6	83.6	3.1	63.5
Link Distance (m)		206.6			248.3			158.3	158.3		122.4	
Upstream Blk Time (%)		0						0	1			
Queuing Penalty (veh)		0						4	11			
Storage Bay Dist (m)	60.0		60.0	60.0		60.0	60.0			60.0		60.0
Storage Blk Time (%)	4	2	0	3	0	2	0	45	46	1		48
Queuing Penalty (veh)	10	4	0	11	1	5	1	42	85	6		504

Intersection: 1: HWY 28 & 54 Ave

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	833.0	831.8
Average Queue (m)	796.4	794.8
95th Queue (m)	963.6	959.2
Link Distance (m)	813.8	813.8
Upstream Blk Time (%)	72	45
Queuing Penalty (veh)	0	0
Storage Bay Dist (m)		
Storage Blk Time (%)	14	
Queuing Penalty (veh)	83	

Intersection: 2: HWY 28 & 52 Ave

Movement	EB	EB	WB	WB	NB	NB	NB	B6	B6	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	T	T	L	T	TR
Maximum Queue (m)	309.0	22.5	26.2	24.6	62.4	202.3	202.1	86.6	91.1	62.5	148.2	144.6
Average Queue (m)	231.6	11.7	18.6	10.4	47.3	170.6	175.0	14.2	18.2	61.6	125.0	114.8
95th Queue (m)	361.6	28.6	27.1	21.6	79.2	207.5	211.7	68.1	75.3	67.1	167.2	164.3
Link Distance (m)	298.5		17.3			181.5	181.5	135.8	135.8		122.4	122.4
Upstream Blk Time (%)	35		30	3		13	21	0	0		38	14
Queuing Penalty (veh)	0		0	0		104	175	0	0		433	159
Storage Bay Dist (m)		20.0		20.0	60.0					60.0		
Storage Blk Time (%)	81	1	30	3	5	47				49	23	
Queuing Penalty (veh)	45	5	19	3	42	89				445	116	

Intersection: 2: HWY 28 & 52 Ave

Movement	B23	B23
Directions Served	T	T
Maximum Queue (m)	144.9	145.2
Average Queue (m)	44.8	37.8
95th Queue (m)	135.2	127.6
Link Distance (m)	158.3	158.3
Upstream Blk Time (%)	1	1
Queuing Penalty (veh)	9	7
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Hwy 28 & Centre Ave

Movement	EB	EB	EB	B14	B14	WB	WB	SE	SE	SE	SE	SE
Directions Served	L	LT	TR	T	T	T	TR	L	L	T	T	R
Maximum Queue (m)	62.4	137.6	139.2	564.5	564.9	62.7	78.7	59.9	62.4	164.2	165.3	62.5
Average Queue (m)	61.7	130.1	129.8	465.9	463.5	36.0	42.1	44.8	60.1	144.8	144.3	56.4
95th Queue (m)	65.6	134.2	138.2	707.6	706.9	57.3	70.0	67.9	73.2	178.4	179.2	86.4
Link Distance (m)		112.9	112.9	548.6	548.6	98.4	98.4			135.8	135.8	
Upstream Blk Time (%)		61	61	62	58					44	43	
Queuing Penalty (veh)		0	0	0	0					422	413	
Storage Bay Dist (m)	60.0							60.0	60.0			60.0
Storage Blk Time (%)	7	56						2	16	47	50	3
Queuing Penalty (veh)	47	196						10	84	238	312	15

Intersection: 3: Hwy 28 & Centre Ave

Movement	B6	B6	NW	NW	NW	NW	B28	B28	B7	B7	B8	B8
Directions Served	T	T	L	L	T	T	T	T	T	T	T	T
Maximum Queue (m)	171.2	176.9	65.8	67.5	96.8	94.5	168.3	163.2	165.3	171.7	27.1	25.6
Average Queue (m)	82.4	85.8	51.8	65.1	85.1	83.3	100.1	96.8	42.0	39.9	1.6	1.5
95th Queue (m)	204.5	209.0	76.1	77.3	97.1	97.0	198.1	192.9	163.9	161.0	16.9	16.2
Link Distance (m)	181.5	181.5			67.5	67.5	144.0	144.0	230.3	230.3	76.3	76.3
Upstream Blk Time (%)	1	1	1	10	51	47	27	19	2	2	0	0
Queuing Penalty (veh)	11	12	0	0	312	291	169	119	10	10	0	0
Storage Bay Dist (m)			80.0	80.0								
Storage Blk Time (%)			1	10	51							
Queuing Penalty (veh)			3	36	179							

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	NB	B9	B9	B9	B18	B18	SB	SB	SB	B8
Directions Served	T	T	R	T	T	T	T	T	L	T	T	T
Maximum Queue (m)	119.8	122.6	18.0	13.4	13.8	8.4	11.9	2.8	52.3	97.5	78.5	44.8
Average Queue (m)	76.3	76.0	0.6	0.6	0.9	0.5	0.5	0.1	37.7	30.2	26.8	2.6
95th Queue (m)	111.3	112.8	13.9	7.0	9.0	5.1	7.4	2.1	58.0	75.8	56.7	24.5
Link Distance (m)	109.6	109.6	109.6	167.2	167.2	167.2	99.7	99.7		76.3	76.3	230.3
Upstream Blk Time (%)	2	2	0							2	0	
Queuing Penalty (veh)	7	8	0							13	1	
Storage Bay Dist (m)									50.0			
Storage Blk Time (%)									6	1		
Queuing Penalty (veh)									27	2		

Intersection: 4: Hwy 28 & 50 St

Movement	B8	B28	SW	SW	B17
Directions Served	T	T	L	R	T
Maximum Queue (m)	21.9	1.5	82.0	62.5	99.1
Average Queue (m)	1.5	0.1	72.1	48.5	58.8
95th Queue (m)	18.2	1.2	88.3	80.3	121.4
Link Distance (m)	230.3	67.5	66.7		90.1
Upstream Blk Time (%)			32	1	12
Queuing Penalty (veh)			0	0	0
Storage Bay Dist (m)				60.0	
Storage Blk Time (%)			34	1	
Queuing Penalty (veh)			87	5	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	TR	L	T	T
Maximum Queue (m)	39.8	27.9	59.8	50.9	30.8	24.0	62.4	66.9	66.1	59.8	59.6	57.3
Average Queue (m)	16.4	10.8	36.7	17.6	14.7	7.5	34.9	36.4	38.2	35.1	26.7	26.8
95th Queue (m)	30.6	21.4	55.1	37.1	25.7	19.7	53.2	55.4	59.3	59.4	47.8	46.1
Link Distance (m)		120.0		287.8			589.0	589.0	589.0		99.7	99.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	60.0		60.0		60.0	60.0				60.0		
Storage Blk Time (%)			0	0			0			1	0	
Queuing Penalty (veh)			1	0			0			3	0	

Intersection: 5: Hwy 28 & 43 Ave

Movement	SB	B9
Directions Served	TR	T
Maximum Queue (m)	59.4	2.8
Average Queue (m)	30.0	0.1
95th Queue (m)	50.7	2.1
Link Distance (m)	99.7	109.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

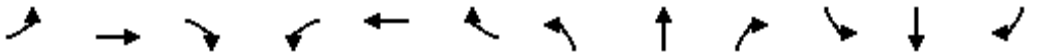
Zone wide Queuing Penalty: 5459

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	974	478	442	861	425	256
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Storage Length (m)		0.0	50.0		0.0	60.0
Storage Lanes		0	1		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Ped Bike Factor	0.99				0.99	0.98
Frt	0.951					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3185	0	1692	3385	1742	1559
Flt Permitted			0.074		0.950	
Satd. Flow (perm)	3185	0	132	3385	1729	1529
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	87					214
Link Speed (k/h)	30			30	50	
Link Distance (m)	117.0			99.9	87.0	
Travel Time (s)	14.0			12.0	6.3	
Confl. Peds. (#/hr)		5	5		5	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	1059	520	480	936	462	278
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1579	0	480	936	462	278
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)		14	24		24	14
Turn Type	NA		pm+pt	NA	NA	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Detector Phase	2		1	6	8	8
Switch Phase						
Minimum Initial (s)	15.0		7.0	15.0	12.0	12.0
Minimum Split (s)	29.0		10.0	29.0	29.0	29.0
Total Split (s)	56.0		29.0	85.0	35.0	35.0
Total Split (%)	46.7%		24.2%	70.8%	29.2%	29.2%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		3.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Max		None	C-Max	None	None
Act Effct Green (s)	51.0		82.0	80.0	30.0	30.0

Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Actuated g/C Ratio	0.42		0.68	0.67	0.25	0.25
v/c Ratio	1.13		1.12	0.41	1.06	0.51
Control Delay	97.8		115.2	9.9	104.0	13.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	97.8		115.2	9.9	104.0	13.5
LOS	F		F	A	F	B
Approach Delay	97.8			45.6	70.0	
Approach LOS	F			D	E	
Queue Length 50th (m)	~220.3		~115.1	48.8	~119.7	11.9
Queue Length 95th (m)	#263.3		#179.4	60.9	#182.4	36.9
Internal Link Dist (m)	93.0			75.9	63.0	
Turn Bay Length (m)			50.0			60.0
Base Capacity (vph)	1403		428	2256	435	542
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	1.13		1.12	0.41	1.06	0.51

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 72.5		Intersection LOS: E	
Intersection Capacity Utilization 104.5%		ICU Level of Service G	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 4: Hwy 28 & 50 St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	34	41	242	104	155	36	872	125	353	1218	184
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	60.0		60.0	60.0		60.0	60.0		60.0	60.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		0.99		0.98	1.00	1.00				0.97
Frt		0.918				0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1667	0	1742	1834	1559	1692	3308	0	1692	3385	1514
Flt Permitted	0.684			0.704			0.207			0.111		
Satd. Flow (perm)	1248	1667	0	1285	1834	1531	368	3308	0	198	3385	1470
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45				168		19				200
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		134.6			302.5			596.3			116.0	
Travel Time (s)		9.7			21.8			42.9			8.4	
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	99	37	45	263	113	168	39	948	136	384	1324	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	82	0	263	113	168	39	1084	0	384	1324	200
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		6
Detector Phase	4	4		8	8	8	2	2		1	6	6
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	15.0	15.0		7.0	15.0	15.0
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	29.0	29.0		10.0	29.0	29.0
Total Split (s)	32.0	32.0		32.0	32.0	32.0	35.0	35.0		23.0	58.0	58.0
Total Split (%)	35.6%	35.6%		35.6%	35.6%	35.6%	38.9%	38.9%		25.6%	64.4%	64.4%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	5.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	22.6	22.6		22.6	22.6	22.6	36.4	36.4		59.4	57.4	57.4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.40	0.40		0.66	0.64	0.64
v/c Ratio	0.32	0.18		0.82	0.25	0.33	0.26	0.80		0.89	0.61	0.20
Control Delay	28.8	13.7		51.3	26.8	5.9	28.1	31.5		45.4	12.1	1.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	28.8	13.7		51.3	26.8	5.9	28.1	31.5		45.4	12.1	1.8
LOS	C	B		D	C	A	C	C		D	B	A
Approach Delay		21.9			32.2			31.4			17.7	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	13.5	4.8		41.6	15.2	0.0	4.9	93.1		46.0	68.6	0.0
Queue Length 95th (m)	25.8	14.6		#68.1	27.3	13.6	14.4	#138.3		#95.9	96.6	8.0
Internal Link Dist (m)		110.6			278.5			572.3			92.0	
Turn Bay Length (m)	60.0			60.0		60.0	60.0			60.0		
Base Capacity (vph)	374	531		385	550	576	148	1347		468	2158	1009
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.26	0.15		0.68	0.21	0.29	0.26	0.80		0.82	0.61	0.20

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 24.1		Intersection LOS: C	
Intersection Capacity Utilization 81.1%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 5: Hwy 28 & 43 Ave

Intersection: 4: Hwy 28 & 50 St

Movement	NB	NB	B9	B9	B18	SB	SB	SB	SW	SW	B17
Directions Served	T	TR	T	T	T	L	T	T	L	R	T
Maximum Queue (m)	130.6	137.2	78.3	87.2	1.8	52.8	43.7	42.2	84.1	62.5	105.2
Average Queue (m)	113.5	122.6	18.4	27.6	0.1	44.0	9.3	6.6	76.4	55.2	89.3
95th Queue (m)	138.9	143.3	58.3	68.6	1.4	48.8	31.7	26.9	81.1	82.3	119.6
Link Distance (m)	109.4	109.4	167.2	167.2	99.7				66.7		90.1
Upstream Blk Time (%)	16	30							60	1	54
Queuing Penalty (veh)	91	170							0	0	0
Storage Bay Dist (m)						50.0				60.0	
Storage Blk Time (%)						1	0		60	2	
Queuing Penalty (veh)						6	0		153	7	

Intersection: 5: Hwy 28 & 43 Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	R
Maximum Queue (m)	35.6	27.8	60.8	64.5	26.3	46.9	99.0	99.2	62.3	90.8	88.1	22.9
Average Queue (m)	16.9	9.0	37.1	17.9	12.3	11.8	59.0	64.9	43.4	45.5	43.8	7.6
95th Queue (m)	31.4	19.8	58.6	40.6	20.5	35.3	90.8	95.4	68.5	78.2	74.8	17.1
Link Distance (m)		120.0		287.7			589.1	589.1		99.7	99.7	99.7
Upstream Blk Time (%)										0	0	
Queuing Penalty (veh)										0	0	
Storage Bay Dist (m)	60.0		60.0		60.0	60.0			60.0			
Storage Blk Time (%)			1	0		0	6		3	1		
Queuing Penalty (veh)			2	0		0	2		18	4		

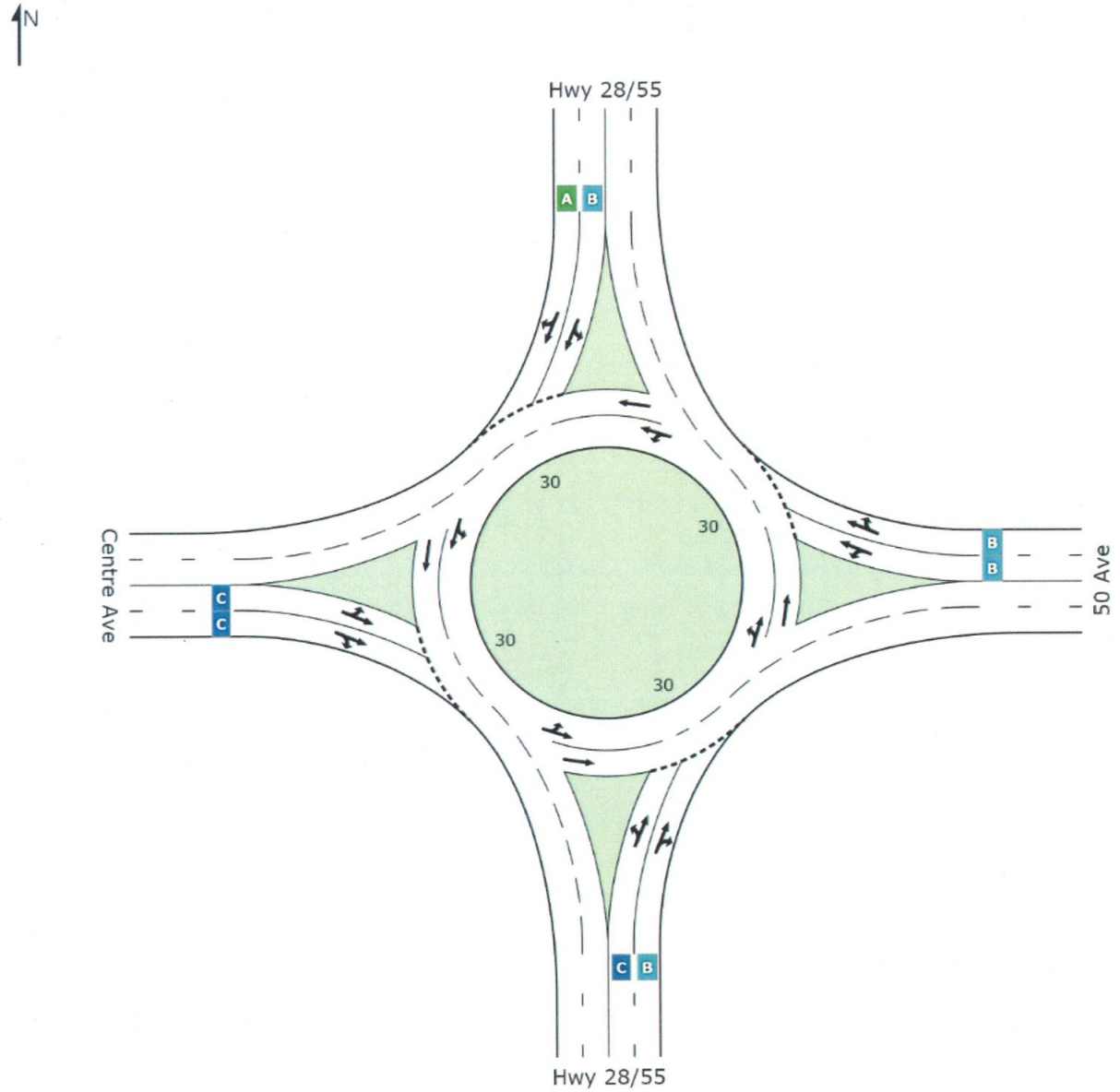
Zone Summary

Zone wide Queuing Penalty: 455

LEVEL OF SERVICE SUMMARY

Site: Hwy 28 & Centre Ave - 2015 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout



	South	East	North	West	Intersection
LOS	B	B	B	C	B

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Hwy 28 & Centre Ave - 2015 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout

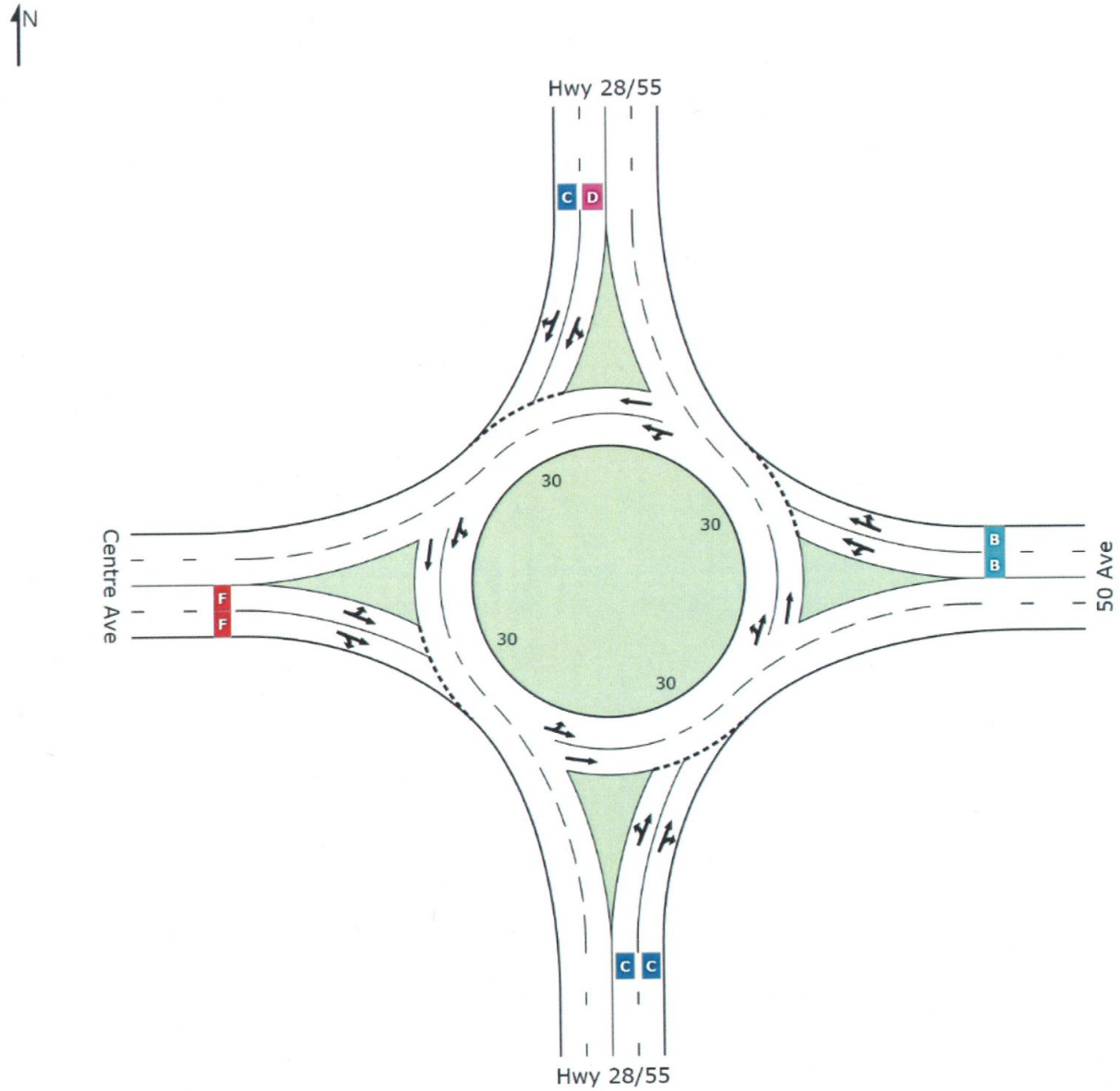
Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hwy 28/55											
1	L	179	5.0	0.710	24.3	LOS C	5.3	38.7	0.92	1.13	37.7
2	T	358	5.0	0.710	16.7	LOS B	5.6	40.6	0.93	1.10	40.7
3	R	113	5.0	0.710	17.7	LOS B	5.6	40.6	0.93	1.12	41.1
Approach		649	5.0	0.710	19.0	LOS B	5.6	40.6	0.93	1.11	39.9
East: 50 Ave											
4	L	49	5.0	0.376	17.7	LOS B	2.1	15.5	0.80	1.01	42.5
5	T	189	5.0	0.376	10.7	LOS B	2.2	15.9	0.80	0.90	46.0
6	R	183	5.0	0.376	11.7	LOS B	2.2	15.9	0.80	0.92	45.7
Approach		422	5.0	0.376	12.0	LOS B	2.2	15.9	0.80	0.92	45.4
North: Hwy 28/55											
7	L	281	5.0	0.645	15.6	LOS B	5.6	40.9	0.74	0.95	43.8
8	T	581	5.0	0.645	8.7	LOS A	5.6	40.9	0.74	0.82	47.2
9	R	342	5.0	0.645	10.0	LOS B	5.6	40.9	0.74	0.86	47.6
Approach		1204	5.0	0.645	10.7	LOS B	5.6	40.9	0.74	0.86	46.4
West: Centre Ave											
10	L	519	5.0	0.906	29.6	LOS C	11.9	87.0	0.99	1.37	34.4
11	T	455	5.0	0.906	22.1	LOS C	12.2	89.2	0.99	1.37	37.2
12	R	186	5.0	0.906	23.3	LOS C	12.2	89.2	1.00	1.37	37.2
Approach		1160	5.0	0.906	25.6	LOS C	12.2	89.2	0.99	1.37	35.8
All Vehicles		3436	5.0	0.906	17.5	LOS B	12.2	89.2	0.87	1.09	40.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LEVEL OF SERVICE SUMMARY

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout



	South	East	North	West	Intersection
LOS	C	B	D	F	E

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Hwy 28 & Centre Ave - 2020 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout

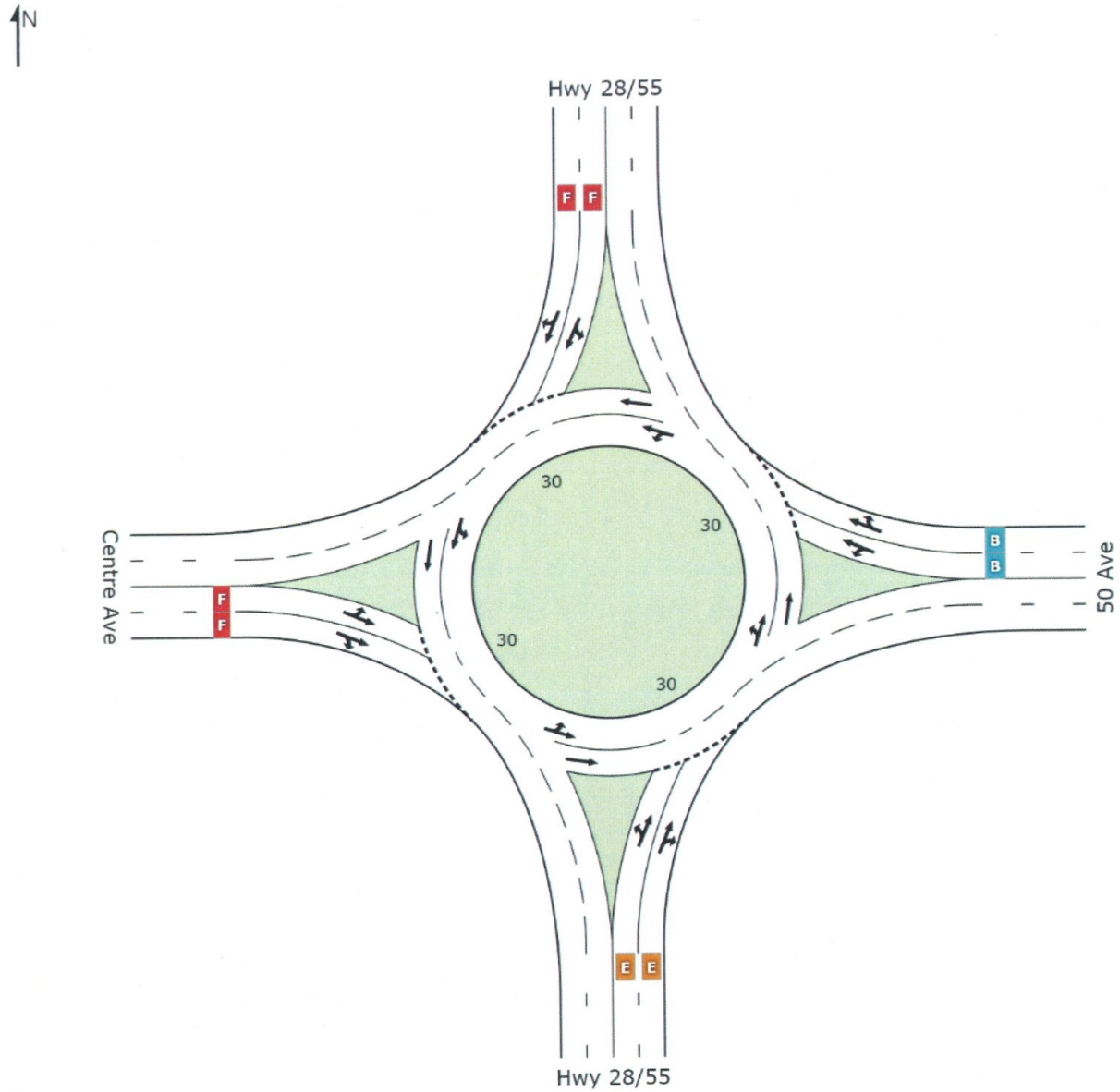
Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hwy 28/55											
1	L	251	5.0	0.844	29.7	LOS C	8.8	64.1	0.97	1.28	34.8
2	T	499	5.0	0.844	22.1	LOS C	9.2	66.9	0.98	1.27	37.0
3	R	139	5.0	0.844	23.0	LOS C	9.2	66.9	0.98	1.28	37.4
Approach		888	5.0	0.844	24.4	LOS C	9.2	66.9	0.98	1.27	36.4
East: 50 Ave											
4	L	57	5.0	0.533	19.7	LOS B	3.4	25.1	0.86	1.07	41.2
5	T	253	5.0	0.533	12.7	LOS B	3.6	25.9	0.86	0.99	44.2
6	R	243	5.0	0.533	13.5	LOS B	3.6	25.9	0.86	1.01	44.0
Approach		553	5.0	0.533	13.8	LOS B	3.6	25.9	0.86	1.00	43.8
North: Hwy 28/55											
7	L	389	5.0	0.996	40.7	LOS D	26.7	194.9	1.00	1.70	30.0
8	T	805	5.0	0.996	33.7	LOS C	26.9	196.2	1.00	1.70	30.9
9	R	475	5.0	0.996	35.0	LOS C	26.9	196.2	1.00	1.70	30.9
Approach		1669	5.0	0.996	35.7	LOS D	26.9	196.2	1.00	1.70	30.7
West: Centre Ave											
10	L	524	5.0	1.367	193.4	LOS F	57.9	422.5	1.00	3.13	10.2
11	T	460	5.0	1.367	185.3	LOS F	63.6	464.6	1.00	3.28	9.9
12	R	188	5.0	1.367	186.6	LOS F	63.6	464.6	1.00	3.29	9.8
Approach		1173	5.0	1.367	189.2	LOS F	63.6	464.6	1.00	3.21	10.0
All Vehicles		4283	5.0	1.367	72.5	LOS E	63.6	464.6	0.98	1.93	20.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LEVEL OF SERVICE SUMMARY

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout



	South	East	North	West	Intersection
LOS	E	B	F	F	F

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Hwy 28 & Centre Ave - 2025 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout

Movement Performance - Vehicles

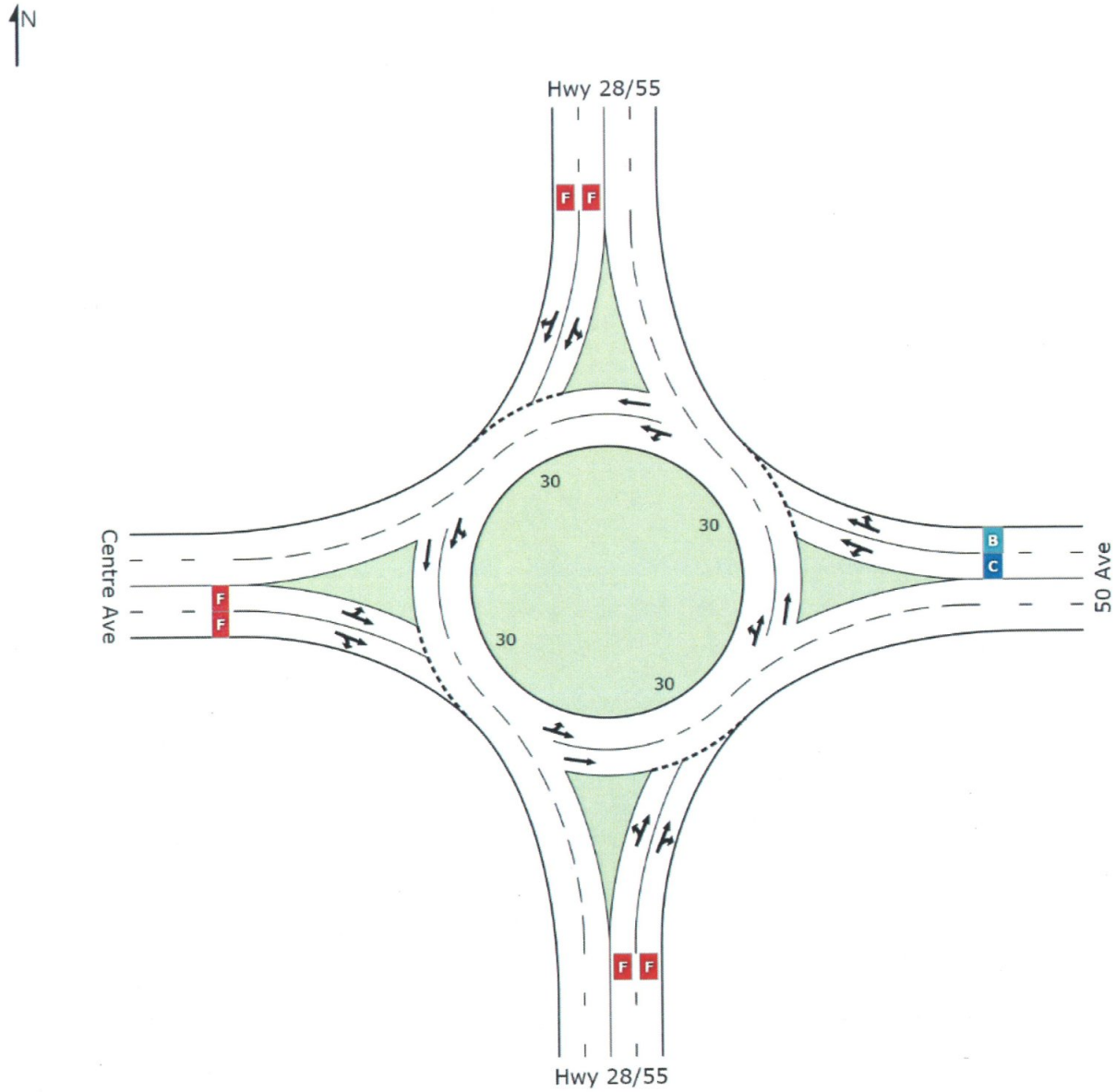
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hwy 28/55											
1	L	315	5.0	1.081	76.5	LOS E	27.0	197.0	1.00	2.08	20.6
2	T	628	5.0	1.081	68.6	LOS E	28.8	210.6	1.00	2.11	20.7
3	R	173	5.0	1.081	69.5	LOS E	28.8	210.6	1.00	2.13	20.8
Approach		1116	5.0	1.081	71.0	LOS E	28.8	210.6	1.00	2.10	20.7
East: 50 Ave											
4	L	62	5.0	0.663	24.3	LOS C	4.8	35.1	0.92	1.13	38.2
5	T	274	5.0	0.663	17.1	LOS B	5.1	36.9	0.92	1.08	40.5
6	R	264	5.0	0.663	17.6	LOS B	5.1	36.9	0.93	1.10	40.7
Approach		600	5.0	0.663	18.1	LOS B	5.1	36.9	0.92	1.09	40.3
North: Hwy 28/55											
7	L	476	5.0	1.284	151.6	LOS F	87.2	636.3	1.00	3.65	12.5
8	T	985	5.0	1.284	144.6	LOS F	89.0	649.9	1.00	3.66	12.1
9	R	580	5.0	1.284	145.8	LOS F	89.0	649.9	1.00	3.68	12.0
Approach		2041	5.0	1.284	146.6	LOS F	89.0	649.9	1.00	3.66	12.2
West: Centre Ave											
10	L	634	5.0	1.566	279.7	LOS F	88.3	644.7	1.00	3.91	7.4
11	T	556	5.0	1.566	271.8	LOS F	96.6	705.4	1.00	4.09	7.1
12	R	228	5.0	1.566	273.1	LOS F	96.6	705.4	1.00	4.11	7.1
Approach		1418	5.0	1.566	275.6	LOS F	96.6	705.4	1.00	4.01	7.2
All Vehicles		5175	5.0	1.566	150.7	LOS F	96.6	705.4	0.99	3.13	11.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

LEVEL OF SERVICE SUMMARY

Site: Hwy 28 & Centre Ave - 2030 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout



	South	East	North	West	Intersection
LOS	F	B	F	F	F

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Hwy 28 & Centre Ave - 2030 - PM (k = 0.10)

Highway 28/55 & Centre Avenue
2030 Horizon (k = 0.10)
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hwy 28/55											
1	L	371	5.0	1.255	144.6	LOS F	51.4	375.4	1.00	2.97	12.9
2	T	740	5.0	1.255	137.0	LOS F	55.5	405.2	1.00	3.04	12.6
3	R	175	5.0	1.255	137.9	LOS F	55.5	405.2	1.00	3.08	12.6
Approach		1285	5.0	1.255	139.3	LOS F	55.5	405.2	1.00	3.02	12.7
East: 50 Ave											
4	L	66	5.0	0.713	26.1	LOS C	5.5	39.9	0.93	1.16	37.2
5	T	291	5.0	0.713	18.9	LOS B	5.8	42.1	0.93	1.12	39.2
6	R	280	5.0	0.713	19.3	LOS B	5.8	42.1	0.94	1.14	39.4
Approach		637	5.0	0.713	19.8	LOS B	5.8	42.1	0.94	1.13	39.1
North: Hwy 28/55											
7	L	538	5.0	1.480	238.1	LOS F	132.5	967.1	1.00	4.70	8.6
8	T	1114	5.0	1.480	231.0	LOS F	136.3	995.0	1.00	4.73	8.2
9	R	656	5.0	1.480	232.2	LOS F	136.3	995.0	1.00	4.77	8.2
Approach		2307	5.0	1.480	233.0	LOS F	136.3	995.0	1.00	4.74	8.3
West: Centre Ave											
10	L	732	5.0	1.773	371.2	LOS F	119.3	871.0	1.00	4.52	5.8
11	T	641	5.0	1.773	363.5	LOS F	130.3	951.5	1.00	4.74	5.5
12	R	263	5.0	1.773	364.7	LOS F	130.3	951.5	1.00	4.76	5.5
Approach		1636	5.0	1.773	367.1	LOS F	130.3	951.5	1.00	4.64	5.6
All Vehicles		5865	5.0	1.773	226.7	LOS F	136.3	995.0	0.99	3.94	8.5

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Appendix E – Storm Sewer – Rational Method Analysis

STORM SEWER

PROJECT : Cold Lake Hwy 28 storm system design
JOB No. : 116239311
DATE : February 2014
DES. BY : Sybren Spyksma

Manning's n = 0.013

Description	From MH	To MH	Storm Event	Area Added (ha)	Area Sub-Total (ha)	Area Total (ha)	C	CA	Sub-Total CA	Total CA	Initial Time (min)	Over-Write tc	Time in Pipe (min)	Total Time (min)	Int. (mm/hr)	# of Lots w/ Foundation Drain	Event Flow (m^3/s)	Added Area (ha)	Inflow Rate (m3/ha/s)	Added Flow (Enter)	Added Flow (m^3/s)	Design Flow (m^3/s)	Length (m)	Pipe Diameter (mm)	Slope %	Cap. (m^3/s)	Vel. (m/s)	Surf. Elev.	Invert Out	Invert In	Avg. Depth Range
			5-yr		0.00		0.35	0.00	0.00														100.00	300	1.00						
Highway 28 - 34 Avenue to 46 Avenue	28-1	28-2	5-yr	1.98	1.98	1.98	0.60	1.19	1.19	1.19	10.00		1.52	11.52	79.08		0.261		0.002	0.000	0.000	0.261	110.00	600	0.30	0.351	1.203	542.50	539.600	539.270	2.82
Highway 28 - 34 Avenue to 46 Avenue	28-2	28-3	5-yr	1.82	3.80	3.80	0.60	1.09	2.28	2.28	11.52		0.72	12.24	71.51		0.452		0.002	0.000	0.000	0.452	90.00	600	0.90	0.609	2.083	542.00	539.270	538.460	2.78
Highway 28 - 34 Avenue to 46 Avenue	28-3	28-4	5-yr	1.49	5.28	5.28	0.60	0.89	3.17	3.17	12.24		0.85	13.09	68.50		0.603		0.002	0.000	0.000	0.603	115.00	600	1.06	0.661	2.261	541.30	538.460	537.241	2.80
Highway 28 - 34 Avenue to 46 Avenue	28-4	28-5	5-yr	1.90	7.18	7.18	0.60	1.14	4.31	4.31	13.09		0.78	13.88	65.33		0.781		0.002	0.000	0.000	0.781	115.00	675	1.06	0.904	2.445	540.00	537.166	535.947	2.84
Highway 28 - 34 Avenue to 46 Avenue	28-5	28-6	5-yr	1.90	9.08	9.08	0.60	1.14	5.45	5.45	13.88		0.99	14.87	62.69		0.948		0.002	0.000	0.000	0.948	100.00	900	0.34	1.100	1.676	538.80	535.722	535.382	3.05
Highway 28 - 34 Avenue to 46 Avenue	28-6	28-7	5-yr	1.65	10.73	10.73	0.60	0.99	6.44	6.44	14.87		1.04	15.91	59.69		1.067		0.002	0.000	0.000	1.067	105.00	900	0.34	1.100	1.676	538.40	535.382	535.025	3.00
Highway 28 - 34 Avenue to 46 Avenue	28-7	28-8	5-yr	1.73	12.46	12.46	0.60	1.04	7.47	7.47	15.91		1.03	16.95	56.88		1.181		0.002	0.000	0.000	1.181	115.00	1050	0.34	1.662	1.859	538.00	534.875	534.484	2.92
Highway 28 - 34 Avenue to 46 Avenue	28-10	28-9	5-yr	0.66	0.66	0.66	0.60	0.40	0.40	0.40	10.00		1.84	11.84	79.08		0.087		0.002	0.000	0.000	0.087	125.00	375	0.50	0.129	1.134	537.90	535.000	534.375	2.86
Highway 28 - 34 Avenue to 46 Avenue	28-9	28-8	5-yr	1.98	2.64	2.64	0.35	0.70	1.09	1.09	11.84		1.36	13.20	70.17		0.213				0.000	0.213	90.00	525	0.30	0.245	1.099	537.20	534.225	533.955	3.11
Existing main	28-8	28-8a	5-yr	3.38	18.48	18.48	0.35	1.19	9.76	9.76	16.95		0.10	17.04	54.41		1.476				0.000	1.476	10.00	1050	0.30	1.561	1.746	537.20	533.430	533.400	-264.82
Highway 28 - 50 Street to 52 Street	28-11	28-12	5-yr	1.82	1.82	1.82	0.60	1.09	1.09	1.09	10.00		1.53	11.53	79.08		0.239		0.002	0.000	0.000	0.239	130.00	525	0.50	0.317	1.419	537.30	534.400	533.750	3.22
Existing main	28-12	28-12a	5-yr	0.00	1.82	1.82	0.35	0.00	1.09	1.09	11.53		0.12	11.64	71.50		0.216				0.000	0.216	10.00	525	0.50	0.317	1.419	537.30	533.750	533.700	-265.08
Highway 28 - 48 Avenue Access to 50 Avenue	28-14	28-15	5-yr	0.00	0.00	0.00	0.60	0.00	0.00	0.00	10.00		1.41	11.41	79.08		0.000		0.002	0.000	0.000	0.000	90.00	375	0.44	0.121	1.064	536.10	533.200	532.804	2.90
Existing main	28-15	28-15a	5-yr	0.00	0.00	0.00	0.60	0.00	0.00	0.00	11.41		0.16	11.57	72.02		0.000		0.002	0.000	0.000	0.000	10.00	375	0.44	0.121	1.064	535.70	532.804	532.760	-264.93
Highway 28 - 48 Avenue Access to 50 Avenue	28-17	28-16	5-yr	1.82	1.82	1.82	0.35	0.64	0.64	0.64	10.00		1.41	11.41	79.08		0.141				0.000	0.141	110.00	375	0.66	0.149	1.303	537.00	534.100	533.374	-265.24
Existing main	28-16	28-16a	5-yr	1.82	3.63	3.63	0.60	1.09	1.73	1.73	11.41		0.12	11.53	72.03		0.346		0.002	0.000	0.000	0.346	10.00	600	0.40	0.406	1.389	536.20	533.300	533.260	2.92
Highway 28 - 52 Avenue to 55 Avenue	28-18	28-19	5-yr	2.48	2.48	2.48	0.60	1.49	1.49	1.49	10.00		1.39	11.39	79.08		0.326		0.002	0.000	0.000	0.326	150.00	525	0.80	0.400	1.795	536.50	533.224	532.024	-264.37
Highway 28 - 52 Avenue to 55 Avenue	28-20	28-19	5-yr	1.90	1.90	1.90	0.60	1.14	1.14	1.14	10.00		1.73	11.73	79.08		0.250		0.002	0.000	0.000	0.250	125.00	600	0.30	0.351	1.203	535.80	532.900	532.525	2.94
54 Avenue - Hwy 28 to 54 Street	28-19	28-21	5-yr	4.54	8.91	8.91	0.60	2.72	5.35	5.35	11.73		0.78	12.51	70.61		1.049		0.002	0.000	0.000	1.049	120.00	900	0.80	1.687	2.572	535.50	532.600	531.640	3.38
Existing main	28-21	28-21a	5-yr	0.00	8.91	8.91	0.60	0.00	5.35	5.35	12.51		0.06	12.57	67.47		1.002		0.002	0.000	0.000	1.002	10.00	900	0.80	1.687	2.572	534.50	531.640	531.560	-264.35
																												534.50		

Appendix F – Public Open House Feedback Summaries

Stantec

Memo

To:	Amjad Khan, P.Eng. City of Cold Lake	From:	Neal Cormack, P.Eng. Stantec Consulting Ltd.
File:	116239311 - 01	Date:	April 7, 2014

Reference: Highway 28 Functional Design – Public Open House Feedback Summary

On March 12, 2014, Stantec presented two functional plan alternatives at the first Public Open House. Since this time, Stantec has received feedback from numerous business owners, residents and the general public. A strong majority of the comments were provided by members of the Assumption Church and Assumption Jr/Sr High School. Please see the attached Public Open House #1 Feedback List for a complete list.

The purpose of this memorandum is to summarize the questions, comments and recommendations that were received. As expected, many of the feedback items were repetitive and have therefore been combined and compiled for constructive discussion. Following this memo, the intention is for Stantec to meet with the City to address the feedback items and potentially incorporate them into the final recommended plan.

The following categories were generated based on the feedback received. The bullets represent a condensed form of the general comments, questions, concerns and public recommendations. This list, along with any of the City's concerns, will be the agenda for discussion at the next meeting. For a detailed background of this list, please refer to pages 4 to 10.

Summary (Condensed Version)

1. General

- What is the closest time to start the project and the latest it will be finished? *Response provided by Stantec on March 17, 2014.*
- The first priority should be the tanker bypass route to the air base.
    - Public Recommendation: Bypass road should be provided to Highway 55 down TWP Road 624 through the City's quarter section (which could be an industrial park) across Veterans Drive and out to Highway 55 on Range Road 23 or something similar.
- The service roads should be maintained.

2. 52 Street and Highway 28 Intersection (Assumption Jr/Sr High School and Assumption Church)

- The proposed access connecting the two parking lots should be removed and/or relocated.
- The access in front of Assumption School should be maintained. The introduction of traffic lights is a good idea.

- Emergency response times will be negatively affected due to removing and relocating the accesses to Assumption School.
- Pedestrian traffic in this area needs to be reviewed. A crosswalk or pedestrian overpass needs to be provided.
- Traffic is now closer to the school, which is unsafe. Also, the service road directly in front of Assumption school should be maintained.
- New proposed access to the school and new hotel development should be removed and/or relocated.
    - Public Recommendation: Move the proposed hotel entrance to the west so traffic doesn't interfere with school access, parking and students walking.
    - Public Recommendation: Use 47 Avenue to access the Holiday Inn Express from Highway 28. In order to do this, lights would need to be installed. A street would have to be built from 47 Avenue to Holiday Inn Express on the east side of the RCMP barracks. 47 Avenue could also be a dangerous goods route to the base.
    - Public Recommendation: Change the access to the new hotel closer to the Court House rather than immediately beside the school.
- Busing routes will be negatively impacted due to removing and relocating the accesses to Assumption School.
- The proposed access to the Assumption Church parking should be removed. Alternative access should be provided.
    - Public Recommendation: Provide a right-in right-out in front of the church parking lot which would be very similar to what's proposed for the new hotel.
- Why such a wide grass median? Wouldn't a concrete barrier be just as effective?

3. Centre Avenue and Highway 28 Intersection

- A traffic circle at this intersection should not be implemented.

4. 52 Avenue and Highway 28 Intersection

- 52 Avenue on the east side of Highway 28, as well as its connection to Highway 28 intersection needs to be reviewed.
    - Public Recommendation: Due to the narrow right-of-way down this roadway, and the fact that vehicles need to park back there, I suggest a one way street.
- 52 Avenue should be signalized with pedestrian crossings.

- Proximity of service road to Highway 28 on west leg causes turning movement conflicts.
- There are turning movement conflicts at east service road and 52 Avenue intersection.
- Public Recommendation: Can the existing boulevard be narrower to accommodate side parking on the building/business site. *(Essentially, this individual is wanting to know if the service road can be widened to allow for more parking).*

5. Best Western Cold Lake Inn

- How will any of your options directly or indirectly affect the Best Western Cold Lake Inn? (*Stantec provided a response on March 19, 2014 explaining the impacts of the proposed improvements on Best Western).*

6. 784 Wing

- It would appear that Stantec has been provided with inaccurate map information regarding 784 Wing boundaries. *(Stantec provided a response on March 31, 2014. In regards to the property lines, Stantec obtained the information in 2012, so if the property ownership had changed since then, the drawings would not have reflected that. However, we will obtain a new legal cadastral to incorporate those updates).*

Reference: Highway 28 Functional Design – Public Open House Feedback Summary

Summary (Detailed Version)

1) General

What is the closest time to start the project and the latest it will be finished?

The first priority should be the tanker bypass route to Base Cold Lake.

- That in itself would eliminate a lot of congestion on the highway, and the dangerous goods would not pass by three schools and two outreach schools. After this has been completed, then consideration can be given to upgrading Highway 28.
- Public Recommendation: Bypass road should be provided to Highway 55 down TWP Road 624 through the City's quarter section (which could be an industrial park) across Veterans Drive and out to Highway 55 on Range Road 23 or something similar.

The service roads should be maintained.

- Service road provides a slower traffic flow for vehicles entering individual businesses.
- The service road provides an area for bicycle and pedestrian traffic.
- During the winter road lines are not visible, and it will be difficult to stop for the many turning lanes into the high number of businesses along the road. There will be a higher risk of rear end collisions without a service road.
- Cold Lake has a high population of foreign workers who walk to work or bike, the service road provides a safer area to walk.
- The Service Road Alternative (Alternative 2) works much better in terms of making adjacent properties more accessible.
- Eliminating service road may cause issues with vehicles being pulled over by police.

2) 52 Street and Highway 28 Intersection (Assumption Jr/Sr High School and Assumption Church)

The proposed access connecting the two parking lots should be removed and/or relocated.

- This area is being reserved for future portable development in the advent AJSH takes in an additional sixty students over the next couple years. This provides the school with the ability to directly connect the portables to the school thus providing water, power and network access to the external buildings.
- In the summer of 2013-14 the City of Cold Lake just approved a $300 000.00 drainage project which is now completed on the east and western portions of the property and the proposed road

in the area 1 would disrupt the drainage and the green space on the eastern portion of the property.

- This area also represents a developed green space for the high school and we are looking into establishing a small baseball field or soccer fields for the physical education program. The district allocated $30,000.00 for sodding and fencing in 2013-14.

- Will 47 Avenue need to be widened and shoulders added to accommodate the increase of traffic it would have with the proposal you have here?

The access in front of Assumption school should be maintained. The introduction of traffic lights is a good idea.

- As a parish member of the AJSH Catholic Church the proposed blockage of the entrance from the north will create additional traffic in a residential area and potentially the school property. This could easily be resolved by maintaining an entrance to the church property which will also provide access to the AJSH staff parking lot.

- I am not clear at the moment why there can't be an exit or off ramp to the AJSH staff parking lot. This would provide staff with an entrance and exit when approaching AJSH from the north. This would also provide parents and visitors access to the front entrance of the school where the office is located. The student and bussing entrance is located at the back (south) of the building and the administrative office is located at the front or north end of the building.

- The AJSH parish community also relies on this entrance for members that come from the Cold Lake north. The staff parking lot is an overflow that is used for parish events and requires adequate access.

- The high school hosts a series of basketball and volleyball tournaments and this proposed configuration would make it very difficult for the transportation buses to navigate the front portion of the school.

- If this intersection is proposed to be signalized, why would you still close off the existing entrance to the AJSH? There is a low volume of vehicles (approximately 40 people) using this access at fixed times during the day.

- If the current proposal goes through, what kind of signage will be installed to direct people from out of town to the entrances to Assumption school and Assumption church? (*It would be sufficient to provide a sign in the northbound and southbound directions that indicate Assumption school can be accessed via Veterans Drive).*

- The exit on 55st in front of City Hall onto Centre street is as big or bigger traffic hazard than at Highway 28 and 52 Street. Why is that exit not being closed?

- Eliminating the access infront of the school makes it very difficult for students needing to go downtown. Also makes it tough on students that live close that walk to school. (*Crosswalks will be provided at this signalized intersection).*

- An increase in inconvenience by lack of access is a potential decrease in usage – any affected business owner would note this in a similar situation.

Emergency response times will be negatively affected due to removing and relocating the accesses to Assumption School.

- If there is an emergency, there will be a delay having to be re-routed around the school. Fire access will be difficult and take more time.
- Making the school entrance difficult to access presents a school safety concern. Staff and student traffic will be funnelled into one area, causing unnecessary congestion. What is the new emergency response time to access the Assumption church using the proposed improvements?

Pedestrian traffic in this area needs to be reviewed. A crosswalk or pedestrian overpass needs to be provided.

- Another concern is the student traffic crossing the street given the latest increase in posted road speeds. It will be very important to have either an elevated walk way or properly posted walk and control walkway solutions. This is an accident waiting to happen at the moment. If safety is a key concern in the design then needs to be addressed properly to ensure the safety of the students crossing the street on a daily bases. Pedestrian overpass has been requested for a number of years.

Traffic is now closer to the school, which is unsafe. Also, the service road directly in front of Assumption school should be maintained.

- Concerned that there is no buffer (service road) in front of the school in the proposed design. *(A service road should not act as a buffer. Also, a boulevard separation is provided in this area).*
- High volumes of traffic would be much closer to the school.

New proposed access to the school and new hotel development should be removed and/or relocated.

- Public Recommendation: Move the proposed hotel entrance to the west so traffic doesn't interfere with school access, parking and students walking.
- Public Recommendation: Use 47 Avenue to access the Holiday Inn Express from Highway 28. In order to do this, lights would need to be installed. A street would have to be built from 47 Avenue to Holiday Inn Express on the east side of the RCMP barracks. 47 Avenue could also be a dangerous goods route to the base.
- Public Recommendation: Change the access to the new hotel closer to the courthouse rather than immediately beside the school.
- This represents the entrance to the Jackson Field project which is suppose to be a community facility and we are hoping to have effective entrance and exit strategies for the field.

- Current the proposed road location would consume some of the parking lot for the event location. Once the field is completed we are hoping to host zones and provincial track field meets, soccer tournaments, and rugby tournaments.

- Secondly we are installing a $400 000.00 Digital Sign in this exact location with a possible 10 year lease agreement.

- We are concerned with the hotel traffic that could be directed close to or through our property boundaries.

- Porkchop configuration shown in drawing won't work. Stantec needs to come up with something better. In what way will this configuration not work?

Busing routes will be negatively impacted due to removing and relocating the accesses to Assumption School.

- It is extremely important to keep in mind the current and possible bussing routes. Any change to the routes could have a significant impact on the length of run times and this is a very sensitive issue or concern with our stakeholders. Something needs to be taken into consideration for the entrance and exit for the bus routes on both the east and west sides of the property. Currently there are no lights at the Fast Gas entrance and no lights at the City Hall exit. This is where the bottle necks will develop with bussing traffic which will impact both public and Catholic bus routes. If Stantec is proposing to close the service road in front of the school (current bus route), 46 Avenue and intersection by City Hall will need to be signalized. Otherwise buses will not be able to enter Highway 28.

- It will be problematic for our school busses as routes involve all three schools (St. Dominic in the north, Holy Cross and Assumption) and the access to the north is already limited because the volume of traffic makes it challenging to get on the road to the north. Eliminating the access to the front of the school means a further increase in the traffic and even more of a challenge to gain access to the north.

The proposed access to the Church parking should be removed. Alternative access should be provided.

- Public Recommendation: Provide a right-in right-out in front of the church parking lot very similar to what's proposed for the new hotel.

- The proposed access to the Assumption Church parking lot from the east through Parkview Crescent would increase traffic on a residential street, especially during Sunday or Saturday evening Church Service, as well as for weekday wedding and funeral traffic using the church parking lot. On Sunday, March 23/2014, 96 vehicles were counted in the church and school staff parking lot.

- When this number of vehicles exits the church parking lot after a Sunday service, it would choke other traffic out of Parkview Crescent for 15 to 20 minutes. While some drivers would escape via

47 Avenue, others would wait at the Fas Gas corner for an opening in highway traffic to turn north.

- The Best Western Hotel is getting a comfortable two way access from the Highway at the 52st intersection. Why can't the Assumption church get the same?

- The closure of the entrance in front of the Church is a great concern for the Church community. There are plenty of businesses to the south (such as FasGas, Western Budget Hotel and Boston Pizza) that have their own entrances. Our entrance into the Assumption Church property is a necessity.

Why such a wide grass median? Wouldn't a concrete barrier be just as effective?

3) Centre Avenue and Highway 28 Intersection

A traffic circle at this intersection should not be implemented.

- I would also not support a traffic circle because during peak time periods it would be very difficult to change lanes in order to be in the correct lane to exit the traffic circle in the desired lane.

- It would be very difficult for tandem fuel trucks driving to the base to safely navigate a traffic circle during peak traffic time periods.

- The Transportation Plan 2013 makes no mention of a roundabout. Traffic flowing out of the base could be controlled in a better fashion by providing signalized intersections on Centre Avenue, leading up to Highway 28.

- It would take a lot of time for people to get used to the roundabout configuration. Also given that this intersection is a current dangerous goods route, a roundabout would most likely result in more accidents.

- With the proposal of a traffic circle at the intersection of Hwy 28 and 50th Avenue, will this result in the need to move the airplanes on pedestals and the removal of Jow Heffner Park? (*There is potential for the planes to be removed and Jow Heffner Park may be reduced in size).*

4) 52 Avenue and Highway 28 Intersection

52 Avenue on the east side of Highway 28, as well as its connection to Highway 28 intersection needs to be reviewed.

- Proposes for the City to buy his land, tear down the existing building (Electric Services) and connect 52 Avenue to 54 Street. (*This is something that could be reviewed with the City).*

- Vehicles fly by the Tanup Salon, one car garage, Muscle Automotive Ltd in this alleyway (essentially) at excessive speeds.

- Owners in the area would like to pave this year and add street bumps along 52 Avenue on the east side of Highway 28.
- Vehicles park on 52 Avenue, causing a reduced roadway width for vehicles to drive down. This causes traffic flow issues and is a safety concern as well.
- Public Recommendation: Due to the narrow right-of-way down this roadway, and the fact that vehicles need to park back there, I suggest a one way street.

52 Avenue should be signalized with pedestrian crossings.

- Currently uncontrolled intersection, causing vehicles to rely on gaps in traffic.
- Currently no painted lines for pedestrians across the four-lane highway. Pedestrian crossing is a major concern at this location. Several near misses have been witnessed.
- Heavy residential cross-traffic at this intersection.
- Uncontrolled nature causes vehicle conflicts (such as blockages and near misses).
- The crosswalk should be of higher priority than Zone 4. (*We need to further explain that zones don't represent the order of priority).*

Proximity of service road to Highway 28 on west leg causes turning movement conflicts.

- Trucks wanting to access A&W from north are unable to do so due to blocked traffic. (*We are proposing to eliminate this turning movement altogether by introducing a median separation).*

There are turning movement conflicts at east service road and 52 Avenue intersection.

- Vehicles using Electric Services park on the service road (technically parking in the middle of a T-intersection.

Public Recommendation: Can the existing boulevard be narrower to accommodate side parking on the building/business site. *(Essentially, this individual wants to know if the service road can be widened to allow for more parking).*

5) Best Western Cold Lake Inn

How will any of your options directly or indirectly affect the Best Western Cold Lake Inn? (*Stantec provided a response on March 19, 2014 explaining the impacts of the proposed improvements on Best Western).*

- There are already two lanes going both ways. Are you proposing to add more lanes? If so, how would you be doing this?

6) 784 Wing

It would appear that Stantec has been provided with inaccurate map information regarding 784 Wing boundaries. *(Stantec provided a response on March 31, 2014. In regards to the property lines, Stantec obtained the information in 2012, so if the property ownership had changed since then, the drawings would not have reflected that. However, we will obtain a new legal cadastral to incorporate those updates).*

- The map (Zone 3 - 50 Street to 51 Avenue) does not reflect the recent land swap between 784 Wing and the City. 784 Wing no longer owns the property extending into the roadway to the north of our building but now owns the triangular piece between our building and the new Holiday Inn site. Therefore, the service road should be extended past our property and the Court House property to 55 Street. We are very anxious that this should happen.

Please do not hesitate to contact me should you have any questions or comments.

Regards,

Stantec Consulting Ltd.

Neal Cormack, P.Eng.
Managing Principal
Phone: 403-348-3315
Fax: 403-342-0969
neal.cormack@stantec.com

Attachment: Public Open House #1 Feedback List

c.

Stantec

Memo

To:	Amjad Khan, P.Eng. City of Cold Lake	From:	Brad Vander Heyden, P.Eng. Stantec Consulting Ltd.
File:	116239311 - 01	Date:	November 4, 2014

Reference: Highway 28 Functional Design – Public Open House #2 Feedback Summary

On October 8, 2014, Stantec presented the preferred plan for the Highway 28 Functional Design project at Public Open House #2. Since this time, Stantec has received feedback from several business owners and the general public. A Public Open House #2 Feedback List will also be provided as a separate document for the City's reference.

The purpose of this memorandum is to summarize the questions, comments, and recommendations that were received. As anticipated, some of the comments were repetitive, and therefore have been combined and compiled for constructive discussion. Following this memo, the intent is for Stantec to meet with the City to address the feedback items and discuss future considerations for the detailed design phase.

The following categories were generated based on the feedback received. For further detail regarding public feedback, Stantec will provide a separate document containing all the original comment forms.

1. General

Comments

- "I think the proposals will be a tremendous improvement in traffic flow and safety. Thanks for the presentation."

Public Recommendations

- Highway 28, from Centre Avenue to 50 Street (*Zone 3)*, should be the start of construction. This area is currently congested and should be of highest priority. *This comment was made by a Class 1 driver who has driven in the area for 36 years.*

2. OK Tire

Comments

- Developments along the west service road (between Centre Avenue and 52 Avenue) are losing access because of the new design at 52 Avenue intersection.
- OK Tire services tractor/trailer units and they may not be able to get in now.
- OK Tire is the only business in the City that services big trucks.

Public Recommendations

- Provide access where the fire station will be getting their access OR eliminate the service roads.

- "My suggestion in regards to this project would be to not put in the proposed median at 52 Avenue infront of the 7-11 as this would cut off our big truck traffic from the north. Instead, open access at 51 Avenue. This could be done by putting in a turning lane between 52 Avenue and 51 Avenue. Similar to the one proposed between 51 Avenue and 50 Avenue."

3. 52 Avenue

Public Recommendations

- "Based on the drawings I saw, the intersection at Highway 28 and 52 Street will have a stop light and a concrete divider to prevent through traffic on the service road on the west side of Highway 28. I submit that either the light or the concrete divider would solve the traffic issues that are of concern. I think that the stop light will be the better solution because it will allow people to get in and out of the area and prevent drivers from trying to dash in and out of traffic. If the concrete divider is put in, drivers will start to use the 7-11 parking lot to get around the divider or drive around the block past the daycare that is in the old elementary school to get to the businesses south of 55 Street. I think that is a poorer traffic pattern than we have now."

4. Jester Paint Supply and Office Essentials

Public Recommendations

- When putting a roadway behind our store and Dairy Queen, if the roadway could include the current back alley as a widened portion of road, it would allow trucks (especially semi trailers – 48's and 54's) a place to pull off and back into our loading docks without interfering with traffic flow.

5. Humpty's Family Restaurant

Public Recommendations

- Since the service road is already in place with storm sewers, block access to 50 Street and provide a shared access to the Humpty's and the adjacent property to the south. *We followed up with this business owner. He is essentially wanting the same access configuration as Tim Hortons or wanting to combine his access with the Ramada, information Centre, and the property to the south of Humpty's (which is currently owned by the Elizabeth Settlement).*

6. Twisted Lizard

Comments

- No access currently provided to Twisted Lizard business, only the adjacent property.
- The alley east of the Twisted Lizard will see more usage due to disconnection of service road and 50 Street. Some vehicles already utilize this alley as a shortcut.
- If the intersection improvements at 50 Street are implemented, this could potentially kill any future commercial property adjacent to the Twisted Lizard, due to limited access.

Public Recommendations

- Provide separate access off private driveway for Twisted Lizard.

7. Rona

Comments

- In a matter of 3 blocks (38 to 34 Avenue) there are three entrances off Highway 28. This is unsafe considering the volume of traffic on Highway 28 and large trucks turning.
- The existing service road acts as a staging area (see feedback form) for super B trucks and truck/trailer combinations (up to 50 to 60 feet). As a result, there would be significant queuing on Highway 28 which is unsafe for trucks and other vehicles. The proposed entrance does not allow for left turns into Rona.
- Proposed entrance from proposed back road (behing Rona) would NEVER be opened for use as this is a lumber yard and not a thru way for traffic. This is not negotiable.
  - Allowing traffic through the yard will be unsafe, as trucks are being loaded and unloaded in this area.
  - Multiple forklifts are constantly moving through the yard transporting large , heavy products.
  - Trucks must back into loading dock of building across this area (where the proposed access is aligned).
  - Insurance company would not allow for such a traffic flow because of unsafe and potentially disastrous traffic environment.
  - If this was enforced, access to the storage building would be restricted and may have to be moved at a major cost.
  - If this was enforced, Rona would lose extensive storage.
- Entrance off 34 Avenue must remain as is. The entrance allows for good traffic flow off and onto Highway 28.
- Paving completed for our site (see feedback form) was specifically designed for the current layout and would require costly change with new proposal. The current road structure is designed well for commercial traffic flow and done in accordance with City of Cold Lake Engineering Standards.
- Proposed entrance off Highway 28 is not acceptable.
  - Does not allow for left hand turns.
  - Area would end up acting as a staging area, which is unsafe.
  - Would restrict access to Rona and frustrate customers and deliveries.
  - Drainage would be seriously affected.

Public Recommendations

- 34 Avenue access must remain (as shown on feedback form).
- Service road from 38 Avenue to 34 Avenue must stay to allow for easy flow of traffic and staging area (see feedback form) . There are large truck volumes that not only service Rona, but also other businesses in the area such as Sears, Bottle Depot, etc.
- 38 Avenue intersection should be designed to allow for Super B trucks to be able to make safe left and right hand turns.
- No need for additional entrances off Highway 28 between 34 and 38 Avenue.

Reference: Highway 28 Functional Design – Public Open House #2 Feedback Summary

8. Assumption Jr/Sr High School

Public Recommendations

- During a planning session between the City and Assumption Jr/Sr High School, a proposed sketch was generated. This sketch includes shifting the proposed right-in right-out configuration closer to Centre Avenue, implementing a truck turnaround infront of the school, and providing a connection between 52 Street and the school's west parking lot. This sketch is provided in the public feedback forms, which will be provided separately to this memorandum.

Please do not hesitate to contact me should you have any questions or comments.

Regards,

Stantec Consulting Ltd.

Neal Cormack, P.Eng.
Managing Principal
Phone: 403-348-3315
Fax: 403-342-0969
neal.cormack@stantec.com

Attachment:

c.

Appendix G – Opinion of Probable Cost

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COST SUMMARY								
Schedule	Description	Subtotal	Contingency	Subtotal, including Contingency	Engineering Services	Subtotal, , including Contingency and Engineering Services	Work by Others	Total Estimated Cost
			20%		**10%**			
A	Zone 1 - Highway 28 from South of Waste Transfer Station Access to 34 Avenue	$3,888,000.00	$777,600.00	$4,665,600.00	$466,560.00	$5,132,160.00	$50,000.00	**$5,182,000.00**
B	Zone 2 - Highway 28 from 34 Avenue to 50 Street	$12,015,000.00	$2,403,000.00	$14,418,000.00	$1,441,800.00	$15,859,800.00	$100,000.00	**$15,960,000.00**
C	Zone 2A - New Access Roadway West of Highway 28 from 34 Avenue to 43 Avenue	$3,864,000.00	$772,800.00	$4,636,800.00	$463,680.00	$5,100,480.00	$100,000.00	**$5,200,000.00**
D	Zone 2B - New Access Roadway East of Highway 28 from 34 Avenue to 47 Avenue	$5,140,000.00	$1,028,000.00	$6,168,000.00	$616,800.00	$6,784,800.00	$100,000.00	**$6,885,000.00**
E	Zone 3 - Highway 28 from 50 Street to North of Centre Avenue and Centre Avenue East and West of Hwy 28	$4,975,000.00	$995,000.00	$5,970,000.00	$597,000.00	$6,567,000.00	$100,000.00	**$6,667,000.00**
F	Zone 4 - Highway 28 from North of Centre Avenue to 110 South of 54 Street	$4,524,000.00	$904,800.00	$5,428,800.00	$542,880.00	$5,971,680.00	$100,000.00	**$6,072,000.00**
	TOTAL PROJECT COST	**$34,406,000.00**	**$6,881,200.00**	**$41,287,200.00**	$4,128,720.00	$45,415,920.00	**$550,000.00**	**$45,966,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule A: Zone 1 - Highway 28 from South of Waste Transfer Station Access to 34 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part A1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$391,400.00	$391,400.00
		Traffic Accommodation	1	Lump sum	$195,700.00	$195,700.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$39,100.00	$39,100.00
		Subtotal Part A1:				**$626,200.00**
Part A2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	2,770	lin. m	$30.00	$83,100.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	2,313	sq. m	$20.00	$46,250.00
		Asphaltic Concrete Pavement Milling - 50mm depth	8,700	sq. m	$15.00	$130,500.00
		Remove and dispose of Street Light, including Base	1	each	$500.00	$500.00
		Remove existing Signs and Posts	3	each	$200.00	$600.00
		Subtotal Part A2:				**$260,950.00**
Part A3:	**Roadway Base Construction**					
		Topsoil Stripping to stockpile	2,376	cu. m	$10.00	$23,760.00
		Waste excavation - Haul off-site to approved disposal site	3,564	cu. m	$15.00	$53,460.00
		Common excavation - Reconstruct Ditch Foreslope	2,673	cu. m	$15.00	$40,095.00
		Subgrade preparation (300 mm depth)	11,880	sq. m	$8.00	$95,040.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	891	cu. m	$28.00	$24,948.00
		300 mm depth Granular Subbase (Pitrun Gravel)	11,880	sq. m	$35.00	$415,800.00
		100 mm depth Granular Base Course	11,880	sq. m	$20.00	$237,600.00
		Subtotal Part A3:				**$890,703.00**
Part A4:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		250 mm Standard or Reversed Curb and Gutter	1,440	lin. m	$140.00	$201,600.00
		Stamped and Colored Concrete Cap for Islands and Medians	1,440	sq. m	$250.00	$360,000.00
		Subtotal Part A4:				**$561,600.00**
Part A5:	**Asphaltic Concrete Paving**					
		Prime coat	11,880	sq. m	$1.50	$17,820.00
		Tack coat	11,880	sq. m	$0.90	$10,692.00
		Hot Mix Asphaltic Concrete Pavement				
		Roadway Paving (16mm Aggregate) - 75 mm lift	11,880	sq. m	$30.00	$356,400.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule A: Zone 1 - Highway 28 from South of Waste Transfer Station Access to 34 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Roadway Paving (12.5 mm Aggregate) - 50 mm lift	11,880	sq. m	$20.00	$237,600.00
		Roadway Overlay Paving (12.5 mm Aggregate) - 50 mm lift	16,668	sq. m	$20.00	$333,350.00
		Subtotal Part A5:				**$955,862.00**
Part A6:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	4,320	m	$30.00	$129,600.00
		Type 1-Pavement Messages (Arrows)	8	Each	$525.00	$4,200.00
		Supply and Install New Roadway Signs	6	Each	$225.00	$1,350.00
		Subtotal Part A6:				**$135,150.00**
Part A7:	**Landscaping and Site Furnishings**					
		Soft-scaping (topsoil, seed)	21,000	sq. m	$15.00	$315,000.00
		Subtotal Part A7:				**$315,000.00**
Part A8:	**Electrical**					
		Supply and Install Streetlighting along centre median	360	lin. m	$100.00	$36,000.00
		Supply and Install Streetlighting along shoulder of roadway	690	lin. m	$100.00	$69,000.00
		Subtotal Part A8:				**$105,000.00**
Part A9:	**Miscellaneous Work**					
		Hydrovac (Provisional)	15	hours	$400.00	$6,000.00
		Supply, Installation and Removal of Silt Fencing	2,100	lin. m	$15.00	$31,500.00
		Subtotal Part A9:				**$37,500.00**
	Subtotal					**$3,887,965.00**
	Contingency				**20%**	**$777,593.00**
	Subtotal, including Contingency					**$4,665,558.00**
	Engineering Services				**10%**	**$466,555.80**
	Subtotal, including Contingency and Engineering Services					**$5,132,113.80**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$50,000.00	$50,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$5,182,113.80**
	SAY:					**$5,182,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule B: Zone 2 - Highway 28 from 34 Avenue to 50 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part B1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$1,209,600.00	$1,209,600.00
		Traffic Accommodation	1	Lump sum	$604,800.00	$604,800.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$121,000.00	$121,000.00
		Subtotal Part B1:				**$1,935,400.00**
Part B2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	5,680	lin. m	$30.00	$170,400.00
		Saw cutting concrete				
		Concrete curb and gutter	40	each	$60.00	$2,400.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	24,132	sq. m	$20.00	$482,640.00
		Asphaltic Concrete Pavement Milling - 50mm depth	13,700	sq. m	$15.00	$205,500.00
		Remove and dispose of concrete curb and gutter	6,300	lin. m	$30.00	$189,000.00
		Remove and dispose of Street Light Bases	12	each	$500.00	$6,000.00
		Remove and salvage existing Traffic Control Strucures	2	each	$50,000.00	$100,000.00
		Remove existing Signs and Posts	20	each	$200.00	$4,000.00
		Subtotal Part B2:				**$1,159,940.00**
Part B3:	**Storm Sewer Mains**					
		Trench Excavation, Compaction, and				
		200mm, 250mm, 300mm & 375 mm Dia. pipe:				
		0 - 4.0 m depth	125	lin. m	$205.00	$25,625.00
		450mm, 525 mm and 600mm Dia.				
		0 - 4.0 m depth	405	lin. m	$205.00	$83,025.00
		675mm, 750mm and 900mm Dia				
		0 - 4.0 m depth	320	lin. m	$335.00	$107,200.00
		1050 mm, 1200mm and 1350mm Dia.. Pipe				
		4.0 m to 5.0 m depth	115	lin. m	$480.00	$55,200.00
		Class B Bedding (Flexible Pipe) - Sand Bedding placed to 300mm above of pipe				
		200 mm, 250 mm, 300 mm and 375 mm Dia. pipe	125	lin. m	$30.00	$3,750.00
		450 mm, 525 mm and 600 mm Dia. pipe	405	lin. m	$40.00	$16,200.00
		Class B Bedding (Rigid Pipe) - Screened Rock Bedding placed to springline of pipe				
		750 mm and 900 mm Dia. pipe	320	lin. m	$30.00	$9,600.00
		1050 mm, 1200 mm and 1350 mm Dia. pipe	115	lin. m	$60.00	$6,900.00
		Remove unsuitable subgrade material and replace with Screened Rock backfill material	145	cu. m	$35.00	$5,066.25

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule B: Zone 2 - Highway 28 from 34 Avenue to 50 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Storm Sewer Pipe - P.V.C. "Ultra-Rib" Pipe, CSA B182.5 c/w bedding				
		375 mm	125	lin. m	$60.00	$7,500.00
		525 mm	90	lin. m	$105.00	$9,450.00
		600 mm	315	lin. m	$155.00	$48,825.00
		675 mm	115	lin. m	$190.00	$21,850.00
		Storm Sewer Pipe - Sulphate Resistant Rubber Gasket Concrete Pipe, ASTM C76 Class 3				
		900 mm	305	lin. m	$450.00	$137,250.00
		1050 mm	115	lin. m	$550.00	$63,250.00
		1200 mm Type 5A Standard Manhole, including Base Precast Barrels, Slab Top, Grade Rings and/or Bricks (Max. Pipe size = 600 mm)	14	vert. m	$1,500.00	$21,000.00
		1200 mm Type 5A Standard Manhole, including Precast Barrels, Slab Top, Grade Rings and/or Bricks installed on "1-S" Base Unit	8	vert. m	$1,200.00	$9,600.00
		Type "1-S" Manhole and Catchbasin Manhole Precast Base Components				
		1200 mm x 1200 mm x 2020 mm Vault (Max. Pipe size = 900 mm)	2	each	$8,100.00	$16,200.00
		1800 mm x 1800 mm x 2020 mm Vault (Max. Pipe size = 1500 mm)	1	each	$15,000.00	$15,000.00
		Storm Manhole and Catchbasin Manhole Frames and covers				
		F49 frame c/w solid cover	10	each	$800.00	$8,000.00
		Catchbasin Assemblies, including frame and cover, side inlet, precast CB collar, and precast barrel c/w monolithic or separate base	20	each	$2,500.00	$50,000.00
		Catchbasin Leads c/w trench excavation, compaction, and backfill				
		250 mm P.V.C. "Ultra-rib"	300	lin. m	$100.00	$30,000.00
		Subtotal Part B3:				**$750,491.25**
Part B4:	**Roadway Base Construction**					
	B4-1: Hwy 28					
		Roadway Waste excavation - Haul off-site to approved disposal site	7,920	cu. m	$40.00	$316,800.00
		Subgrade preparation (300 mm depth)	19,800	sq. m	$8.00	$158,400.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	1,980	cu. m	$28.00	$55,440.00
		300 mm depth Granular Subbase (Pitrun Gravel)	26,400	sq. m	$35.00	$924,000.00
		100 mm depth Granular Base Course	26,400	sq. m	$20.00	$528,000.00
	B4-2: Service Roads, Cross Street connections and Roadway Connections from Hwy 28 to Private Properties					
		Roadway Waste excavation - Haul off-site to approved disposal site	4,720	cu. m	$40.00	$188,800.00
		Subgrade preparation (300 mm depth)	7,080	sq. m	$8.00	$56,640.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule B: Zone 2 - Highway 28 from 34 Avenue to 50 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	708	cu. m	$28.00	$19,824.00
		375 mm depth Granular Base Course	9,440	sq. m	$20.00	$188,800.00
	B4-3:	**Asphalt Trails**				
		Asphalt Trail Waste excavation - Haul off-site to approved disposal site	226	cu. m	$40.00	$9,030.00
		Subgrade preparation (150 mm depth)	645	sq. m	$4.00	$2,580.00
		200 mm depth Granular Base Course	645	sq. m	$20.00	$0.00
		Subtotal Part B4:				**$2,448,314.00**
Part B5:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		250 mm Standard or Reversed Curb and Gutter	7,350	lin. m	$140.00	$1,029,000.00
		Stamped and Colored Concrete Cap for Islands and Medians	3,850	sq. m	$250.00	$962,500.00
		Subtotal Part B5:				**$1,991,500.00**
Part B6:	**Asphaltic Concrete Paving**					
		Prime coat	27,590	sq. m	$1.50	$41,385.00
		Tack coat	61,270	sq. m	$0.90	$55,143.00
	B6-1:	**Hwy 28**				
		Hot Mix Asphaltic Concrete Pavement				
		Roadway Paving (16mm Aggregate) - 75 mm lift	19,980	sq. m	$30.00	$599,400.00
		Roadway Paving (12.5 mm Aggregate) - 50 mm lift	19,980	sq. m	$20.00	$399,600.00
		Roadway Overlay Paving (12.5 mm Aggregate) - 50 mm lift	13,700	sq. m	$20.00	$274,000.00
	B6-2:	**Service Roads, Cross Street connections and Roadway Connections from Hwy 28 to Private Properties**				
		Roadway Paving (12.5 mm Aggregate) - Initial 50 mm lift	7,610	sq. m	$20.00	$152,200.00
		Roadway Paving (12.5 mm Aggregate) - Final 50 mm lift	7,610	sq. m	$20.00	$152,200.00
	B6-3:	**Asphalt Trails**				
		Asphalt Trail Paving - Mix Type 5d (16mm Aggregate) - 50 mm lift	645	sq. m	$20.00	$12,900.00
		Subtotal Part B6:				**$1,686,828.00**
Part B7:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	5,900	m	$30.00	$177,000.00
		Type 1-Thermoplastic Painted Pavement Markings, Intersection Guide Lines, 100mm Wide		m	$75.00	$0.00
		Type 1-Thermoplastic Pavement Markings, Stop Bars 300mm wide	200	m	$90.00	$18,000.00
		Type 1-Thermoplastic Cross Walk Lines, 200mm	1,200	m	$65.00	$78,000.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule B: Zone 2 - Highway 28 from 34 Avenue to 50 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Type 1-Pavement Messages (Arrows)	30	Each	$525.00	$15,750.00
		Supply and Install New Roadway Signs	20	Each	$225.00	$4,500.00
		Subtotal Part B7:				**$293,250.00**
Part B8:	**Landscaping and Site Furnishings**					
		Tree Planting		each	$2,000.00	$0.00
		Soft-scaping (topsoil, seed)	28,150	sq. m	$15.00	$422,250.00
		Subtotal Part B8:				**$422,250.00**
Part B9:	**lectrical**					
		Supply and Install Streetlighting	1,350	lin. m	$100.00	$135,000.00
		Supply and Install Traffic Control, including davit bases, davit structures, ducting and traffic controller	4	each	$275,000.00	$1,100,000.00
		Subtotal Part B9:				**$1,235,000.00**
Part B10:	**Miscellaneous Work**					
		Hydrovac (Provisional)	30	hours	$400.00	$12,000.00
		Supply, Installation and Removal of Silt Fencing	2,700	lin. m	$15.00	$40,500.00
		Supply, Installation, Cleaning and Removal of Sediment Traps	20	each	$2,000.00	$40,000.00
		Subtotal Part B10:				**$92,500.00**
	Subtotal					**$12,015,473.25**
	Contingency				**20%**	**$2,403,094.65**
	Subtotal, including Contingency					**$14,418,567.90**
	Engineering Services				**10%**	**$1,441,856.79**
	Subtotal, including Contingency and Engineering Services					**$15,860,424.69**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$100,000.00	$100,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$15,960,424.69**
	SAY:					**$15,960,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule C: Zone 2A - New Access Roadway West of Highway 28 from 34 Avenue to 43 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part C1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$389,000.00	$389,000.00
		Traffic Accommodation	1	Lump sum	$194,500.00	$194,500.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$38,900.00	$38,900.00
		Subtotal Part C1:				**$622,400.00**
Part C2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	150	lin. m	$30.00	$4,500.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	3,000	sq. m	$20.00	$60,000.00
		Remove existing Signs and Posts	15	each	$200.00	$3,000.00
		Subtotal Part C2:				**$67,500.00**
Part C3:	**Storm Sewer Mains**					
		Trench Excavation, Compaction, and				
		450mm, 525 mm and 600mm Dia.				
		0 - 4.0 m depth	315	lin. m	$205.00	$64,575.00
		675mm, 750mm and 900mm Dia				
		0 - 4.0 m depth	320	lin. m	$335.00	$107,200.00
		1050 mm, 1200mm and 1350mm Dia.. Pipe				
		4.0 m to 5.0 m depth	115	lin. m	$480.00	$55,200.00
		Class B Bedding (Flexible Pipe) - Sand Bedding placed to 300mm above of pipe				
		450 mm, 525 mm and 600 mm Dia. pipe	315	lin. m	$40.00	$12,600.00
		Class B Bedding (Rigid Pipe) - Screened Rock Bedding placed to springline of pipe				
		750 mm and 900 mm Dia. pipe	320	lin. m	$30.00	$9,600.00
		1050 mm, 1200 mm and 1350 mm Dia. pipe	115	lin. m	$60.00	$6,900.00
		Remove unsuitable subgrade material and replace with Screened Rock backfill material	113	cu. m	$35.00	$3,937.50
		Storm Sewer Pipe - P.V.C. "Ultra-Rib" Pipe, CSA B182.5 c/w bedding				
		600 mm	315	lin. m	$155.00	$48,825.00
		675 mm	115	lin. m	$190.00	$21,850.00
		Storm Sewer Pipe - Sulphate Resistant Rubber Gasket Concrete Pipe, ASTM C76 Class 3				
		900 mm	305	lin. m	$450.00	$137,250.00
		1050 mm	115	lin. m	$550.00	$63,250.00
		1200 mm Type 5A Standard Manhole, including Base Precast Barrels, Slab Top, Grade Rings and/or Bricks (Max. Pipe size = 600 mm)	14	vert. m	$1,500.00	$21,000.00
		1200 mm Type 5A Standard Manhole, including Precast Barrels, Slab Top, Grade Rings and/or Bricks installed on "1-S" Base Unit	8	vert. m	$1,200.00	$9,600.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule C: Zone 2A - New Access Roadway West of Highway 28 from 34 Avenue to 43 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Type "1-S" Manhole and Catchbasin Manhole Precast Base Components				
		1200 mm x 1200 mm x 2020 mm Vault (Max. Pipe size = 900 mm)	2	each	$8,100.00	$16,200.00
		1800 mm x 1800 mm x 2020 mm Vault (Max. Pipe size = 1500 mm)	1	each	$15,000.00	$15,000.00
		Storm Manhole and Catchbasin Manhole Frames and covers				
		F49 frame c/w solid cover	10	each	$800.00	$8,000.00
		Catchbasin Assemblies, including frame and cover, side inlet, precast CB collar, and precast barrel c/w monolithic or separate base	20	each	$2,500.00	$50,000.00
		Catchbasin Leads c/w trench excavation, compaction, and backfill				
		250 mm P.V.C. "Ultra-rib"	150	lin. m	$100.00	$15,000.00
		Subtotal Part C3:				**$665,987.50**
Part C4:	**Roadway Base Construction**					
		Roadway Waste excavation - Haul off-site to approved disposal site	10,080	cu. m	$40.00	$403,200.00
		Subgrade preparation (300 mm depth)	15,120	sq. m	$8.00	$120,960.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	1,512	cu. m	$28.00	$42,336.00
		375 mm depth Granular Base Course	20,160	sq. m	$20.00	$403,200.00
		Subtotal Part C4:				**$969,696.00**
Part C5:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		250 mm Standard or Reversed Curb and Gutter	2,880	lin. m	$140.00	$403,200.00
		Subtotal Part C5:				**$403,200.00**
Part C6:	**Asphaltic Concrete Paving**					
		Prime coat	15,840	sq. m	$1.50	$23,760.00
		Tack coat	15,840	sq. m	$0.90	$14,256.00
	B6-2:	**Service Roads, Cross Street connections and Roadway Connections from Hwy 28 to Private Properties**				
		Roadway Paving (12.5 mm Aggregate) - Initial 50 mm lift	15,840	sq. m	$20.00	$316,800.00
		Roadway Paving (12.5 mm Aggregate) - Final 50 mm lift	15,840	sq. m	$20.00	$316,800.00
		Subtotal Part C6:				**$671,616.00**
Part C7:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	1,440	m	$30.00	$43,200.00
		Supply and Install New Roadway Signs	20	Each	$225.00	$4,500.00
		Subtotal Part C7:				**$47,700.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule C: Zone 2A - New Access Roadway West of Highway 28 from 34 Avenue to 43 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part C8:	**Landscaping and Site Furnishings**					
		Soft-scaping (topsoil, seed)	12,960	sq. m	$15.00	$194,400.00
		Subtotal Part C8:				**$194,400.00**
Part C9:	**lectrical**					
		Supply and Install Streetlighting	1,440	lin. m	$100.00	$144,000.00
		Subtotal Part C9:				**$144,000.00**
Part C10:	**Miscellaneous Work**					
		Hydrovac (Provisional)	10	hours	$400.00	$4,000.00
		Supply, Installation and Removal of Silt Fencing	2,880	lin. m	$15.00	$43,200.00
		Supply, Installation, Cleaning and Removal of Sediment Traps	15	each	$2,000.00	$30,000.00
		Subtotal Part C10:				**$77,200.00**
	Subtotal					**$3,863,699.50**
	Contingency				**20%**	**$772,739.90**
	Subtotal, including Contingency					**$4,636,439.40**
	Engineering Services				**10%**	**$463,643.94**
	Subtotal, including Contingency and Engineering Services					**$5,100,083.34**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$100,000.00	$100,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$5,200,083.34**
	SAY:					**$5,200,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule D: Zone 2B - New Access Roadway East of Highway 28 from 34 Avenue to 47 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part B1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$517,500.00	$517,500.00
		Traffic Accommodation	1	Lump sum	$258,700.00	$258,700.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$51,700.00	$51,700.00
		Subtotal Part B1:				**$827,900.00**
Part B2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	500	lin. m	$30.00	$15,000.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	4,800	sq. m	$20.00	$96,000.00
		Remove existing Signs and Posts	15	each	$200.00	$3,000.00
		Subtotal Part B2:				**$114,000.00**
Part B3:	**Storm Sewer Mains**					
		Trench Excavation, Compaction, and				
		200mm, 250mm, 300mm & 375 mm Dia. pipe:				
		0 - 4.0 m depth	125	lin. m	$205.00	$25,625.00
		450mm, 525 mm and 600mm Dia.				
		0 - 4.0 m depth	405	lin. m	$205.00	$83,025.00
		675mm, 750mm and 900mm Dia				
		0 - 4.0 m depth	320	lin. m	$335.00	$107,200.00
		1050 mm, 1200mm and 1350mm Dia.. Pipe				
		4.0 m to 5.0 m depth	115	lin. m	$480.00	$55,200.00
		Class B Bedding (Flexible Pipe) - Sand Bedding placed to 300mm above of pipe				
		200 mm, 250 mm, 300 mm and 375 mm Dia. pipe	125	lin. m	$30.00	$3,750.00
		450 mm, 525 mm and 600 mm Dia. pipe	405	lin. m	$40.00	$16,200.00
		Class B Bedding (Rigid Pipe) - Screened Rock Bedding placed to springline of pipe				
		750 mm and 900 mm Dia. pipe	320	lin. m	$30.00	$9,600.00
		1050 mm, 1200 mm and 1350 mm Dia. pipe	115	lin. m	$60.00	$6,900.00
		Remove unsuitable subgrade material and replace with Screened Rock backfill material	135	cu. m	$35.00	$4,738.13
		Storm Sewer Pipe - P.V.C. "Ultra-Rib" Pipe, CSA B182.5 c/w bedding				
		600 mm	315	lin. m	$155.00	$48,825.00
		675 mm	115	lin. m	$190.00	$21,850.00
		Storm Sewer Pipe - Sulphate Resistant Rubber Gasket Concrete Pipe, ASTM C76 Class 3				
		900 mm	305	lin. m	$450.00	$137,250.00
		1050 mm	115	lin. m	$550.00	$63,250.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule D: Zone 2B - New Access Roadway East of Highway 28 from 34 Avenue to 47 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		1200 mm Type 5A Standard Manhole, including Base Precast Barrels, Slab Top, Grade Rings and/or Bricks (Max. Pipe size = 600 mm)	14	vert. m	$1,500.00	$21,000.00
		1200 mm Type 5A Standard Manhole, including Precast Barrels, Slab Top, Grade Rings and/or Bricks installed on "1-S" Base Unit	8	vert. m	$1,200.00	$9,600.00
		Type "1-S" Manhole and Catchbasin Manhole Precast Base Components				
		1200 mm x 1200 mm x 2020 mm Vault (Max. Pipe size = 900 mm)	2	each	$8,100.00	$16,200.00
		1800 mm x 1800 mm x 2020 mm Vault (Max. Pipe size = 1500 mm)	1	each	$15,000.00	$15,000.00
		Storm Manhole and Catchbasin Manhole Frames and covers				
		F49 frame c/w solid cover	10	each	$800.00	$8,000.00
		Catchbasin Assemblies, including frame and cover, side inlet, precast CB collar, and precast barrel c/w monolithic or separate base	20	each	$2,500.00	$50,000.00
		Catchbasin Leads c/w trench excavation, compaction, and backfill				
		250 mm P.V.C. "Ultra-rib"	150	lin. m	$100.00	$15,000.00
		Subtotal Part B3:				**$718,213.13**
Part B4:	**Roadway Base Construction**					
		Roadway Waste excavation - Haul off-site to approved disposal site	14,000	cu. m	$40.00	$560,000.00
		Subgrade preparation (300 mm depth)	21,000	sq. m	$8.00	$168,000.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	2,100	cu. m	$28.00	$58,800.00
		375 mm depth Granular Base Course	28,000	sq. m	$20.00	$560,000.00
		Subtotal Part B4:				**$1,346,800.00**
Part B5:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		250 mm Standard or Reversed Curb and Gutter	4,000	lin. m	$140.00	$560,000.00
		Subtotal Part B5:				**$560,000.00**
Part B6:	**Asphaltic Concrete Paving**					
		Prime coat	22,000	sq. m	$1.50	$33,000.00
		Tack coat	22,000	sq. m	$0.90	$19,800.00
	B6-2:	**Service Roads, Cross Street connections and Roadway Connections from Hwy 28 to Private Properties**				
		Roadway Paving (12.5 mm Aggregate) - Initial 50 mm lift	22,000	sq. m	$20.00	$440,000.00
		Roadway Paving (12.5 mm Aggregate) - Final 50 mm lift	22,000	sq. m	$20.00	$440,000.00
		Subtotal Part B6:				**$932,800.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule D: Zone 2B - New Access Roadway East of Highway 28 from 34 Avenue to 47 Avenue

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part B7:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	2,000	m	$30.00	$60,000.00
		Supply and Install New Roadway Signs	20	Each	$225.00	$4,500.00
		Subtotal Part B7:				**$64,500.00**
Part B8:	**Landscaping and Site Furnishings**					
		Soft-scaping (topsoil, seed)	18,000	sq. m	$15.00	$270,000.00
		Subtotal Part B8:				**$270,000.00**
Part B9:	**lectrical**					
		Supply and Install Streetlighting	2,000	lin. m	$100.00	$200,000.00
		Subtotal Part B9:				**$200,000.00**
Part B10:	**Miscellaneous Work**					
		Hydrovac (Provisional)	15	hours	$400.00	$6,000.00
		Supply, Installation and Removal of Silt Fencing	4,000	lin. m	$15.00	$60,000.00
		Supply, Installation, Cleaning and Removal of Sediment Traps	20	each	$2,000.00	$40,000.00
		Subtotal Part B10:				**$106,000.00**
	Subtotal					**$5,140,213.13**
	Contingency				**20%**	**$1,028,042.63**
	Subtotal, including Contingency					**$6,168,255.75**
	Engineering Services				**10%**	**$616,825.58**
	Subtotal, including Contingency and Engineering Services					**$6,785,081.33**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$100,000.00	$100,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$6,885,081.33**
	SAY:					**$6,885,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule E: Zone 3 - Highway 28 from 50 Street to North of Centre Avenue and Centre Avenue East and West of Hwy 28

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part E1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$500,800.00	$500,800.00
		Traffic Accommodation	1	Lump sum	$250,400.00	$250,400.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$50,100.00	$50,100.00
		Subtotal Part E1:				**$801,300.00**
Part E2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	80	lin. m	$30.00	$2,400.00
		Saw cutting concrete				
		Concrete curb and gutter	14	each	$60.00	$840.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	10,000	sq. m	$20.00	$200,000.00
		Asphaltic Concrete Pavement Milling - 50mm depth	10,000	sq. m	$15.00	$150,000.00
		Remove and dispose of concrete curb and gutter	2,000	lin. m	$30.00	$60,000.00
		Remove and dispose of Street Light Bases	12	each	$500.00	$6,000.00
		Remove and salvage existing Traffic Control Strucures	2	each	$50,000.00	$100,000.00
		Remove existing Signs and Posts	20	each	$200.00	$4,000.00
		Subtotal Part E2:				**$523,240.00**
Part E3:	**Storm Sewer Mains**					
		Trench Excavation, Compaction, and				
		200mm, 250mm, 300mm & 375 mm Dia. pipe:				
		0 - 4.0 m depth	90	lin. m	$205.00	$18,450.00
		Class B Bedding (Flexible Pipe) - Sand Bedding placed to 300mm above of pipe				
		200 mm, 250 mm, 300 mm and 375 mm Dia. pipe	90	lin. m	$30.00	$2,700.00
		Remove unsuitable subgrade material and replace with Screened Rock backfill material	14	cu. m	$35.00	$472.50
		Storm Sewer Pipe - P.V.C. "Ultra-Rib" Pipe, CSA B182.5 c/w bedding				
		375 mm	90	lin. m	$60.00	$5,400.00
		1200 mm Type 5A Standard Manhole, including Base Precast Barrels, Slab Top, Grade Rings and/or Bricks (Max. Pipe size = 600 mm)	3	vert. m	$1,500.00	$4,500.00
		Storm Manhole and Catchbasin Manhole Frames and covers				
		F49 frame c/w solid cover	1	each	$800.00	$800.00
		Catchbasin Assemblies, including frame and cover, side inlet, precast CB collar, and precast barrel c/w monolithic or separate base	6	each	$2,500.00	$15,000.00
		Catchbasin Leads c/w trench excavation, compaction, and backfill				
		250 mm P.V.C. "Ultra-rib"	75	lin. m	$100.00	$7,500.00
		Subtotal Part E3:				**$54,822.50**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule E: Zone 3 - Highway 28 from 50 Street to North of Centre Avenue and Centre Avenue East and West of Hwy 28

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part E4:	**Roadway Base Construction**					
	E4-1: Hwy 28 and Centre Avenue					
		Roadway Waste excavation - Haul off-site to approved disposal site	3,000	cu. m	$40.00	$120,000.00
		Subgrade preparation (300 mm depth)	7,500	sq. m	$8.00	$60,000.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	750	cu. m	$28.00	$21,000.00
		300 mm depth Granular Subbase (Pitrun Gravel)	10,000	sq. m	$35.00	$350,000.00
		100 mm depth Granular Base Course	10,000	sq. m	$20.00	$200,000.00
	E4-2: Service Roads					
		Roadway Waste excavation - Haul off-site to approved disposal site	1,344	cu. m	$40.00	$53,760.00
		Subgrade preparation (300 mm depth)	3,360	sq. m	$8.00	$26,880.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	336	cu. m	$28.00	$9,408.00
		375 mm depth Granular Base Course	4,480	sq. m	$20.00	$89,600.00
	E4-3: Asphalt Trails					
		Asphalt Trail Waste excavation - Haul off-site to approved disposal site	746	cu. m	$40.00	$29,820.00
		Subgrade preparation (150 mm depth)	2,130	sq. m	$4.00	$8,520.00
		200 mm depth Granular Base Course	2,130	sq. m	$20.00	$42,600.00
		Subtotal Part E4:				**$1,011,588.00**
Part E5:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		250 mm Standard or Reversed Curb and Gutter	3,900	lin. m	$140.00	$546,000.00
		Stamped and Colored Concrete Cap for Islands and Medians	2,475	sq. m	$250.00	$618,750.00
		Subtotal Part E5:				**$1,164,750.00**
Part E6:	**Asphaltic Concrete Paving**					
		Prime coat	16,305	sq. m	$1.50	$24,457.50
		Tack coat	16,305	sq. m	$0.90	$14,674.50
	E6-1: Hwy 28 and Centre Avenue					
		Hot Mix Asphaltic Concrete Pavement				
		Roadway Paving (16mm Aggregate) - 75 mm lift	6,250	sq. m	$30.00	$187,500.00
		Roadway Paving (12.5 mm Aggregate) - 50 mm lift	6,250	sq. m	$20.00	$125,000.00
		Roadway Overlay Paving (12.5 mm Aggregate) - 50 mm lift	10,000	sq. m	$20.00	$200,000.00
	E6-2: Service Roads					
		Roadway Paving (12.5 mm Aggregate) - Initial 50 mm lift	3,500	sq. m	$20.00	$70,000.00
		Roadway Paving (12.5 mm Aggregate) - Final 50 mm lift	3,500	sq. m	$20.00	$70,000.00
	E6-3: Asphalt Trails					
		Asphalt Trail Paving - Mix Type 5d (16mm Aggregate) - 50 mm lift	2,130	sq. m	$20.00	$42,600.00
		Subtotal Part E6:				**$734,232.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule E: Zone 3 - Highway 28 from 50 Street to North of Centre Avenue and Centre Avenue East and West of Hwy 28

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part E7:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	1,900	m	$30.00	$57,000.00
		Type 1-Thermoplastic Painted Pavement Markings, Intersection Guide Lines, 100mm Wide	60	m	$75.00	$4,500.00
		Type 1-Thermoplastic Pavement Markings, Stop Bars 300mm wide	20	m	$90.00	$1,800.00
		Type 1-Thermoplastic Cross Walk Lines, 200mm	80	m	$65.00	$5,200.00
		Type 1-Pavement Messages (Arrows)	8	Each	$525.00	$4,200.00
		Supply and Install New Roadway Signs	20	Each	$225.00	$4,500.00
		Subtotal Part E7:				**$77,200.00**
Part E8:	**Landscaping and Site Furnishings**					
		Tree Planting	25	each	$2,000.00	$50,000.00
		Soft-scaping (topsoil, seed)	7,800	sq. m	$15.00	$117,000.00
		Subtotal Part E8:				**$167,000.00**
Part E9:	**ectrical**					
		Supply and Install Streetlighting	1,000	lin. m	$100.00	$100,000.00
		Supply and Install Traffic Control, including davit bases, davit structures, ducting and traffic controller	1	each	$275,000.00	$275,000.00
		Subtotal Part E9:				**$375,000.00**
Part E10:	**Miscellaneous Work**					
		Hydrovac (Provisional)	30	hours	$400.00	$12,000.00
		Supply, Installation and Removal of Silt Fencing	2,500	lin. m	$15.00	$37,500.00
		Supply, Installation, Cleaning and Removal of Sediment Traps	8	each	$2,000.00	$16,000.00
		Subtotal Part E10:				**$65,500.00**
	Subtotal					**$4,974,632.50**
	Contingency				**20%**	**$994,926.50**
	Subtotal, including Contingency					**$5,969,559.00**
	Engineering Services				**10%**	**$596,955.90**
	Subtotal, including Contingency and Engineering Services					**$6,566,514.90**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$100,000.00	$100,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$6,666,514.90**
	SAY:					**$6,667,000.00**

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule F: Zone 4 - Highway 28 from North of Centre Avenue to 110 South of 54 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
Part F1:	**Contract Administration**					
		Mobilization/Demobilization	1	Lump sum	$455,500.00	$455,500.00
		Traffic Accommodation	1	Lump sum	$227,700.00	$227,700.00
		Design, Supply & Implementation of ECO Plan	1	Lump sum	$45,500.00	$45,500.00
		Subtotal Part F1:				**$728,700.00**
Part F2:	**Site Work Demolition and Removals**					
		Saw cutting asphaltic concrete pavement - various depths	900	lin. m	$30.00	$27,000.00
		Saw cutting Concrete curb and gutter	8	each	$60.00	$480.00
		Remove and dispose of Asphaltic Concrete Pavement, including existing asphalt trails	10,510	sq. m	$20.00	$210,200.00
		Asphaltic Concrete Pavement Milling - 50mm depth	3,870	sq. m	$15.00	$58,050.00
		Remove and dispose of concrete curb and gutter	3,520	lin. m	$30.00	$105,600.00
		Remove and dispose of Street Light Bases	15	each	$500.00	$7,500.00
		Remove and salvage existing Traffic Control Strucures	2	each	$50,000.00	$100,000.00
		Remove existing Signs and Posts	15	each	$200.00	$3,000.00
		Relocate existing boulevard trees	40	each	$200.00	$8,000.00
		Subtotal Part F2:				**$519,830.00**
Part F3:	**Storm Sewer Mains**					
		Catchbasin Assemblies, including frame and cover, side inlet, precast CB collar, and precast barrel c/w monolithic or separate base	10	each	$2,500.00	$25,000.00
		Catchbasin Leads c/w trench excavation, compaction, and backfill				
		250 mm P.V.C. "Ultra-rib"	250	lin. m	$100.00	$25,000.00
		Subtotal Part F3:				**$50,000.00**
Part F4:	**Roadway Base Construction**					
	F4-1: Hwy 28					
		Roadway Waste excavation - Haul off-site to approved disposal site	1,806	cu. m	$40.00	$72,240.00
		Subgrade preparation (300 mm depth)	2,258	sq. m	$8.00	$18,060.00
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	23	cu. m	$28.00	$632.10
		300 mm depth Granular Subbase (Pitrun Gravel)	3,010	sq. m	$35.00	$105,350.00
		100 mm depth Granular Base Course	3,010	sq. m	$20.00	$60,200.00
	F4-2: Service Roads					
		Roadway Waste excavation - Haul off-site to approved disposal site	5,445	cu. m	$40.00	$217,800.00
		Subgrade preparation (300 mm depth)	8,168	sq. m	$8.00	$65,340.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule F: Zone 4 - Highway 28 from North of Centre Avenue to 110 South of 54 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Remove unsuitable subgrade material and replace with 300 mm depth pitrun gravel backfill material	817	cu. m	$28.00	$22,869.00
		375 mm depth Granular Base Course	10,890	sq. m	$20.00	$217,800.00
	F4-3:	**Asphalt Trails**				
		Asphalt Trail Waste excavation - Haul off-site to approved disposal site		cu. m	$40.00	$0.00
		Subgrade preparation (150 mm depth)		sq. m	$4.00	$0.00
		200 mm depth Granular Base Course		sq. m	$20.00	$0.00
		Subtotal Part F4:				**$780,291.10**
Part F5:	**Concrete Work, Concrete Pavers and Interlocking Retaining Wall Systems**					
		1.5 m Monolithic Curb, Gutter and Sidewalk	1,210	lin. m	$175.00	$211,750.00
		250 mm Standard or Reversed Curb and Gutter	1,210	lin. m	$140.00	$169,400.00
		Stamped and Colored Concrete Cap for Islands and Medians	1,840	sq. m	$250.00	$460,000.00
		Subtotal Part F5:				**$841,150.00**
Part F6:	**Asphaltic Concrete Paving**					
		Prime coat	11,830	sq. m	$1.50	$17,745.00
		Tack coat	16,130	sq. m	$0.90	$14,517.00
	F6-1:	**Hwy 28**				
		Hot Mix Asphaltic Concrete Pavement				
		Roadway Paving (16mm Aggregate) - 75 mm lift	2,580	sq. m	$30.00	$77,400.00
		Roadway Paving (12.5 mm Aggregate) - 50 mm lift	2,580	sq. m	$20.00	$51,600.00
		Roadway Overlay Paving (12.5 mm Aggregate) - 50 mm lift	3,870	sq. m	$20.00	$77,400.00
	F6-2:	**Service Roads**				
		Roadway Paving (12.5 mm Aggregate) - Initial 50 mm lift	9,680	sq. m	$20.00	$193,600.00
		Roadway Paving (12.5 mm Aggregate) - Final 50 mm lift	9,680	sq. m	$20.00	$193,600.00
	F6-3:	**Asphalt Trails**				
		Asphalt Trail Paving - Mix Type 5d (16mm Aggregate) - 50 mm lift		sq. m	$20.00	$0.00
		Subtotal Part F6:				**$625,862.00**
Part F7:	**Pavement Marking and Signage**					
		Type 1-Thermoplastic Painted Pavement Markings, Solid or Dashed Lines, 100mm Wide	1,010	m	$30.00	$30,300.00
		Type 1-Thermoplastic Pavement Markings, Stop Bars 300mm wide	30	m	$90.00	$2,700.00
		Type 1-Thermoplastic Cross Walk Lines, 200mm	100	m	$65.00	$6,500.00

HIGHWAY 28 IMPROVEMENTS - CONSTRUCTION OPINION OF PROBABLE COSTS

Schedule F: Zone 4 - Highway 28 from North of Centre Avenue to 110 South of 54 Street

Item	Section Number	Item of Work	Estimated Quantity	Unit	Unit Price	Total
		Type 1-Pavement Messages (Arrows)	6	Each	$525.00	$3,150.00
		Supply and Install New Roadway Signs	15	Each	$225.00	$3,375.00
		Subtotal Part F7:				**$46,025.00**
Part F8:	**Landscaping and Site Furnishings**					
		Tree Planting	40	each	$2,000.00	$80,000.00
		Soft-scaping (topsoil, seed)	14,520	sq. m	$15.00	$217,800.00
		Subtotal Part F8:				**$297,800.00**
Part F9:	**lectrical**					
		Supply and Install Streetlighting	1,640	lin. m	$100.00	$164,000.00
		Supply and Install Traffic Control, including davit bases, davit structures, ducting and traffic controller	1	each	$275,000.00	$275,000.00
		Supply and Install Traffic Control (Emegency only), including davit bases, davit structures, ducting and traffic controller	1	each	$150,000.00	$150,000.00
		Subtotal Part F9:				**$589,000.00**
Part F10:	**Miscellaneous Work**					
		Hydrovac (Provisional)	15	hours	$400.00	$6,000.00
		Supply, Installation and Removal of Silt Fencing	1,300	lin. m	$15.00	$19,500.00
		Supply, Installation, Cleaning and Removal of Sediment Traps	10	each	$2,000.00	$20,000.00
		Subtotal Part F10:				**$45,500.00**
	Subtotal					**$4,524,158.10**
	Contingency				**20%**	**$904,831.62**
	Subtotal, including Contingency					**$5,428,989.72**
	Engineering Services				**10%**	**$542,898.97**
	Subtotal, including Contingency and Engineering Services					**$5,971,888.69**
Work By Others						
		Prime Cost Sum, Utility Companies Miscellanous Tasks	1	lump sum	$100,000.00	$100,000.00
	TOTAL OPINION OF PROBABLE COSTS					**$6,071,888.69**
	SAY:					**$6,072,000.00**