City of Cold Lake
Highway 28 Functional Design

FINAL REPORT

Volume 1 of 2

Prepared for:
City of Cold Lake

Prepared by:
Stantec Consulting Ltd.

December 9, 2015

Sign-off Sheet

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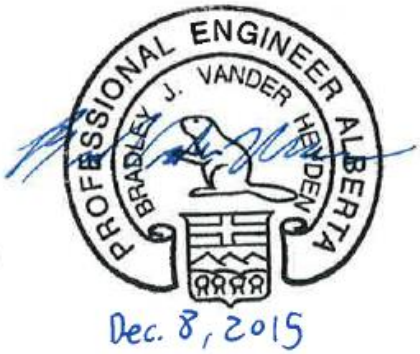

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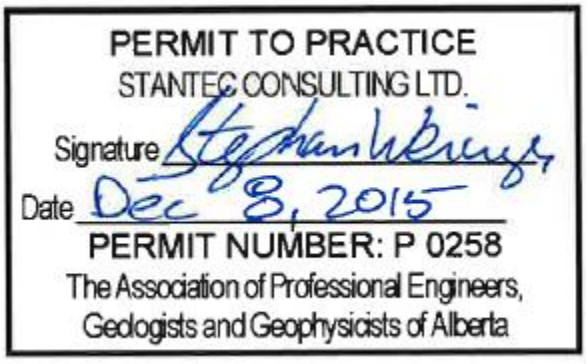

Corporate Permit to Practice

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Executive Summary

The City of Cold Lake retained the services of Stantec Consulting Ltd. to complete a functional design review of Highway 28 from Township Road 624 (South City Limit) to 54 Avenue. This design review will set forth a basis for future detailed design and construction staging of Highway 28. The Highway 28 corridor from the South City Limit to 54 Avenue is, and will continue to be, one of the most economically and socially significant roadways within the City of Cold Lake. The objectives of this project included, but were not limited to assessing and modeling existing and future traffic volumes, completing geometric roadway assessments, reviewing existing and future land use plans, developing access management options, deep utility planning, completing historical and environmental assessments, determining future right-of-way and land acquisition requirements, presenting and gathering feedback from relevant stakeholders and the general public, and preparing order of magnitude opinions of probable costs. These objectives aided Stantec and the City in developing a plan that addressed the short and long term roadway issues within the study limits by improving safety, traffic flow, and operational efficiency for current and future conditions.

In assessing the existing conditions of the project, Stantec completed a review of available as-built data, outline plans, legal cadastrals, aerial photography, digital base maps, and utility plan information. In general, it was determined that the project area could be broken down into four separate “zones”, each with their own unique characteristics. A brief description of the existing roadway conditions and utilities within these zones is described in Section 2.0. As part of the existing conditions review process, Stantec also reviewed safety information including collision history and operational issues identified in the Transportation Master Plan completed by Associated Engineering in 2010.

The design criteria for Highway 28 is based on the City of Cold Lake Municipal Engineering Standards and Standard Construction Specifications and supplemented with Transportation Association of Canada (TAC) standards. The majority of the Highway 28 corridor within the project limits will ultimately be classified as an urban arterial divided roadway with a design speed of 70 km/h. Roadway classifications, intersection spacing, traffic volumes, horizontal and vertical alignments, design vehicles, cross-section elements, and access management criteria were assessed and are described in detail in Section 3.0 of this report.

Stantec has completed a historical resource review for the project area by preparing a statement of justification (SoJ). The objective of the SoJ was to inform the City of Cold Lake of historic resources that are protected under the provisions of the Alberta Historical Resources Act. For results and recommendations from this review, refer to Section 4.0.

Nichols Environmental (Canada) Ltd., Stantec’s environmental subconsultant for this project, completed a Limited Phase 1 Environmental Site Assessment (ESA) for Highway 28 from Township Road 624 to 54 Avenue. The purpose of the Phase 1 ESA was to identify and assess at a high level the existing and potential site contamination. Results and recommendations from this assessment are described in Section 5.0.

Traffic analyses were completed for five key intersections along Highway 28, including 43 Avenue, 50 Street, Centre Avenue, 52 Avenue, and 54 Avenue. The ultimate design horizon for this project is the 20 year horizon. Stantec generated traffic volumes based on the City's Transportation Study as well as the existing 2010 traffic counts supplied by the City. Synchro and Sim Traffic software was used to assess the capacity and queuing of the intersections as well as the Volume to Capacity (V/C) ratio and Levels of Service (LOS). Two alternatives were analyzed which included an Auxiliary Lane Alternative (Preferred Plan) and a Service Road Alternative. The differences between these alternatives affected only the southern two intersections (50 Street and 43 Avenue). Traffic modeling results are shown in Figures 6.2 A and 6.2B. A summary of the Synchro results along with Outputs from Synchro/Sim Traffic are attached in Appendix D.

Currently, Highway 28 is designed with commercial and residential development constructed along a service road configuration where accesses to the development primarily provided by the service roads. One of the greatest concerns with the operation of the study area is the lack of spacing between the service road intersections with Highway 28 intersections at cross streets. To improve this operational condition, two basic concepts were developed - the Auxiliary Lane Alternative (Preferred Plan) and the Service Road Alternative. These plans are described in detail in Section 7.0. During the functional design process, including public consultation, various workshops and council presentations, auxiliary lanes were presented and recommended as the ultimate alternative to eliminate the existing service roads. The existing service roads, which parallel the existing Highway 28 lanes currently operate at a reasonable level of service, however as traffic volumes increase on Highway 28, the existing parallel service roads become undesirable due to the lack of sufficient bulbing, the increased conflict points, decision-making factors and resulting reduced driver sightlines. The final Functional Design, which is shown in Figures 7.1A to 7.1G, illustrates the implementation of the Auxiliary Lane Alternative along "Zone 2", which extends from 34 Avenue to 50 Street. These auxiliary lanes would be able to allow frequent access to adjacent land uses and are also seen as a safer method to accommodate traffic in and out of various developments. An in depth description of both alternatives, as well as their corresponding cross sections and intersection configurations, is provided in Section 7.2 to 7.4. To supplement the intersection configuration designs, turning movement diagrams have been provided for the key intersections along Highway 28 and are shown in Figures 7.3A to 7.3I.

As per the Municipal Development Plan (MDP), the City has a vision of encouraging the development of trails for pedestrians and bicyclists as a healthier and more sustainable mode of transportation. Policy 8.5 (Highway 28 Commercial Corridors) states the importance of having a pedestrian friendly environment along Highway 28 since it is planned to be the primary arterial commercial area in the City of Cold Lake. As such, the Millennium Trail Alignment has been maintained in both alternatives.

According to the MDP and available Area Structure Plans, there will be extensive future development south of 48 Avenue in Cold Lake South. This includes, but is not limited to, Fisher Estates, Iron Horse, SouthEast and Golden Eagle Estates. Within these areas, there will be expansion of arterial commercial, low density residential, high density residential and public services developments. Further south of these four main areas (south of 34 Avenue), there will be additional commercial arterial, industrial and public services land developed. In conjunction with the Master Drainage Plan (UMA/AECOM, August 2006), the Water Distribution System Modelling and Assessment (AECOM, December 2009), and the

Wastewater System Modelling Assessment (AECOM, December 2009) Section 7.6 summarizes the long term utility servicing and storm drainage requirements for existing and future growth areas.

Over the length of the project, the Highway 28 corridor is located within six major storm basins. In the 2006 City of Cold Lake Master Drainage Plan, these basins were analyzed in detail and several recommendations were made. The general recommendation was to create a Storm Water Management Facility (SWMF) in each basin and abandon the existing ditch system which interferes with future land development. Figure 7.5 illustrates the Overall Storm Drainage Concept, which includes the proposed basin boundaries and storm management facilities. A description of the major storm system is provided in Section 7.7.

The ultimate preferred plan for the Highway 28 upgrade will require approximately 3.7 Hectares of land acquisition to accommodate right-of-way requirements. Details of the land acquisition requirements for each land parcel are shown in the Land Acquisition drawings (Figures 8.1A to 8.1H) and are summarized in a table in Section 8.0 of this report.

As part of this project, two public open houses were facilitated to present the functional design alternatives (Open House #1) and a further refined plan (Open House #2) to the public and gather input and feedback to incorporate into the design. Summaries of each of the open houses are provided in the Section 9.0. Comment forms and attendance lists were utilized to formally document all comments and feedback received as part of the consultation process; these are included in a separate document which can be requested by the City for reference. Two memorandums were issued to summarize the questions, comments, and recommendations received from the public; these are available in the appendices.

An Opinion of Probable Cost was prepared for the ultimate preferred plan and is based on current industry construction pricing and estimated quantities for the configurations shown in figures 7.1A to 7.1G and as detailed in Appendix G. The associated costs include a 30% allowance for contingency and professional services. The costs sum to a total of approximately $45.3M and exclude land costs. The costs should be updated in the future, as required, to incorporate phasing considerations and pricing trends.

1.0 Introduction

The City of Cold Lake retained the services of Stantec Consulting Ltd. to complete a functional design review of Highway 28 from 54 Avenue to the South City Limit. This design review will set forth a basis for future detailed design and construction staging of Highway 28.

The Highway 28 corridor from the South City Limit to 54 Avenue is, and will continue to be, one of the most economically and socially significant roadways within the City of Cold Lake. As such, the purpose of this review is to develop a plan that addresses the short and long term issues of the roadway.

1.1 BACKGROUND

Over the last 15 years, the City of Cold Lake has experienced rapid population growth due to the strong economic conditions encountered throughout Alberta. The City's population is projected to continue to grow at an aggressive pace and could potentially reach a population of 30,000 people by 2037. Land development and upgrades to the City's existing infrastructure will be required to accommodate the future population.

The City of Cold Lake contains a multitude of land uses including commercial, residential, educational, recreational and industrial developments that are currently in place. According to the City of Cold Lake Municipal Development Plan (MDP), there will be a significant amount of expansion of these development types, especially in the southern region. The continuous population and economic growth in the City of Cold Lake has resulted in, and will continue to result in, increased traffic volumes.

1.2 PROJECT AREA

This functional design includes the portion of Highway 28 extending from 54 Avenue to Township Road 624 (South City Limit). Figure 1.1, included at the end of this section, illustrates the project area.

1.3 PROJECT OBJECTIVES

Following are the key project objectives:

- Develop a plan that addresses the short and long term roadway issues within the study limits by improving safety, traffic flow and operational efficiency for current and future conditions;
- Complete geometric assessments and capacity analysis at key intersections utilizing the Transportation Study traffic volumes and provide recommendations for improvements;
- Develop reasonable access management options balanced with safety and improved traffic flow;
- Deep utility planning;
- Complete historical and environmental assessment; and
- Identify future right-of-way requirements.

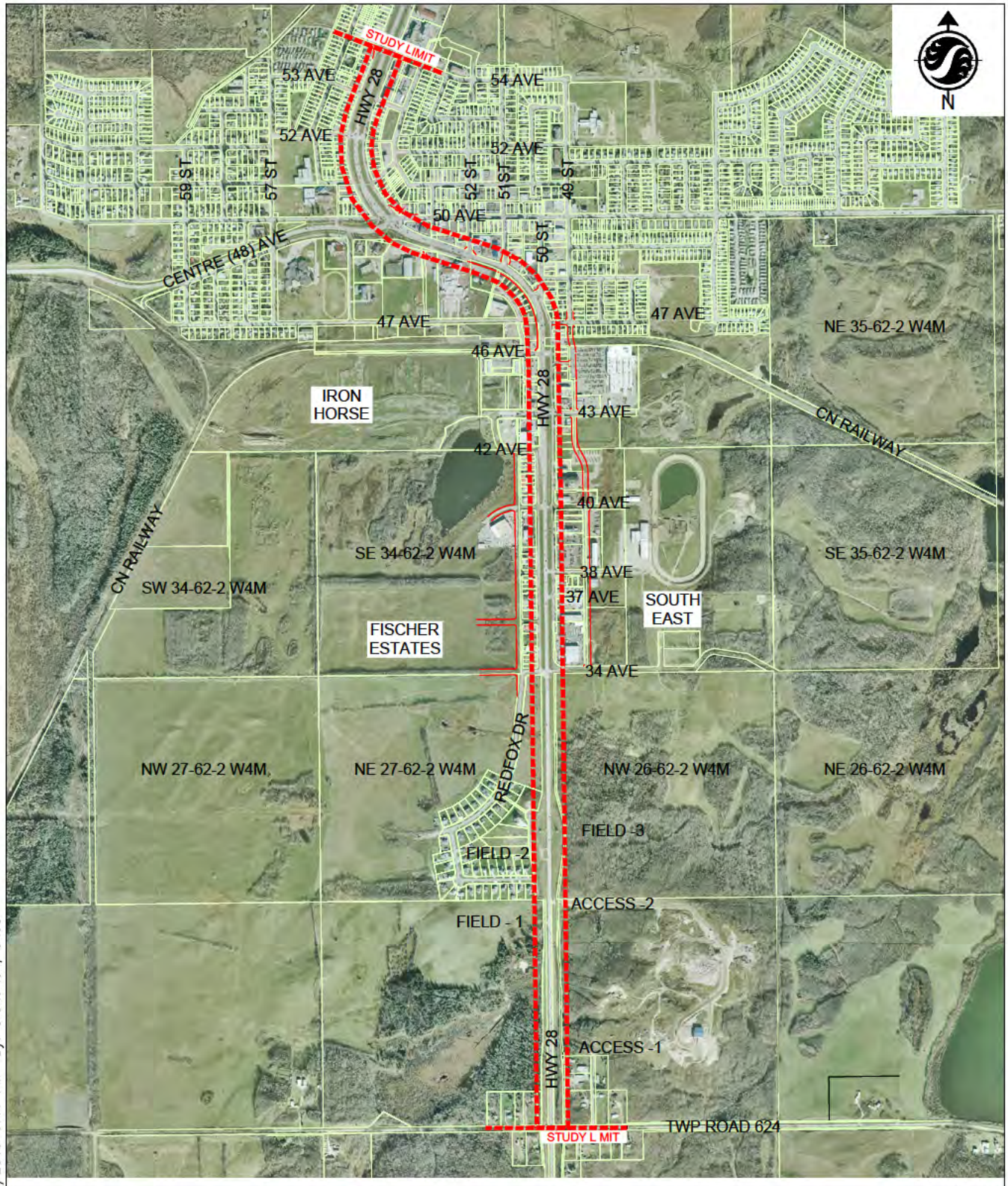
1.4 RELEVANT STUDIES COMPLETED

In order to familiarize ourselves with the project, Stantec has reviewed the following:

- City of Cold Lake Intermunicipal Servicing Plan (Stantec Consulting Ltd., July 2012);
- Cold Lake Transportation Study (Associated Engineering, 2010);
- Water Distribution System Modelling and Assessment (AECOM, December 2009);
- Wastewater System Modelling and Assessment (AECOM, December 2009);
- City of Cold Lake Municipal Engineering Servicing Standards and Standard Construction Specifications (City of Cold Lake, January 2008);
- Municipal Development Plan 2007 – 2037 (City of Cold Lake, August 2007);
- Master Drainage Plan (UMA/AECOM, August 2006);
- Iron Horse Subdivision Area Structure Plan (SE Design and Consulting Inc., July 4 2005);
- Fischer Estates Area Structure Plan, Bylaw #144-LU-03 (Scheffer Andrew Ltd., March 2003);
- Golden Eagle Estates Area Structure Plan, Bylaw #136-LU-02 (Scheffer Andrew Ltd. December 2002);
- Functional Planning Report for the Urbanization of Highway 28 in the Town of Cold Lake (UMA Engineering Ltd., December 1993);
- Town of Grand Centre Southeast Area Structure Plan, Bylaw #89-676 (Town of Grand Centre Municipal Planning Commission and Planning Services Division, Alberta Municipal Affairs, 1989);
- Land title certificates.

1.5 OTHER RELEVANT PROJECTS IN PROGRESS

- Design of Waste Transfer Station Access Road intersection improvements



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Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
1.1

Title
STUDY LIMITS
CITY OF COLD LAKE

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City of Cold Lake

2.0 Existing Conditions and Safety Considerations

This section describes, in detail, a review of the existing conditions, including a review of all as-built data, outline plans, legal cadastrals, aerial photography, digital base maps, and utility plan information.

The following items have been included in preparation of the existing conditions review process and are discussed in detail in the subsections below:

- Existing Roadway Conditions; and
- Existing Utilities.

As part of the existing conditions review process, Stantec reviewed safety information including collision history and operational issues identified in the Transportation Master Plan completed by Associated Engineering in 2010.

2.1 EXISTING ROADWAY CONDITIONS

In general, the project area can be broken down into four separate "zones", each with their own unique characteristics:

- Zone 1 – Township Road 624/South City Limit to 34 Avenue (Station 0+240 to Station 1+870)
- Zone 2 – 34 Avenue to 50 Street (Station 1+870 to 3+200)
- Zone 3 – 50 Street to 51 Avenue (Station 3+200 to 3+980)
- Zone 4 – 51 Avenue to 54 Avenue (Station 3+980 to 4+460)

A brief description of each zone is outlined below. Table 2.1 summarizes existing conditions of the four zones.

2.1.1 Zone 1

Zone 1 is a two-lane undivided rural roadway with a posted speed limit of 100 km/hr. There is currently a transition of posted speed to 70 km/hr between the Waste Transfer Station Access and 34 Avenue. Although there is little existing development south of 34 Avenue, there are future City plans for residential, commercial and industrial land uses surrounding Highway 28.

There are two unsignalized intersections located between 34 Avenue and Township Road 624. The Waste Transfer Station Access Road intersection, located approximately 800 metres south of 34 Avenue, will be widened in the future as part of the City of Cold Street Improvement Program. The other intersection, located approximately 300 metres north of Township Road 624, also provides access to the waste transfer station. Zone 1 currently provides access to the Waste Transfer Station via the two unsignalized intersections.

2.1.2 Zone 2

Zone 2 consists of a two-lane undivided rural roadway with a posted speed limit of 50km/hr and a four-lane divided arterial roadway with a posted speed limit of 50 km/hr. There is also a 130 m transition zone from rural conditions (two-lane undivided roadway with roadside ditches) to urban conditions (four-lane

divided roadway with curb and gutter). The majority of the existing development in this zone is arterial commercial; however there are extensive plans for low and medium density residential developments as well as public services.

The 34 Avenue / Highway 28 intersection is currently unsignalized and provides access to the west service road. The Municipal Development Plan proposes 34 Avenue as a future arterial roadway and dangerous goods route. 43 Avenue and 50 Street are currently the only signalized intersections within the Zone 2 limits. Eastbound and westbound left turning movements are prohibited at 46 Avenue and 42 Avenue respectively.

The spacing of intersections along a road has a significant impact on the operation, level of service, and capacity of the roadway. For new arterial roadways, TAC recommends a minimum intersection spacing of 400 metres. In areas where there is intense existing development, 200 metre spacing is typically considered acceptable. Table 2.2 shows the existing intersection spacings along Highway 28. There is currently an intersection spacing of 90 metres between 37 Avenue and 38 Avenue.

Currently, vehicles generally access adjacent businesses on the two-way service roads via 50 Street, 46 Avenue, 43 Avenue, 40 Avenue, 32 Avenue, 37 Avenue, and 34 Avenue. A continuous auxiliary lane exists from 46 Avenue to 42 Avenue in the southbound direction, and provides access to businesses directly off Highway 28 such as the Brick, McDonalds, Shell, Boston Pizza, Western Budget Motel and Fas Gas.

2.1.3 Zone 3

Zone 3 is a four-lane divided and undivided arterial roadway with a posted speed limit of 50 km/hr. Most of the land use within this segment has already been developed.

Zone 3 contains a section of 22 metre right-of-way and the lowest intersection spacings within the project limits. As discussed in Section 2.1.2, intersection spacing has a significant impact on the operation, level of service and capacity of the roadway. Currently, Zone 3 contains two intersections with intersection spacings below 200 meters. Refer to Table 2.2 for existing intersection spacing along Highway 28.

Centre Avenue is currently the only signalized intersection within the Zone 3 limits. Traveling east on Centre Avenue (also known as 50 Avenue) leads to the Central Business District of Cold Lake South while traveling west on Centre Avenue (also known as 48 Avenue) leads to the Canadian Forces Base. The current skew angle at the Centre Avenue / Highway 28 intersection, is under 70°. TAC Geometric Design Guide for Canadian Roads does not recommend intersection angles less than 70° or greater than 110°. The City of Cold Lake Municipal Engineering Servicing Standards specifies a minimum intersection angle of 75°.

Currently, there are obstructions well within the clear zone along the Lake City Motor Products and Best Western property lines. The clear zone is defined as the minimum recovery area which should be provided for a given design situation. This recovery zone should be free from obstacles that may cause serious collisions.

Zone 3 contains a small section of service road that provides access to a few developments including the church and Assumption Junior / Senior High School. Access to businesses within the downtown area is provided via 51 Street, 52 Street, 53 Street, and Centre Avenue. Direct access is restricted except for the access immediately north of the school.

2.1.4 Zone 4

Similarly to Zone 3, Zone 4 has portions of four-lane divided and undivided arterial roadway cross-sections with a posted speed limit of 50 km/hr. Most of the land use within this segment has already been developed.

There is only one signalized intersection (54 Avenue) within Zone 4. This intersection has been recently upgraded during the Highway 28 Twinning project in 2010.

Similarly to Zone 2, vehicles generally access adjacent businesses and residential developments on the two-way service roads via 51 Avenue, 52 Avenue, and 54 Avenue.

Table 2.1 Highway 28 Existing Conditions

Parameter	Existing Conditions			
Zone	1	2	3	4
South Limit	Township Road 624	34 Avenue	50 Street	51 Avenue
North Limit	34 Avenue	50 Street	51 Avenue	54 Avenue
Road Classification	RAU-110	UAD-60	UAD-60	UAD-60
ROW Width (m)	126	47 to 75	22 to 47	70 to 71
Posted Speed (km/h)	100	50 to 70	50	50
Lane Widths (m)	3.70	3.70	3.05 to 3.40	3.20 to 3.70
Maximum Median Width (m)	N/A	1.45 in areas that contain medians	4.25 in areas that contain medians	3.52 in areas that contain medians
Grade Limits (%)	-4.1 to 3.4	-1.1 to 0.5	-1.2 to 0.6	-1.2 to 0.8
Crest Ver. Curves (K)	75	300	N/A	36
Sag Ver. Curves (K)	60 - 75	N/A	N/A	110
Super Elevation (%)	N/A	N/A	3.3	1.5
Hor. Curve Radius (m)	N/A	N/A	274	350

Table 2.2 - Intersection Spacing

Intersections	Zone	Intersection Spacing (m)
Township Road 624 to Access Road 1	Zone 1	310
Access Road 1 to Access Road 2		425
Access Road 2 to 34 Avenue		820
34 Avenue to 37 Avenue	Zone 2	265
37 Avenue to 38 Avenue		90
38 Avenue to 40 Avenue		230
40 Avenue to 43 Avenue *		335
43 Avenue * to 46 Avenue		210
46 Avenue to 50 Street *		210
50 Street * to 51 Street	Zone 3	150
51 Street to 52 Street		125
52 Street to Centre Avenue*		310
Centre Avenue* to 52 Avenue		340
52 Avenue to 54 Avenue *	Zone 4	315

* Represents signalized intersections along Highway 28.

2.2 EXISTING PAVEMENT STRUCTURE

The assumed pavement structure for Highway 28, major intersections, cross-streets, and service roads will be as per the Highway 28 Functional Planning Report Study completed by UMA/AECOM in 2007. This pavement structure is outlined in Tables 2.3 below.

Table 2.3 – Assumed Pavement Structure for Highway 28, Major Intersections, Cross-Streets, and Service Roads

Description	Asphaltic Concrete Pavement (mm)	Crushed Granular Base Course (mm)	75 mm Minus Pit-Run Gravel (mm)	Subgrade Preparation (mm)
Highway 28, Major Intersections, and Cross-Streets	125	100	300	300
Service Roads	100	375	-	300

2.3 SAFETY CONSIDERATIONS

As part of this functional design, Stantec reviewed the safety information provided in the Transportation Master Plan completed by Associated Engineering. This included an analysis of collision history and operational issues along Highway 28.

2.3.1 Collision History

As part of the City of Cold Lake 2010 Transportation Study, Associated Engineering reviewed collision data from 2005 to 2009, which included several intersections within the project limits. This included review of the collision frequency, collision type and possible causes that led to the collisions. Stantec has reviewed the information and addressed the safety issues identified in the Transportation Study in the proposed design. The full document can be found in Appendix B of the Transportation Master Plan.

2.3.2 Operational Issues

As part of the Cold Lake Transportation Study, Associated Engineering performed a traffic operational analysis of several intersections along the Highway 28 corridor. This included review of the operational efficiency of all major intersections within the project area since it can directly impact the risk of collisions. Stantec has reviewed the information and addressed the safety issues identified in the Transportation Study in the proposed design. The full document can be found in Appendix A of the Transportation Master Plan.

2.4 EXISTING UTILITIES

There are numerous City owned and privately owned utilities along or within the vicinity of the Highway 28 corridor, including water mains, sanitary sewer, storm sewer, ATCO Electric, ATCO Gas, TELUS and Alberta SuperNet. A plan view of these utilities is shown in the Existing Utility Alignments Drawings (Figures 2.3A through 2.3G).

All existing utility information is based on information provided by the respective owners. The accuracy of the utility locations is limited to what was available digitally and as such, the alignments are conceptual only. All utilities should be located in the field in the future design phases of the project.

2.4.1 Deep Utilities

A) Water Mains

There are several existing water main lines running in the vicinity of the right-of-way area from 40 Avenue to 54 Avenue (Zone 2 to Zone 4). The most notable lines are the 300mm and 400mm water mains that cross Highway 28 as well as a 150m long 400mm trunk that runs along the east service road.

B) Storm Sewer

There are several storm sewer lines running in the vicinity of the right-of-way area from 40 Avenue to 54 Avenue (Zone 2 to Zone 4). These storm sewer lines run along the east and west boulevards. There are several lines crossing Highway 28 including at the 43 Avenue, Centre Avenue, and 54 Avenue intersections.

C) Sanitary Sewer

Sanitary sewer exists within the right-of-way from 40 Avenue to 54 Avenue (Zone 2 to Zone 4). There are several sanitary sewer lines crossing Highway 28, as well as running along the boulevards and service roads adjacent to the Highway 28.

2.4.2 Shallow Utilities

A) ATCO Gas

ATCO Gas has lines in the vicinity of the right-of-way area from 34 Avenue to 54 Avenue (Zone 2 to Zone 4). This includes the west service road, east and west property lines, and several crossings underneath Highway 28.

B) ATCO Electric

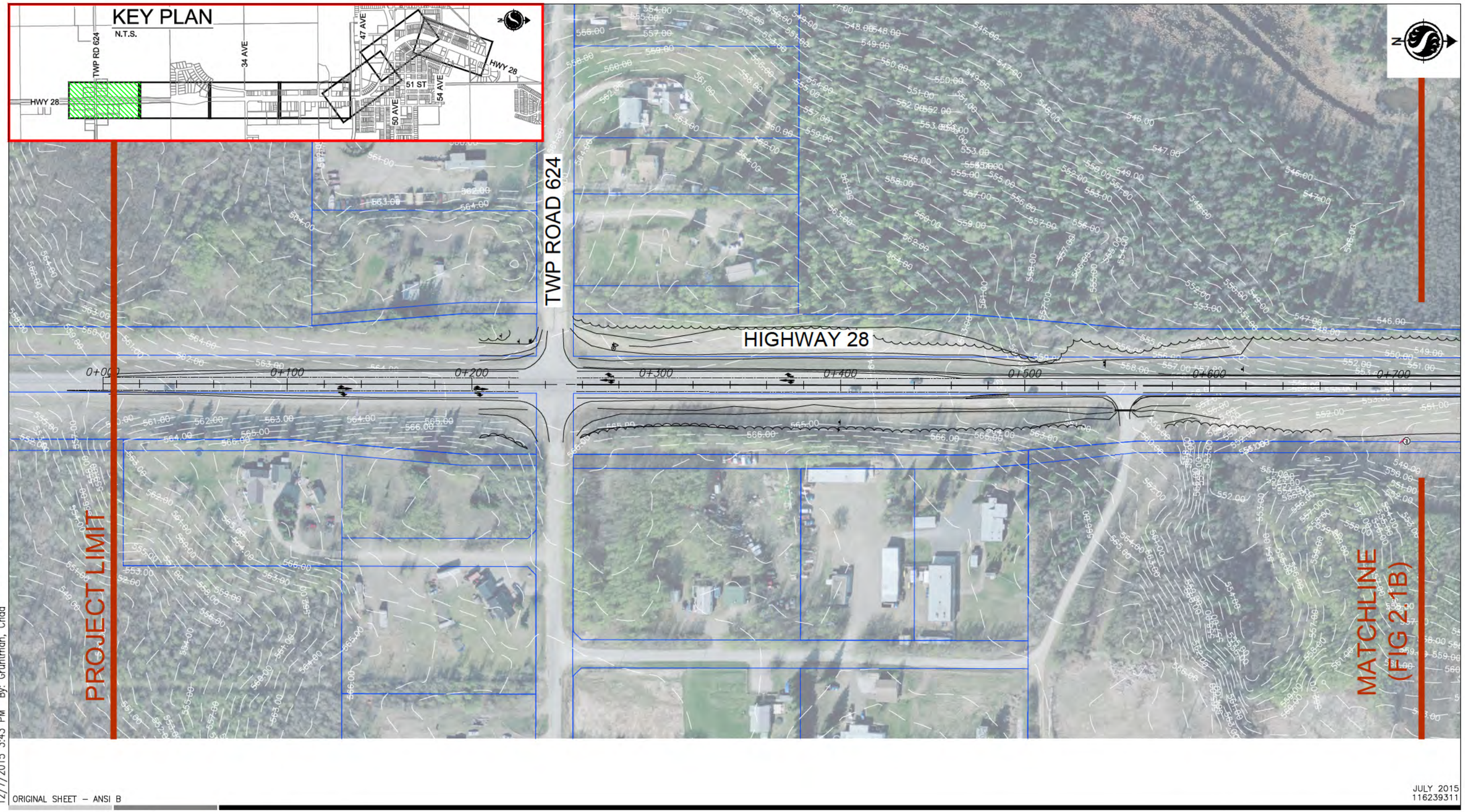
There are several underground and overhead power lines that are within the right-of-way area between Township Road 624 and 34 Avenue (Zone 1 to Zone 4).

C) TELUS

There are several existing buried TELUS lines that run along the boulevards, service roads, and property lines along Highway 28 from Township Road 624 to 54 Avenue (Zone 1 to Zone 4). There are many locations in which the lines cross Highway 28, the service roads, and roadways that intersect with Highway 28.

D) Alberta SuperNet

There are numerous Alberta SuperNet lines that run along the east property line, east boulevard, and west boulevard along Highway 28 from Township Road 624 to 54 Avenue (Zone 1 to Zone 4).



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- EXISTING LANES
- EXISTING CURBLINE
- EXISTING STREET LIGHTS
- EXISTING MILLENNIUM TRAIL
- EXISTING SIDEWALK ROUTES
- SIGN POST
- (PP) EXISTING POWERPOLE

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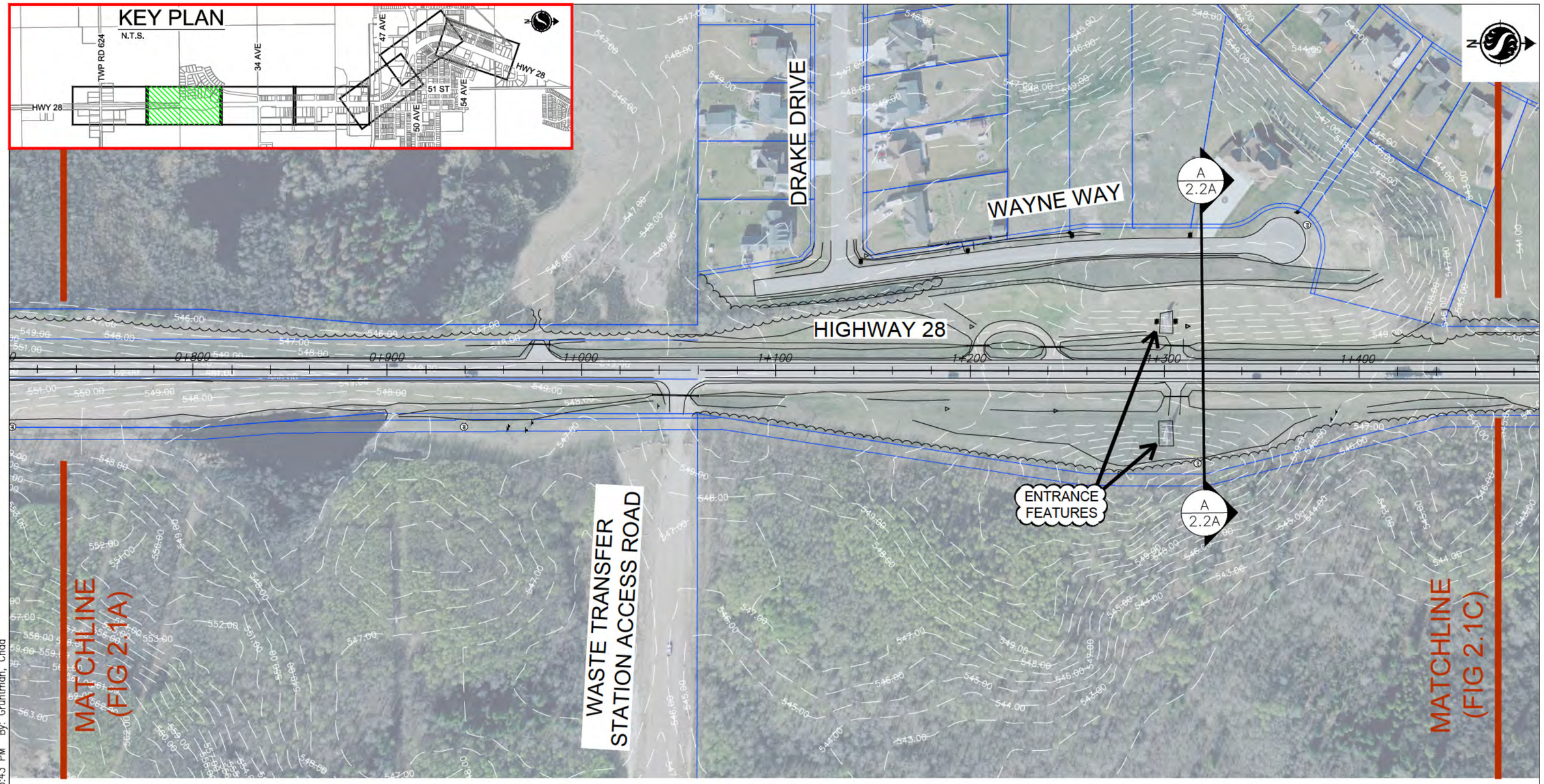
Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1A

Title
EXISTING ROADWAY
ZONE 1



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- SIGN POST
- (PP) EXISTING POWERPOLE

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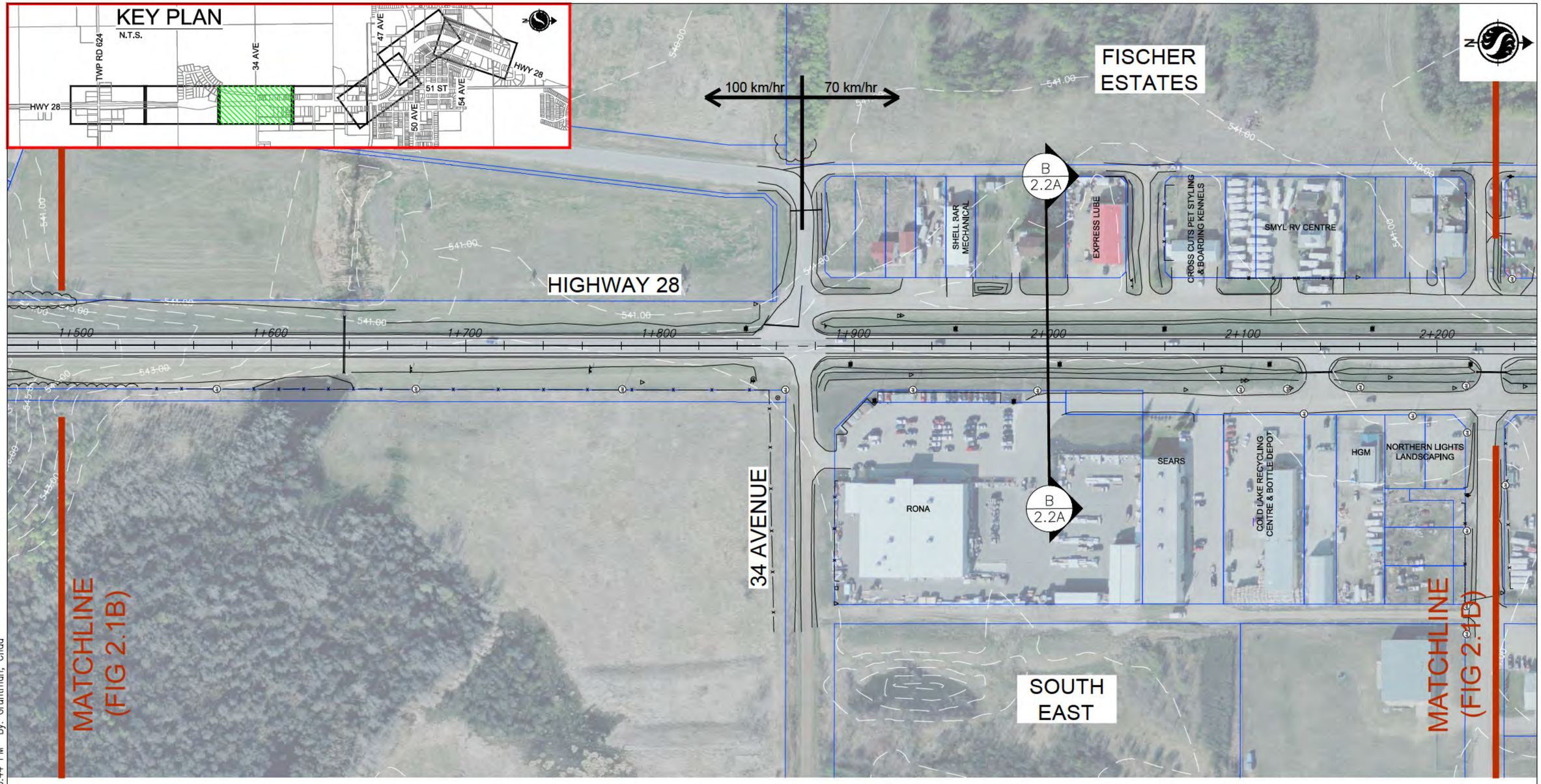
0 20 60 100m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1B

Title
EXISTING ROADWAY
ZONE 1



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- EXISTING MILLENNIUM TRAIL
- EXISTING SIDEWALK ROUTES
- SIGN POST
- (PP) EXISTING POWERPOLE

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0 20 60 100m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1C

Title
EXISTING ROADWAY
ZONE 1 & ZONE 2

KEY PLAN
N.T.S.

TWP RD 624
34 AVE
47 AVE
HWY 28
51 ST
50 AVE
54 AVE

FISCHER ESTATES

IRON HORSE

INADEQUATE TRANSITION

INADEQUATE INTERSECTION SPACING

42 AVENUE

C 2.2A

NAPA AUTO PARTS
KIA
PAWN SHOP
HONDA
THE BRICK
MCDONALDS
SHELL
BOSTON PIZZA
WESTERN BUDGET MOTEL

2+300 2+400 2+500 2+600 2+700 2+800 2+900 3+000

HIGHWAY 28

COLD LAKE FORD
NATIONAL OIL WELL
RAMADA
INFORMATION CENTRE
HUMPTY'S
TIM HORTONS
EASYHOME / REITMANS
LUBE X

40 AVENUE

70 km/hr
50 km/hr

43 AVENUE

MATCHLINE (FIG 2.1C)

MATCHLINE (FIG 2.1E)

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- EXISTING SIDEWALK ROUTES
- SIGN POST
- (PP) EXISTING POWERPOLE

Stantec

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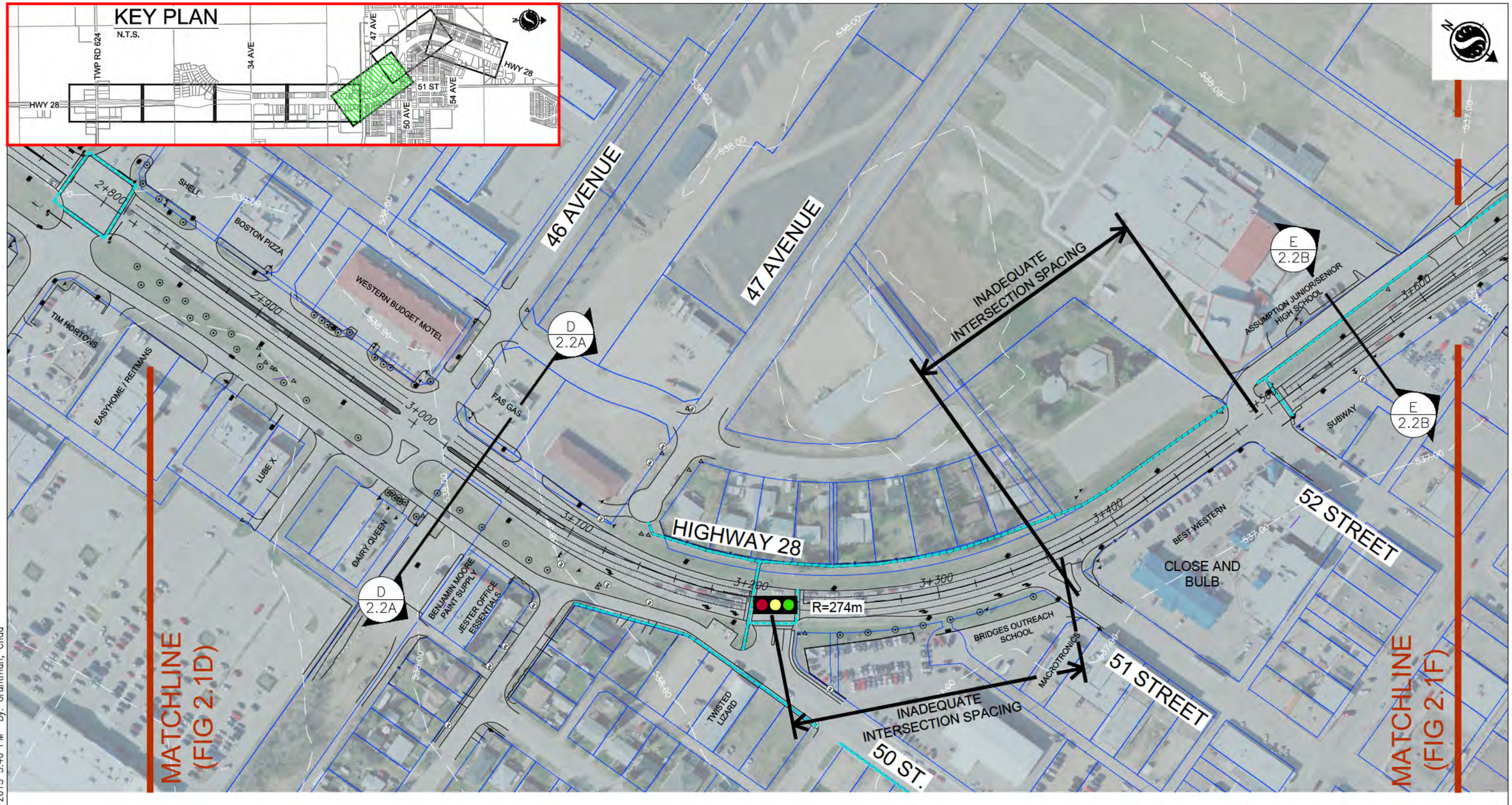
City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1D

Title
EXISTING ROADWAY
ZONE 2



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12/7/2015 3:46 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- EXISTING LANES
- EXISTING CURBLINE
- EXISTING STREET LIGHTS
- EXISTING MILLENNIUM TRAIL
- EXISTING SIDEWALK ROUTES
- SIGN POST
- (PP) EXISTING POWERPOLE

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0 20 60 100m

City of Cold Lake

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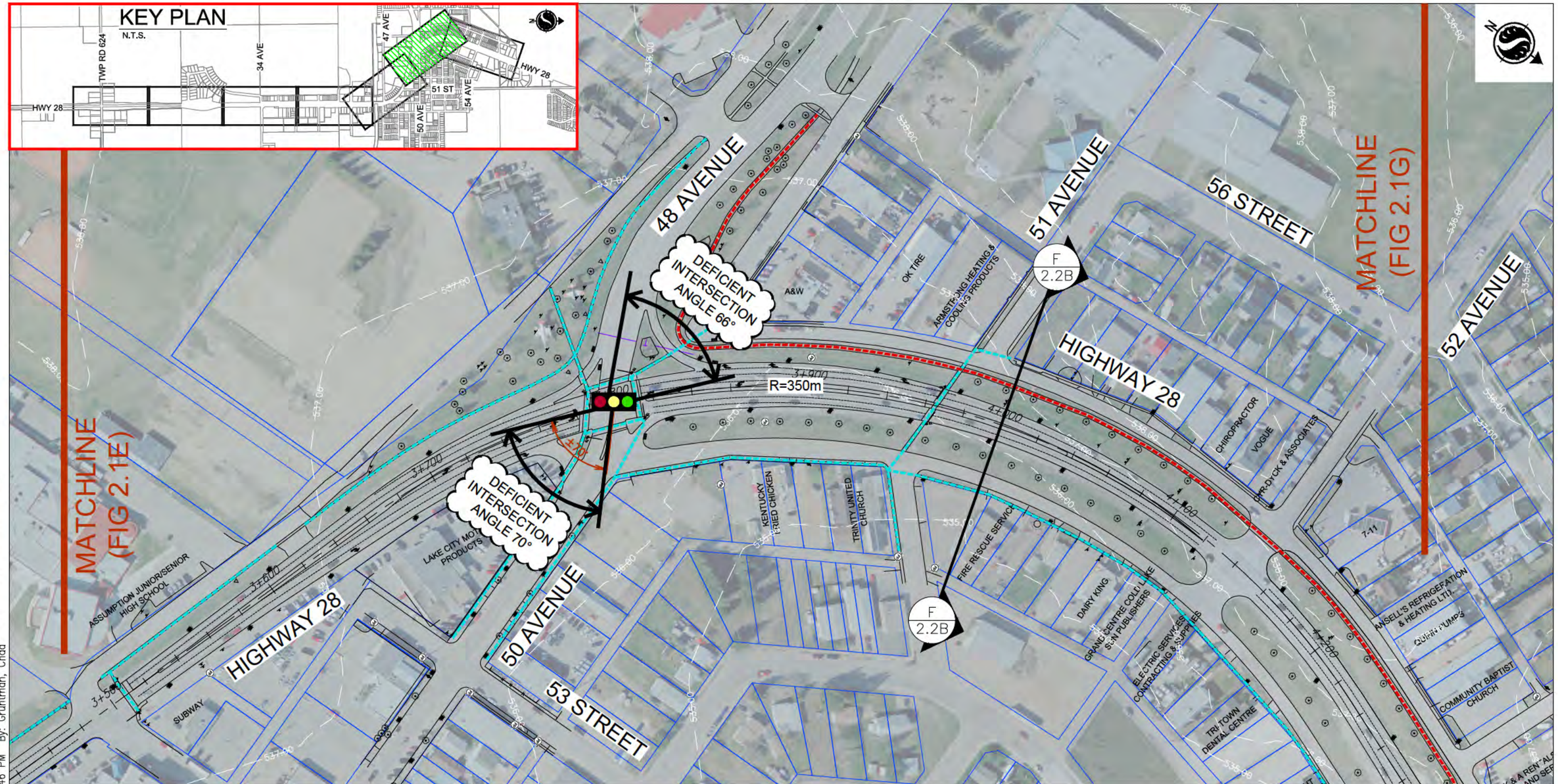
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1E

Title
EXISTING ROADWAY
ZONE 2 & ZONE 3



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12/7/2015 3:46 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

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Legend

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Stantec

0 20 60 100m

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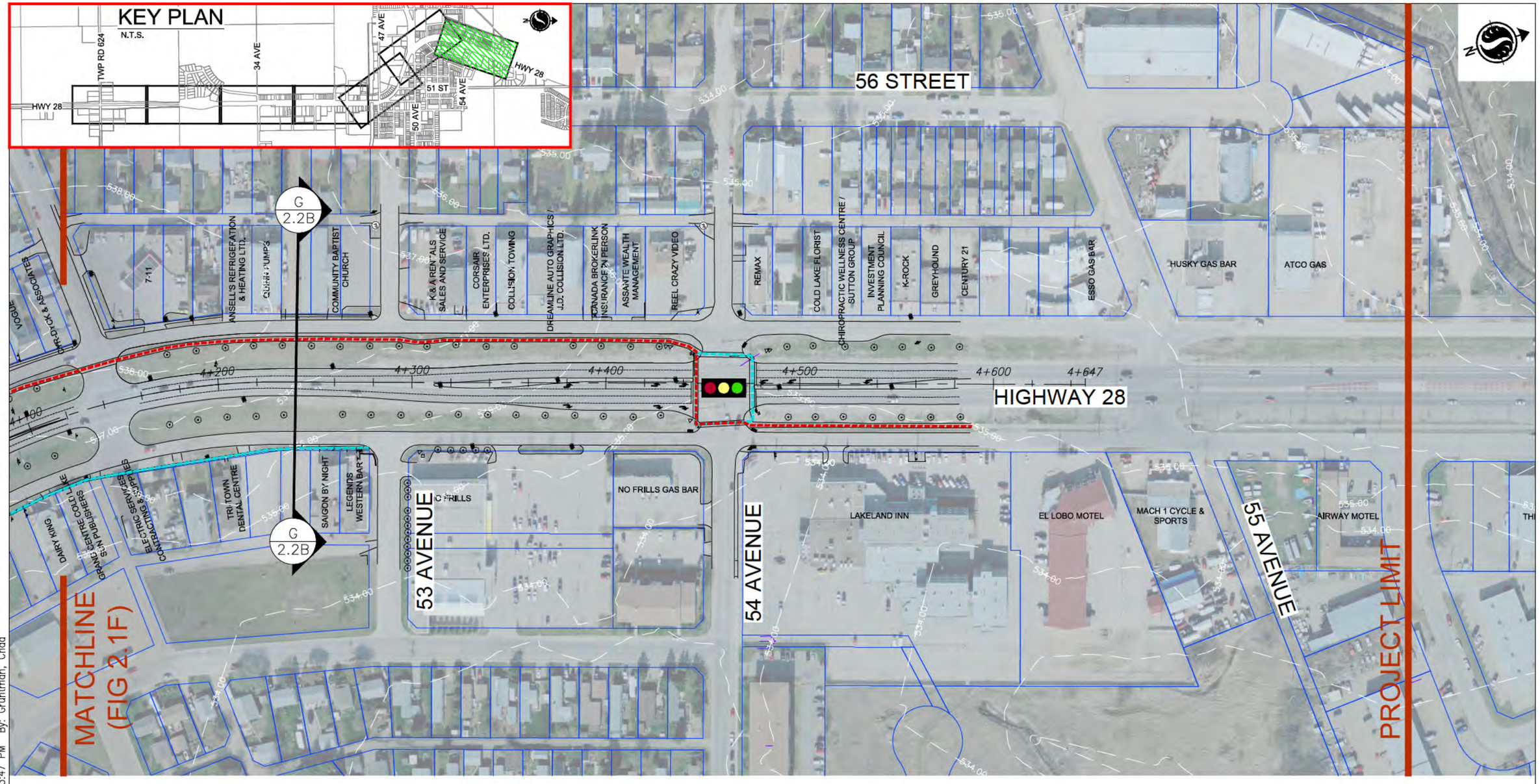
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1F

Title
EXISTING ROADWAY
ZONE 3 & ZONE 4



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ORIGINAL SHEET – ANSI B

JULY 2015
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Legend

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0 20 60 100m

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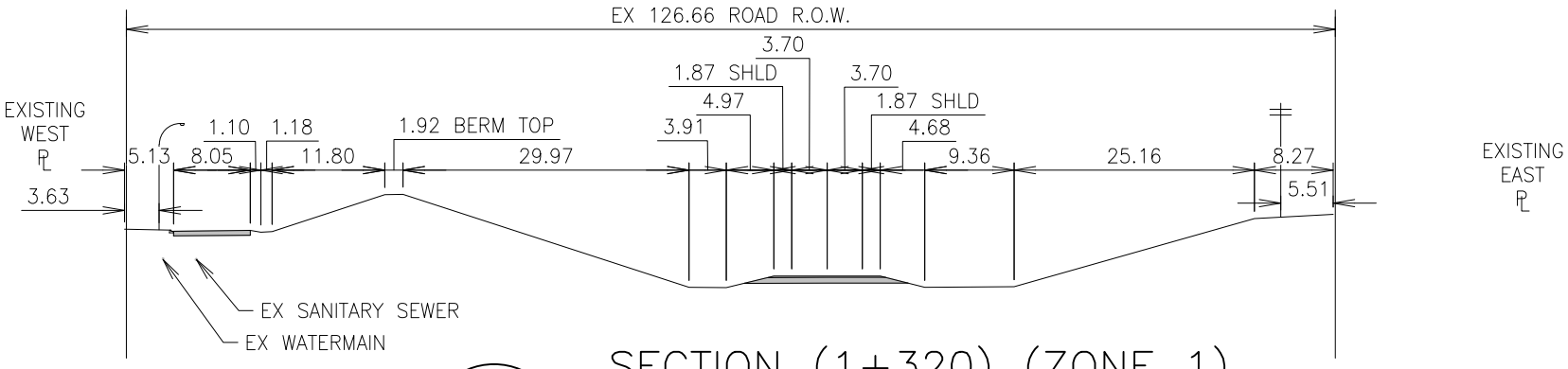
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.1G

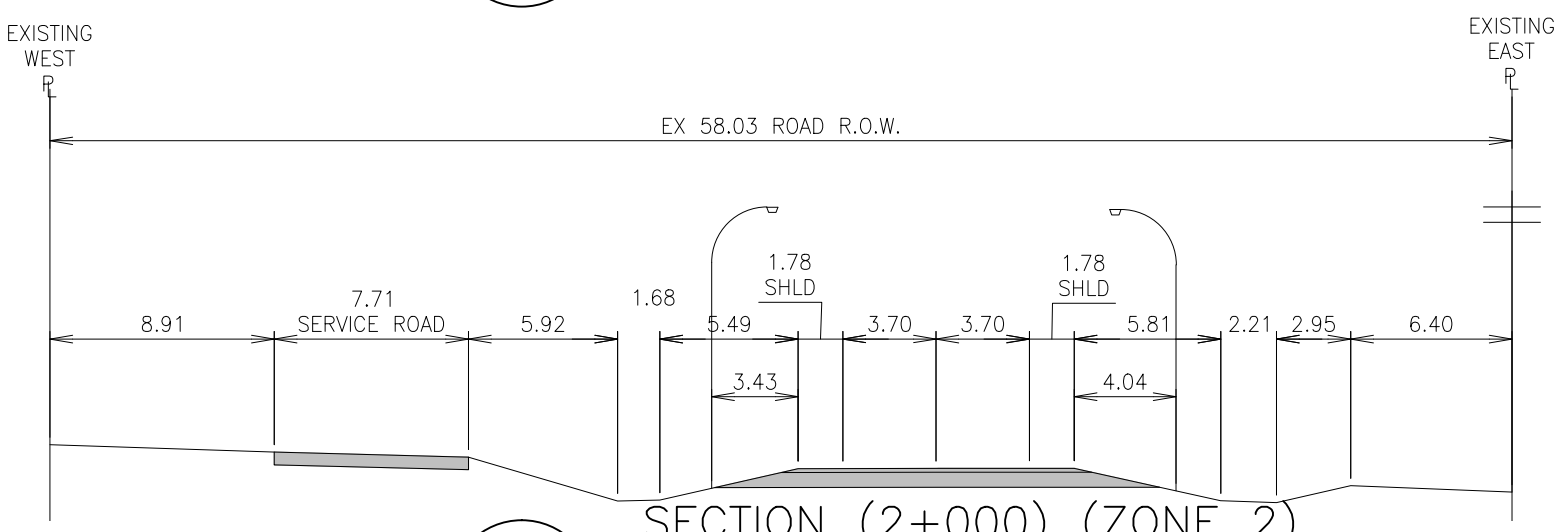
Title
EXISTING ROADWAY
ZONE 4



A — SECTION (1+320) (ZONE 1) TYPICAL FROM 'A TO B'

2.1B

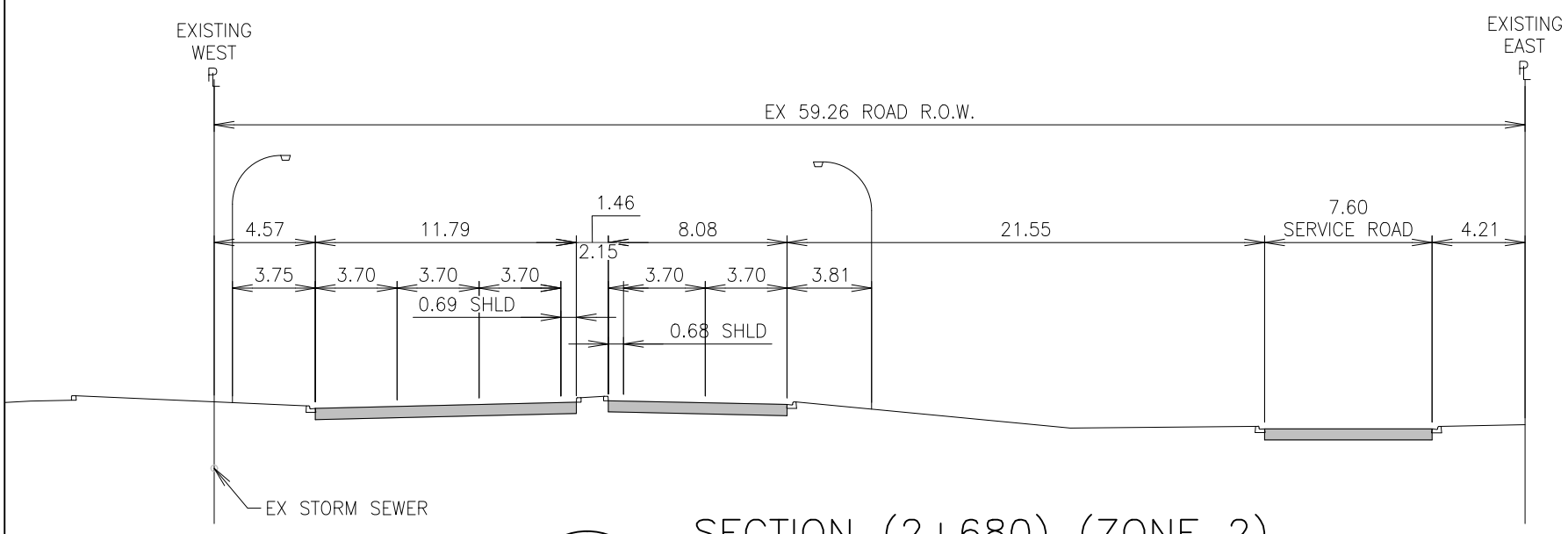
LOOKING NORTH 1:750



B — SECTION (2+000) (ZONE 2) TYPICAL FROM 'B TO C'

2.1C

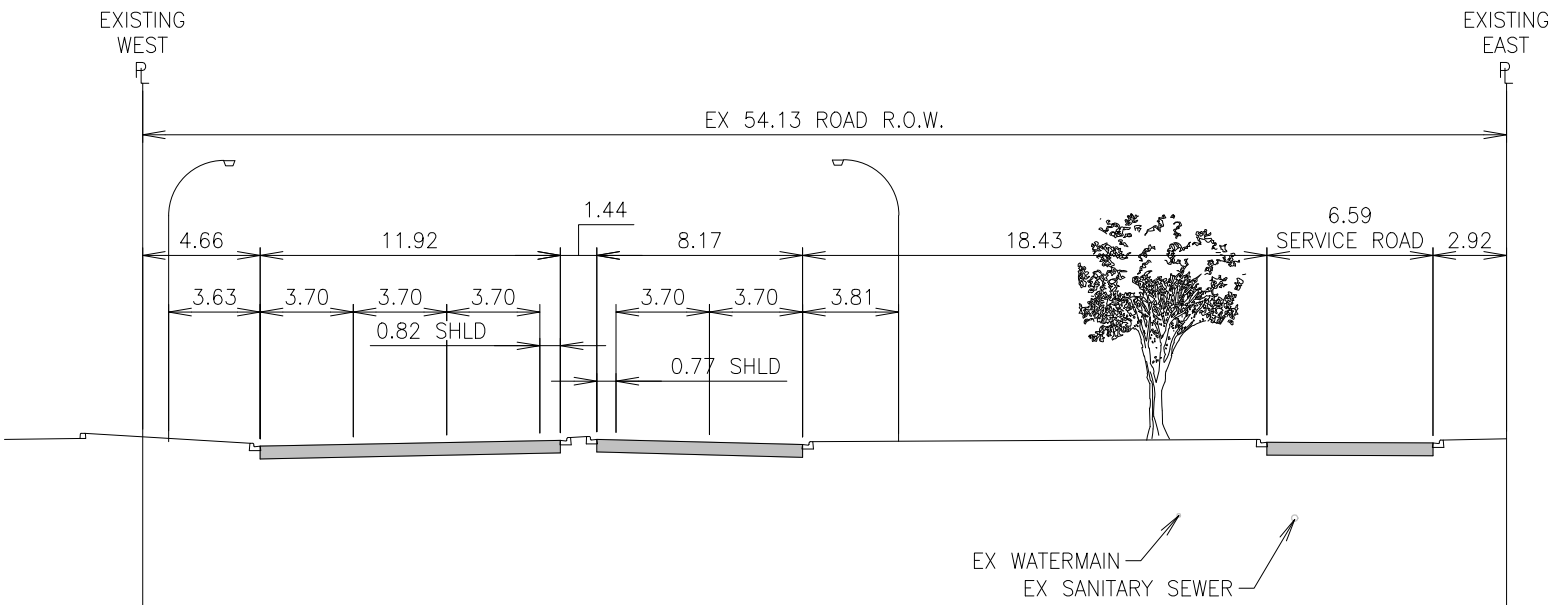
LOOKING NORTH 1:300



C — SECTION (2+680) (ZONE 2) TYPICAL FROM 'C TO D'

2.1D

LOOKING NORTH 1:300



D — SECTION (3+040) (ZONE 2) TYPICAL FROM 'D TO E'

2.1E

LOOKING NORTH 1:300

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Fax. 403.342.0969
www.stantec.com

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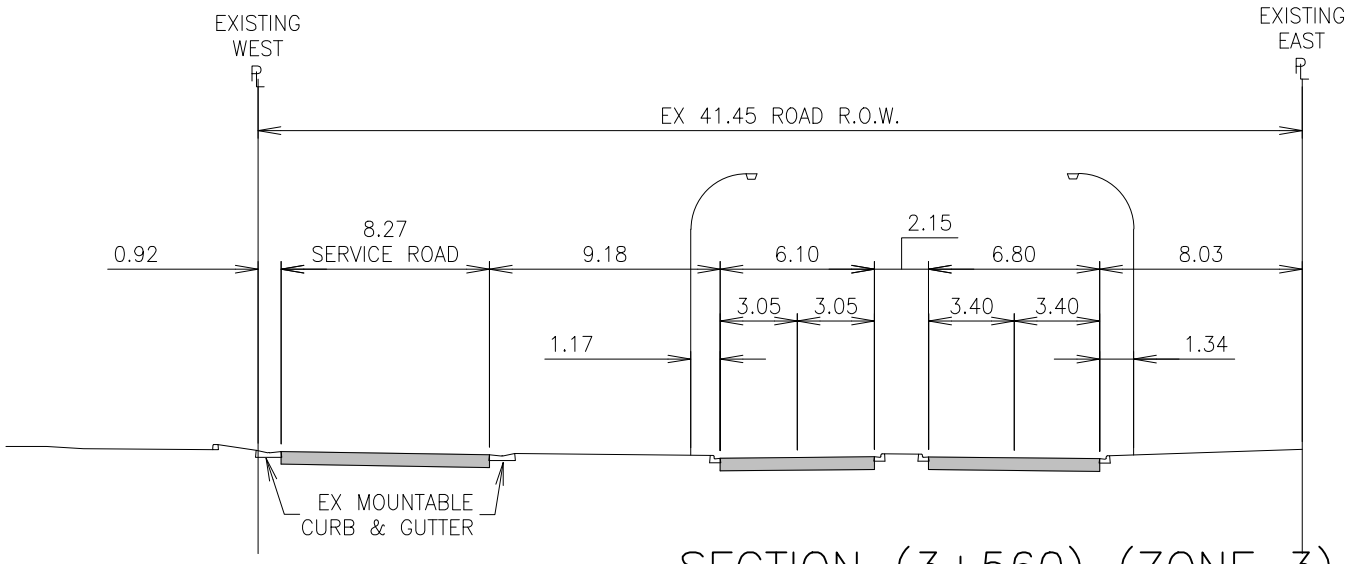
Figure No.
2.2A

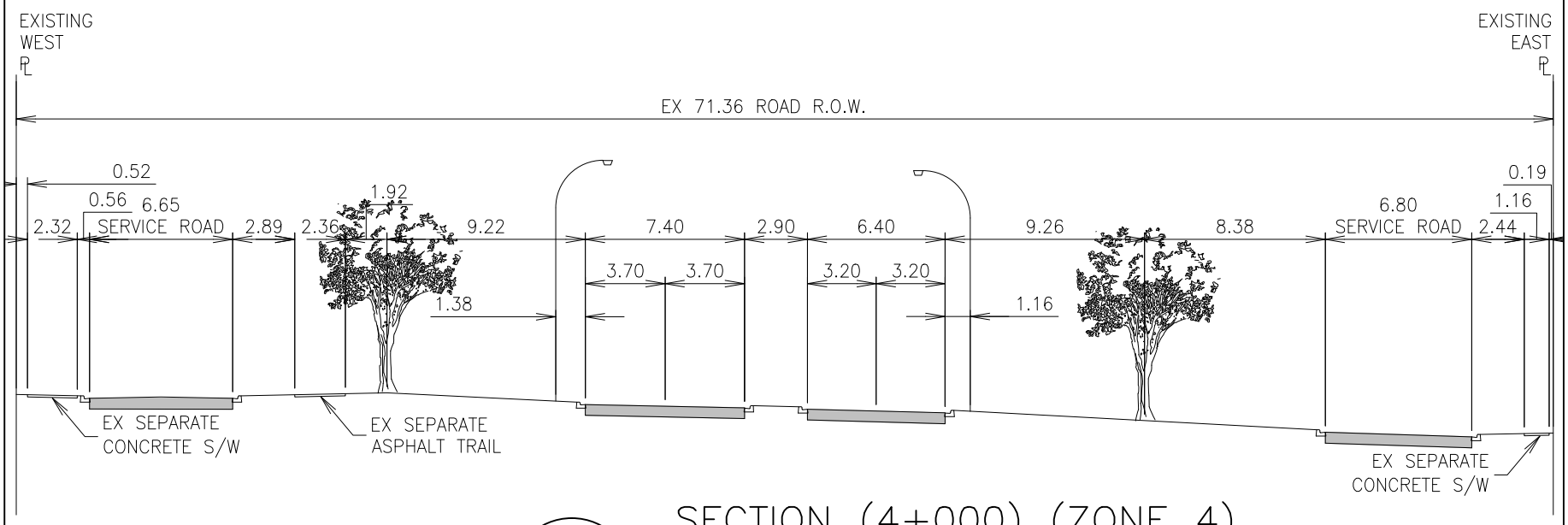
Title
EXISTING CROSS SECTIONS



E
2.1E

SECTION (3+560) (ZONE 3) TYPICAL FROM 'E TO F'

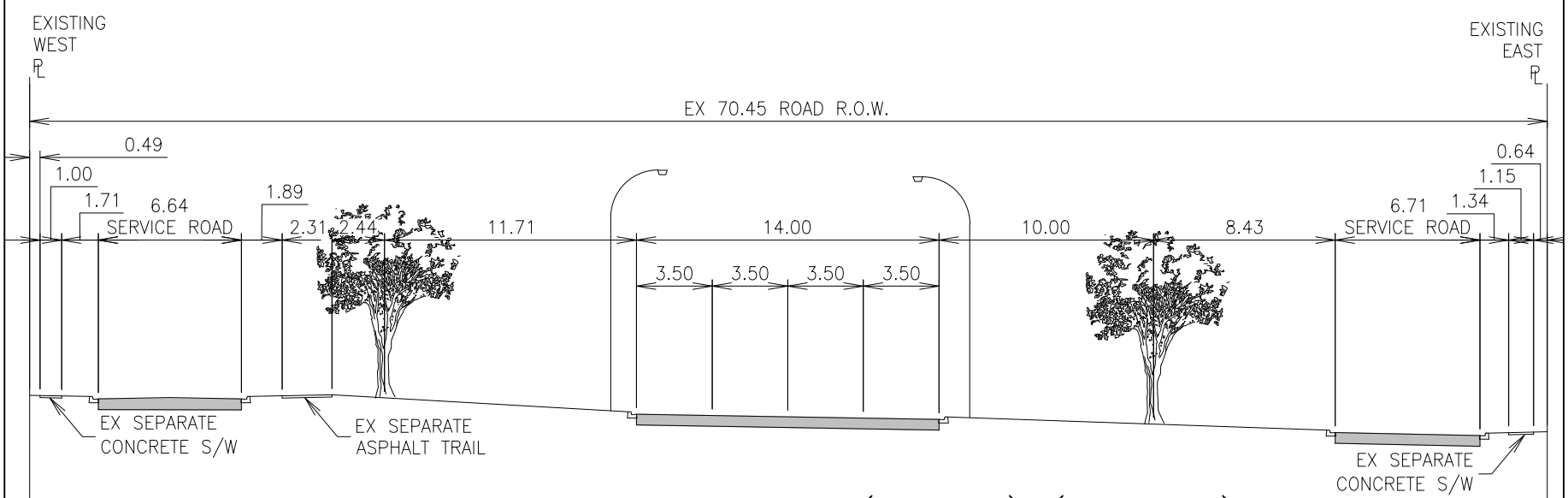
LOOKING NORTH 1:300



F
2.1F

SECTION (4+000) (ZONE 4) TYPICAL FROM 'F TO G'

LOOKING NORTH 1:300



G
2.1G

SECTION (4+240) (ZONE 4) TYPICAL FROM 'G TO H'

LOOKING NORTH 1:300

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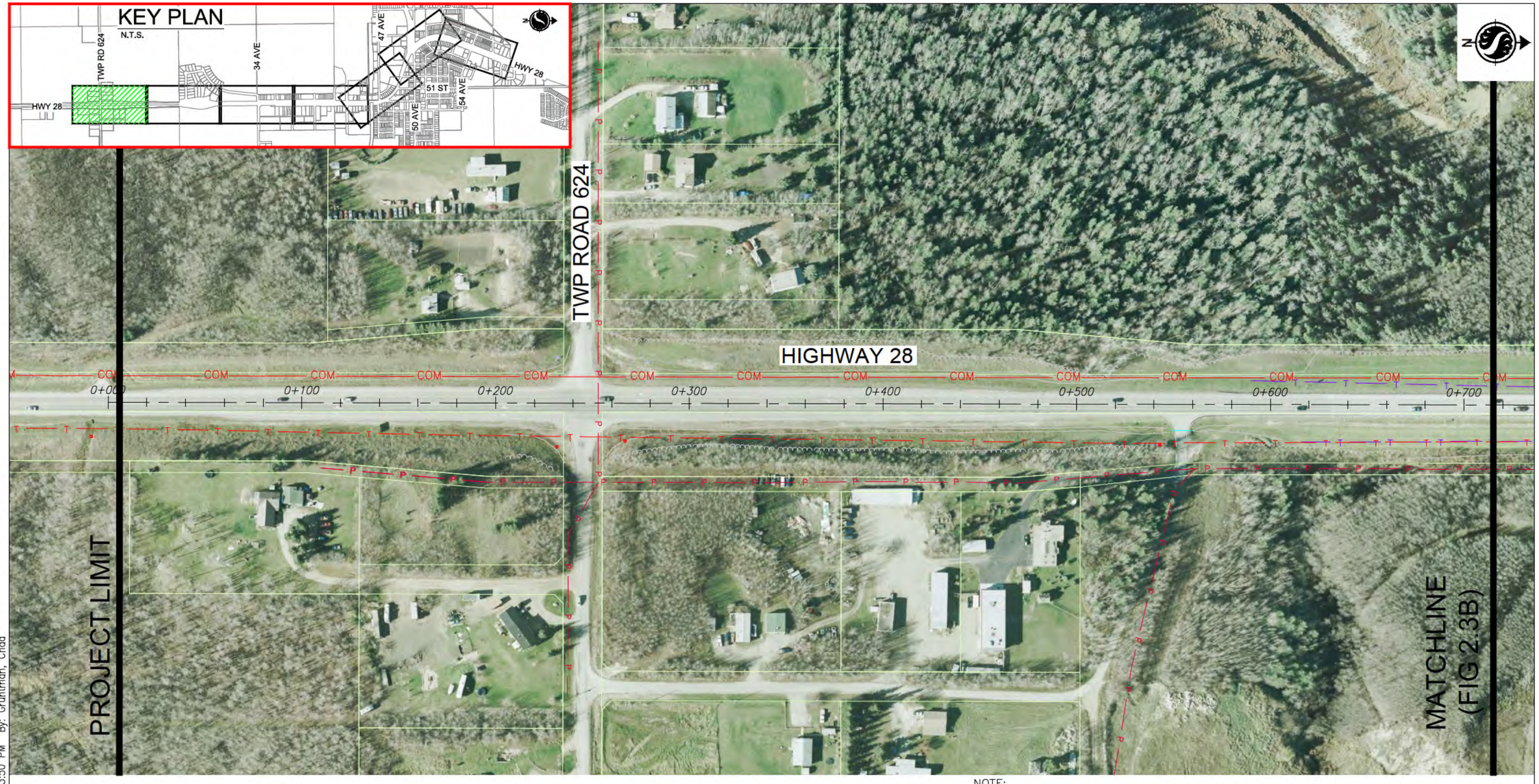
Figure No.
2.2B

Title
EXISTING CROSS SECTIONS



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ORIGINAL SHEET – ANSI B

Legend

- EXISTING PROPERTY LINE
- EXISTING CURB LINE
- SS — EXISTING SANITARY SEWER
- ST — EXISTING STORM SEWER
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- POWER POLE
- STREET LIGHTS
- FIRE HYDRANT
- WATER VALVE
- CATCHBASIN MANHOLE
- CATCHBASIN
- MANHOLE

0 20 60 100m

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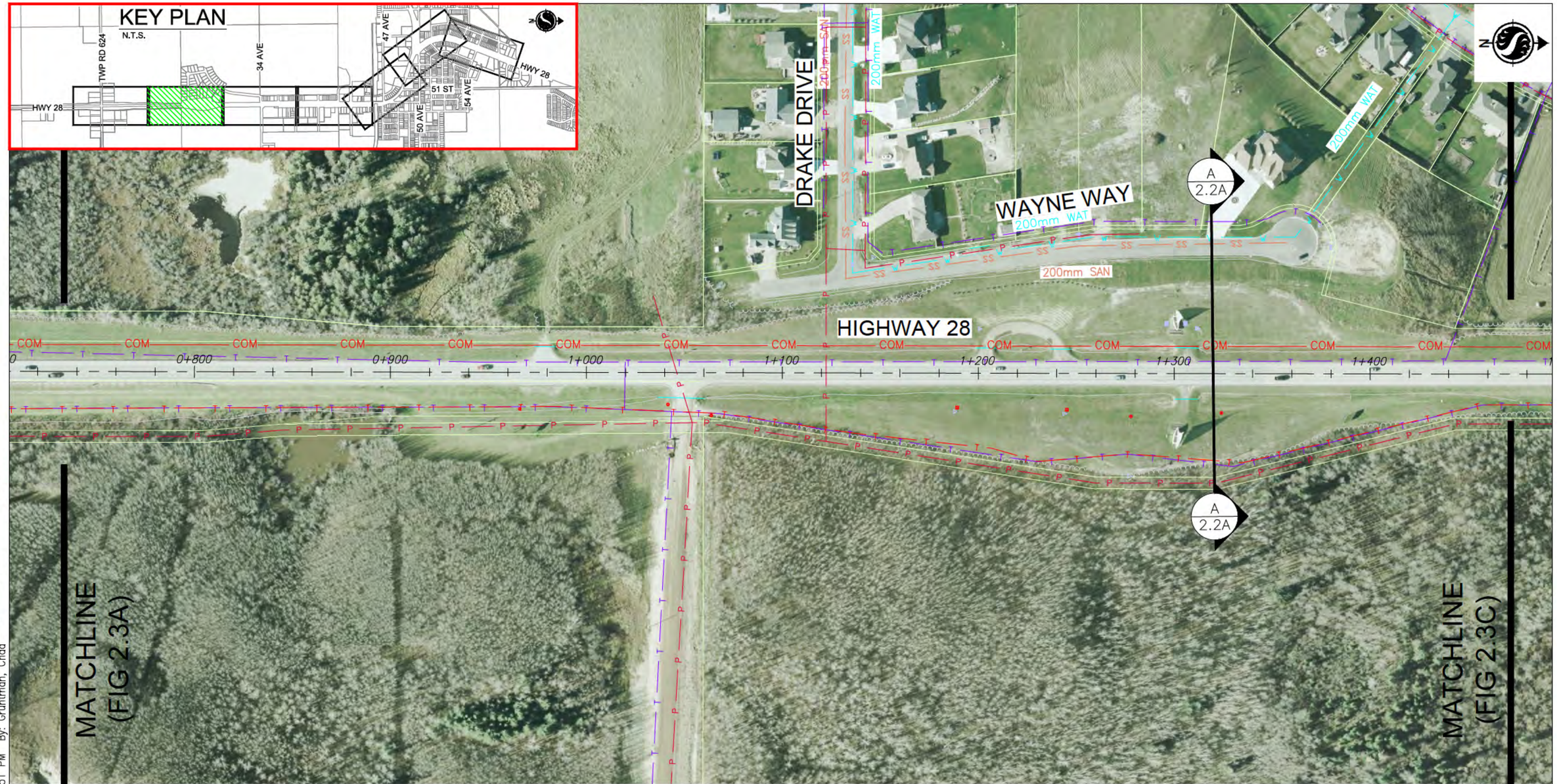
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3A

Title
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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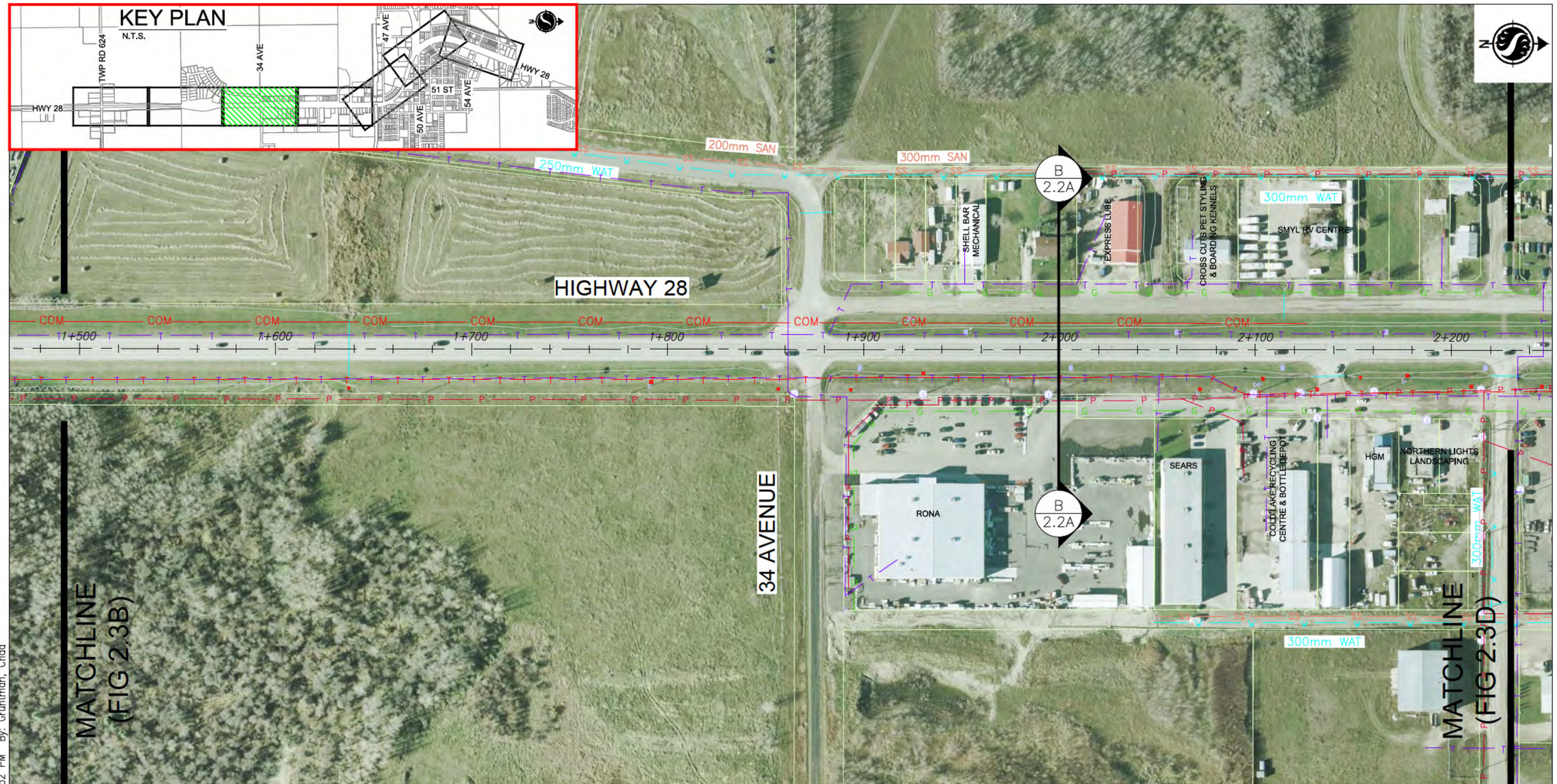
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3B

Title
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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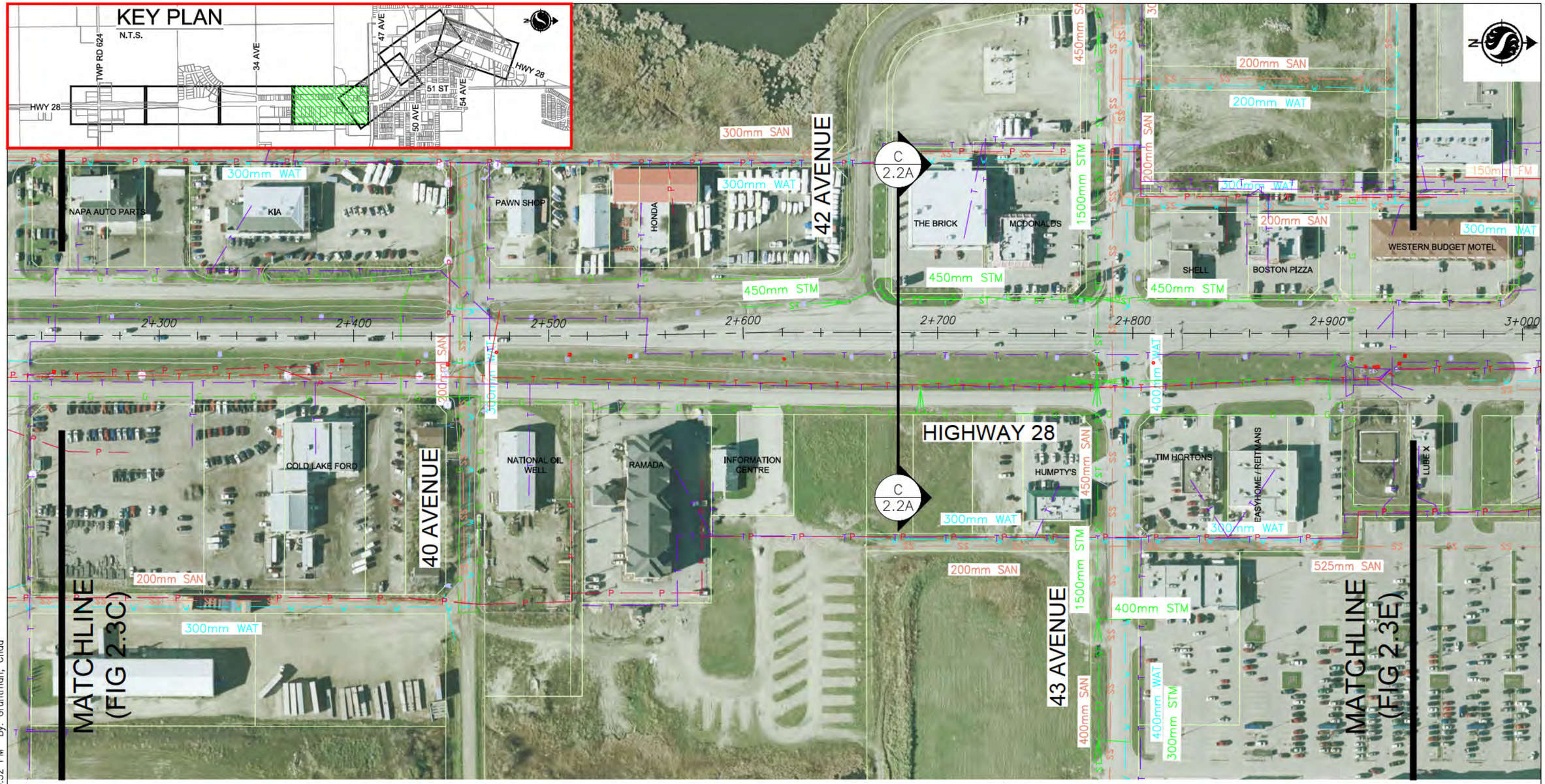
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3C

Title
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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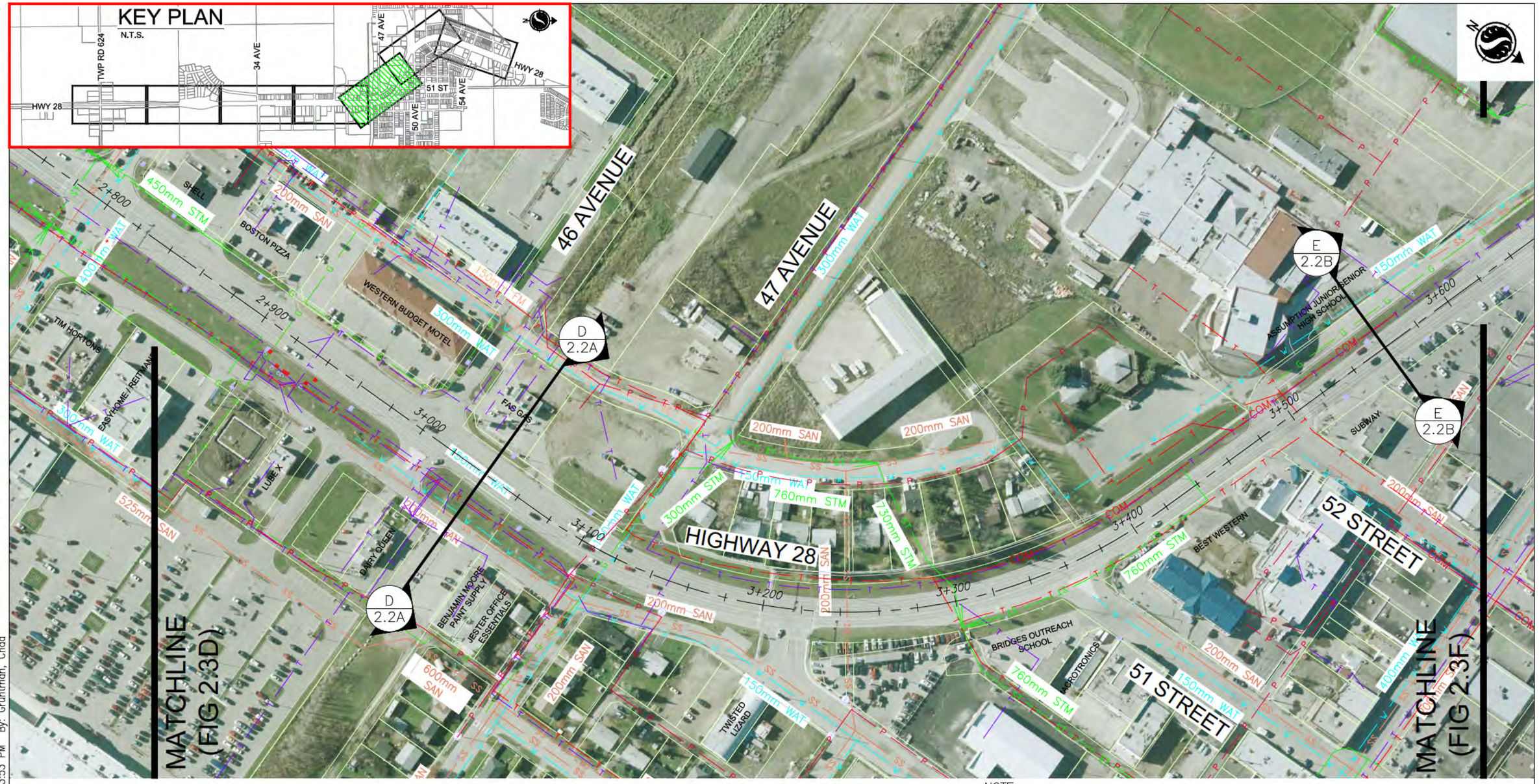
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3D

Title
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3E

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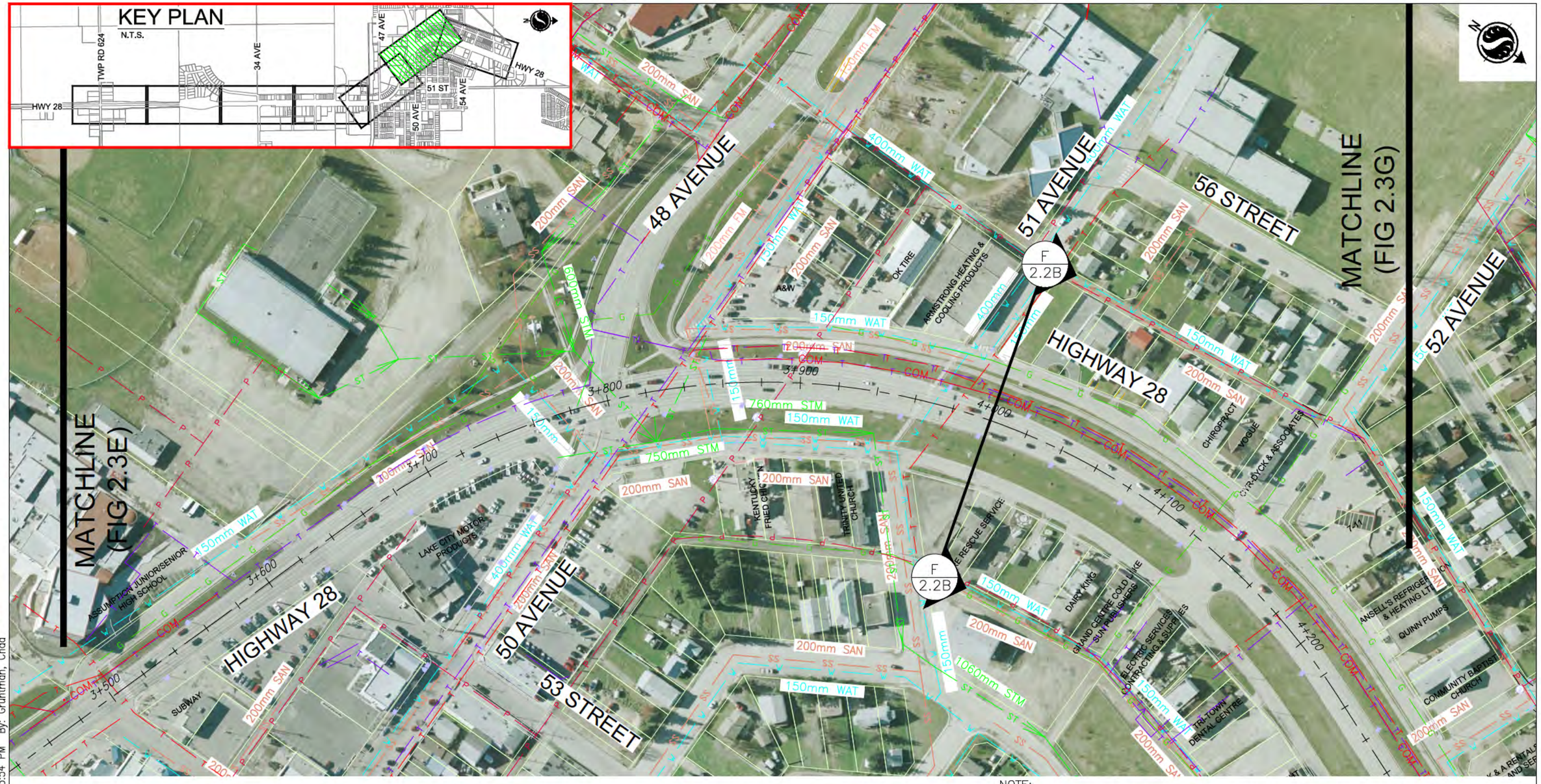
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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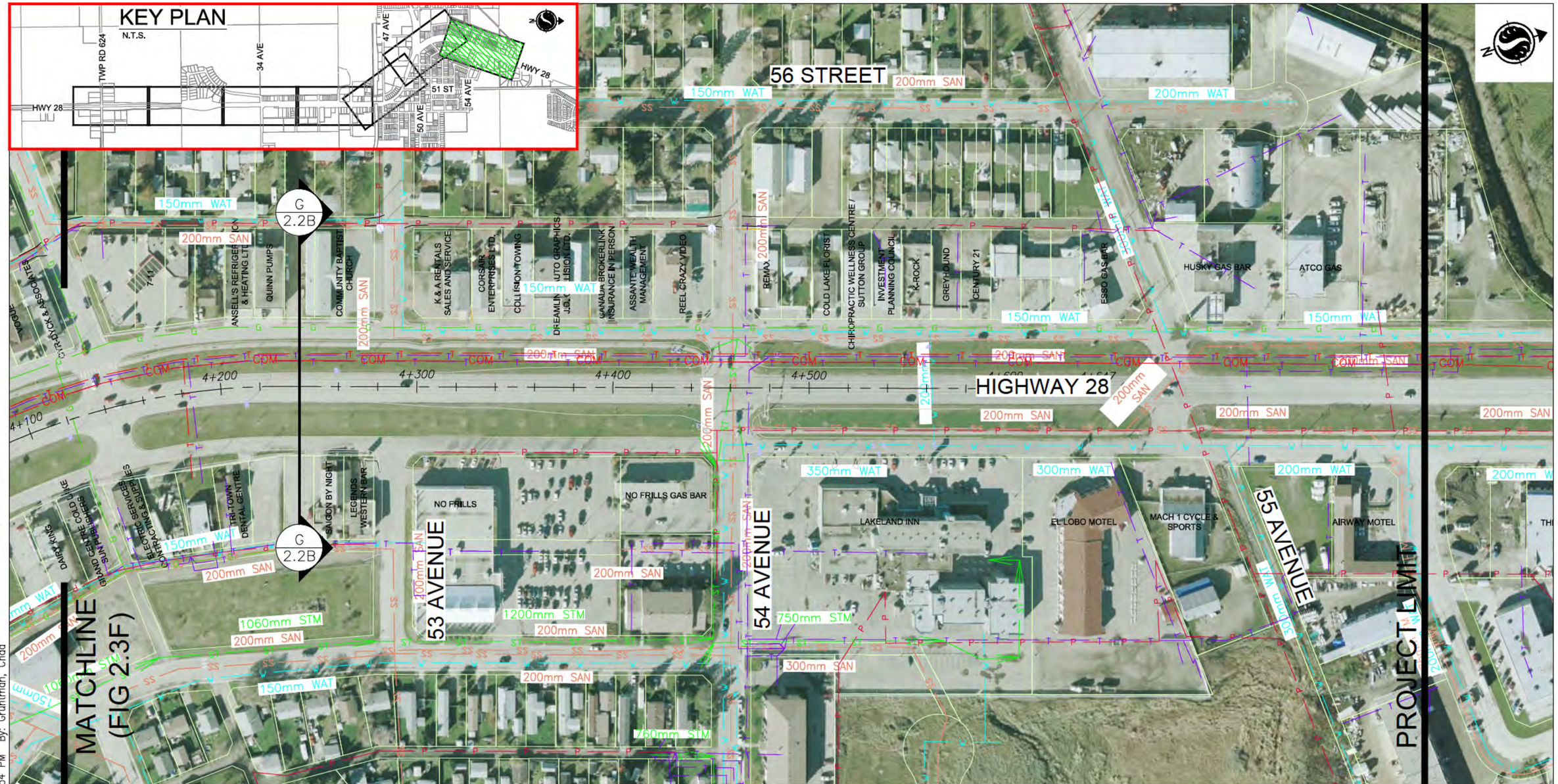
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3F

Title
EXISTING UTILITY ALIGNMENTS



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0 20 60 100m

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HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
2.3G

Title
EXISTING UTILITY ALIGNMENTS

3.0 Design Criteria

The design criteria for Highway 28 is based on the City of Cold Lake Municipal Engineering Standards and Standard Construction Specifications and supplemented with Transportation Association of Canada (TAC) standards. Both the City and TAC provide recommendations for desirable design criteria elements where site conditions are favorable. They also provide recommendations for maximum and minimum tolerances where unique circumstances such as unique topography, variations in right-of-way width and preservation of service roads make it impossible or impractical to implement desirable criteria.

The design criteria for the functional plan for Highway 28 are summarized in Table 3.1.

Table 3.1 Highway 28 Design Criteria

Parameter	Design Criteria			
Zone	1	2	3	4
South Limit	Township Road 624	34 Avenue	50 Street	51 Avenue
North Limit	34 Avenue	50 Street	51 Avenue	54 Avenue
Road Classification	RAU-110	UAD-70	UAD-70	UAD-70
Design Speed (km/h)	110	70	70	70
Posted Speed (km/h)	100	50	50	50
Lane Width (m)	3.70	3.70	3.70	3.70
Median Width (m)	N/A	6.0	6.0	6.0
Curb and Gutter Width (m)	N/A	0.5	0.5	0.5
Maximum Grade (%)	6.0	6.0	6.0	6.0
Minimum Grade (%)	0.5	0.5	0.5	0.5
Min. Crest Ver. Curve (K)	113	22	22	22
Min. Sag Ver. Curve (K)	31	12	12	12

Super Elevation (%)	6.0	6.0	6.0	6.0
Min. Hor. Curve Radius (m)	600	250	250	250
Clear Zone (m) 1V:4H or Flatter, Over 6,000 AADT	6.0 to 8.5	6.0 to 8.5	6.0 to 8.5	6.0 to 8.5
Design Vehicle	WB-21	WB-21	WB-21	WB-21

3.1 ROADWAY CLASSIFICATION

Based on the Transportation Master Plan, Highway 28 from Township Road 624 to 54 Avenue will ultimately consist of two classifications. Township Road 624 to 34 Avenue will be maintained as a 2-lane undivided arterial with a posted speed of 100km/hr (RAU-110) and 34 Avenue to 54 Avenue will be considered a 4-lane divided arterial with a posted speed of 50km/hr (UAD-70).

In general, the primary design consideration for major arterial roadways is traffic movement. Access to adjacent properties is rigidly controlled and typically only provided to major commercial developments or other unique circumstances in retrofit situations. Arterial roadways require more travel lanes and greater spacing between intersections and accesses than collector roadways. Further, arterial roadways are often divided where geometry permits while collectors are almost always undivided.

Figure 3.1 shows the roadway classification of Highway 28 and its intersecting streets and avenues.

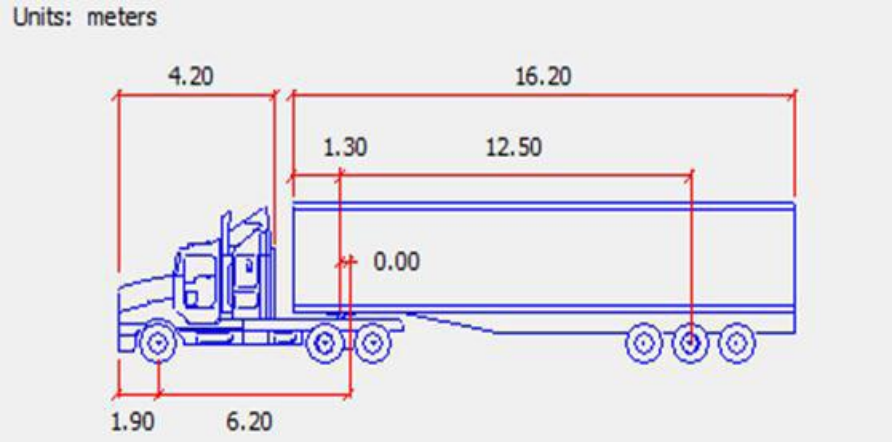
3.2 DESIGN VEHICLES AND TURNING MOVEMENTS

Selection of design vehicles is important in establishing geometric design of roadways, particularly at intersections and unique business accesses. Turning paths made by the various types of traffic using the roadway must be taken into consideration in the design of cross-sections, intersections and major business accesses. Design parameters such as radius returns, left-turn radii, lane widths, median openings, turning roadways, and sight distances are affected based on the selection of the design vehicles.

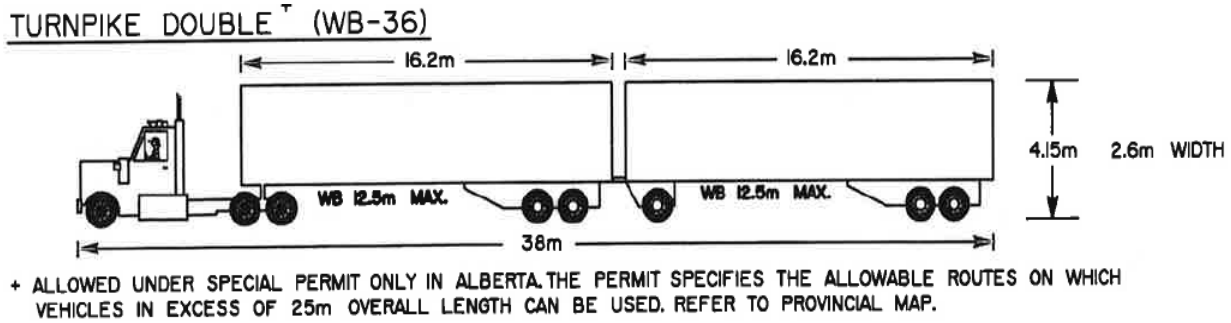
For the majority of intersections, the design vehicle will be the WB-21 Tractor-Semi Trailer, which is shown below. The WB-21 requires a larger turning path than the B-Train Double due to its longer wheel base. Section 7.4 discusses turning movements for various intersection configurations along Highway 28.

As described in the Cold Lake Transportation Study, there are currently trucks that carry jet fuel (dangerous goods) from Edmonton to the airfield in Medley. The Dangerous Goods Route is along

Highway 28 from the South City Limit to Centre Avenue, and west to the Air Base. As such, considerations have been made to accommodate a WB-36 Turnpike Double which is shown below.



WB-21 Tractor-Semi Trailer



WB-36 Turnpike Double

3.3 HORIZONTAL ALIGNMENT

The standard design elements of the horizontal alignment include horizontal curve radii and rates of superelevation on curves. The horizontal alignment design criteria are directly related to each other as well as the design speed of the roadway.

The maximum rate of superelevation, as per the City of Cold Lake Municipal Engineering Servicing Standards, for the horizontal curves within the project limits will be 0.06m/m.

For a design speed of 70km/hr and 110km/hr and maximum superelevation (e_{max}) of 0.06m/m, the Engineering Servicing Standards recommend using a minimum radius of 250 metres and 600 metres respectively.

3.4 VERTICAL ALIGNMENT

The lands adjacent to the various roadways are extremely flat. For the majority of the roadways, the existing grades will be used to establish the grades of the new roadway and sidewalk construction.

3.5 CROSS-SECTION ELEMENTS

Cross section elements provide vital guidance to the driver through their presence, dimensions and coordination. The cross section normally consists of the travelled way, curb and gutter, medians and related drainage features. Design criteria for cross-section elements are shown in Table 3.1.

3.5.1 Medians and Boulevards

Medians are provided on multi-lane divided roadways to separate opposing flows of traffic, thus increasing safety. Medians also provide space for left turn lanes, snow storage, surface water collection, and refuge for pedestrians at crosswalks. To maintain consistency throughout the Highway 28 corridor, the median width will be 6.0 metres to accommodate single left turn lanes.

The boulevard serves as a safety separation as well as a location for underground utilities, snow storage, traffic signs and other control devices. Typically, it is preferred to locate obstructions away from the travelled lanes and it is desirable to provide a boulevard if the design speed exceeds 60 km/h. The minimum boulevard width recommended by TAC for arterial roadways is 1.5 metres and the desirable boulevard width is 3.0 metres.

3.5.2 Clear Zone

Curbs, walls, barriers, piers, signs and signal supports, mature trees, landscaping items, and power poles are primary examples of the type of features that can affect a driver's speed or lane position if located too close to the edge of the roadway. The clear zone is defined as the unobstructed, relatively flat area provided beyond the edge of the travelled way for the recovery of errant vehicles and is measured from the lip of gutter.

The TAC guidelines (TAC Figure 3.1.3.4 in Appendix A) state that for a design speed of 70km/hr roadway with average daily traffic volumes greater than 6000, the clear zone will range from 6.0 meters where the boulevard is flat, to 8.5 meters where the boulevard has 4:1 slope. The clear zone for the service roads would be 2.0 meters.

3.6 ACCESS MANAGEMENT

For major arterial roadways, TAC recommends that access be either restricted or denied, particularly for new roadways that are not required to accommodate existing property accesses. TAC has an access classification system that includes categories ranging on a scale of 1 to 7, Access Level 1 being highly restricted and Access Level 7 having minimal restriction, limited to safety requirements only. Highway 28

can be considered to be within either of or somewhere between the categories of Access Levels 3 and 4, which TAC defines as follows:

- Access Level 3 – right-turn access driveway only; and
- Access Level 4 – right and left-turn access in, right-turn access out.

For Highway 28, it is recommended that the access management for the proposed road improvements be provided as Level 3. The primary accesses to these developments would be via the collector roadways, service roads, auxiliary lanes / rear accesses. Depending on the size and parameters of some developments, secondary access could be provided directly on/off Highway 28 as right-in/right-out only accesses.

The land use (both present and proposed) immediately adjacent to Highway 28 is characterized as commercial and residential. As such, requirements for accesses are critical to businesses and residents alike. The recommended road network was carefully developed to provide a superior operation of the study area as a whole, while balancing the need for access to the adjacent businesses and residential developments. For the most part accesses were not reduced, but were relocated if necessary.

3.7 TWO-WAY SERVICE ROAD / CROSS ROAD INTERSECTION TREATMENT

The design of the service road / cross street intersections along Highway 28 has a significant impact on the operation of the intersections. TAC has established minimum guidelines for the design and operation of intersections. The off-set distance and size of bulb radius is related to the traffic volumes on the cross street, signalization and cross street medians.

The three intersection treatment standards are described below:

- The minimum standard of intersection treatment is illustrated in TAC Figure 3.2.7.3 (Appendix A) where the crossroad volumes are less than 2,000 vehicles per day, the main intersection is unsignalized and a centre median is not provided on the cross-street. The minimum offset from the outer separation to the service road entrance is 24.0 m.
- When the main intersection is signalized, a median is often desirable on the cross road, as shown on TAC Figure 3.2.7.4 (Appendix A). If an intersection is signalized, the vehicle volumes are normally greater than 2,000 vehicles per day. With these volumes, the queue lengths on the cross roads are such that the service road intersection becomes blocked. A median on the cross road prevents left hand turns from the service road onto the cross road.
- If the main intersection is signalized and there is no median installed on the cross road, the alternative is to use a bulb design with a 45.0 m separation between the outer separation and the service road entrance. This increased distance provides for a larger queue length on the cross road. The larger bulb design is illustrated in TAC Figure 3.2.7.5 (Appendix A). Where the cross service road approaches 5,000 vehicles per day, a typical service road offset of 45.0 m is required to provide adequate channelization and queuing storage length to allow the intersection to operate efficiently.

In established areas, it is often difficult to accommodate the TAC design standard due to conflicts with existing development and buildings. Often a reduced level of service has been accepted, which provides a lesser amount of queuing storage, but meets the requirements for major turning movements.

3.8 AUXILIARY LANE TREATEMENT

The inclusion of auxiliary lanes is desirable for the following circumstances as per TAC:

- Along an arterial with a posted speed of 70km/h or less;
- When frequent direct access is required to adjacent land uses; and
- To safely accommodate traffic in and out of various developments.

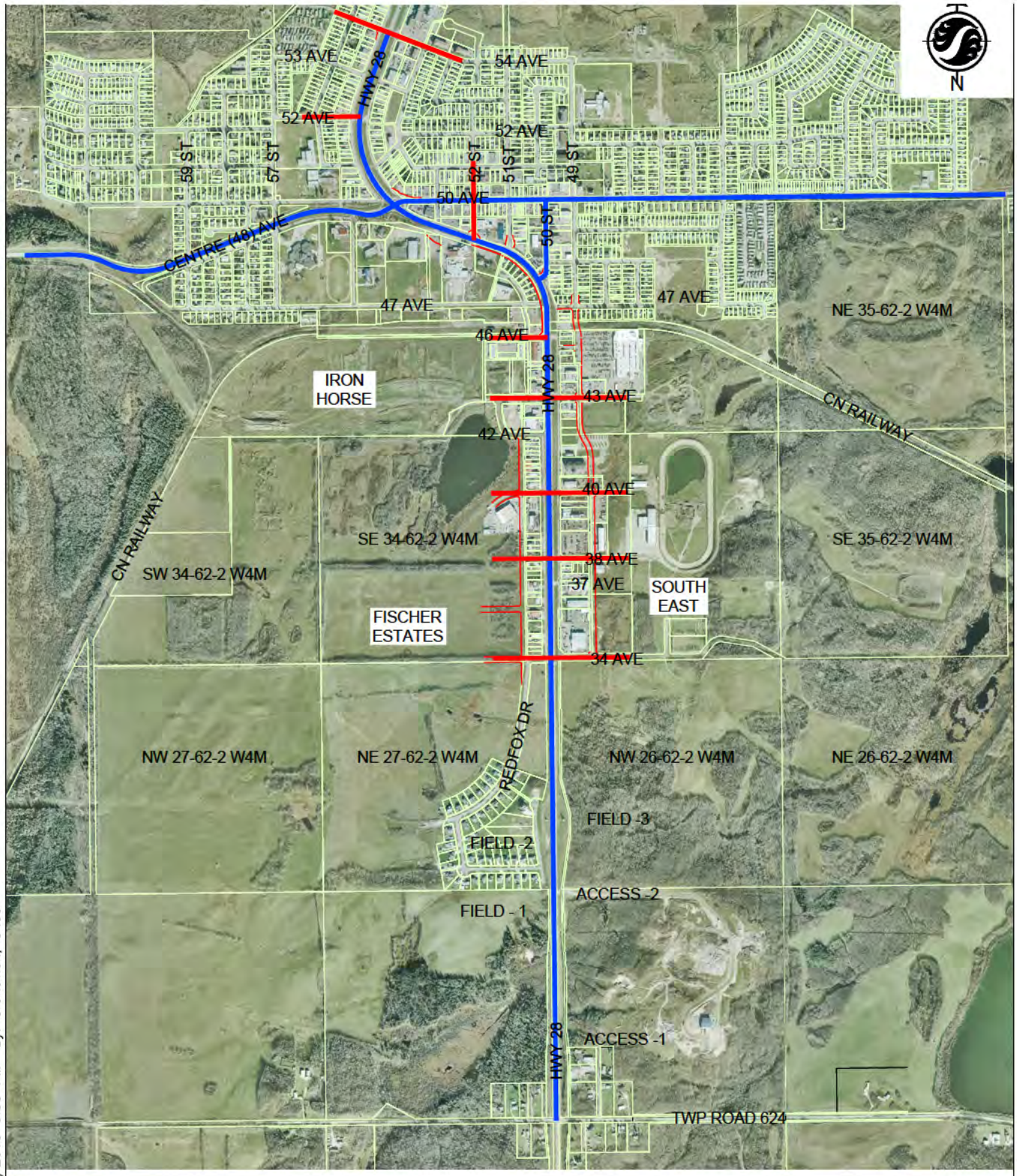
The most common is the right-turn auxiliary lane for access along a divided arterial road. A continuous auxiliary lane is recommended when there is a high need for frequent accesses along an arterial roadway. If the separation between accesses is greater than 200 metres, it may be possible to provide a right-turn bay/acceleration lane instead of a continuous access. This is known as an auxiliary lane mid-block access.

TAC recommends that auxiliary lane widths range from 3.5 m to 4.3 m, not including curb and gutter. The wider lane would be desirable for bike shared bike lanes and large trucks needing to accesses a driveway via the auxiliary lane.

In order to minimize conflicts at cross road intersections, driveways accessing developments should be located at a safe distance away from the cross road. For example, without this adequate spacing, drivers traveling on the arterial road wanting to access the first access would experience conflict with vehicles turning right off the crossroad and weaving left onto the arterial road. This spacing, also known as the clearance distance (C), is shown in TAC Figure 3.2.5.6 (Appendix A) which illustrates the suggested minimum clearance associated with two-way driveways.

3.9 PEDESTRIANS AND BICYCLISTS

As per the MDP, the City of Cold Lake has a vision of encouraging the development of trails for pedestrians and bicyclists as a healthier and more sustainable mode of transportation. Policy 8.5 (Highway 28 Commercial Corridors) states the importance of having a pedestrian friendly environment along Highway 28 since it is planned to be the primary arterial commercial area in the City of Cold Lake. As per the City of Cold Lake Municipal Engineering Standards, the minimum width for walkways is specified to be 1.5 m wide.



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ARTERIAL ROADWAY

COLLECTOR ROADWAY

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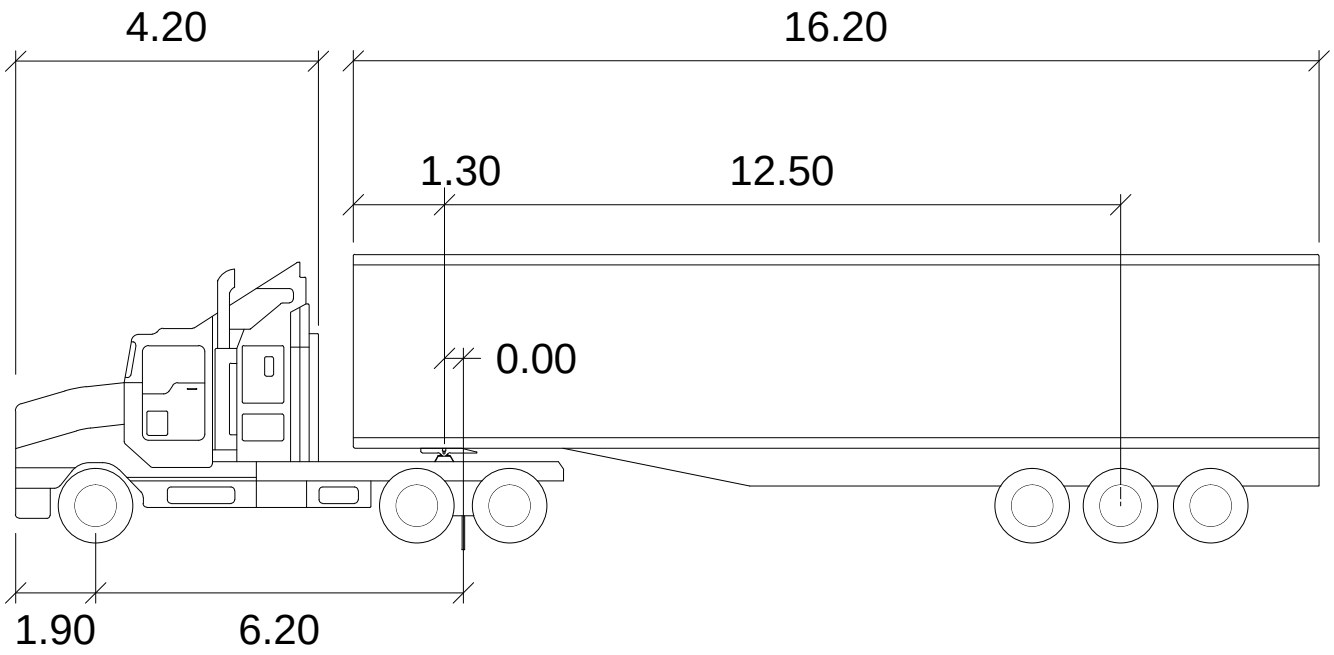
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
3.1

Title
ROADWAY CLASSIFICATION



WB21 meters

Tractor Width	:	2.60	Lock to Lock Time	:	6.0
Trailer Width	:	2.60	Steering Angle	:	26.6
Tractor Track	:	2.60	Articulating Angle	:	70.0
Trailer Track	:	2.60			

ORIGINAL SHEET – ANSI A

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116239311

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CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
3.2

Title
DESIGN VEHICLE

4.0 Historical Resources

Stantec has completed historical resource review for the project area. The following sections provide a brief overview of the objectives, methodology, and recommendations in the statement of justification. For additional detail, the full statement of justification is included in Appendix B

4.1 OBJECTIVES AND METHODOLOGY

The objective of the statement of justification is to inform the City of Cold Lake of historic resources that are protected under the provisions of the Alberta Historical Resources Act. The scope of the SoJ included:

- A desktop review of several references to determine existing disturbance as well as landscape/environmental information.
- A review of Listing of Historic Resources (AC September 2012), historic township plans (Department of the Interior), aerial photographs (AESRD) and survey plans of the project area in order to determine the Precontact and archaeological potential of the area.
- A review of several references to determine the level of Historic Resource Values and palaeontological potential within the project area.
- A site visit was conducted to confirm the existing disturbance and landscape/environment as well as identify any obvious historic resources that may exist in the project area.

4.2 RESULTS AND RECOMMENDATIONS

It was concluded that there is little potential for impacts on palaeontological resources. No further palaeontological work or monitoring is recommended.

There are undisturbed treed areas at the southern end of the project area that have a moderate to high archaeological potential. A historical resource impact assessment (HRIA) is recommended for the treed areas within W-26-062-02-W4M and E-27-062-02-W4M.

Any structures predating 1965 that are in danger of being impacted by the project should be photographed and mapped in detail prior to the commencement of the Project.

5.0 Environmental Assessment

Nichols Environmental (Canada) Ltd., Stantec's environmental subconsultant for this project, completed a Limited Phase 1 Environmental Site Assessment (ESA) for Highway 28 from 54th Avenue to Township Road 624 (South City Limit). The sections provide a brief overview of the objectives, methodology, and recommendations outlined in the report. For additional detail, the full Limited Phase 1 ESA completed by Nichols is included in Appendix C.

5.1 OBJECTIVES AND METHODOLOGY

The purpose of the Phase 1 ESA was to identify and assess at a high level the existing and potential site contamination. The scope of the investigation included:

- A review of historical environmental audits, ESA's, environmental baseline studies, well drilling, and geotechnical reports;
- A review of historical aerial photographs of the project area and adjacent properties;
- A review of information from federal and provincial agencies;
- An on-site inspection of the project area and a high level review of adjacent lands; and
- A report, discussing the results and recommendations of the Limited Phase 1 ESA.

5.2 RESULTS AND RECOMMENDATIONS

The aerial photographs suggest that the existing project area was developed before 1950. A railway intersected the Highway 28 corridor to the south of 47th Avenue in the 1960's and 1970's. It was also noted that, based on the aerial photography, the Highway 28 roadway was widened sometime between 1972 and 1977.

The groundwater monitoring wells inspected showed no evidence of environmental liabilities. There are 21 service station or automotive-related developments in the vicinity of the project area which have potential for environmental risk. The existing Subway restaurant property, formerly a Turbo service station, may be of the highest environmental concern.

It is recommended that a subsurface investigation (Phase II ESA) for the former Turbo station located at 4910 – 52nd Avenue be completed in the future as part of a future development or road upgrade. The active service stations along the Highway 28 corridor should also be considered for investigation.

6.0 Traffic Analysis

6.1 STUDY INTERSECTIONS

The Cold Lake functional design project includes traffic analysis at the following key intersections:

1. Highway 28 and 54 Avenue;
2. Highway 28 and 52 Avenue;
3. Highway 28 and Centre Avenue;
4. Highway 28 and 50 Street; and
5. Highway 28 and 43 Avenue.

6.2 DESIGN VOLUMES

6.2.1 Assumptions

The assumptions regarding traffic volumes made for this report are as follows;

- The total traffic projections in "The City of Cold Lake, Cold Lake Transportation Study", completed in 2010 by Associated Engineering Alberta Ltd. (Associated) are assumed to be accurate.
- The directional distribution of the traffic provided in the Transportation Study for the 2010 traffic counts will remain the same throughout the various analyzed population horizons.

6.2.2 Variance in Projected Traffic Volumes

A review of available information suggests that the projected traffic growth rates and the volumes depicted in the 2010 Transportation Study may be aggressive. Based on review of the "Highway 28 Intersection Needs Assessments – Summary of Findings and Recommendations", completed in April of 2009 by AECOM, the projected daily traffic along Highway 28 at the intersection of 54 Avenue is significantly lower than the corresponding volumes shown for the same intersection in the 2012 Transportation Study.

Table 6.1 shows the projected daily volumes from each report for the 20 year design horizons. The results show that projected traffic volumes almost double in the one year difference between studies.

Table 6.1 – Variance in Highway 28 Daily Traffic Volumes

Description		Existing (2010) Daily Traffic Volumes	AECOM (2029) – Daily Traffic Volumes	Associated Engineering (2030) – Daily Traffic Volumes
North of 54 Avenue	Northbound	7,500	15,417	24,020
	Southbound	7,150	14,500	28,920
South of 54 Avenue	Northbound	6,970	14,667	20,930
	Southbound	6,870	12,917	24,610

The AECOM methodology included a 3% annual, non-compounded background growth rate combined with development generated traffic, as outlined in Section 3 and Appendix C of the Intersections Needs Assessment. The Associated methodology included a 2% annual, non-compounded background growth rate combined with development generated traffic, as outlined in Appendix C of the Transportation Study – "Traffic Volume Forecast and Analysis." The Transportation Study includes a much higher volume of development generated traffic spread over a larger area of the City. The net effect of the projected background growth combined with development generated traffic is shown in Table 6.2, which expresses the projected traffic volume growth as a simplified linear growth rate up to the 20-year horizon. The higher volume of development generated traffic in the Transportation Study results in 40% to 90% more traffic projected at the 20-year horizon. If these higher volumes turn out to be an aggressive projection, the horizon years may not occur until later than the expected dates (e.g. the "20-year horizon" may occur in 30 or more years).

Table 6.2 – Total Traffic Growth (Simplified Linear Rate)

Description		AECOM (2029) – Annual Traffic Increase	Associated Engineering (2030) – Annual Traffic Increase
North of 54 Avenue	Northbound	5.6% / year	11.0% / year
	Southbound	5.4% / year	15.2% / year
South of 54 Avenue	Northbound	5.8% / year	10.0 % / year
	Southbound	4.6% / year	12.9 % / year

6.2.3 Methodology

The daily total traffic volumes developed in the Transportation Study were used as the traffic volumes for the various analyzed horizons. These volumes show the daily traffic along the roadways, but not specific turning movements at intersections.

Intersection turning movements were calculated by using the distribution of the existing traffic counts supplied by the City for 2010 and applied to the daily traffic volumes.

Traffic modeling software packages analyze traffic at intersections using the peak hour volumes. Thus, it is necessary to convert the daily volumes into peak hour volumes. As per Alberta Transportation's *Highway Geometric Design Guide* (HGDG):

- DHV = k (AADT), where DHV is the design hourly volume, AADT is the average annual daily traffic and k is a factor equivalent to 0.10.

As the highest volumes are expected during the PM peak they are used as the design hour volumes. The same distribution observed in the 2010 PM peak hour volumes was then applied to each intersection to determine the turning movement volumes.

Through the design process for the Highway 28 Functional Design it was determined that due to the intersection geometry and relatively low projected volumes, the intersection of Highway 28 and Centre Avenue should have banned northbound right and westbound left movements. However, the City considers the westbound left movement as important for the area and prefers to keep it open accordingly. The traffic that would currently use the Centre Avenue intersection was distributed to 52 Street with the following splits:

- 100% of Centre Avenues northbound right and westbound left movements have been assumed to use the intersection of 52 Street with Highway 28.

The traffic volumes were then analyzed using Synchro and Sim Traffic to obtain the levels of service (LOS) and volume to capacity (V/C) ratios based on the proposed lane configuration.

The design volumes are shown on Figure 6.1.

6.3 TRAFFIC MODELING AND DESIGN CRITERIA

6.3.1 Cycle Length

Cycle length is defined as the time in seconds (sec) required for one complete color sequence of signal indications. A maximum cycle length of 120 sec was utilized for the Highway 28 traffic analysis.

6.3.2 Peak Hour Factor

Peak Hour Factor (PHF) is defined as the measure of variability of demand during the peak hour. The City's transportation study specifies a PHF of 0.86. However, as the City becomes more urbanized and traffic volumes increase a higher peak hour factor would be more reasonable when analyzing traffic. For the purpose of this study a PHF of 0.92, with a 15 minute (min) analysis period was utilized for this study.

6.3.3 Minimum Green Time

The minimum green time is based on the roadway designation, (i.e. Main Street or a Side Street). It can also be based on if it is a left turn movement. A minimum green time of 20 seconds, 10 seconds and 7 seconds was allotted to the Main Street, Side Street and left turn movements, respectively.

6.3.4 Intergreen Time

The intergreen time is defined as the time between the end of the green interval for one phase and the beginning of the earliest green interval for the next phase in the same cycle length. This time is provided for vehicles to clear the intersection after the green interval before conflicting movements is released, which consists of the amber interval and the all-red period. An amber interval of 3 seconds and an all-red period of 2 seconds were utilized. Through movements; an amber interval of 3 seconds and an all-red period of one second was used for protected left-turn movements; and an amber interval of 3 seconds with no all red time was used for protected-permissive left-turn movements.

6.3.5 Pedestrian "Walk" and "Don't Walk" Time

The pedestrian "Walk" and "Flashing Don't Walk" times are based on the City's Transportation Study where, for planning purposes, a walk time of 7sec and a flashing "Don't Walk" time of 17 seconds was utilized.

6.3.6 Ideal Saturation Flow Rate

Ideal Saturation Flow Rate is defined as the flow rate in vehicles/hour (veh/hr) that a lane can carry if it has the green indication continuously. A value of 1,850 veh/hr is applied for the left, through and right turning movements.

6.3.7 Volume to Capacity Ratio

The Volume to Capacity (V/C) Ratio is defined as the ratio of flow rate to capacity for a transportation facility. The higher the value, the more congestion is experienced by motorists. The Transportation Study does not indicate a threshold V/C Ratio for triggering intersection improvements. The V/C Ratio range compared to the level of congestion is summarized in Table 6.3 below:

Table 6.3: V/C Ratio Range and Level of Congestion

V/C Ratio Range	Level of Congestion
0.55 to 0.65	Minimal Congestion
0.65 to 0.75	Moderate Congestion
0.75 to 1.00	Maximum Acceptable Congestion
> 1.00	Unacceptable Congestion

6.3.8 Level of Service

The Level of Service (LOS) of each intersection movement is based on the amount of delay experienced by vehicles making the movement and is expressed as sec/vehicle. Based on the delay, a grade is assigned to the individual movement. The LOS criteria for signalized and un-signalized intersection are summarized in Table 6.4. For this project the maximum acceptable level of delay for triggering roadway / intersection improvements is LOS-D and LOS-E for the short term (up to the 10 year horizon) and long term (15 to 20 year horizon), respectively.

Table 6.4: Level of Service Criteria for Signalized and Un-signalized Intersection

Level of Service	Control Delay Per Vehicle (s)		Comment
	Unsignalized Intersection	Signalized Intersection	
A	≤10	≤10	Very Good Operation
B	>10 and ≤15	>10 and ≤20	Good Operation
C	>15 and ≤25	>20 and ≤35	Acceptable Operation
D	>25 and ≤35	>35 and ≤55	Congestion
E	>35 and ≤50	>55 and ≤80	Significant Congestion
F	>50	>80	Unacceptable Operations
Breakdown	Very High	Very High	Conditions so poor that capacity calculations are meaningless

6.3.9 Percentage of Heavy Vehicles

Values of 5% and 2% were utilized as the percentage of heavy vehicles (HV) in daily traffic on Highway 28 and the side streets respectively. This value can change depending on land use (i.e. industrial area, commercial area, etc).

The design criteria for the highway 28 functional design are summarized in Table 6.5., below.

Table 6.5: City of Cold Lake Traffic Modeling Design Criteria

Factors	Values
Cycle Length	120 sec or less
PHF	0.92
Minimum Green Time	20 sec for main street (Highway 28)
	10 sec for side streets.
	7 sec for Left Turn
Amber Time (Intergreen Time)	3.0 sec
All Red Period (Intergreen Time)	0.0-2.0 sec
Pedestrian "Walk" Time	7.0 sec
Pedestrian "Flashing Don't Walk" Time	17.0 sec
Ideal Saturation Flow Rate	1850 veh/hr for left, through and right turn movements
V/C Ratio	Maximum of 1.00
LOS	Maximum LOS-D: 5 & 10-year horizons
	Maximum LOS-E: 15 & 20-year horizons
Percent Heavy Vehicles	5% on Highway 28
	2% on side streets

6.4 TRAFFIC ANALYSIS RESULTS

As part of the Cold Lake Highway 28 Functional Design, five key intersections along Highway 28 were analyzed at the 5-year, 10-year, 15-year and 20-year horizons to identify the impacts based on the proposed lane configurations. Two alternatives were analyzed which includes an Auxiliary Lane Alternative (Alternative 1) and a Service Road Alternative (Alternative 2). The differences between these alternatives affected only the southern two intersections (50 Street and 43 Avenue).

Traffic modeling results are shown in Figures 6.2 A and 6.2B. A summary of the Synchro results along with Outputs from Synchro/Sim Traffic are attached in Appendix D.

6.4.1 Highway 28 and 54 Avenue

2015-5 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2020-10 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2025-15 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the northbound through and southbound left-turn movements.

2030-20 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the northbound through, southbound left-turn and southbound though movements.

6.4.2 Highway 28 and 52 Avenue

2015-5 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2020-10 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2025-15 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the eastbound though, northbound through and southbound left-turn movements.

2030-20 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the eastbound through, westbound through, northbound left-turn, northbound through, southbound left-turn and southbound though movements.

6.4.3 Highway 28 and Centre Avenue

It should be noted that because the proposed intersection configuration contains an eastbound dedicated left-turn lane along with a shared left-turn/through lane, split-phase timing has been incorporated for the eastbound and westbound phases.

2015-5 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the eastbound left-turn movement.

2020-10 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the eastbound left-turn movement.

2025-15 Year Horizon

As shown in Figure 6.2A, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the northbound left-turn, northbound through and southbound though movements.

2030-20 Year Horizon

As shown in Figure 6.2A, the only movements expected to fall within the threshold criteria in terms of V/C Ratio and LOS are the westbound shared through/right-turn movements.

6.4.3.1 Roundabout Alternative

A roundabout alternative was looked at for the intersection of Highway 28 and Centre Avenue using the traffic modeling software of SIDRA Intersection 6. A symmetrical, two-laned roundabout was used for the analysis at all horizons. Based on the results of the traffic modeling for this alternative, the recommended alternatives include a conventional intersection configuration at the intersection of Highway 28 and Centre Avenue.

Traffic modeling results for this roundabout alternative are discussed below, and are summarized on Figure 6.2.c. Outputs from SIDRA are attached in Appendix D.

2015-5 Year Horizon

All four legs of the roundabout show acceptable LOS at the 5-year horizon. However, the eastbound approach shows a V/C ratio of 0.91 at this horizon, exceeding the threshold criteria of 0.85.

2020-10 Year Horizon

The eastbound approach of the roundabout shows LOS-F with a corresponding V/C Ratio of 1.37 at the 10-year horizon. The southbound approach also exceeds the threshold criteria with a V/C Ratio of 1.00.

2025-15 Year Horizon

Both the southbound and eastbound approaches show LOS-F with corresponding V/C Ratios of 1.28 and 1.57, respectively, at the 15-year horizon. The northbound approach also exceeds the threshold criteria with a V/C Ratio of 1.08.

2030-20 Year Horizon

The northbound, southbound and eastbound approaches show LOS-F with corresponding V/C Ratios of 1.26, 1.48 and 1.77, respectively, at the 20-year horizon.

6.4.4 Highway 28 and 50 Street

2015-5 Year Horizon

As shown in Figure 6.2A and Figure 6.2B for the Auxiliary Lane and Service Road alternatives, respectively, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2020-10 Year Horizon

As shown in Figure 6.2A and Figure 6.2B for the Auxiliary Lane and Service Road alternatives, respectively, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2025-15 Year Horizon

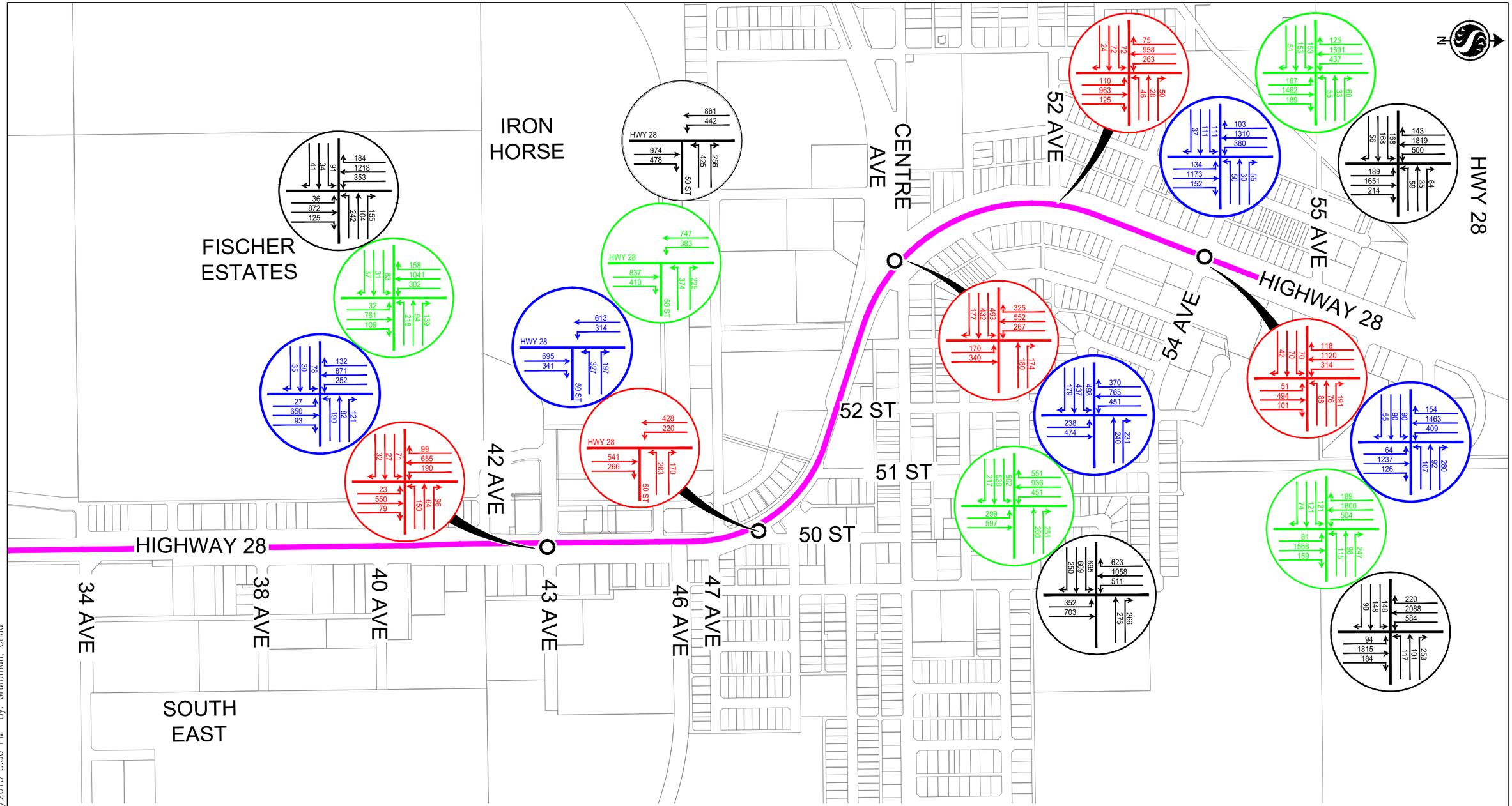
As shown in Figure 6.2A and Figure 6.2B for the Auxiliary Lane and Service Road alternatives, respectively, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS.

2030-20 Year Horizon

As shown in Figure 6.2A for the Auxiliary Lane alternative, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS. As shown in Figure 6.2B for the Service Road alternative, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS, except for the westbound left-turn, northbound through, and southbound left-turn movements.

6.4.5 Highway 28 and 43 Avenue

As shown in Figure 6.2A and Figure 6.2B for the Auxiliary Lane and Service Road alternatives, respectively, all movements are expected to fall within the threshold criteria in terms of V/C Ratio and LOS for all analyzed horizons.



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Legend

- STUDY INTERSECTIONS
- 920 PM PEAK HOUR TRAFFIC VOLUMES
- 2015 – TOTAL TRAFFIC VOLUMES (PM PEAK)
- 2020 – TOTAL TRAFFIC VOLUMES (PM PEAK)
- 2025 – TOTAL TRAFFIC VOLUMES (PM PEAK)
- 2030 – TOTAL TRAFFIC VOLUMES (PM PEAK)

0 75 225 375m

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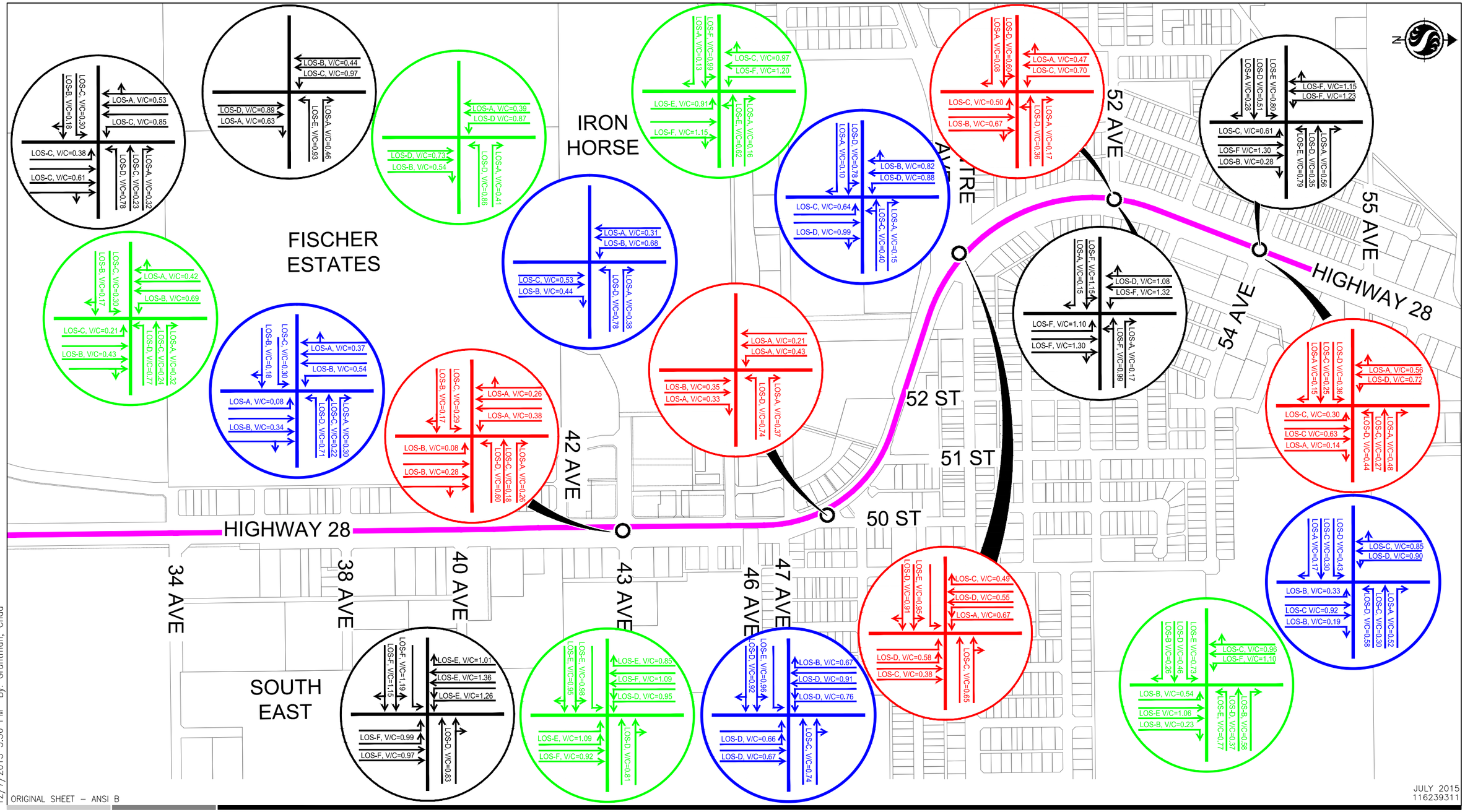
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
6.1

Title
INTERSECTION DESIGN VOLUMES



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JULY 2015
116239311

Legend

- STUDY INTERSECTIONS
- 2015 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2020 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2025 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2030 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

0 75 225 375m

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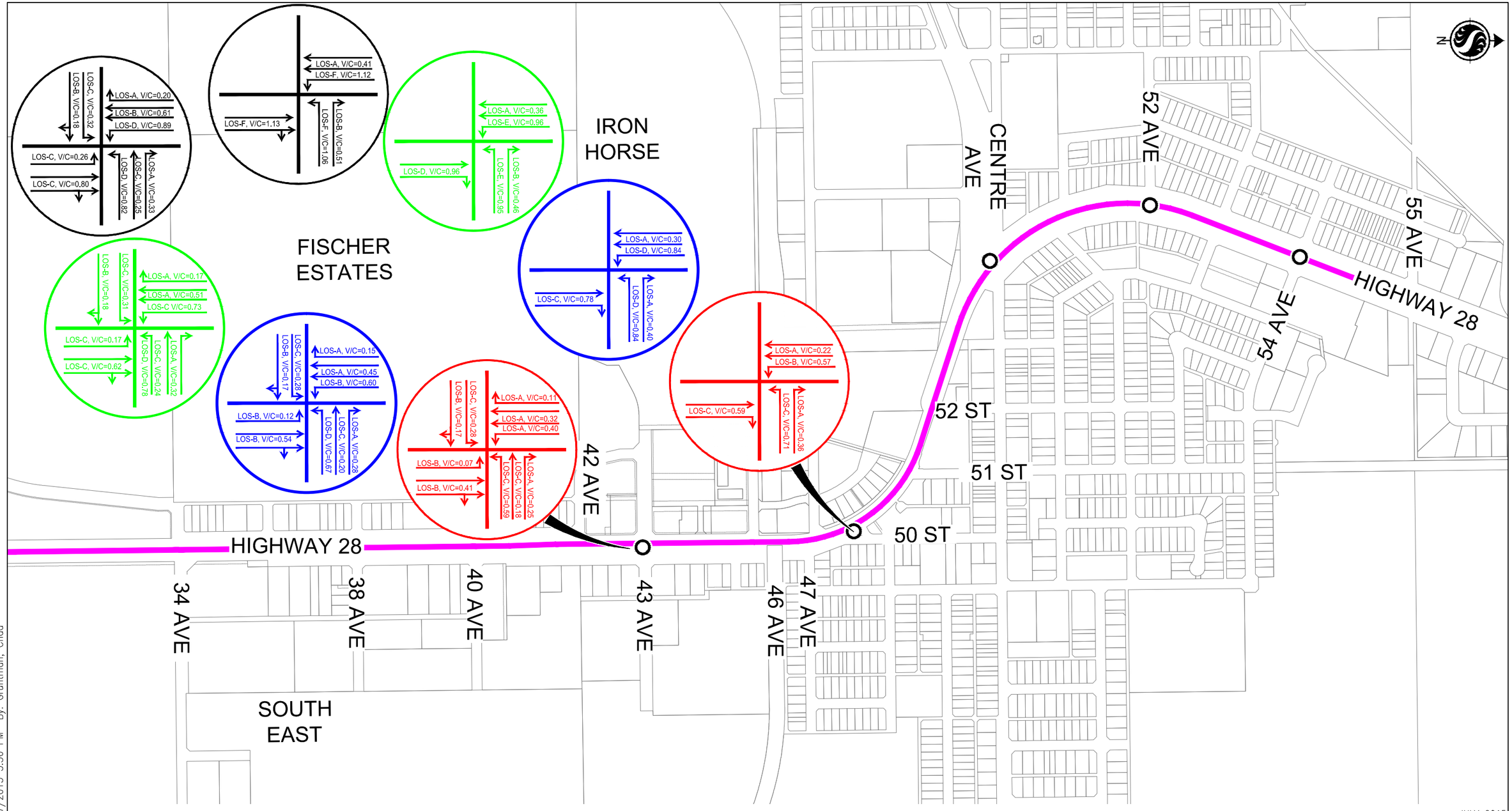
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
6.2A

Title
LEVEL OF SERVICE & LANE CONFIGURATION AUXILIARY LANE ALTERNATIVE



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STUDY INTERSECTIONS

2015 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

2020 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

2025 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

2030 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

Stantec

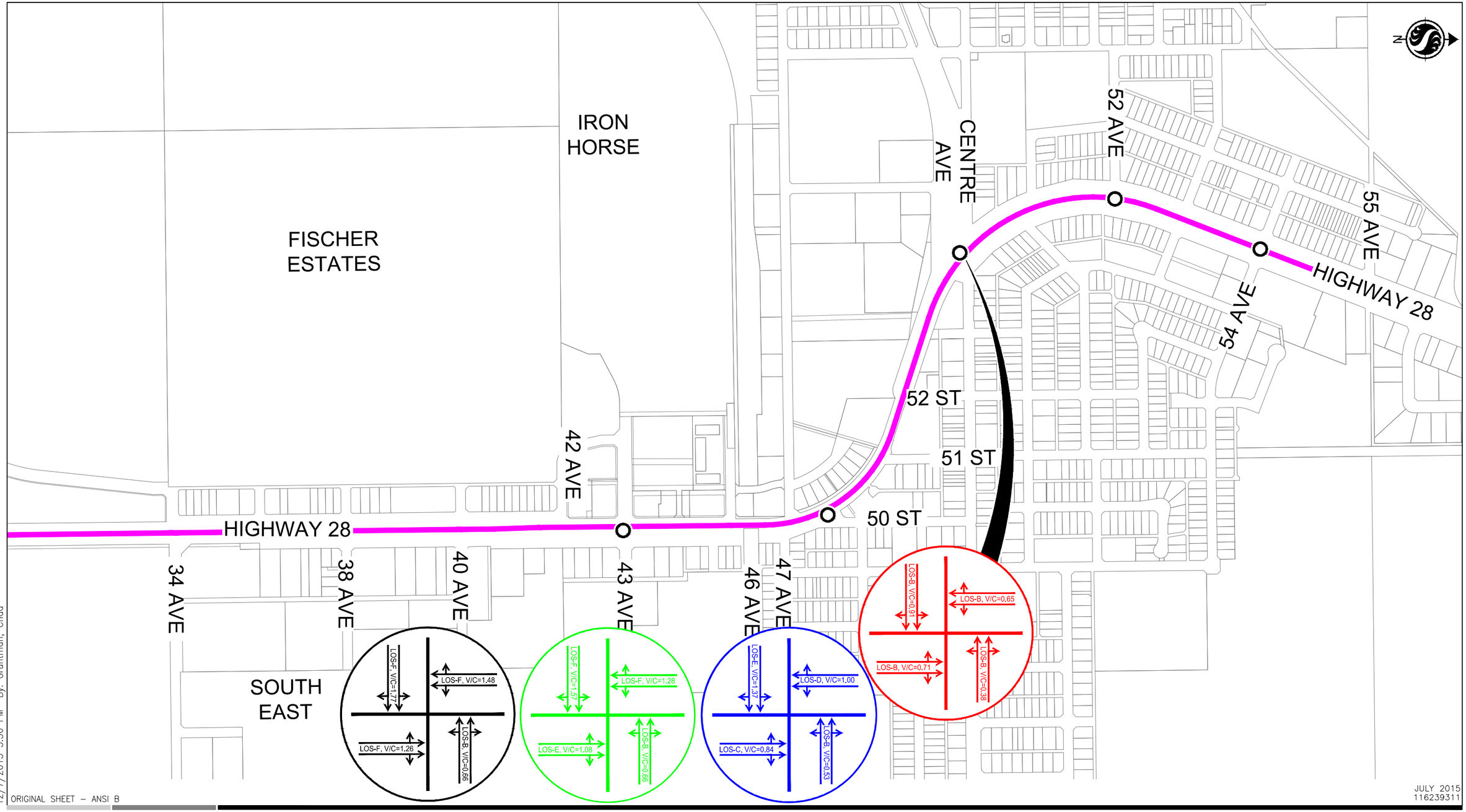
0 75 225 375m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
6.2B

Title
LEVEL OF SERVICE & LANE CONFIGURATION SERVICE ROAD ALTERNATIVE



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- STUDY INTERSECTIONS
- 2015 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2020 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2025 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION
- 2030 – TOTAL TRAFFIC VOLUMES (PM PEAK) & LANE CONFIGURATION

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City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
6.2C

Title
LEVEL OF SERVICE & LANE CONFIGURATION
ROUNDABOUT

7.0 Functional Plan

7.1 OVERVIEW

Currently, Highway 28 is designed with commercial and residential development constructed along a service road configuration where accesses to the development are off the service roads. One of the greatest concerns with the operation of the study area is the impact of the service road intersections with Highway 28 intersections at cross streets. Over the years, the Highway 28 corridor has matured and full development exists from 54 Avenue to 34 Avenue (with proposed future arterial commercial development south of 34 Avenue). There is inadequate storage for the cross streets and the result is that traffic backs up in all of the approaches to the intersections. At signalized intersections, as the light turns green, there is gridlock experienced as vehicles jockey for their turn to enter the intersection.

To improve this operational constraint, two basic concepts were developed:

Auxiliary Lane Alternative (Preferred Plan)

This alternative consists of replacing the service roads with continuous auxiliary lanes. These auxiliary lanes would be able to allow frequent access to adjacent land uses. They are also seen as a safer method to accommodate traffic in and out of various developments. During the functional design process, including public consultation, various workshops and council presentations, the City decided to proceed with the Auxiliary Lane Alternative. This preferred alternative is shown in figures 7.1A to 7.1G.

Service Road Alternative

This alternative proposes to improve the existing service road configuration. One of the major improvements would include bulbing the intersections. Bulbing service road intersections provide more vehicle storage and greater separation from Highway 28, thus improving the safety and operation of the intersections.

7.2 PLAN DESCRIPTION

Based on the Transportation Master Plan, Highway 28 from Township Road 624 to 54 Avenue will ultimately consist of two classifications. Township Road 624 to 34 Avenue will be maintained as a 2-lane undivided arterial with a posted speed of 100km/hr (RAU-110) and 34 Avenue to 54 Avenue will be considered a 4-lane divided arterial with a posted speed of 50km/hr (UAD-70).

The horizontal curves located within the project area are proposed to be maintained as is. The southernmost and northernmost horizontal curves are 274 and 350 metres respectively, which meet the minimum standards of 250 metres for a 70km/hr design speed.

As discussed in Section 2, Highway 28 from Township Road 624 to 54 Avenue is broken into four unique zones which are identified as follows:

- Zone 1 – Township Road 624/South City Limit to 34 Avenue
- Zone 2 – 34 Avenue to 50 Street
- Zone 3 – 50 Street to 51 Avenue
- Zone 4 – 51 Avenue to 54 Avenue

Throughout the functional design process, these zones received different types of treatment based on their varying characteristics. The conceptual plan, shown in Figures 7.1A to 7.1L, was developed in conjunction with safety considerations, design criteria, traffic considerations and access management considerations. Zone 2 consists of two separate alternatives, the Auxiliary Lane Alternative (Figures 7.1A to 7.1G) and the Service Road Alternative (Figures 7.1H to 7.1K).

The conceptual plans for the four zones, as well as their applicable alternatives, are described in detail below.

7.2.1 Zone 1

As per the Transportation Master Plan, this section of roadway is proposed to remain as an undivided rural arterial roadway. However, as shown in Figure 7.1B, the transition zone from a two lane undivided to a four lane undivided roadway has been lengthened considerably from existing conditions to allow traffic to safely merge into one lane. This transition zone is also proposed in order to accommodate the new Waste Transfer Station Access configuration.

As outlined in the City's Area Structure Plans and Municipal Development Plan, there will be a significant amount of future arterial commercial and low density residential development in the surrounding area.

7.2.2 Zone 2

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

As shown in Figures 7.1C to 7.1E, Zone 2 is proposed to consist of continuous auxiliary lanes with the removal of the existing service roads. This essentially increases the road cross section from a four lane divided roadway to a six lane divided roadway with the same median separation.

As discussed in Section 3.8, in order to minimize conflicts in the vicinity of the crossroad intersections, driveways accessing developments should be located a safe distance away from the crossroad. For the majority of accesses, this clearance (C) along the continuous auxiliary lane was provided at 5.0m as per TAC standards. However, accommodating these minimum clearances in retrofit situations is not always possible.

As outlined in the Area Structure Plans and the Municipal Development Plan, there will be a significant amount of surrounding future arterial commercial and low density residential development within this

area. As such, the cross streets within this zone have been extended for conceptual purposes to accommodate this future development.

As shown in Figures 7.1C to 7.1E, the proposed auxiliary lane provides access to businesses directly off of Highway 28. In areas where frontage access was not deemed feasible, rear access was provided. In some instances, there was also opportunity to provide rear accesses in addition to the existing frontage accesses.

Currently, drivers traveling on Highway 28 wanting to access businesses on the opposite side of the highway would access the service roads via 50 Street, 46 Avenue, 43 Avenue, 40 Avenue, 38 Avenue, 37 Avenue, and 34 Avenue. All of these intersections are currently unsignalized, with the exception of 50 Street and 43 Avenue. With the proposed auxiliary lane design, drivers wanting to access these same businesses would be able to do so on the rear accesses via 46 Avenue, 43 Avenue, 40 Avenue, 38 Avenue and 34 Avenue. In Alternative 1, all of these intersections are proposed to be signalized in the future.

The east service road that exists between 46 Avenue and 50 Street is proposed to be maintained, however, access to this road would be via rear access only. Also, the disconnection between the east service road and 50 Street is shown in this alternative. Vehicles wanting to access the proposed private driveway would need to do so on the rear access via 43 Avenue or 48 Avenue.

Detailed description of intersection configurations are provided in Section 7.4.

Alternative 2 – Service Road Alternative

Alternative 2 proposes to maintain the service roads and improve the intersections within Zone 2, as shown in Figures 7.1H to 7.1K. As discussed in Section 3.7, bulbing the service road intersections can have a positive impact on the safety and operation of these intersections. With average daily traffic exceeding 5000 vehicles per day on the cross roads, TAC recommends a bulbing offset of 45m. Providing an offset of this magnitude would have significant impacts on adjacent businesses. As a result, a much lower bulbing offset was provided. When it was not possible to provide bulbing at all, such as at 43 Avenue, a median separation was provided on the cross road to reduce the number of turning movements onto and off of the east service road.

As outlined in the Area Structure Plans and the Municipal Development Plan, there will be a significant amount of surrounding future arterial commercial and low density residential development within this area. As such, the cross streets within this zone have been extended for conceptual purposes to accommodate this future development.

Similar to the existing roadway configuration within this zone, Alternative 2 offers access to businesses via the service roads. Currently, vehicles traveling in both directions on Highway 28 wanting to access adjacent would access the service roads via 37 Avenue, 38 Avenue, 40 Avenue, 43 Avenue, 46 Avenue and 50 Street. All of these intersections are currently unsignalized, with the exception of 43 Avenue and 50 Street. As shown in Figures 7.1I to 7.1K the service road accesses have been reduced to 34 Avenue, 40 Avenue, 43 Avenue, and 50 Street which are all proposed to be signalized in the future.

Detailed description of intersection configurations are provided in Section 7.4.

7.2.3 Zone 3

Zone 3 is unique because it contains minimal sections of service road with the exception of the access provided to Assumption Junior and Senior High School and the church. This service road will be maintained. Although a four lane divided roadway with a 6.0 metre median has been provided in this zone, the existing ROW allows for minimal boulevard width to be implemented.

The surrounding land adjacent to Highway 28 within this zone has been fully developed, with the exception of the proposed future commercial development located northwest of the school.

Generally, the small amount of service roads that exist within Zone 3 have been maintained, however, as discussed in Section 2 the geometrics and accesses to the service roads have been slightly altered for safety and operational purposes.

A median separation is proposed infront of 51 Street with a right-in only access off of Highway 28. Drivers wanting to access Highway 28 from businesses such as the Best Western and Bridges Outreach School would be able to do so via 50 Street and 52 Street.

As shown in Figure 7.1F, 52 Street is proposed to be a four legged intersection. Vehicles that currently access Assumption Junior and Senior High School via 52 Street access would now be able to access the school via a modified right-in / right-out (RIRO) located at the west property line of the school's currently vacated lot. For northbound traffic, vehicles could access the school and Future Commercial Development from the service road via Centre Avenue.

Detailed description of intersection configurations are provided in Section 7.4.

7.2.4 Zone 4

The service roads are proposed to be maintained within Zone 4. Bulbing was not incorporated into the signalized intersections within this zone due to right-of-way constraints and the large impacts on surrounding residential developments as shown in Figures 7.1F and 7.1G.

The auxiliary lane option was not implemented in this area because this area primarily consists of residential development which would each require a private driveway. This would require very tight driveway spacing along a major arterial roadway which is not desirable.

Generally, vehicle trips within the proposed Zone 4 configuration have remained unchanged. However, considering the new emergency facility location (Figure 7.1F), access has been provided at 51 Avenue for emergency vehicles only which will be enforced by utilizing specialized emergency actuated signals.

Detailed description of intersection configurations are provided in Section 7.4.

7.3 PROPOSED CROSS-SECTIONS

Figure 7.2, at the end of this section, illustrates typical cross-sections proposed for Highway 28 from 34 Street to 54 Avenue (Zone 2 – Zone 4). The roadway south of 34 Street (Zone 1) will be maintained and therefore a proposed cross-section is not shown. All cross-sections include the same basic design criteria such as travel lane width, median width / turn bay width, curb and gutter width, cross slope, and walkway width. However, some values vary in different zones based on existing right-of-way widths and boundary conditions. The proposed cross-section parameters are summarized in Table 7.1 below.

Table 7.1 Cross-Section Parameters

Cross-Section Parameter	Zone 2 (Service Road Alternative)	Zone 2 (Auxiliary Lane Alternative)	Zone 3	Zone 4
Travel Lane Width	3.7m	3.7m	3.7m	3.7m
Median Width / Turn Bay Width	6.0m / 3.5m	6.0m / 3.5m	6.0m / 3.5m	6.0m / 3.5m
Curb and Gutter Width	0.5m	0.5m	0.5m	0.5m
Cross Slope	2.0%	2.0%	2.0%	2.0%
Boulevard Width	2-18m	10-26m	0-20m	12-16m
Walkways	3.0m	3.0m	3.0m	3.0m

Referring to the typical proposed cross-sections (Figure 7.2), the boulevard width will vary in different zones. In Zone 2, the boulevard width varies from 2-18 metres for Service Road Alternative and 10 - 26 metres for the Auxiliary Lane Alternative. In Zone 3, the minimum boulevard width approaches zero meters in some areas due to right-of-way constraints. Since Zone 4 will utilize service roads, it will contain a boulevard width similar to that of Zone 2's Service Road Alternative, but ranges from 12 - 16 metres.

As outlined in Section 3, TAC recommends a minimum clear zone of 6.0 metres for this roadway classification. All zones will mostly be able to accommodate this minimum clear zone requirement with the exception of Zone 3. In retrofit situations, it's not always possible to achieve the specified clear zone although it should always be considered and incorporated if possible. It is recommended that the City consider acquiring land in order provide a 6.0 meter buffer from obstructions such as light standards and parking lots.

7.4 PROPOSED INTERSECTION CONFIGURATIONS

The proposed intersection configurations are described in detail below and are shown in Figures 7.1 to 7.1L. Since there are two alternatives within Zone 2 (Auxiliary Lane and Service Road), there are also two separate intersection configurations. Zone 3 also contains two different intersection configurations at Centre Avenue.

As mentioned in Section 3, the design vehicle for this project is a WB-21 Tractor-Semi Trailer. Turning movement diagrams have been provided for the key intersections along Highway 28 and are shown in Figures 7.3A to 7.3I. As described in the Cold Lake Transportation Study, there are currently trucks that carry jet fuel (dangerous goods) from Edmonton to the airfield in Medley. The Dangerous Goods Route is along Highway 28 from the South City Limit to Centre Avenue, and west to the Air Base. As such, Centre Avenue has been designed to accommodate a WB-36 vehicle which is also shown in the turning movement diagrams.

7.4.1 Zone 1

7.4.1.1 Highway 28 and Township Road 624

The intersection of Highway 28 and Township Road 624 is proposed to remain the same.

7.4.1.2 Highway 28 and Waste Transfer Station Access

The City has plans to upgrade the intersection of Highway 28 and Waste Transfer Station Access road. These intersection improvements have been incorporated into the proposed design. The northbound direction will consist of a single through and a dedicated right turn lane while the southbound direction will consist of a single through and dedicated right turn lane.

7.4.2 Zone 2

There will be a total of six signalized intersections within this zone (34 Avenue, 38 Avenue, 40 Avenue, 43 Avenue, 46 Avenue, and 50 Street) for the Auxiliary Lane Alternative. A total of four signalized intersections are proposed for the Service Road Alternative in Zone 2 (34 Avenue, 40 Avenue, 43 Avenue, and 50 Street).

Refer to the subsections below for a detailed description of intersection configurations.

7.4.2.1 Highway 28 and 34 Avenue

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1C, the intersection of Highway 28 and 34 Avenue is proposed to be a signalized intersection. A single shared through, right and left turn lane is provided in the eastbound and westbound directions. Dual through and dedicated left and right turn lanes are provided in the southbound direction. The northbound direction consists of a single through, a dedicated left, and a shared through and right turn lane.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1I, the intersection of Highway 28 and 34 Avenue is proposed to be a signalized intersection. A single shared through, right and left turn lane is provided in the eastbound and westbound directions. The northbound and southbound directions will consist of a single through, a shared through and right, and a dedicated left turn lane.

7.4.2.2 Highway 28 and 38 Avenue

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1C, the intersection of Highway 28 and 38 Avenue is proposed to be a signalized intersection. A single shared through, right and left turn lane is provided in the eastbound and westbound directions. The northbound and southbound directions consist of a dual through, a shared through and right, and a dedicated left turn lanes.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1, this intersection is proposed to be closed in the future in the service road alternative.

7.4.2.3 Highway 28 and 40 Avenue

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1D, the intersection of Highway 28 and 40 Avenue is proposed to be a signalized intersection. A single shared through, right and left turn lane is provided in the eastbound and westbound directions. The southbound direction consists of a dual through, a shared through and right, and a dedicated left turn lane. The northbound direction consists of a dual through, a dedicated right, and a dedicated left turn lane.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1J, the intersection of Highway 28 and 40 Avenue is proposed to be a signalized intersection. Bulbing has been provided at this intersection to provide more vehicle storage and to increase the separation between Highway 28 and the service roads. A single shared through, right and left turn lane is provided in the eastbound and westbound directions. The northbound and southbound directions consist of a single through, a shared through and right, and a dedicated left turn lane.

7.4.2.4 Highway 28 and 43 Avenue

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1D, the intersection of Highway 28 and 43 Avenue is proposed to remain a signalized intersection. The eastbound direction consists of a single shared through and right and a dedicated left turn lane. A single through, a dedicated left turn, and a dedicated right turn lane is provided in the westbound direction. The southbound direction consists of a dual through, a single through and right turn lane, and a dedicated left turn lane. The northbound direction consists of a dual through, a dedicated right turn lane, and a dedicated left turn lane.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1J, the intersection of Highway 28 and 43 Avenue is proposed to remain a signalized intersection. The eastbound direction consists of a single shared through and right and a dedicated left turn lane. A single through, dedicated left, and a dedicated right turn lane are provided in the westbound direction. The northbound direction consists of a single through, a shared through and right, and a dedicated left turn lane. The southbound direction consists of a dual through, a dedicated left, and a dedicated right turn lane. A median separation has been provided on the east leg to minimize turning conflicts associated with the service roads.

7.4.2.5 Highway 28 and 46 Avenue

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1E, the intersection of Highway 28 and 46 Avenue is proposed to be a signalized three legged intersection. The west leg of the intersection consists of a single right and left turn lane. The northbound direction consists of a triple through and dedicated left turn lane. The southbound direction consists of a single through and a shared through and right turn lane.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1K, the intersection of Highway 28 and 46 Avenue is proposed to be an unsignalized three legged intersection with a right-in right-out configuration on the west leg. Two through lanes are provided in the northbound direction and a through lane and a shared through and right turn lane is provided in the southbound direction.

7.4.2.6 Highway 28 and 50 Street

Alternative 1 – Auxiliary Lane Alternative (Preferred Plan)

Referring to Figure 7.1E, the intersection of Highway 28 and 50 Street is proposed to remain a signalized three legged intersection. The east leg of the intersection consists of a dedicated right and left turn lane. Dual through lanes with a channelized right turn via the auxiliary lane are provided in the northbound direction. The southbound direction consists of a dual through and dedicated left turn lanes.

The existing bulbing at 50 Street offers unsafe turning movements as well as a high level of conflict points. In efforts to alleviate these concerns as well as improve the operation of this intersection, a private driveway was implemented (as shown in Figure 7.1E). Also, with the termination of the auxiliary lane being channelized onto 50 Street, this connection would be difficult to accommodate geometrically.

Alternative 2 – Service Road Alternative

Referring to Figure 7.1K, the intersection of Highway 28 and 50 Street is proposed to remain a signalized three legged intersection. The east leg of the intersection consists of a dedicated right and left turn lane. The northbound direction consists of a single through and a shared through and right turn lane. The southbound direction consists of a dual through and dedicated left turn lane.

7.4.3 Zone 3

There are two signalized intersections proposed within this zone (52 Street and Centre Avenue).

Refer to the subsections below for a detailed description of intersection configurations.

7.4.3.1 Highway 28 and 51 Street

Referring to Figure 7.1E, the intersection of Highway 28 and 51 Street is proposed to be closed with the implementation of a right-in only access. Closing this intersection would provide an acceptable intersection spacing of 275m between 50 Street and 52 Street, which is adequate in an area that has already been intensely developed.

7.4.3.2 Highway 28 and 52 Street

Referring to Figure 7.1F, the intersection of Highway 28 and 52 Street is proposed to be a four legged signalized intersection. The north leg of the intersection consists of a shared through and left turn lane and a dedicated right turn lane. A single through, shared through and right turn lane, and a dedicated left turn lane has been provided on the east leg. The west leg consists of a single through, a shared through and right, and a dedicated left turn lane. The south leg (school entrance) consists of a shared through, left, and right turn lane.

7.4.3.3 Highway 28 and Centre Avenue

Two alternative configurations have been provided for the intersection of Highway 28 and Centre Avenue which are described below.

Four Legged Intersection Configuration

Referring to Figure 7.1F, the intersection of Highway 28 and Centre Avenue is proposed to remain a 4 legged signalized intersection. The eastbound direction consists of a single through, a shared through and left, a dedicated right turn lane, and a dedicated left turn lane. The westbound direction consists of a shared through and left turn lane and a shared through and right turn lane with a dedicated right to access the east service road. Dual through and dual left turn lanes have been provided in the northbound direction. The southbound direction consists of a dual through, dual left and a channelized right turn lane with a porkchop median. In order to function, a split timing cycle may be needed.

In providing the above lane configuration, the northbound right off of Highway 28 has been eliminated. Due to the small traffic volumes associated with this movement as well as efforts to minimize conflict points and awkward turns with the intersection skew angle, this turning movement was removed.

There are safety concerns associated with the existing connection of the north leg of the east service road to Centre Avenue. The proposed design, shown in Figure 7.1F now provides a median separation so eastbound traffic travelling on Centre Avenue is unable to access this service road. Also, access to Centre Avenue from the east service road is prohibited with the incorporation of a Cul-De-Sac.

As discussed in Section 2.1.3, adjusting the skew angle of this intersection would improve the overall safety of Centre Avenue and Highway 28. Stantec reviewed the possibility of realigning the roadway to provide the proper skew and curve radii. However, following discussions with the City, due to right of way constraints and the disruption to surrounding developments, this was not deemed feasible.

Roundabout Configuration Alternative

Referring to Figure 7.1L, the alternative intersection of Highway 28 and Centre Avenue is proposed to consist of a roundabout. All four legs will consist of dual entry and exit lanes. The benefit of the roundabout is that it eliminates the existing skew and conflict points while providing all turning movements, including the eliminated movements in the previous configuration. Similar to the previous configuration a Cul-De-Sac design has been provided at the east service road / Centre Avenue intersection to avoid traffic coming from the east service road.

7.4.4 Zone 4

There are two signalized intersections in this zone (52 Avenue and 54 Avenue). Refer to the subsections below for a detailed description of intersection configurations.

7.4.4.1 Highway 28 and 51 Avenue

Referring to Figure 7.1F, this intersection is proposed to be closed with the exception of the east leg in order to provide access to the Emergency Rescue Facility. Special emergency actuated signals will be provided at this intersection for emergency vehicles only.

7.4.4.2 Highway 28 and 52 Avenue

Referring to Figure 7.1F, the intersection of Highway 28 and 52 Avenue is proposed to be a four legged signalized intersection. A shared through and left as well as a dedicated right turn lane will be provided in the eastbound and westbound directions. The northbound and southbound directions will consist of a single through, a single shared through and right, and a dedicated right turn lane.

7.4.4.3 Highway 28 and 54 Avenue

Referring to Figure 7.1G, the intersection of Highway 28 and 54 Avenue is proposed to remain a signalized intersection. The eastbound and westbound directions consist of a single through, a dedicated right, and dedicated left turn lane. A dual through, a dedicated right, and a dedicated left turn lane is provided in the northbound direction. The southbound direction consists of a single through, a shared through and right, and a dedicated left turn lane.

7.5 PEDESTRIAN TRAFFIC AND MILLENNIUM TRAIL

As per the MDP, the City of Cold Lake has a vision of encouraging the development of trails for pedestrians and bicyclists as a healthier and more sustainable mode of transportation. Policy 8.5 (Highway 28 Commercial Corridors) states the importance of having a pedestrian friendly environment along Highway 28 since it is planned to be the primary arterial commercial area in the City of Cold Lake. As shown in Figures 8.6F to 8.6G, the proposed functional design will maintain the existing Millennium Trail Alignment in both the four legged and roundabout intersection configurations.

7.6 DEEP UTILITIES

According to the Municipal Development Plan and the Area Structure Plans, there will be extensive future development south of 48 Avenue in Cold Lake South. This includes, but is not limited to, Fisher Estates, Iron Horse, SouthEast and Golden Eagle Estates. Within these areas, there will be expansion of arterial commercial, low density residential, high density residential and public services developments. Further south of these four main areas (south of 34 Avenue), there will be additional commercial arterial, industrial and public services land developed. In conjunction with the Master Drainage Plan (UMA/AECOM, August 2006), the Water Distribution System Modelling and Assessment (AECOM,

December 2009), and the Wastewater System Modelling Assessment (AECOM, December 2009) this section summarizes the long term utility servicing and storm drainage requirements for existing and future growth areas.

7.6.1 Proposed Water System

Figure 7.4A and 7.4B illustrate the proposed water main distribution upgrades and replacements along Highway 28 and in the surrounding area. The proposed water line alignment and pipe sizes are according to the Water Distribution System Modelling and Assessment completed by AECOM.

From Township Road 624 to Centre Avenue

As mentioned previously, most of the future land development within Cold Lake South is planned to be south of Centre Avenue. As such, the Municipal Development Plan outlines the locations of proposed water trunk mains in this area. For the most part, these mains will not disrupt the improvement of the Highway 28 corridor. There are a few exceptions however, including the proposed trunk main running along 34 Avenue and crossing Highway 28. As recommended in the City of Cold Lake Water Distribution System Modelling and Assessment report, there are proposed upgrades and new installations that may conflict with improving the Highway 28 corridor which are described below.

- Proposed 250mm pipe (being upgraded from 150mm) beginning at east side of 50 Street intersection running south along east service road for approximately 250m.
- New 300m pipe crossing Highway 28 and connecting to 300mm water mains running parallel to Highway 28 and servicing the commercial arterial developments.

From Centre Avenue to 54 Avenue

The areas adjacent to Highway 28 are currently serviced and planned to be further serviced through existing water main connections. As recommended in the City of Cold Lake Water Distribution System Modelling and Assessment report, there are several proposed upgrades and new installations that may conflict with improving the Highway 28 corridor which are described below.

- New 300mm pipe crossing underneath Highway 28 along 54 Avenue;
- Proposed 300mm pipe (being upgraded from 150mm) running underneath the west service road from 54th Avenue to 53rd Avenue;
- New 250mm pipe running underneath Highway 28 at 53rd Avenue; and
- New 200mm pipe, approximately 80m in length, running alongside the east service road immediately north of Centre Avenue.

7.6.2 Proposed Sanitary System

As part of the Wastewater System Modelling Assessment (AECOM, December 2009), the sanitary sewer system was assessed under existing conditions as well as its capacity to convey flows from future development and recommended that if pipes require replacement for condition reasons, that the capacity and sizing requirements be reviewed and any upsizing be coordinated with the replacement. Stantec recommends that any future upgrades should also be coordinated with the proposed Highway 28 functional plan.

7.7 STORMWATER MANAGEMENT

The stormwater management component of this project has been broken down into two systems, the Major Storm System and the Minor Storm System, as discussed in the subsections below. The minor storm system for this project is comprised of storm sewer; which is designed to provide a basic level of service in accommodating minor storms (1:5 year event or lesser). The major storm system is comprised of the roadway, ditches, and storm ponds that convey runoff for events that are greater than the capacity of the minor storm system.

7.7.1 Major Storm System

Over the length extending from Township Road 624 to 54 Avenue, the Highway 28 corridor is located within six major storm basins. In the 2006 City of Cold Lake Master Drainage Plan, these basins were analyzed in detail and several recommendations were made. The general recommendation was to create a Storm Water Management Facility (SWMF) in each basin and abandon the existing ditch system which interferes with future land development. Figure 7.5 illustrates the Overall Storm Drainage Concept, which includes the proposed basin boundaries and storm management facilities. A description of the major storm system is provided below.

Station 0+240 – Station 1+050

Basin 9: Currently, this basin contains a landfill and should be self-contained. As such, the runoff from Basin 9 will not impact the City of Cold Lake drainage system.

Station 1+050 – Station 1+880

Basin 8: Currently, Basin 8 does not contain any development. Runoff from this basin is collected in the roadside ditch. According to the Municipal Development Plan, there are plans for Basin 8 to contain arterial commercial and industrial developments. A section of the basin also contains a buffer area, which has an unspecified land use at this time. There is a proposed Storm Water Management Facility (SWMF), located in the northwest corner of Basin 8, which will collect runoff from this basin. Due to this future configuration, a storm sewer crossing will be required to accept flow from this SWMF and cross underneath Highway 28 at 34 Avenue, shown in Figure 7.5.

Basins 2 & A2: Currently, the majority of this land is undeveloped with the exception of a small residential development which exists immediately to the west of the highway. Runoff within this basin is

either collected in the roadside ditch or flows north into Basin 4, which flows into the existing wetland and ultimately discharges into Palm Creek.

According to the Municipal Development Plan, the majority of this area will consist of low density residential development with a small portion of commercial expansion along Highway 28. There is a proposed SWMF, which will be located to the west of 34 Avenue. The discharge from this facility will converge with the proposed drainage route flowing from SWMF 8 and travel west, where it will ultimately discharge into Palm Creek. It should also be noted that this basin will also accommodate runoff from a 10.5 Ha area of land (area A2), which is located immediately outside the south city limit, shown in Figure 7.5.

Station 1+880 – Station 2+920

Basins 4 & 4a: Basin 4 is currently mostly comprised of arterial commercial development and Basin 4a does not contain any development. For the most part, runoff from both basins runs into the existing wetland located west of Highway 28. The remaining runoff flows into Basin 5, which discharges the stormwater into the existing wetland east of Highway 28 and south of 43 Avenue. This water is then conveyed through a 1500mm storm sewer trunk located at 43 Avenue underneath Highway 28 and conjoins with a ditch carrying stormwater discharged from the existing wetland/pond. Currently, the water leaves this pond and collects into a ditch where it travels north and connects with a sewer line that runs underneath Highway 28.

Most of the future development within Basins 4 and 4a is planned to be low density residential (Fisher Estates and Iron Horse). The existing wetland is proposed to be enhanced into SWMF 4 and accept runoff from Basin 4. The existing ditch traveling north is proposed to be abandoned. Instead, stormwater leaving this SWMF will connect to a sewer line that will travel west underneath the future Iron Horse development. This sewer line will connect with the existing drainage ditch that runs along abandoned CN Railway and ultimately drain into Palm Creek. SWMF 4a will collect stormwater from the future Iron Horse development and then utilize the same ditch as SWMF 4, shown in Figure 7.5.

Station 1+920 – Station 4+460

Basin 34: The current land use within this area includes commercial, low density residential and parks and open space developments. Currently, the sewer system from 46 Avenue to 51 Avenue accepts drainage from Highway 28 and the surrounding area. The stormwater then flows through the existing drainage ditches located northeast of the existing City development, which ultimately flows into Palm Creek.

The proposed SWMF will be located east of Highway 28 and north of 55 Avenue and will accept runoff from its surroundings. The drainage ditches previously mentioned are planned to be abandoned and replaced with a High Density Residential development. As such, UMA/AECOM has recommended extending the existing storm sewer to SWMF 34, shown in Figure 7.5.

7.7.2 Minor Storm System

The minor storm system upgrade (storm sewer), has been designed to accommodate all runoff within the existing right-of-way. All runoff within future developments adjacent to Highway 28 will be contained and managed within the development areas and thus, will not be accommodated for in the Highway 28 storm sewer system upgrade. Figures 7.6A and 7.6F show the proposed storm sewer plan and profile.

As per the City of Cold Lake Municipal Engineering Servicing Standards and Standard Construction Specifications, the storm sewer along Highway 28 was designed using the Rational method, as follows:

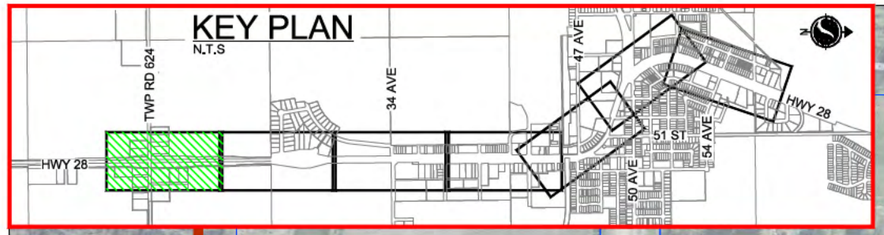
$$Q = \frac{CiA}{360}$$

Where:
- Q = The peak design flow rate in m^3/s
- i = The intensity of rainfall in millimeters per hour corresponding to the time of concentration
- A = The contributing area in hectares
- C = The runoff coefficient

Detailed storm sewer design calculations are included in Appendix E.

7.8 SHALLOW AND OVERHEAD UTILITIES

Please refer to Section 2.4 for a description of the existing shallow and overhead utilities throughout the project area. Utility conflicts and future alignments should be coordinated during future design stages of this project.



HIGHWAY 28

0+100 0+200 0+300 0+400 0+500 0+600 0+700 0+800

PROJECT LIMIT

TWP ROAD 624

ACCESS -1

MATCHLINE (FIG 7.1B)

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12/7/2015 3:57 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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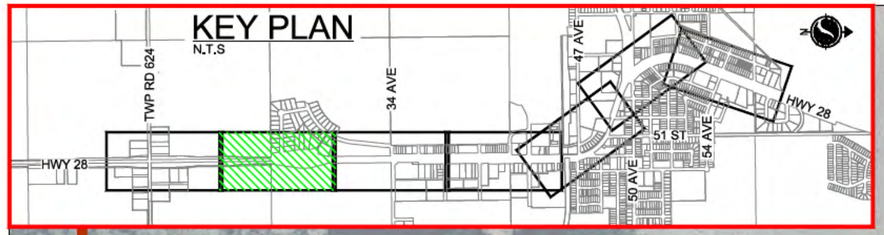
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1A

Title
HORIZONTAL GEOMETRICS
ZONE 1



HIGHWAY 28

0+800 0+900 1+000 1+100 1+200 1+300 1+400 1+500

MATCHLINE (FIG 7.1A)

WASTE TRANSFER STATION ACCESS

MATCHLINE (FIG 7.1C)

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12/7/2015 3:57 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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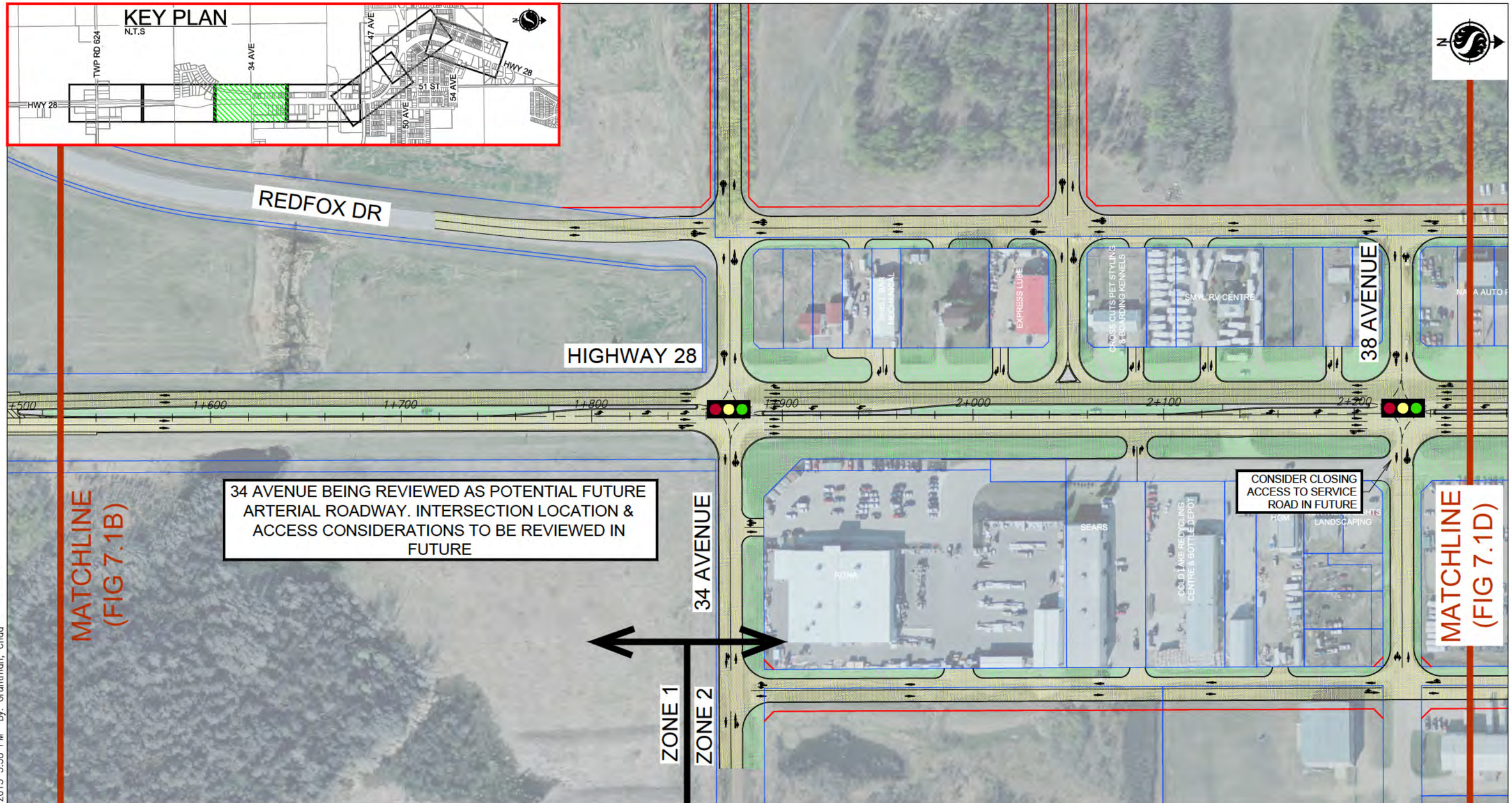
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1B

Title
HORIZONTAL GEOMETRICS ZONE 1



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12/7/2015 3:58 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
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Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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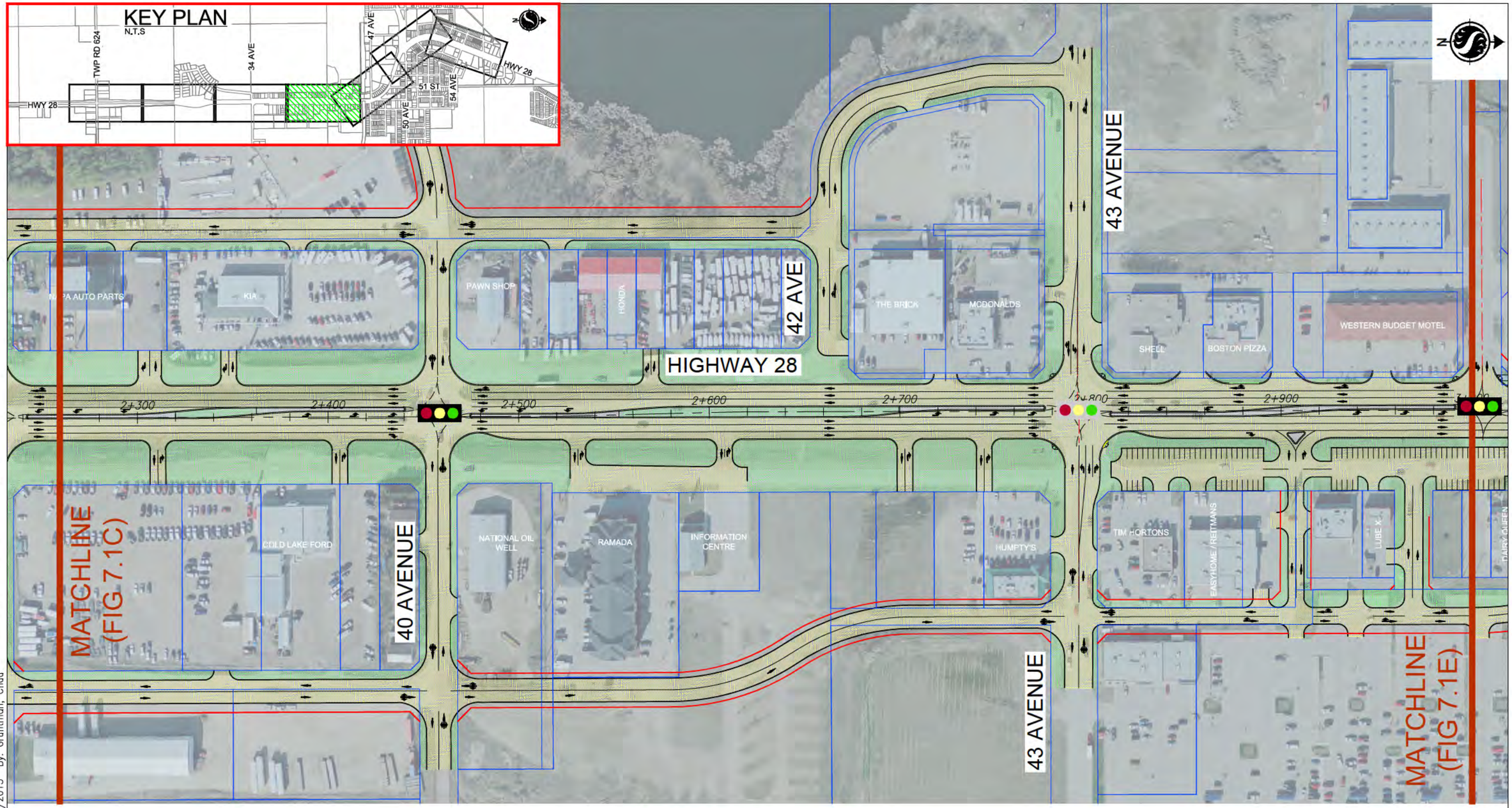
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1C

Title
HORIZONTAL GEOMETRICS ZONE 1 & ZONE 2



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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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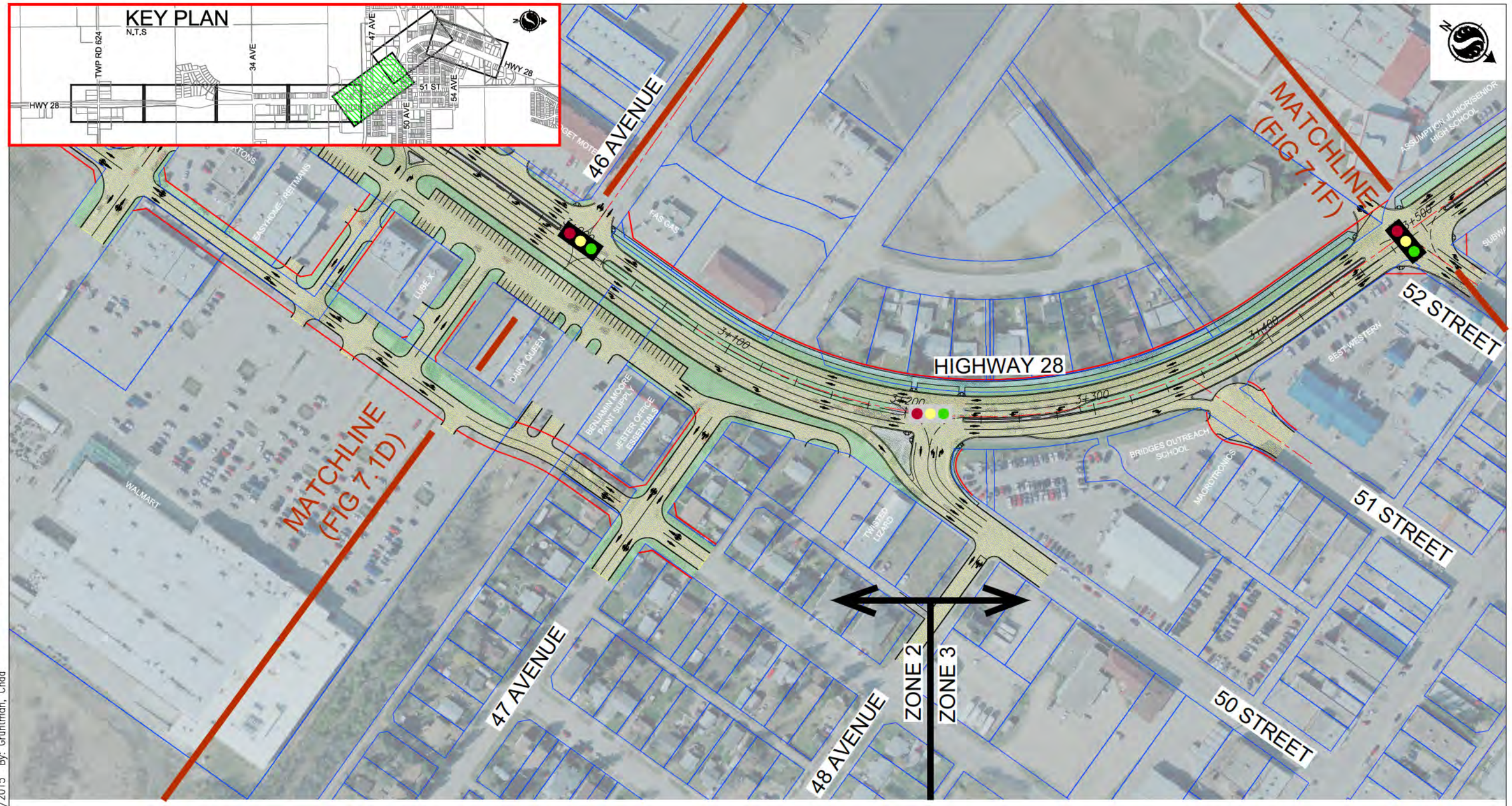
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1D

Title
HORIZONTAL GEOMETRICS ZONE 2



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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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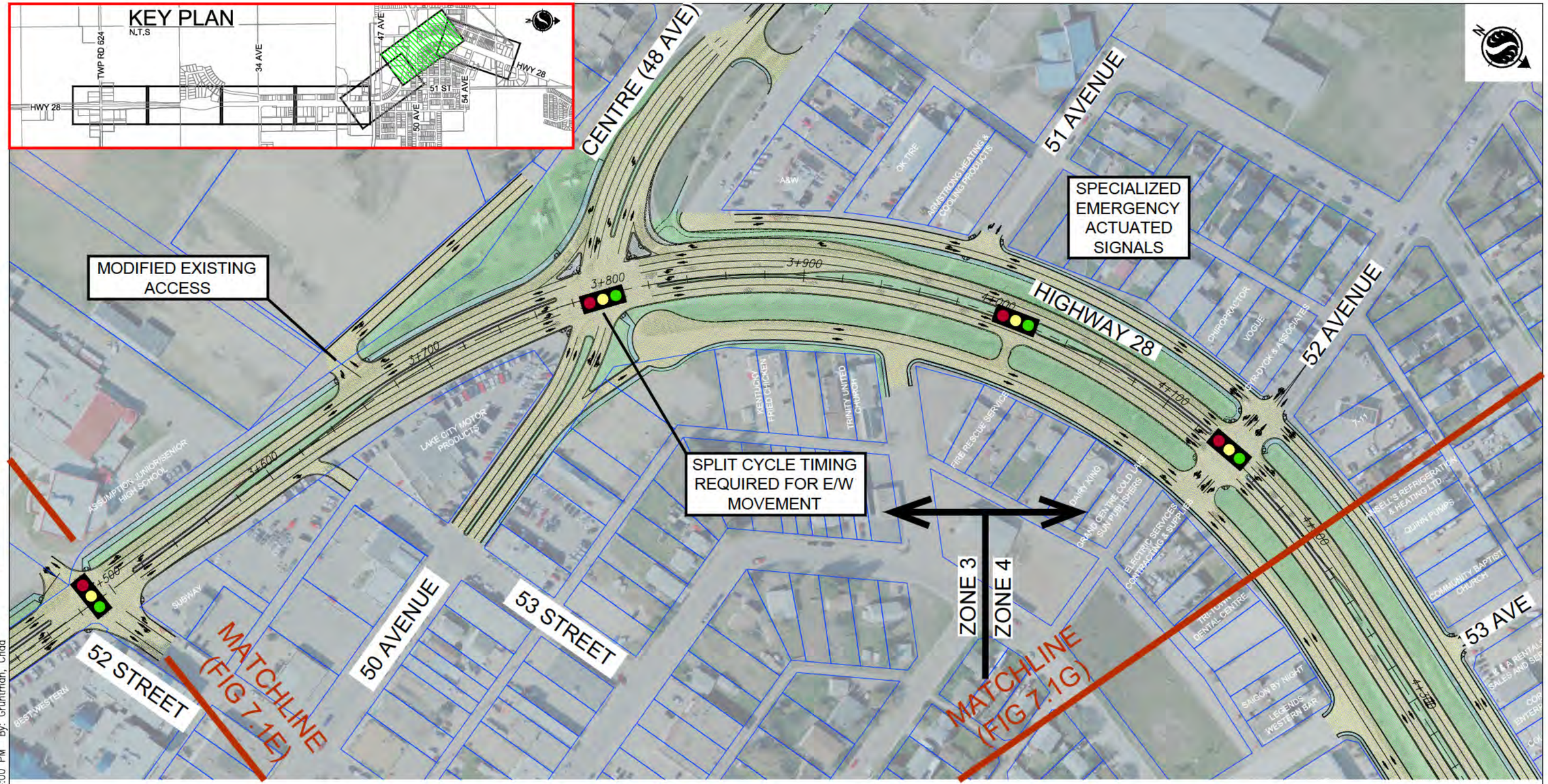
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1E

Title
HORIZONTAL GEOMETRICS
ZONE 2 & ZONE 3



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12/7/2015 4:00 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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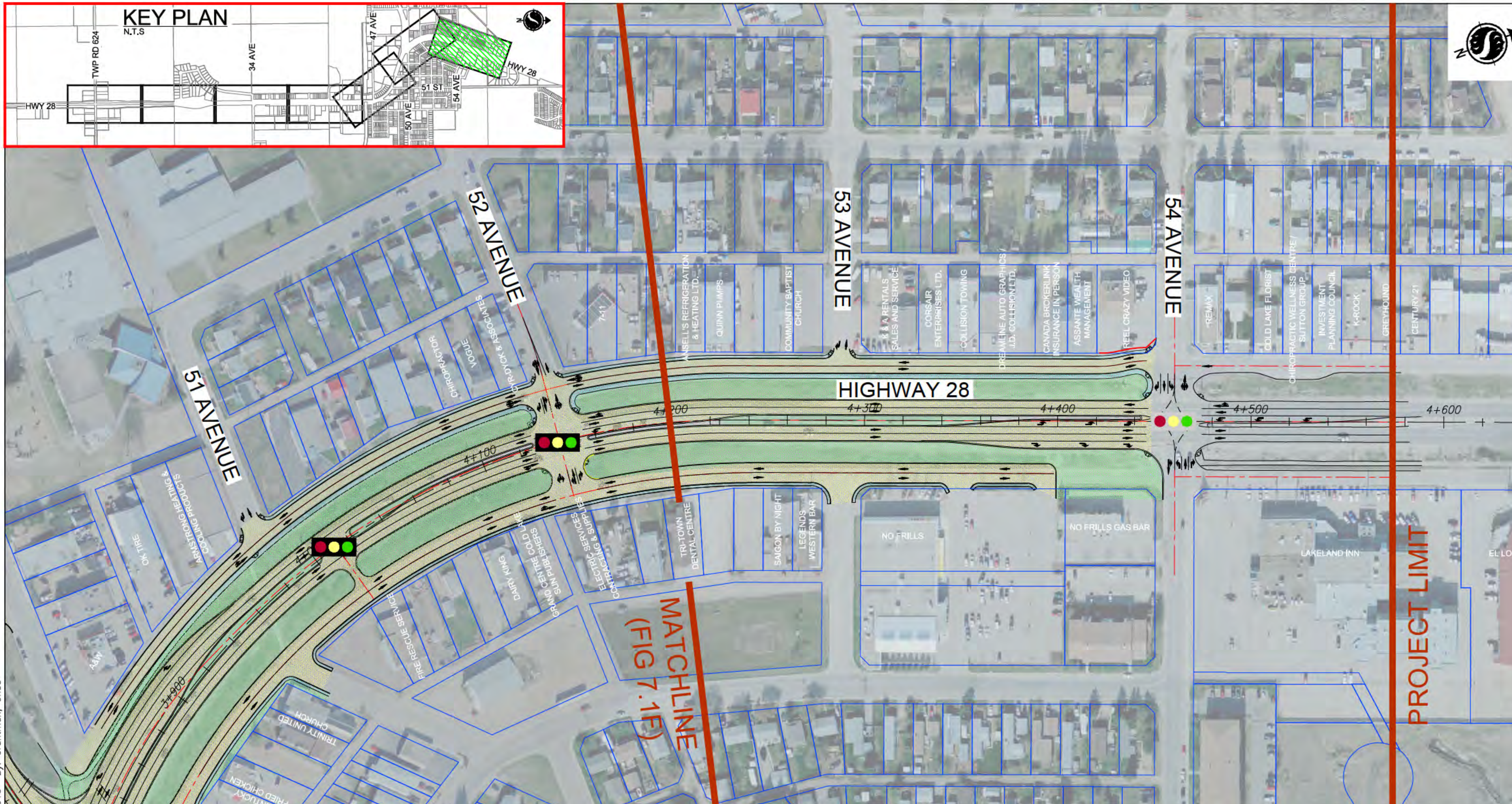
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1F

Title
HORIZONTAL GEOMETRICS ZONE 3 & ZONE 4



KEY PLAN
N.T.S
TWP RD 624
34 AVE
47 AVE
HWY 28
51 ST
50 AVE
54 AVE
52 AVENUE
53 AVENUE
54 AVENUE
51 AVENUE
HIGHWAY 28
4+100
4+200
4+300
4+400
4+500
4+600
3+900
MATCHLINE
(FIG 7.1F)
PROJECT LIMIT
NO FRILLS
NO FRILLS GAS BAR
LAKELAND INN
EL LOBO
7-11
ANSELL'S REFRIGERATION & HEATING LTD.
QUINN PUMPS
COMMUNITY BAPTIST CHURCH
K & A RENTALS SALES AND SERVICE
CORSAIR ENTERPRISES LTD.
COLLISION TOWING
DREAMLINE AUTO GRAPHICS / J.D. COLLISION LTD.
CANADA BROKERLINK INSURANCE IN PERSON
ASSANTE WEALTH MANAGEMENT
REEL CRAZY VIDEO
REMAX
COLD LAKE FLORIST
CHIROPRACTIC WELLNESS CENTRE / SUTTON GROUP
INVESTMENT PLANNING COUNCIL
K-ROCK
GREYHOUND
CENTURY 21
CHIROPRACTOR
VOGUE
DYCK & ASSOCIATES
OK TIRE
ARMSTRONG HEATING & COOLING PRODUCTS
A&W
TRI-TOWN DENTAL CENTRE
SAIGON BY NIGHT
LEGENDS WESTERN BAR
ELECTRIC SERVICES
CONTRACTING & SUPPLIES
GRAND CENTRE COLD LAKE SUN PUBLISHERS
DAIRY KING
FIRE RESCUE SERVICE
TRINITY UNITED CHURCH
KENTUCKY FRIED CHICKEN

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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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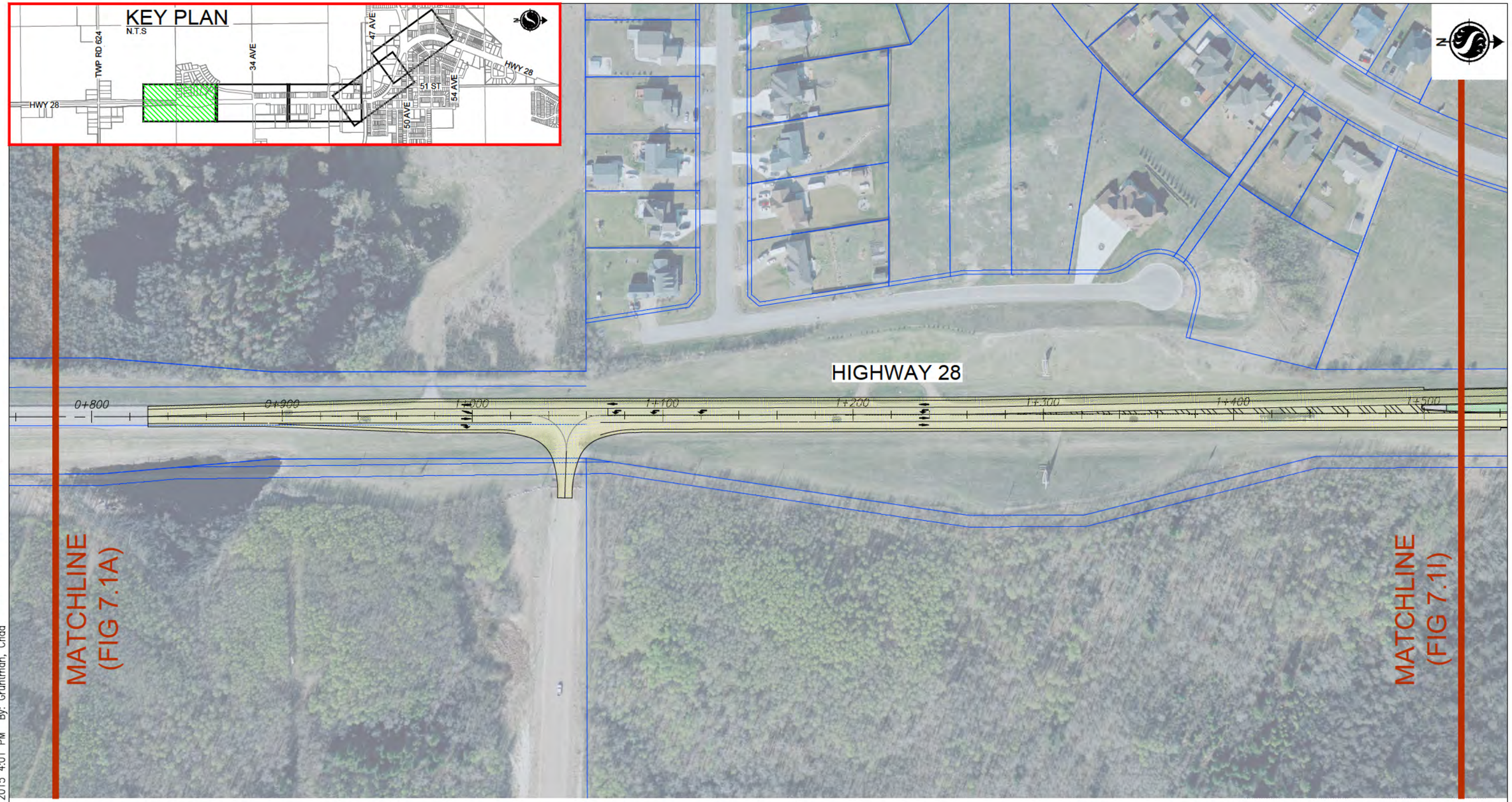
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1G

Title
HORIZONTAL GEOMETRICS ZONE 3 & ZONE 4



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12/7/2015 4:01 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

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- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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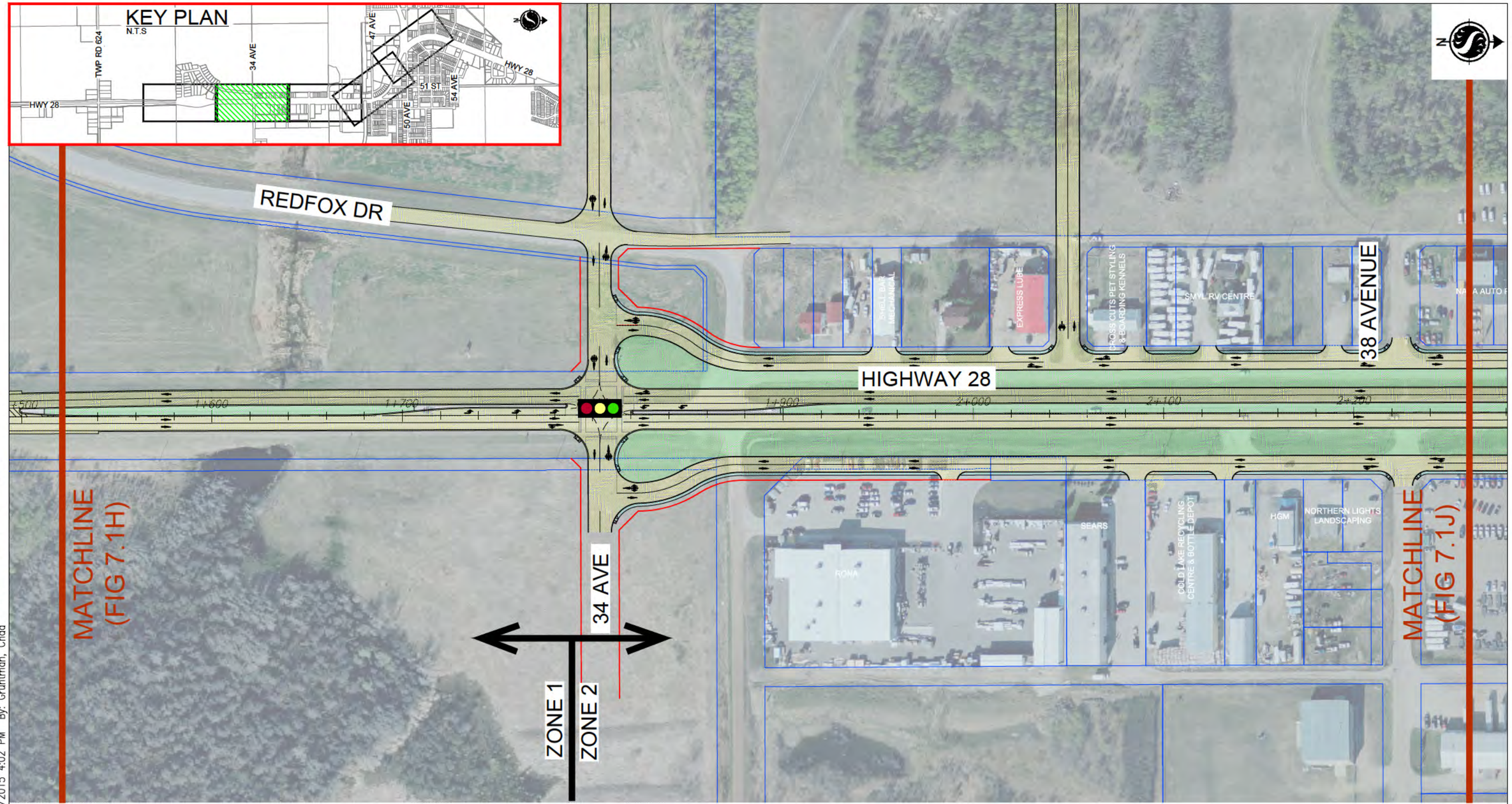
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1H

Title
HORIZONTAL GEOMETRICS
SERVICE ROAD ALTERNATIVE
ZONE 1



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12/7/2015 4:02 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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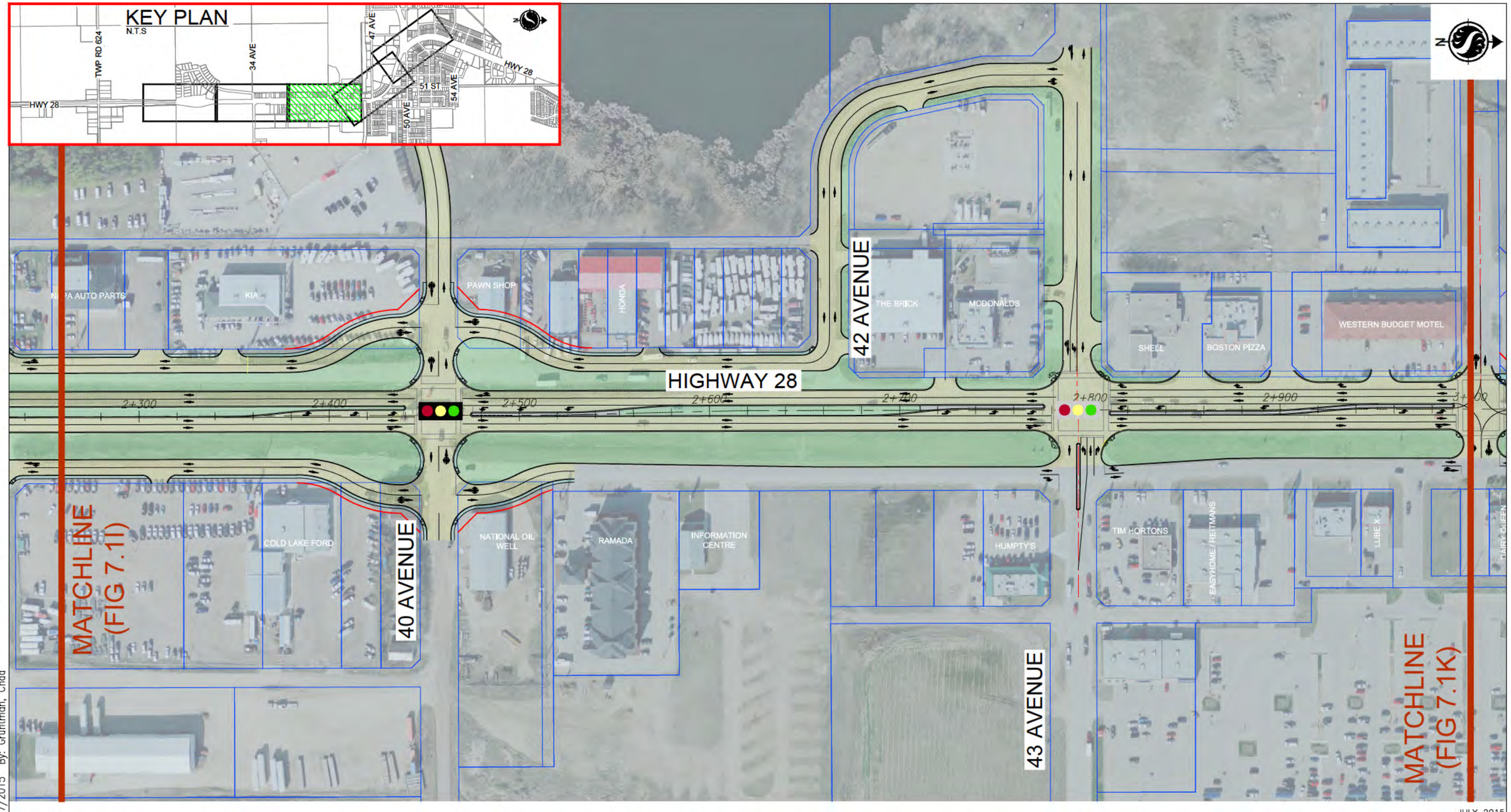
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1I

Title
HORIZONTAL GEOMETRICS
SERVICE ROAD ALTERNATIVE
ZONE 1 & ZONE 2



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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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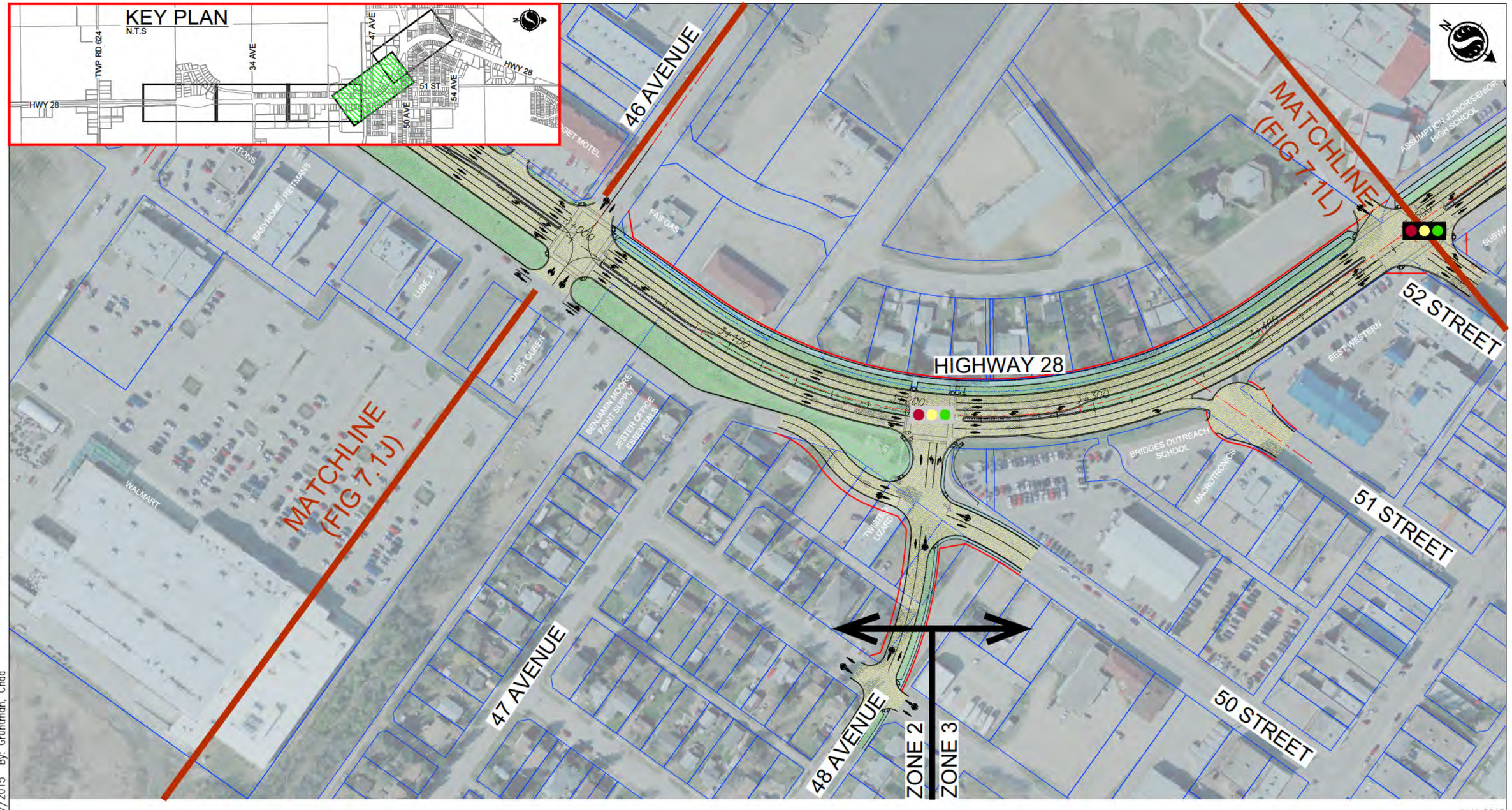
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1J

Title
HORIZONTAL GEOMETRICS
SERVICE ROAD ALTERNATIVE
ZONE 2



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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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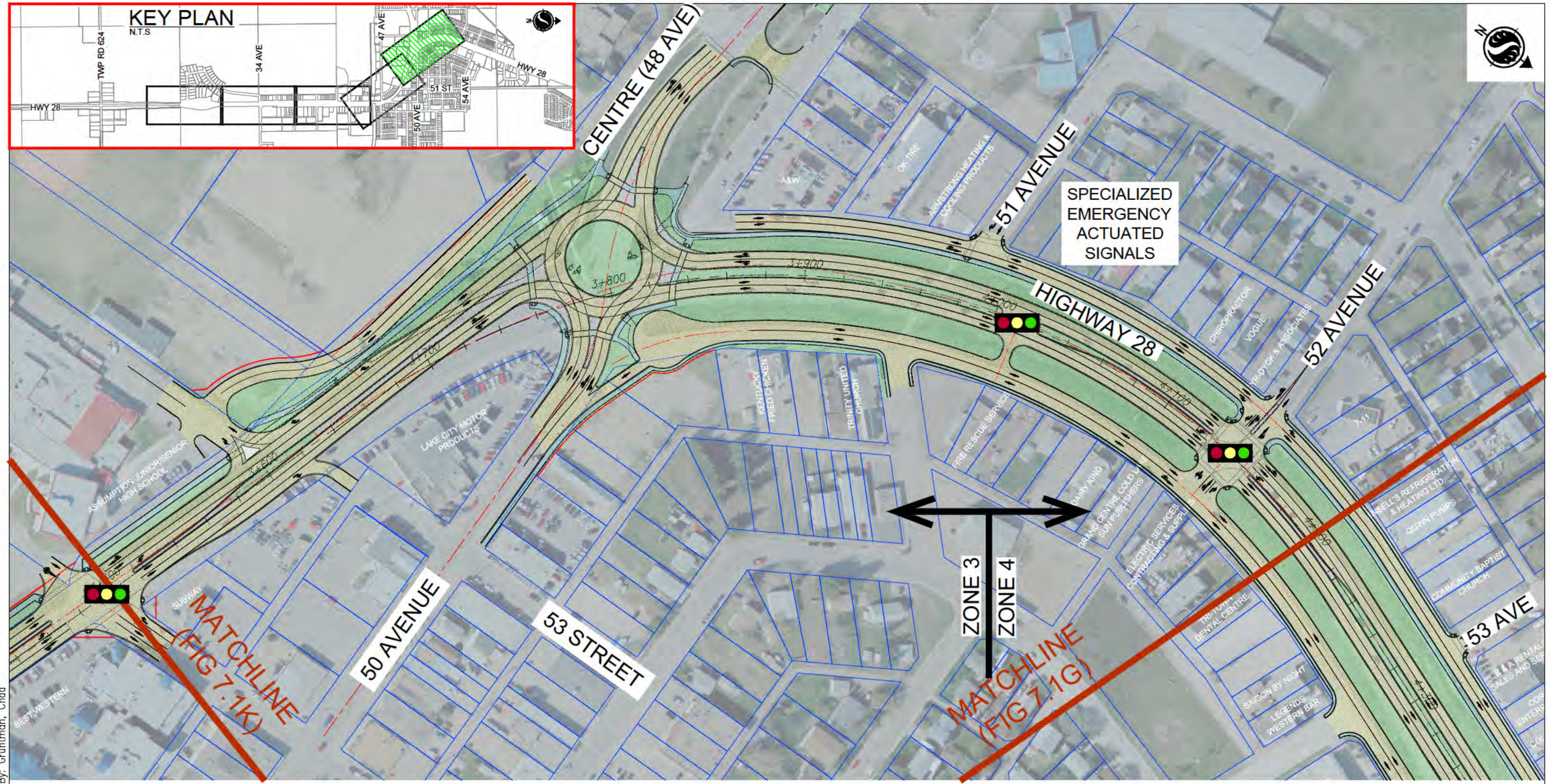
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.1K

Title
HORIZONTAL GEOMETRICS
SERVICE ROAD ALTERNATIVE
ZONE 2 & ZONE 3



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12/7/2015 By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- PROPOSED ROAD NETWORK
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- PROPOSED SIDEWALK/TRAIL
- PROPOSED TRAFFIC SIGNALS
- EXISTING TRAFFIC SIGNALS

0 25 75 125m

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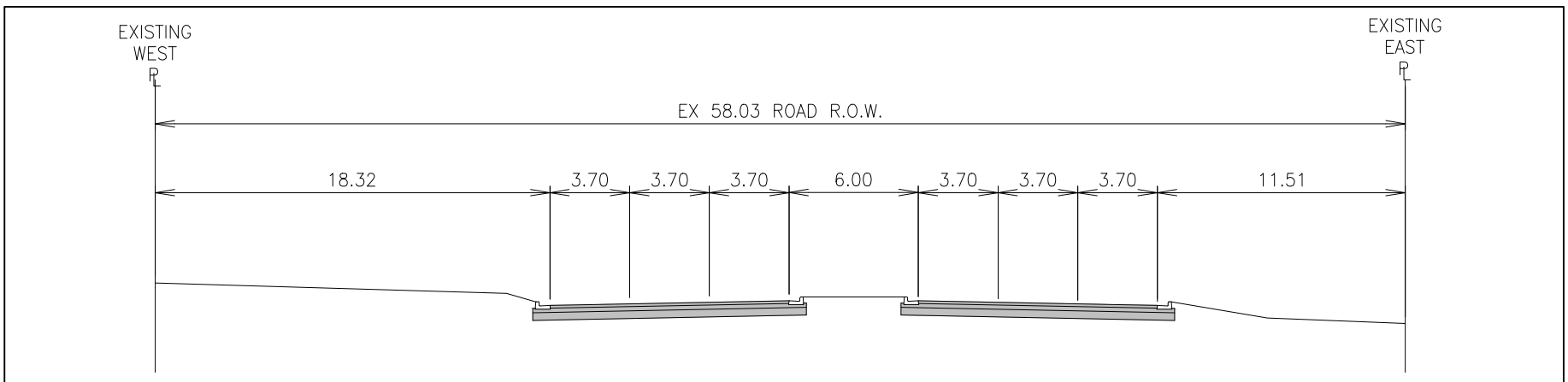
HIGHWAY 28 FUNCTIONAL DESIGN

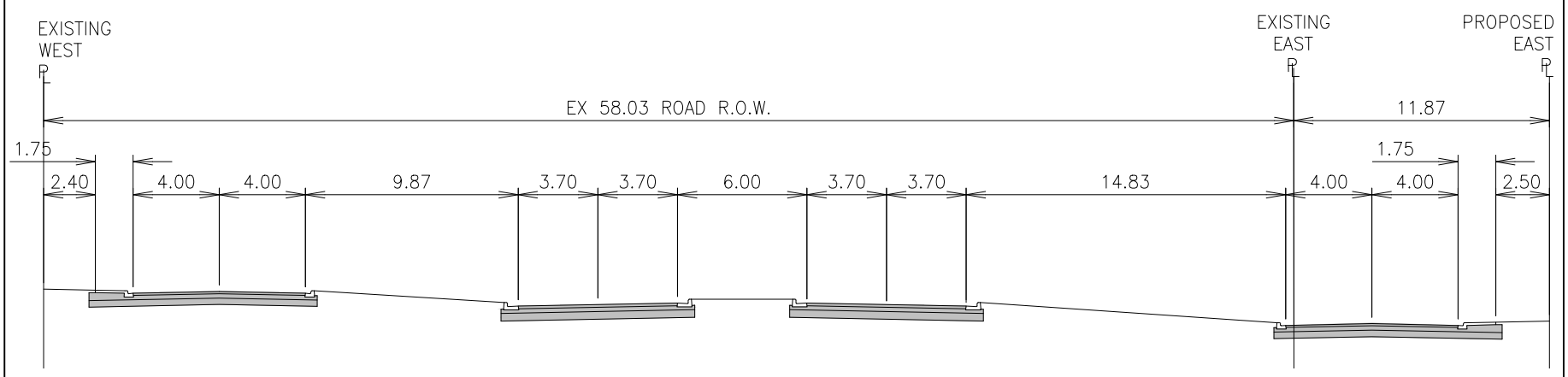
Figure No.
7.1L

Title
HORIZONTAL GEOMETRICS
ROUNDABOUT CONFIG.
ZONE 3 & ZONE 4



A TYPICAL AUXILIARY LANE ZONE 2

LOOKING NORTH 1:300

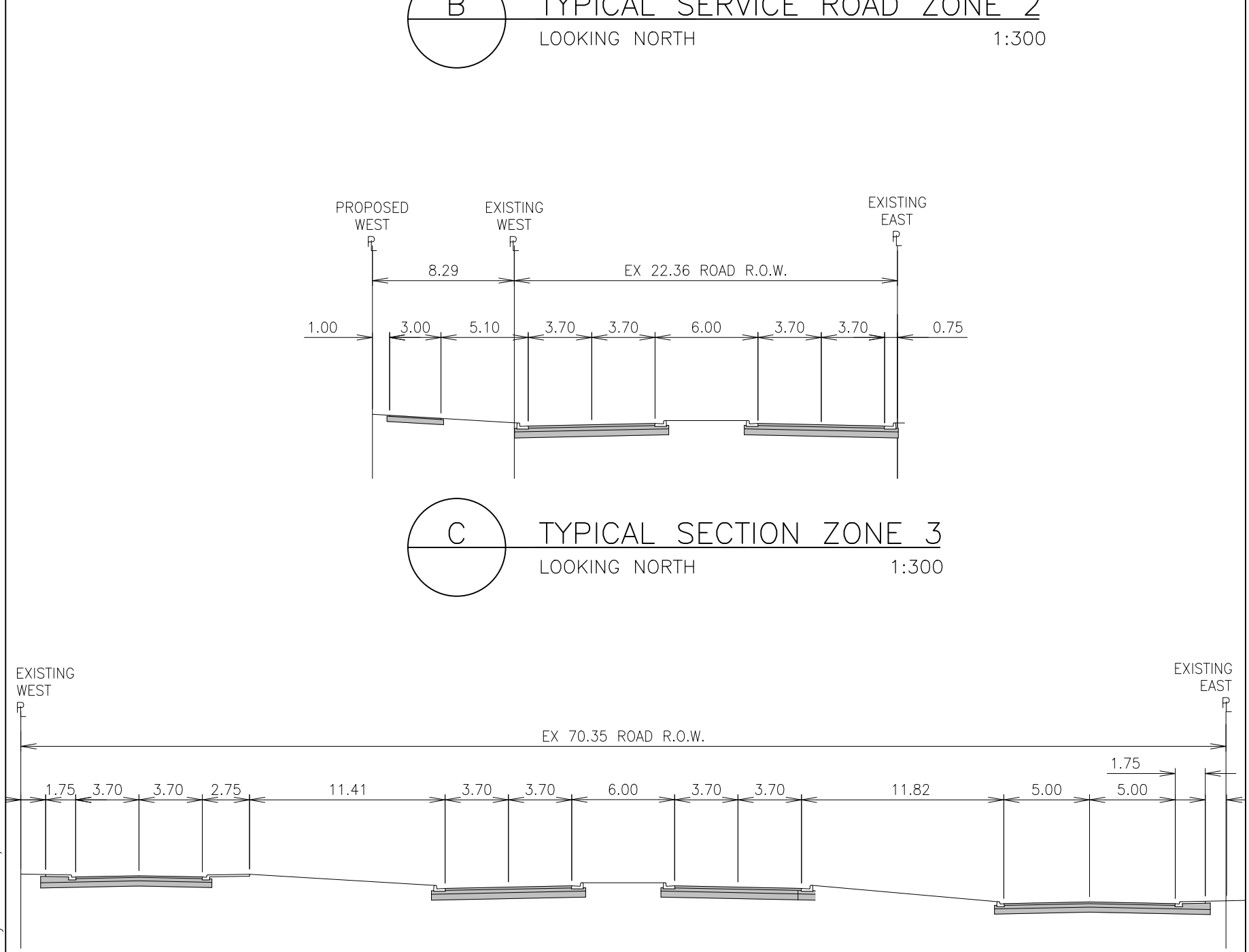


B TYPICAL SERVICE ROAD ZONE 2

LOOKING NORTH 1:300

C TYPICAL SECTION ZONE 3

LOOKING NORTH 1:300



D TYPICAL SECTION ZONE 4

LOOKING NORTH 1:300

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12/7/2015 4:04 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

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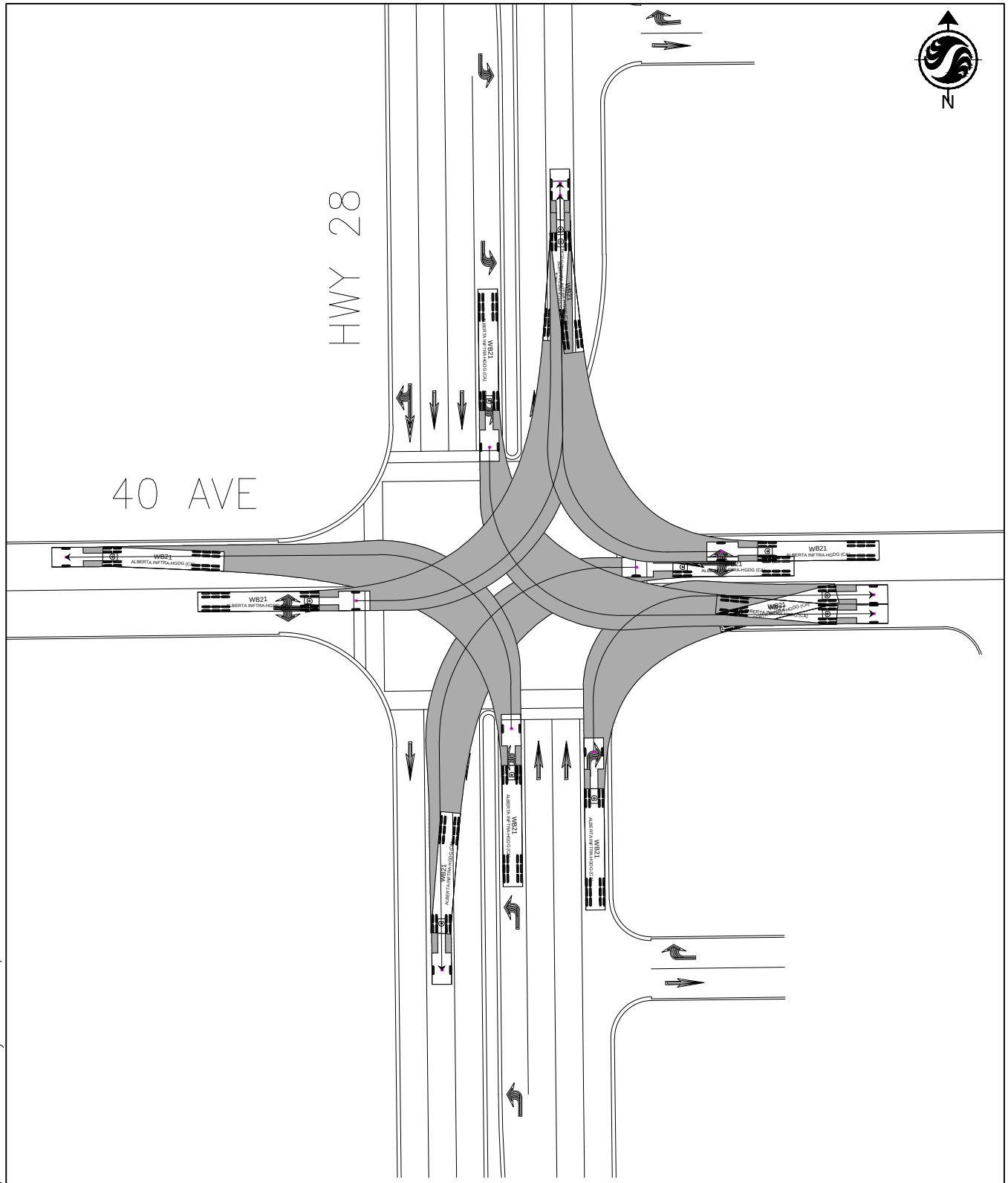
116239311

Stantec Consulting Ltd.
1100 – 4900 50 Street
Red Deer AB Canada
T4N 1X7
Tel. 403.341.3320
Fax. 403.342.0969
www.stantec.com

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.2

Title
PROPOSED CROSS SECTIONS



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12/7/2015 4:04 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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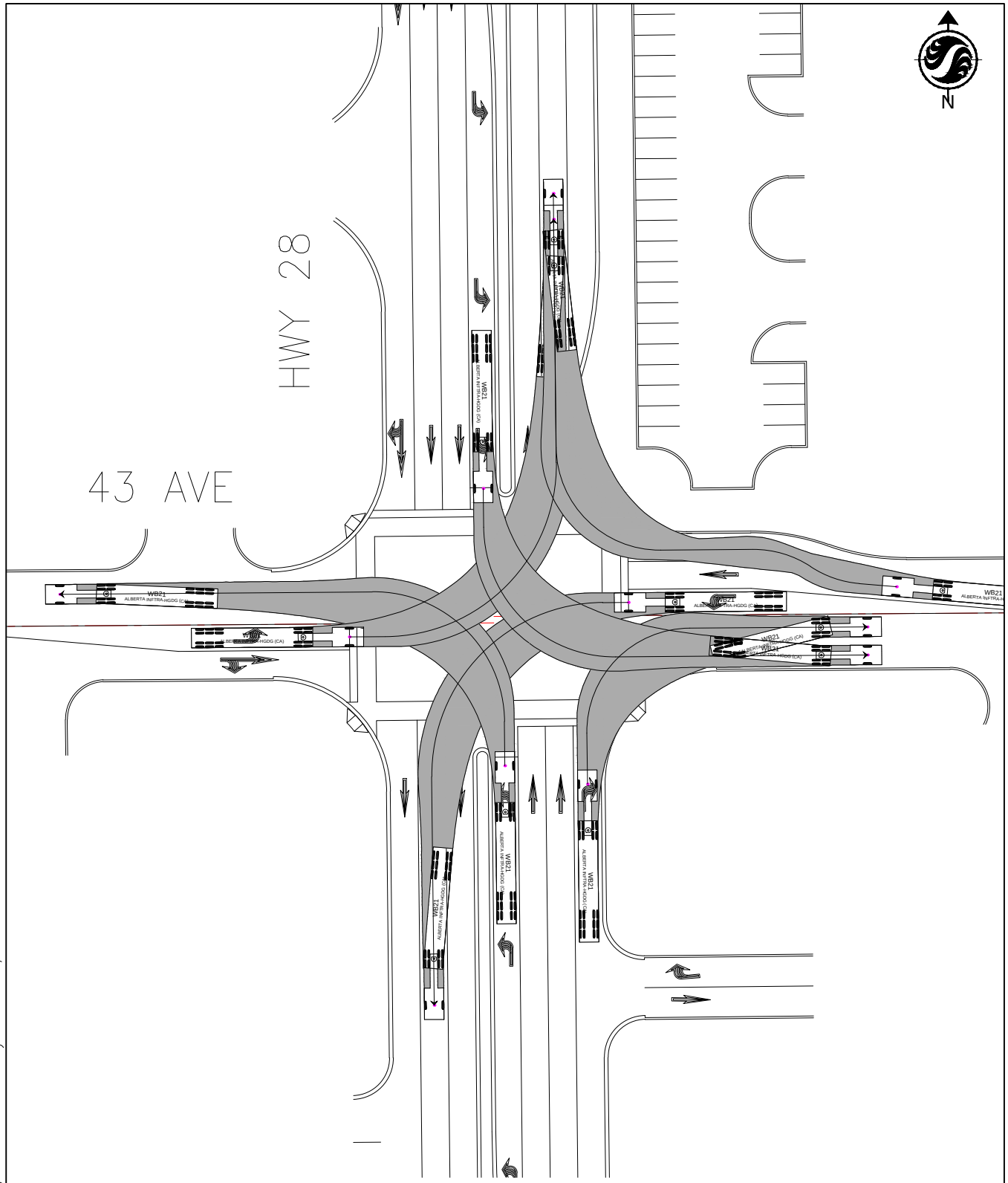
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3A

Title
TURNING MOVEMENTS
HWY 28 & 40 AVE WB-21
AUXILIARY LANE ALT



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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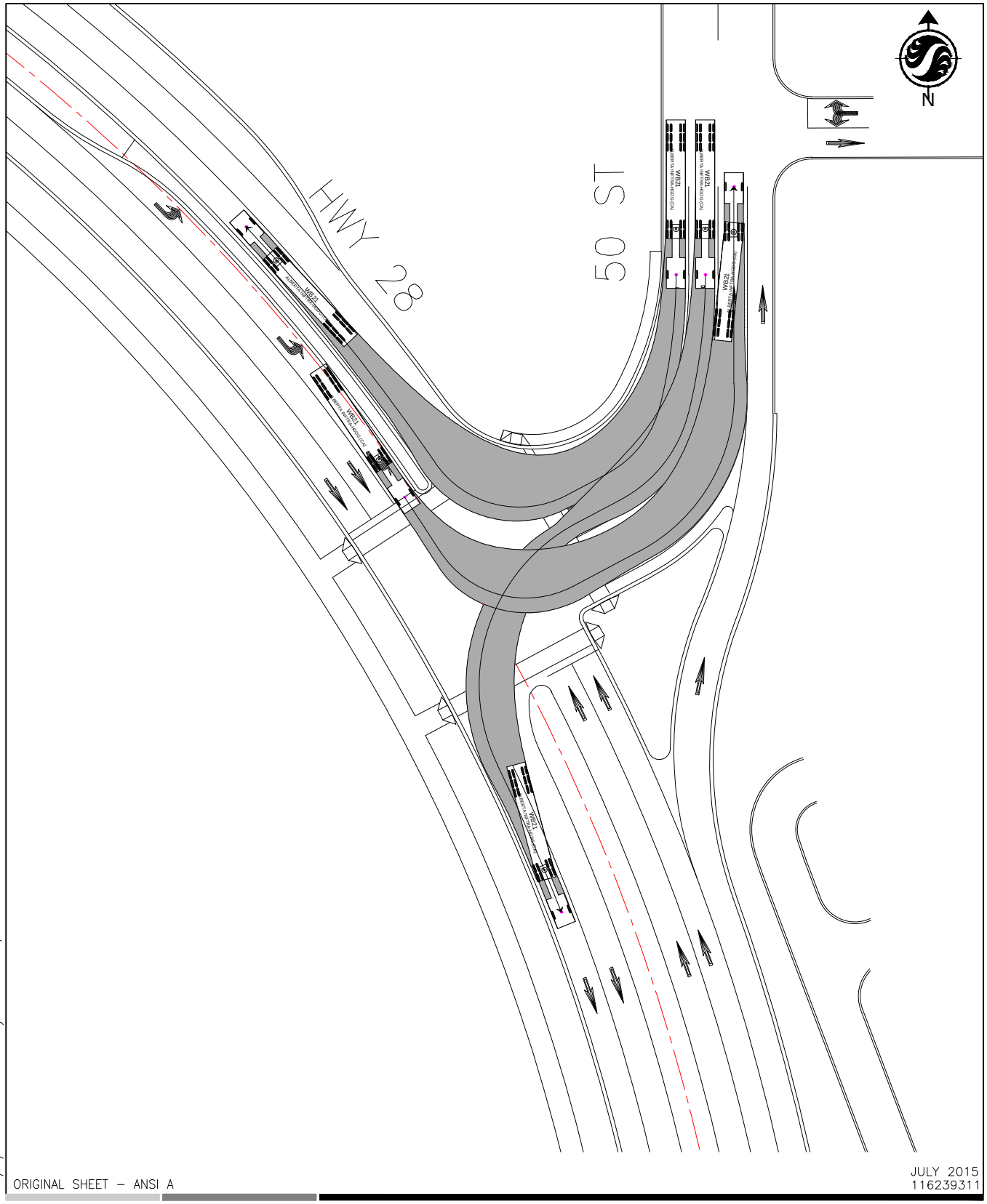
Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3B

Title
TURNING MOVEMENTS
HWY 28 & 43 AVE WB-21
AUXILIARY LANE ALT



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3C

Title
TURNING MOVEMENTS
HWY 28 & 50 ST WB-21
AUXILIARY LANE ALT

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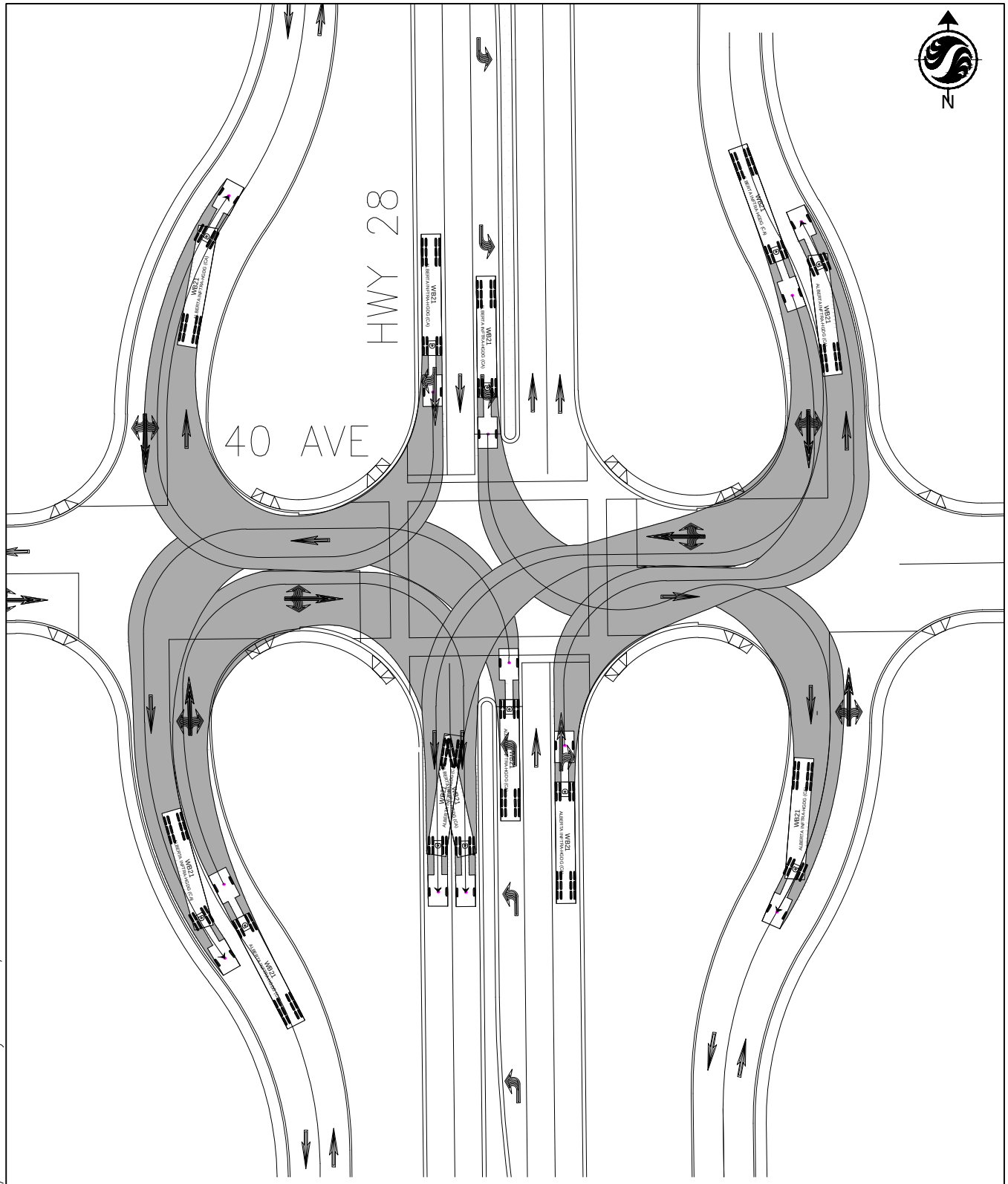
City of Cold Lake



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ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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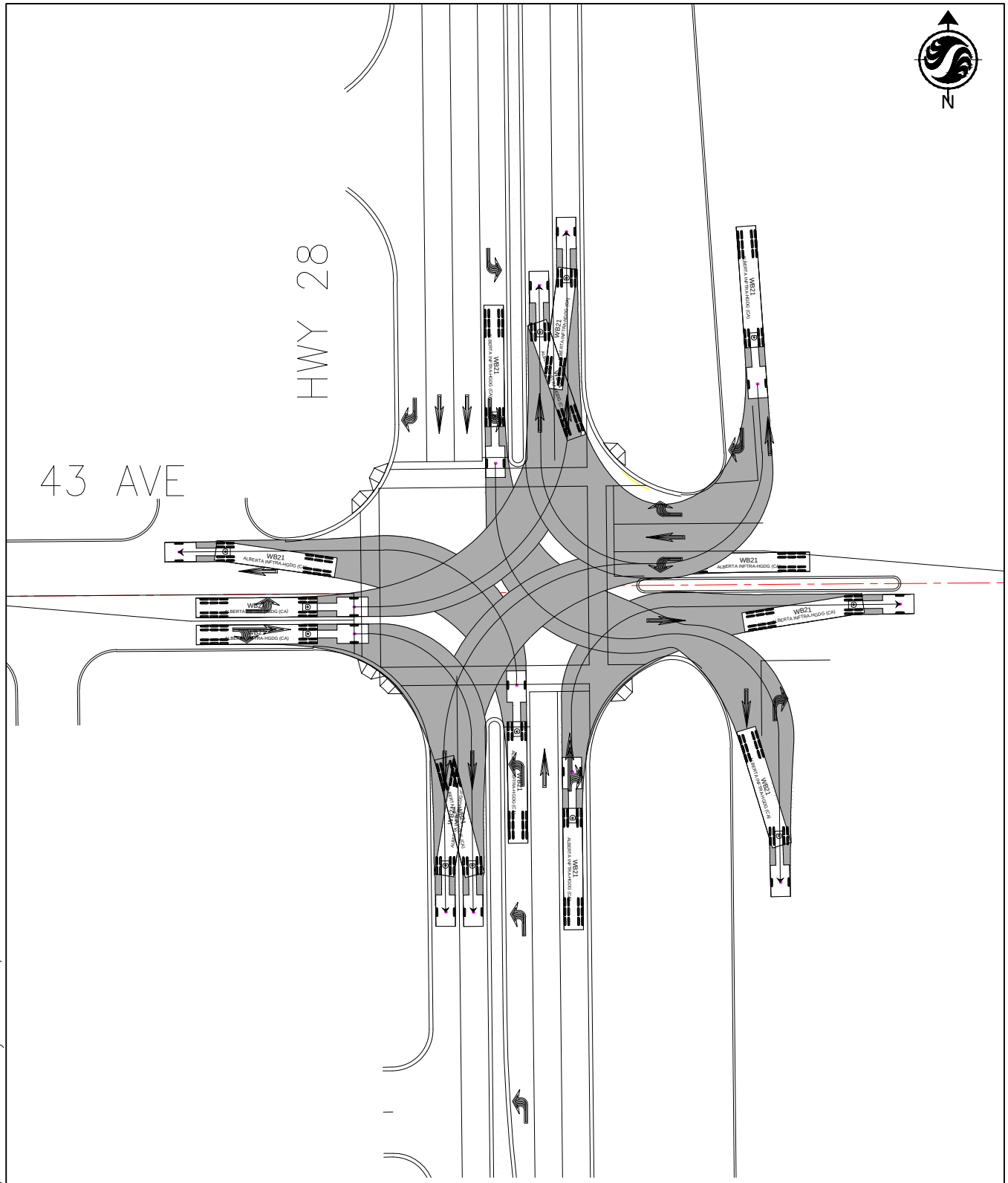
City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3D

Title
TURNING MOVEMENTS
HWY 28 & 40 AVE WB-21
SERVICE ROAD ALT



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3E

Title
TURNING MOVEMENTS
HWY 28 & 43 AVE WB-21
SERVICE ROAD ALT

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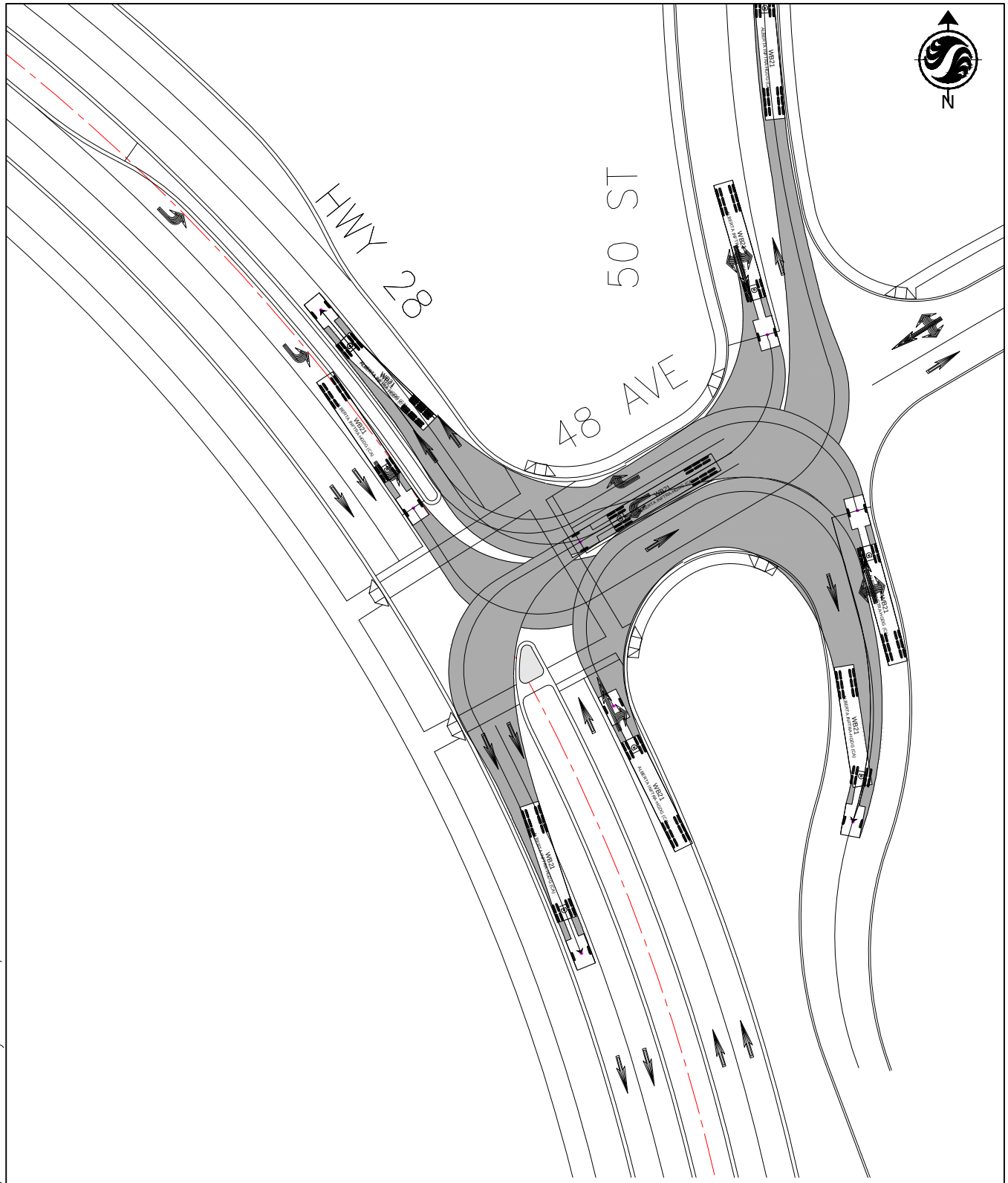
City of Cold Lake



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

Stantec

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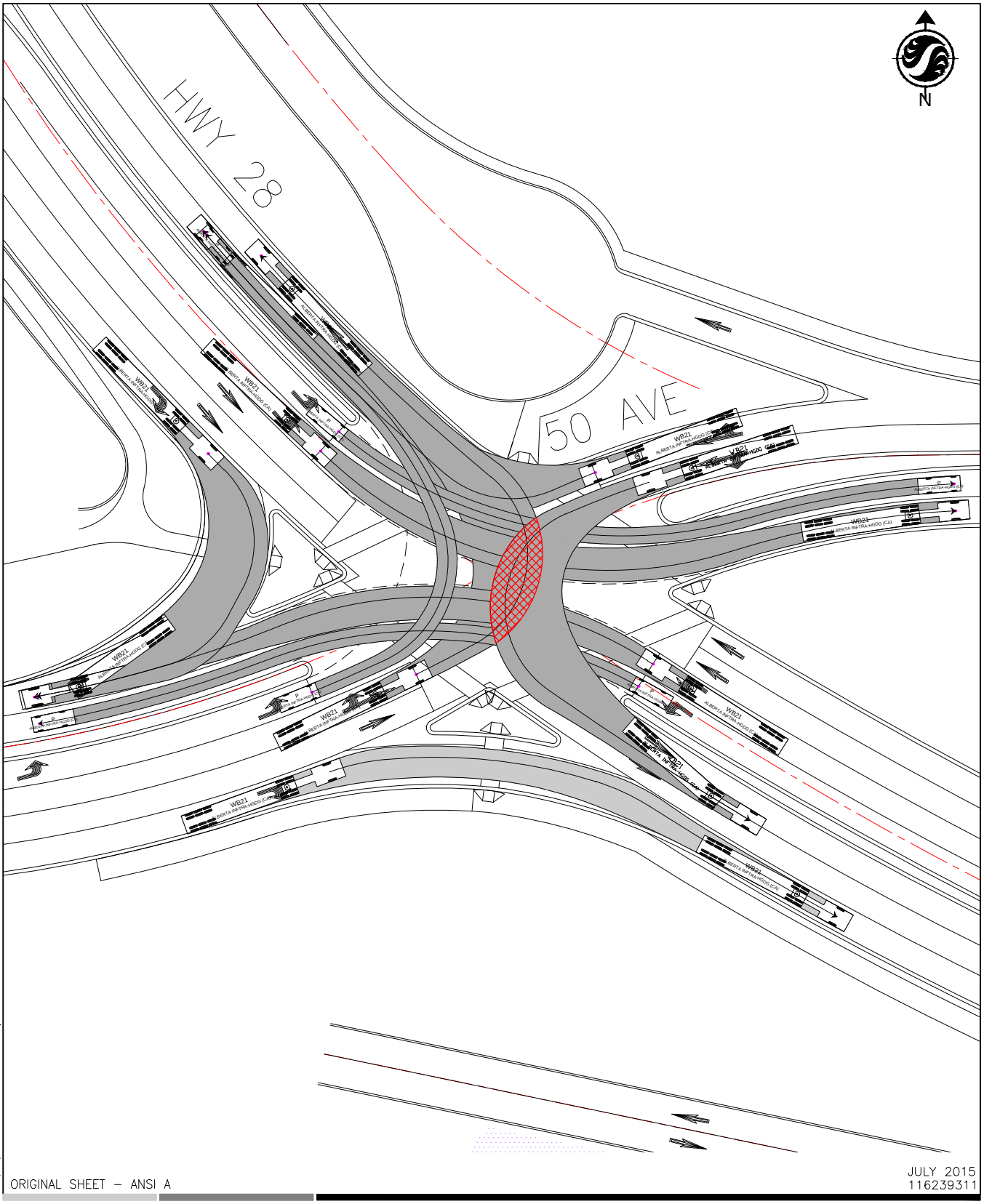
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3F

Title
TURNING MOVEMENTS
HWY 28 & 50 ST WB-21
SERVICE ROAD ALT



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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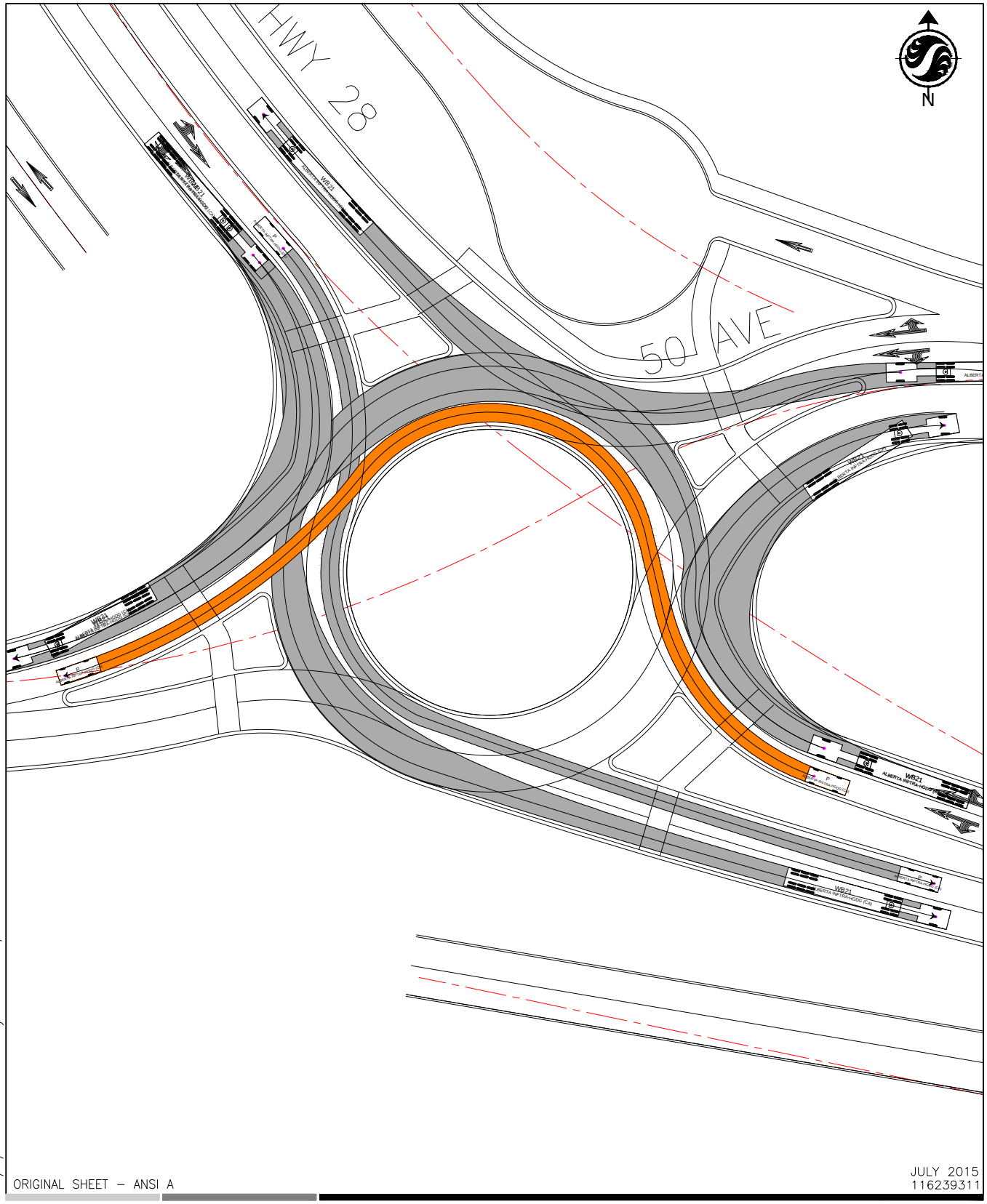
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3G

Title
TURNING MOVEMENTS
HWY 28 & 50 AVE WB-21



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12/7/2015 4:05 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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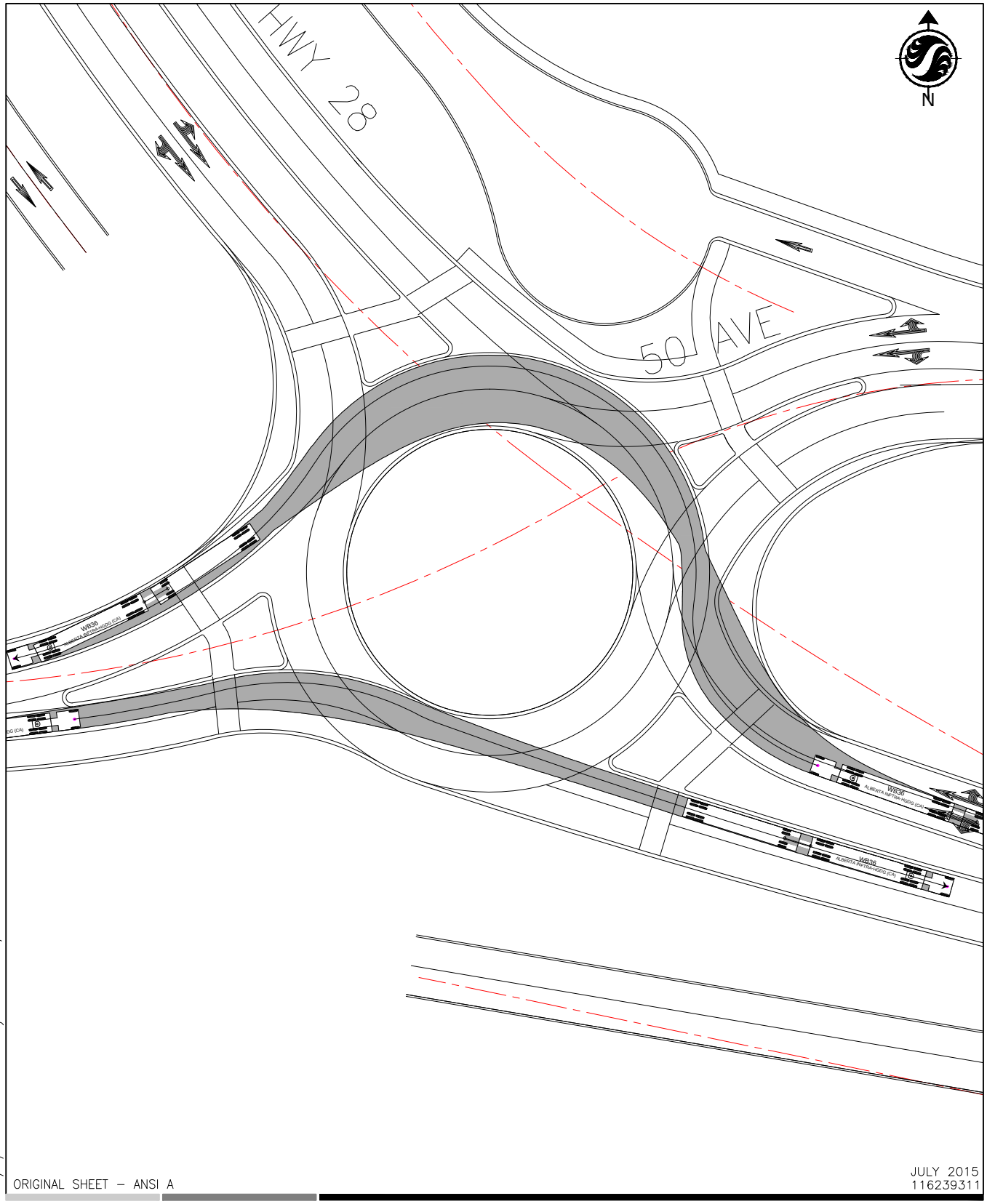
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3H

Title
TURNING MOVEMENTS
HWY 28 & 50 AVE WB-21
ROUNDABOUT ALT



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ORIGINAL SHEET – ANSI A

JULY 2015
116239311

0 7.5 22.5 37.5m

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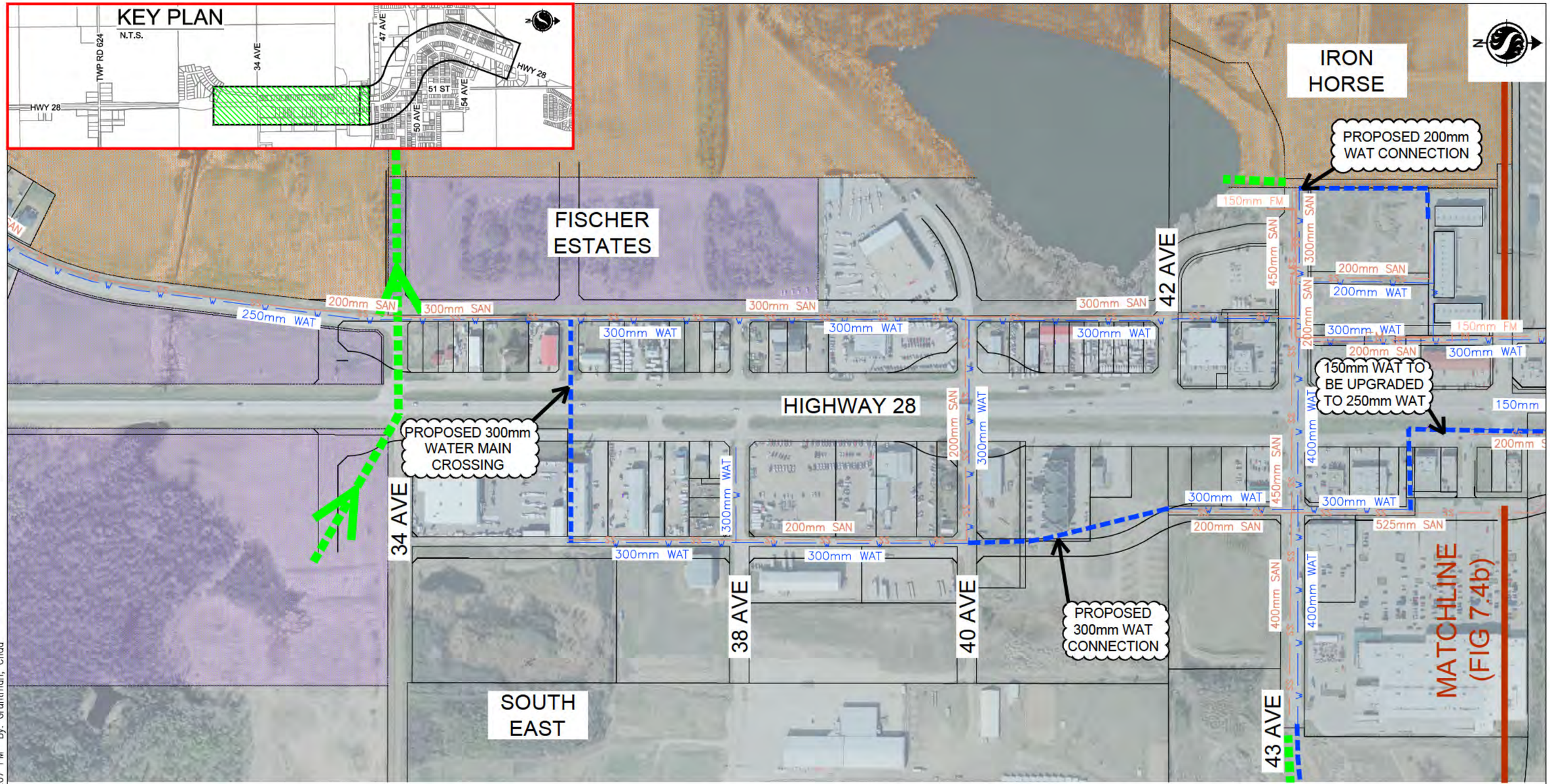
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.3J

Title
TURNING MOVEMENTS
HWY 28 & 50 AVE WB-36
ROUNDABOUT ALT



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12/7/2015 4:07 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- W — EXISTING WATER MAIN
- FUTURE WATER MAIN OR WATER MAIN UPGRADE
- SS — EXISTING SANITARY SEWER
- FM — EXISTING FORCE MAIN

0 40 120 200m

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HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.4A

Title
SANITARY AND WATER MAIN DISTRIBUTION

MATCHLINE (FIG 7.4a)

150mm WAT TO BE UPGRADED TO 250mm WAT

PROPOSED 250mm WAT CONNECTION

150mm WAT TO BE UPGRADED TO 200mm WAT

PROPOSED 250mm WAT CONNECTION

150mm WAT TO BE UPGRADED TO 250mm WAT

150mm WAT TO BE UPGRADED TO 200mm WAT

150mm WAT TO BE UPGRADED TO 250mm WAT

PROPOSED 200mm WAT CONNECTION

PROPOSED 200mm WAT CONNECTION

150mm WAT TO BE UPGRADED TO 200mm WAT

150mm WAT TO BE UPGRADED TO 250mm WAT

PROPOSED 250mm WATER MAIN CROSSING

150mm WAT TO BE UPGRADED TO 200mm WAT

PROPOSED 200mm WAT CONNECTION

150mm WAT TO BE UPGRADED TO 300mm WAT

PROPOSED 300mm WAT CONNECTION

PROPOSED 200mm WAT CONNECTION

PROJECT LIMIT

47 AVE

HIGHWAY 28

CENTRE AVE

50 AVE

51 ST

52 AVE

52 ST

49 ST

54 AVE

HIGHWAY 28

52 AVE

54 AVE

KEY PLAN

N.T.S.

TWP RD 624

34 AVE

47 AVE

HWY 28

51 ST

54 AVE

50 AVE

HWY 28

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12/7/2015 4:07 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- W — EXISTING WATER MAIN
- FUTURE WATER MAIN OR WATER MAIN UPGRADE
- SS — EXISTING SANITARY SEWER
- FM — EXISTING FORCE MAIN

Stantec

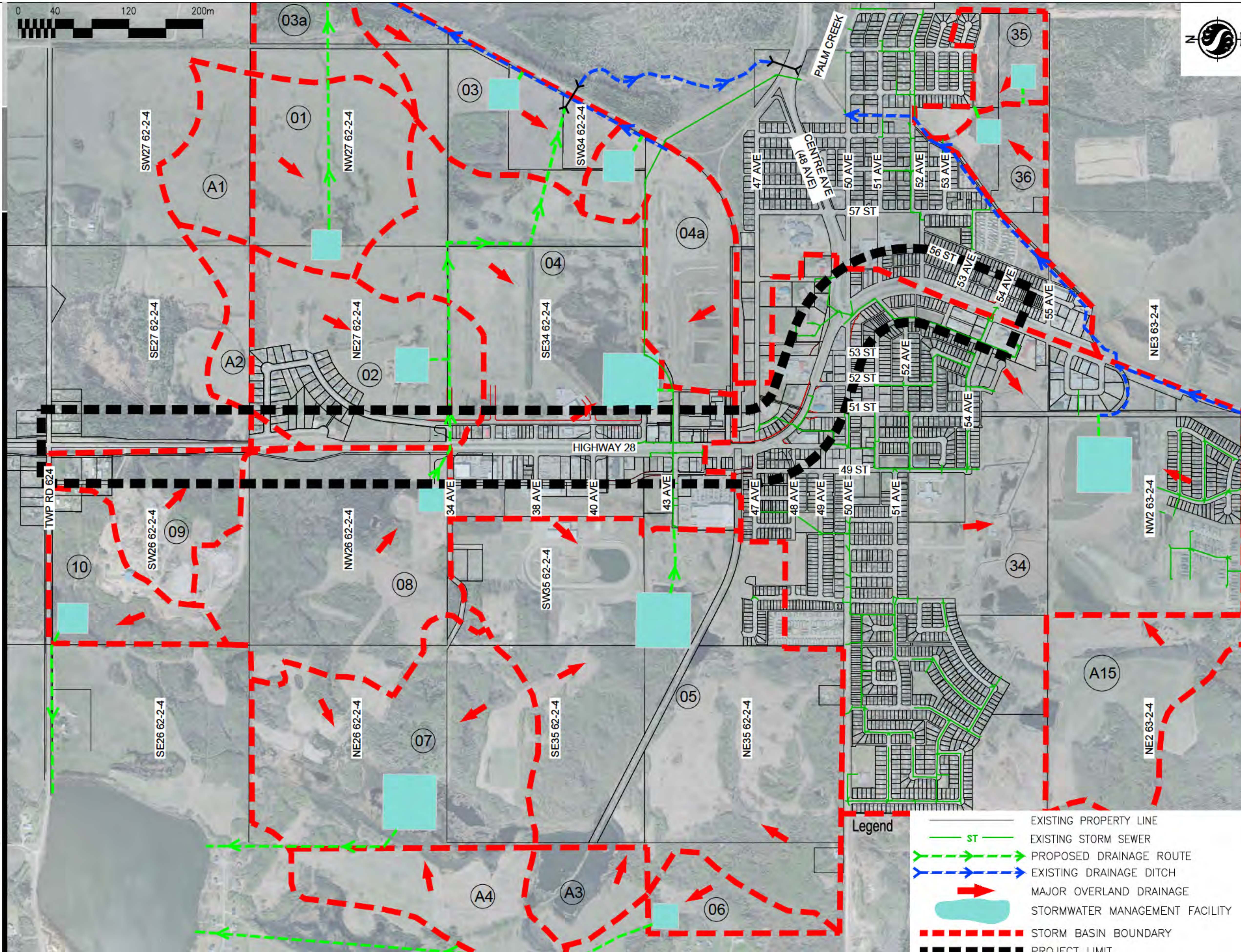
0 40 120 200m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.4B

Title
SANITARY AND WATER MAIN DISTRIBUTION


0 40 120 200m
03a
01
03
SW27 62-2-4
NW27 62-2-4
SW34 62-2-4
A1
04a
04
SE27 62-2-4
NE27 62-2-4
SE34 62-2-4
A2
02
HIGHWAY 28
TWP RD 624
34 AVE
38 AVE
40 AVE
43 AVE
47 AVE
48 AVE
49 AVE
50 AVE
51 AVE
52 AVE
53 AVE
54 AVE
55 AVE
49 ST
51 ST
52 ST
53 ST
56 ST
57 ST
CENTRE AVE (48 AVE)
PALM CREEK
35
36
NE3 63-2-4
NW2 63-2-4
34
09
10
SW26 62-2-4
NW26 62-2-4
08
SW35 62-2-4
05
NE35 62-2-4
A15
NE2 63-2-4
SE26 62-2-4
NE26 62-2-4
07
SE35 62-2-4
A4
A3
06
Legend
EXISTING PROPERTY LINE
ST
EXISTING STORM SEWER
PROPOSED DRAINAGE ROUTE
EXISTING DRAINAGE DITCH
MAJOR OVERLAND DRAINAGE
STORMWATER MANAGEMENT FACILITY
STORM BASIN BOUNDARY
PROJECT LIMIT

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Client/Project

CITY OF COLD LAKE

HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.

7.5

Title

OVERALL STORM DRAINAGE CONCEPT

ORIGINAL SHEET – ANSI B

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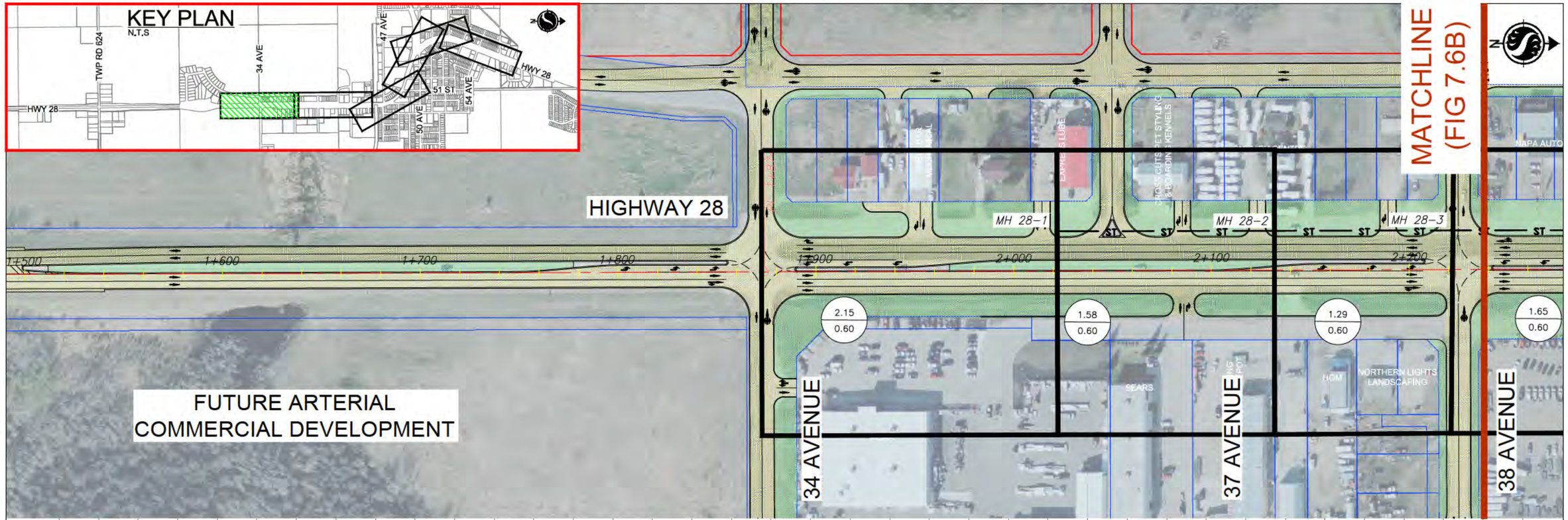
2015-12-07 4:08 PM by Gruntman, Chad



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ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Stantec

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST — PROPOSED STORM SEWER
- ST — EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

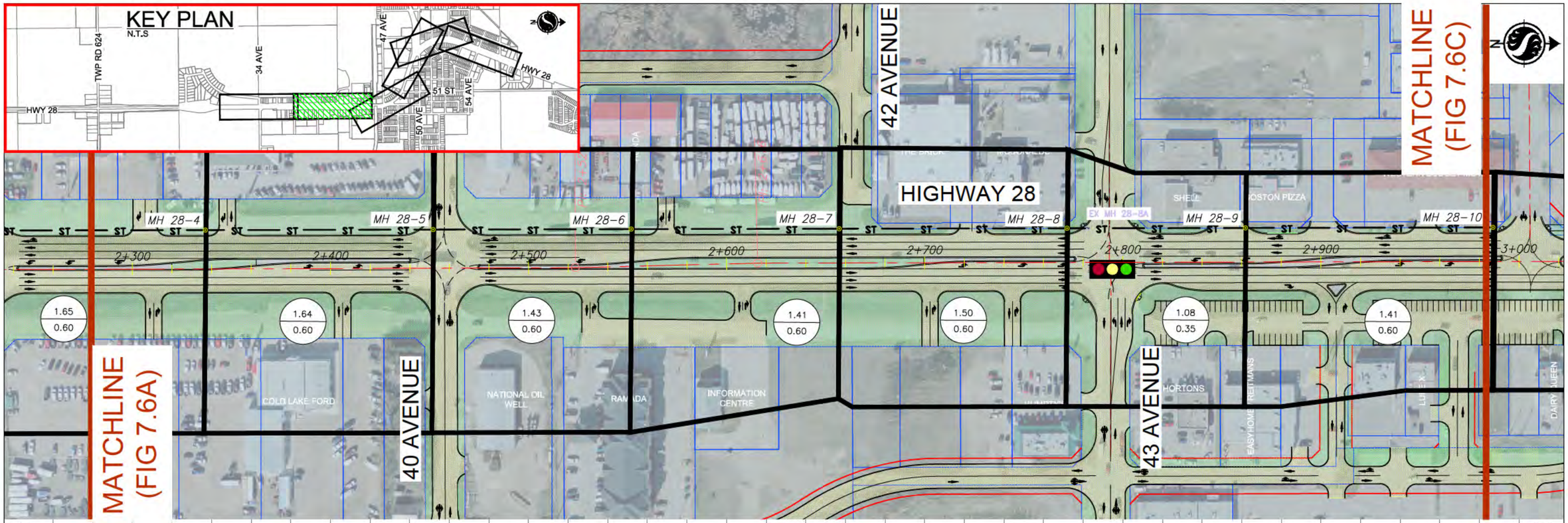
0 25 75 125m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6A

Title
STORM SEWER
PLAN AND PROFILE



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12/7/2015 4:10 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Stantec

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST — PROPOSED STORM SEWER
- ST — EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

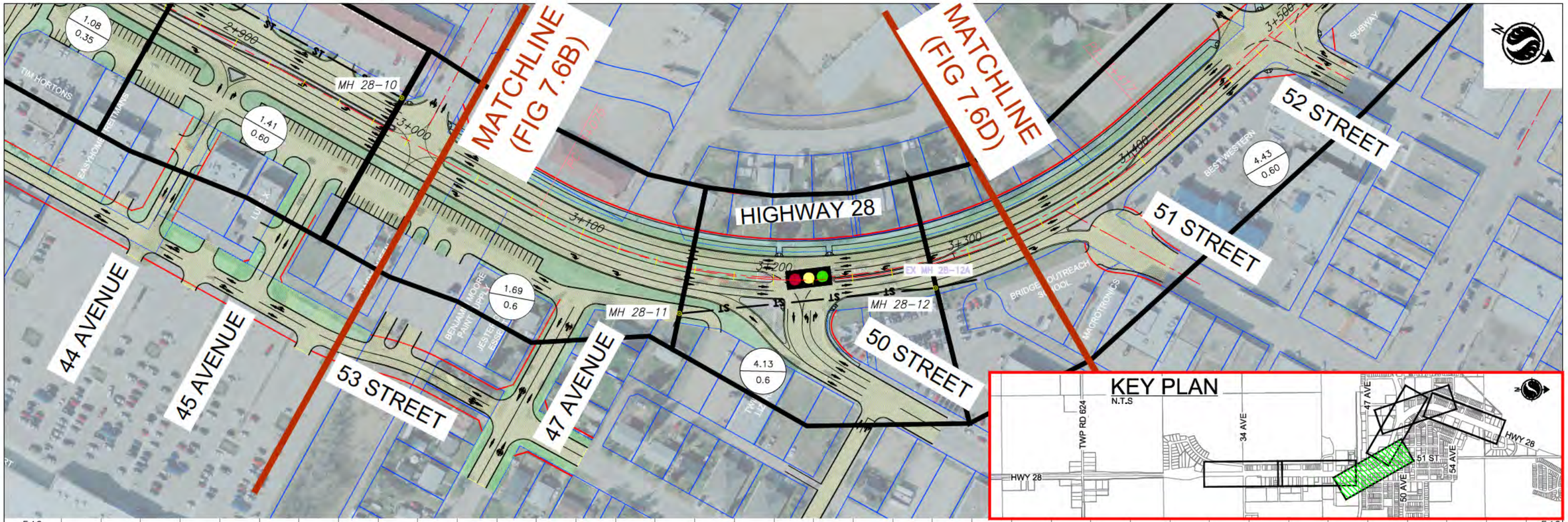
0 25 75 125m

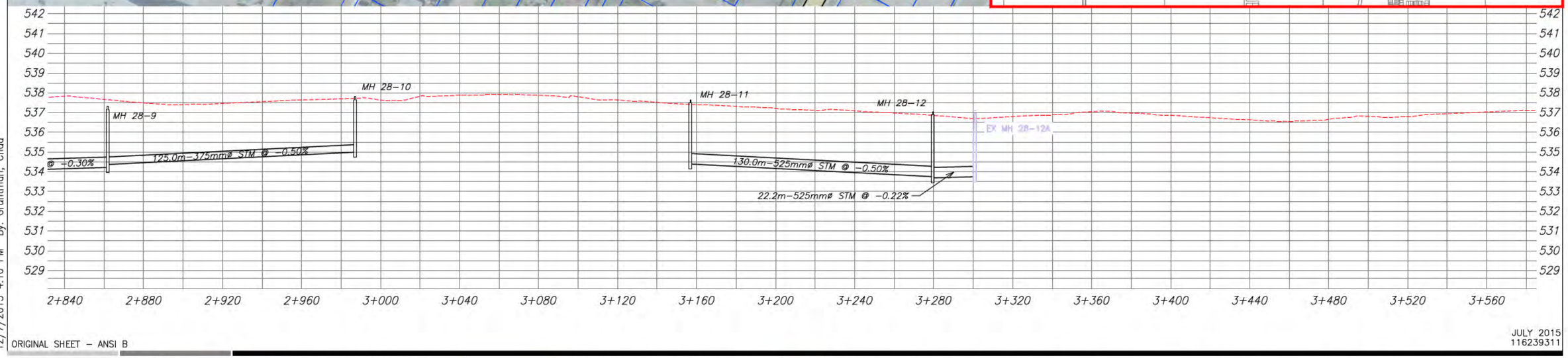
City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6B

Title
STORM SEWER PLAN AND PROFILE





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12/7/2015 4:10 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST PROPOSED STORM SEWER
- ST EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

0 25 75 125m

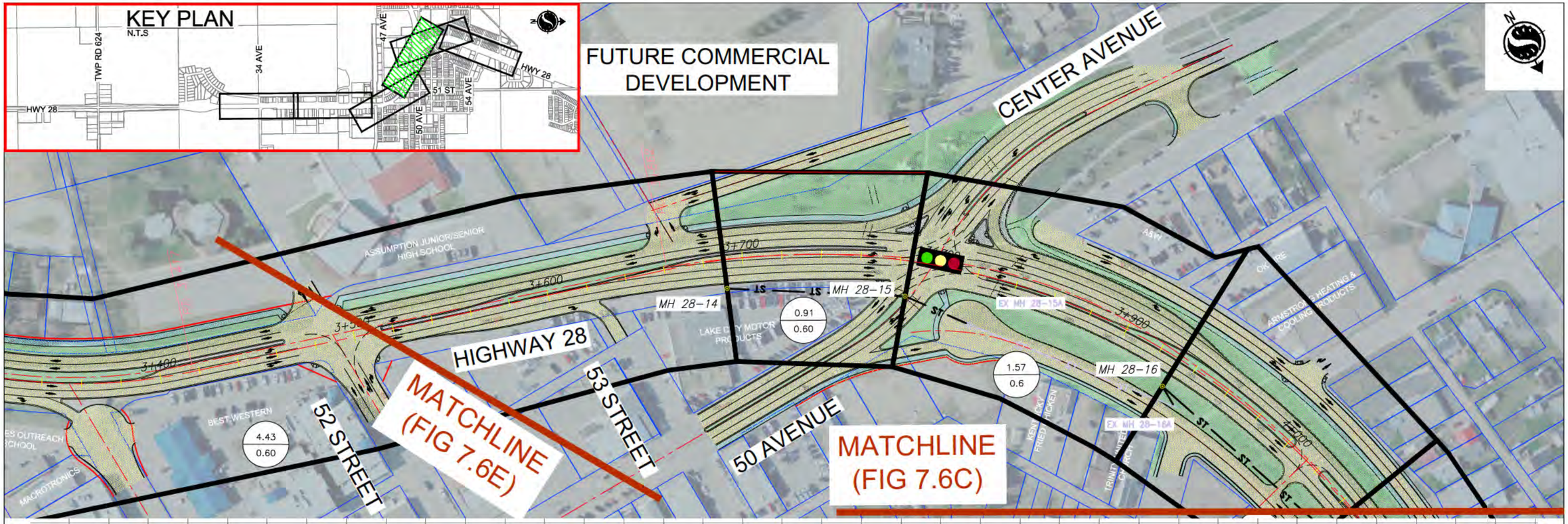
Stantec

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6C

Title
STORM SEWER PLAN AND PROFILE



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ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST — PROPOSED STORM SEWER
- ST — EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

0 25 75 125m

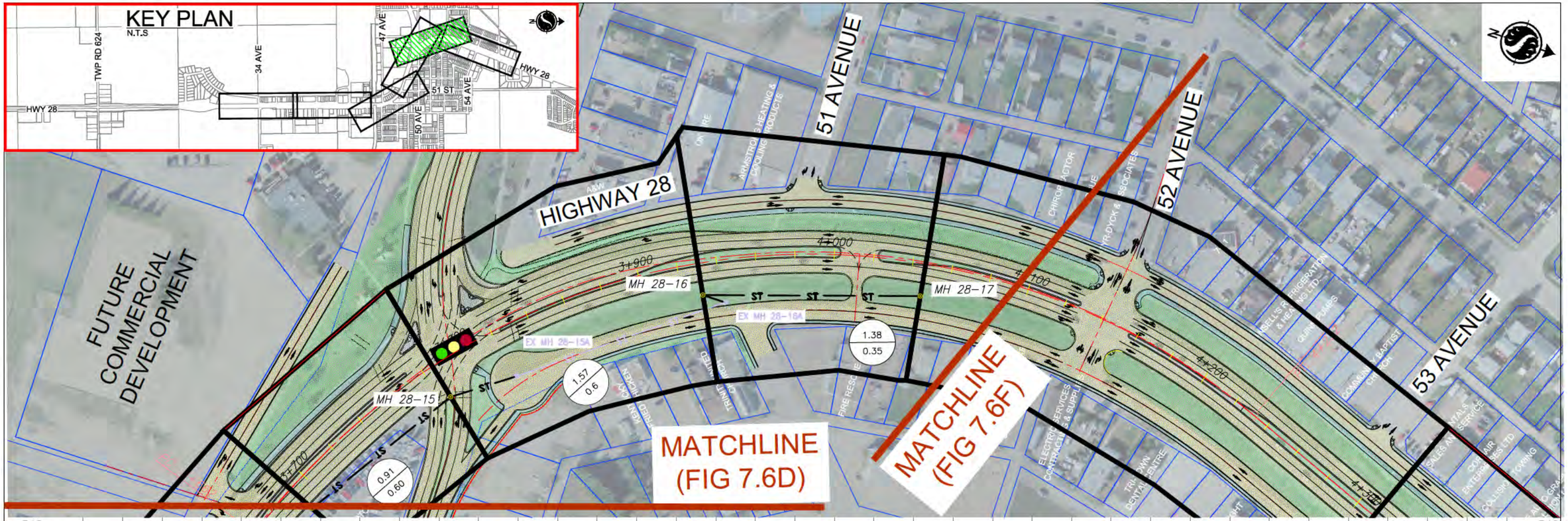
Stantec

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6D

Title
STORM SEWER PLAN AND PROFILE



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ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST PROPOSED STORM SEWER
- ST EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

0 25 75 125m

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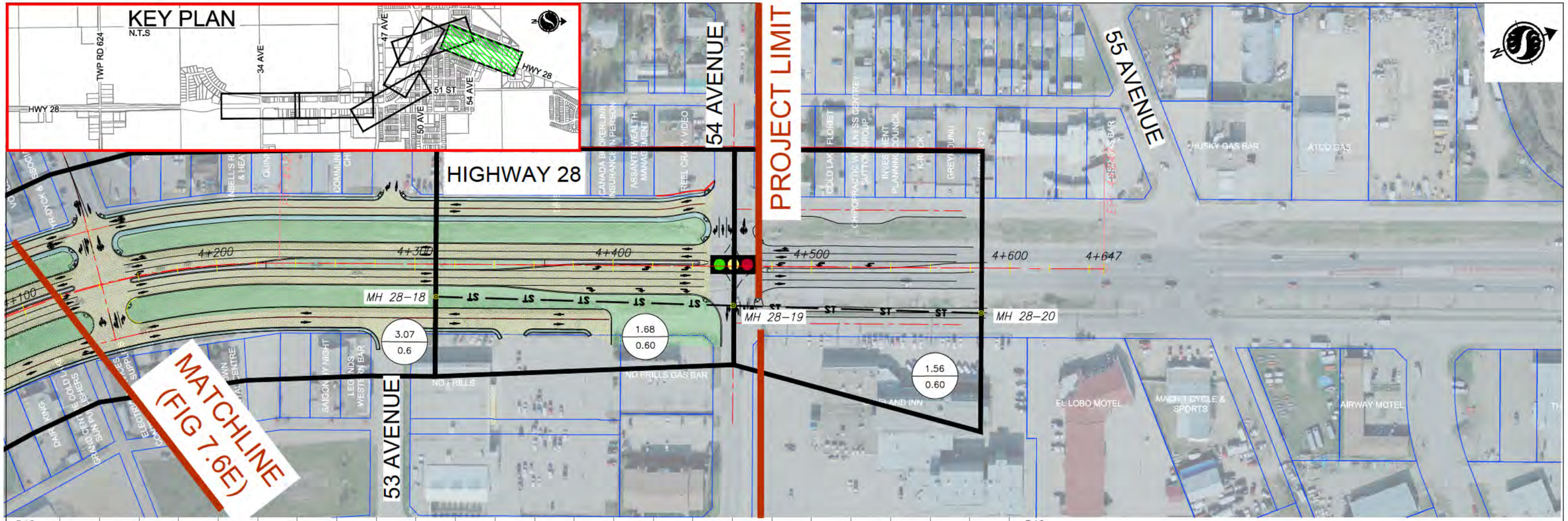
City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6E

Title
STORM SEWER PLAN AND PROFILE



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12/7/2015 4:12 PM By: Gruntman, Chad

ORIGINAL SHEET – ANSI B

JULY 2015
116239311

Legend

- EXISTING PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED PROPERTY LINE
- EXISTING CURBLINE
- PROPOSED CURBLINE
- ST PROPOSED STORM SEWER
- ST EXISTING STORM SEWER
- CATCHMENT BOUNDARY
- PROPOSED ROAD NETWORK
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE MEDIAN/ISLAND CAPS
- PROPOSED SIDEWALK/TRAIL
- PROPOSED STORM MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED TRAFFIC SIGNALS

0 25 75 125m

Stantec

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
7.6F

Title
STORM SEWER PLAN AND PROFILE

8.0 Land Acquisition

8.1.1 Zone 1 (Township Road 624 to 34 Avenue)

Alternative 1 – Auxiliary Lane Alternative

As shown in Figure 8.1A, a small section of land is required south of 34 Avenue due to the proposed roadways running behind the existing commercial developments.

Alternative 2 – Service Road Alternative

As shown in Figure 8.1F, land is required from two separate parcels to accommodate the proposed bulbing of the service roads at 34 Avenue intersection.

8.1.2 Zone 2 (34 Avenue to 50 Street)

Alternative 1 – Auxiliary Lane Alternative

As part of the Auxiliary Lane Alternative, there are proposed roadways running behind the existing commercial developments. These roadways would require land acquisition as shown in Figures 8.1A and 8.1B.

There is also minimal land required along the existing west property line from 46 Avenue to 50 Street in order to accommodate the proposed boulevard and trail as shown in Figure 8.1C.

Alternative 2 – Service Road Alternative

In order to extend the east service road to 34 Avenue intersection, land acquisition will be required from the Rona parking lot.

Land is required at 43 Avenue to accommodate the proposed bulbing configuration. The affected businesses include Napa Auto Parts, the Pawn Shop, Honda, Cold Lake Ford, and National Oil Well.

In order to implement the proposed bulbing at 50 Street intersection, land will need to be acquired from the Twisted Lizard and 2 residential parcels.

Land acquisition requirements are shown in Figure 8.1F - 8.1H.

8.1.3 Zone 3 (50 Street to 51 Avenue)

As shown in Figure 8.1C, a minimal amount of land is required along the west property line from 50 Street to 52 Street in order to accommodate the proposed boulevard and trail. This acquisition would involve the existing church and residential developments.

Land is required from Best Western, Bridges Outreach School and Macrotronics to accommodate the implementation of a Cul-De-Sac configuration at 51 Street.

Land is required on 4 parcels to accommodate the dedicated right turn onto the east service road at Centre Avenue intersection.

Land acquisition requirements are shown in Figure 8.1C and 8.1D.

8.1.4 Zone 4 (51 Avenue to 54 Avenue)

The proposed design will require a minimal amount of land on the southwest corner of the intersection of Highway 28 and 54 Avenue as shown in Figure 8.1E.

Land acquisition requirements are summarized in Table 8.1 below.

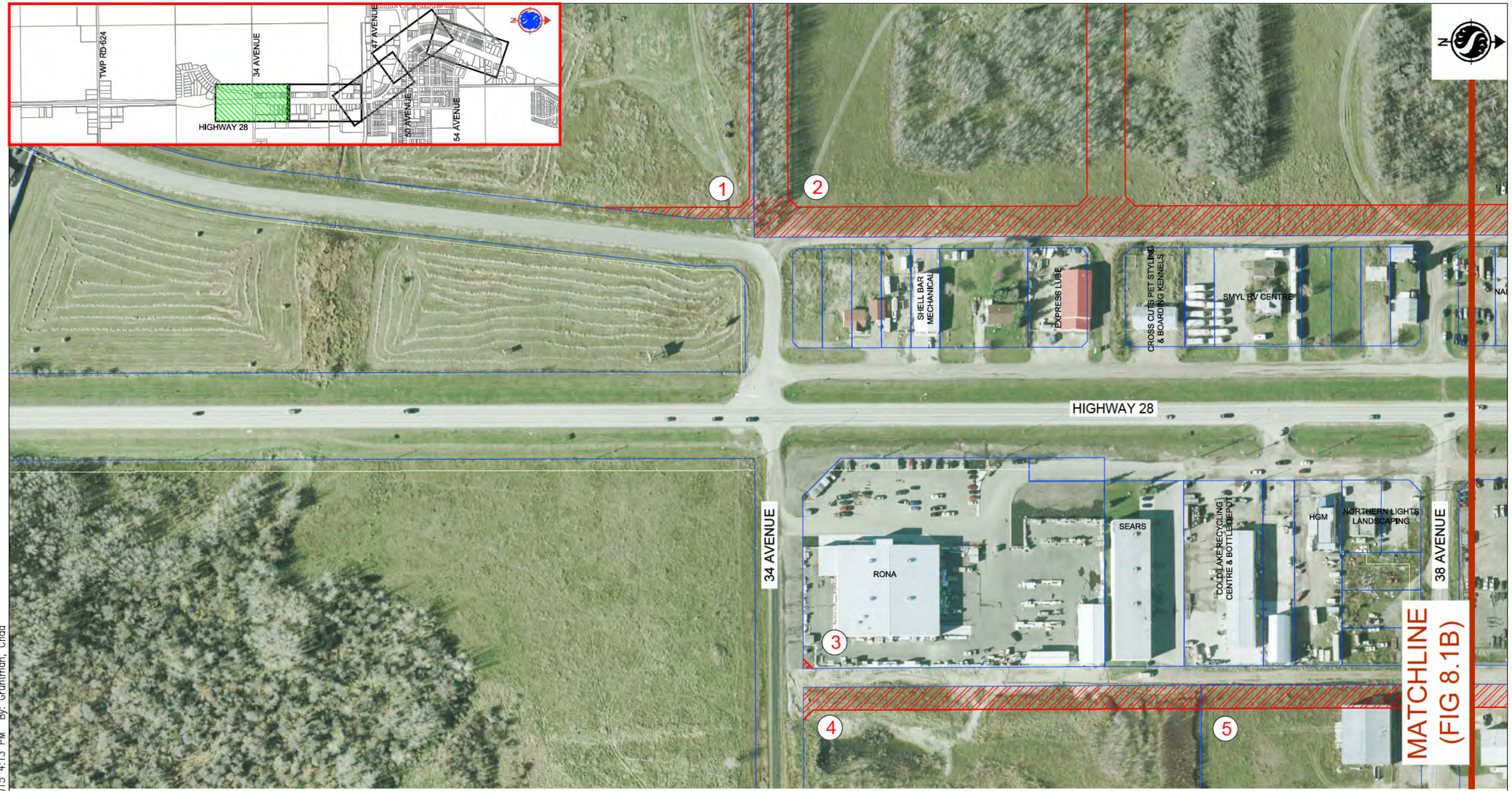
Table 8.1 : Land Acquisition Requirements

Parcel	Legal Land Description / Certificate of Title (COT)	Zone	Alternative 1 (Auxiliary Lane) Area (Ha)	Alternative 2 (Service Road) Area (Ha)
1	NE27-62-2-4 (COT 072 015 724)	1	0.0352	-
1A	NE 27-62-2-4 (COT 072 015 724)	1	-	0.3766
1B	NW 26-62-2-4 (COT 132 237 536 +1)	1	-	0.2029
2	SE34-62-2-4 (COT 022 127 225)	2	1.2897	-
2A	Lot A, Block 3, Plan 1889KS (COT 072 110 608)	2	-	0.0931
2B	Lot 1, Block 4, Plan 752 1432 (COT 132 338 151)	2	-	0.0693
2C	Lot 2, Block 4, Plan 752 1432 (COT 092 127 986)	2	-	0.0177
2D	Lot 3, Block 4, Plan 752 1432 (COT 092 127 986 +1)	2	-	0.0046
2E	Lot 4, Block 4, Plan 752 1432 (COT 092 127 985 +1)	2	-	0.0001
2F	Lot 3, Block 6, Plan 2218MC (COT 072 242 954)	2	-	0.0054
2G	Pt. Lot 4, Block 6, Plan 2218MC (COT 042 301 345)	2	-	0.0248

2H	Pt. Lot 4, Block 6, Plan 2218MC (COT 072 302 592)	2	-	0.0372
3	Lot 13A, Block 5, Plan 112 5072 (COT 112 347 650)	2	0.0013	0.1241
4	Lot 8A, Block 5, Plan 112 5072 (COT 112 347 650 +1)	2	0.2564	-
5	Lot 5A, Block 5, Plan 972 2430 (COT 122 282 048)	2	0.1430	-
6	Lot 6, Block 6, Plan 992 5150 (COT 992 307 384)	2	0.1409	-
7	Lot 8, Block 6, Plan 992 5150 (COT 992 318 323)	2	0.1192	-
8	Lot 1, Block 7, Plan 892 0030 (COT 112 198 543)	2	0.1125	0.0668
9	Lot 2, Block 7, Plan 892 0030 (COT 122 041 726 +1)	2	0.3065	-
10	Lot 3, Block 7, Plan 082 7374 (COT 082 424 461)	2	0.0286	-
11	Lot 4, Block 29, Plan 002 1507 (COT 132 231 584)	2	0.0062	-
12	Lot 3, Block 29, Plan 002 1507 (COT 132 231 583)	2	0.0190	-
13	Lot 7, Block 29, Plan 042 6501 (COT 132 231 582)	2	0.0169	-
14	Lot 6, Block 29, Plan 042 6501 (COT 042 513 392)	2	0.0230	-
15	Lot 5, Block 29, Plan 012 1939 (COT 022 115 245)	2	0.0888	-
16	Lot 7, Block 28, Plan 012 1939 (COT 012 378 030)	2	0.0362	-
17	Lot 9, Block 28, Plan 082 8087 (COT 082 427 048)	2	0.3258	-
18	Lot 6, Block 28, Plan 002 1507 (COT 002 202 344)	2	0.0288	-
19	Lot 5, Block 28, Plan 002 1507 (COT 032 135 453 +1)	2	0.0190	-
20	Lot 4, Block 28, Plan 002 1507 (COT 032 135 453)	2	0.0739	-
21	Lot 8, Block 28, Plan 112 3896 (COT 112 239 645 +1)	2	0.0523	-
22	Railway Plan 5030EO (COT 942 137 415)	2	0.0681	-
23	Lot 1, Block 23, Plan 597KS (COT 022 219 914)	2	0.0562	-

24	Lot 2, Block 23, Plan 597KS (COT 062 168 373)	2	0.0216	-
25	Lot 9, Block 24, Plan 597KS (COT 072 410 944)	2	0.0025	-
26	Lot 8, Block 24, Plan 597KS (COT 092 053 129)	2	0.0011	-
27	Lot 1, Block 21, Plan 1378KS (COT 132 311 982)	2	0.0047	-
27A	Lot 4, Block 21, Plan 1378KS (COT 092 461 291)	2	-	0.0003
27B	Lot 11, Block 21, Plan 092 4312 (COT 122 241 375)	2	-	0.0130
27C	Lot 6, Block 21, Plan 1378KS (COT 072 028 544)	2	-	0.0298
27D	Lot 7, Block 21, Plan 1378KS (COT 052 161 405)	2	-	0.0259
27E	Lot 1, Block 20, Plan 5630HW (COT 052 161 405 +1)	2	-	0.0227
27F	Lot 2, Block 20, Plan 5630HW (COT 072 222 004)	2	-	0.0376
27G	Lot 3, Block 20, Plan 5630HW (COT 072 222 005)	2	-	0.0598
27H	Lot 1, Block 19, Plan 5493HW (COT 122 078 974)	2	-	0.0003
27I	Unit 5, Condominium Plan 062 6969 (COT 082 296 421)	2	-	0.0220
	Unit 6, Condominium Plan 062 6969 (COT 072 351 359)			
	Unit 7, Condominium Plan 062 6969 (COT 082 269 002)			
	Unit 8, Condominium Plan 062 6969 (COT 072 293 219)			
28	Lot 1, Plan 952 0648 (COT 062 182 728)	2	0.0112	0.0112
29	Lot 2, Plan 952 0648 (COT 982 204 410)	2	0.0189	0.0188
30	Lot R1, Block 4, Plan 5456MC (COT 53K243)	2	0.1280	0.0433
31	Lot 1, Block 4, Plan 5456MC (COT 062 440 262)	2	0.0003	0.0001
32	Lot 2, Block 4, Plan 5456MC (COT 862 114 029)	2	0.0004	0.0003
33	Lot 3, Block 4, Plan 5456MC (COT 61N212)	2	0.0006	0.0005

34	Lot 4, Block 4, Plan 5456MC (COT 902 366 358)	3	0.0008	0.0008
35	Lot 5, Block 4, Plan 5456MC (COT 84Z206)	3	0.0011	0.0011
36	Lot 6, Block 4, Plan 5456MC (COT 872 221 631)	3	0.0015	0.0015
37	Lot 7, Block 4, Plan 5456MC (COT 032 385 946)	3	0.0019	0.0019
38	Lot 8, Block 4, Plan 5456MC (COT 022 458 906)	3	0.0023	0.0023
39	Lot 9, Block 4, Plan 5456MC (COT 052 036 656)	3	0.0039	0.0038
40	Lot 10A, Block 4, Plan 092 9685 (COT 092 362 277)	3	0.0860	0.0860
41	Lot 10B, Block 4, Plan 092 9685 (COT 092 362 277 +1)	3	0.0045	0.0045
42	Lot 1, Block 5, Plan 082 6562 (COT 132 210 696 +1)	3	0.0000	0.0000
43	Lot 9A, Block 26, Plan 102 2368 (COT 122 073 732 +2)	3	0.0057	-
44	Lot 8, Block 26, Plan 082 9010 (COT 082 484 180)	3	0.0098	0.0098
45	Lot 6, Block 26, Plan 5630HW (COT 042 277 587)	3	0.0051	0.0050
46	Lot 11, Block 1, Plan 3894TR (COT 792 062 616)	3	0.0027	0.0007
47	Lot 14A, Block 2, Plan 092 4792 (COT 092 141 088)	3	0.0221	0.0221
48	Lot 8C, Block 3, Plan 792 0180 (COT 062 483 209)	3	0.0047	0.0047
49	Lot 4, Block 4, Plan 8442ET (COT 052 197 038)	3	0.0009	-
50	Lot 5, Block 4, Plan 8442ET (COT 932 122 797)	3	0.0020	-
51	Lots 6 & 7, Block 4, Plan 8442ET (COT 932 122 797 +8)	3	0.0194	-
52	Lot 8A, Block 4, Plan 4969HW (COT 932 122 797 +9)	3	0.0371	-
53	Lot D, Block 28, Plan 2929KS (COT 092 465 233)	4	0.0052	-



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Red Deer AB Canada
T4N 1X7
Tel. 403.341.3320
Fax. 403.342.0969
www.stantec.com

Legend

RIGHT–OF–WAY REQUIRED

1 LANDOWNER IDENTIFIER

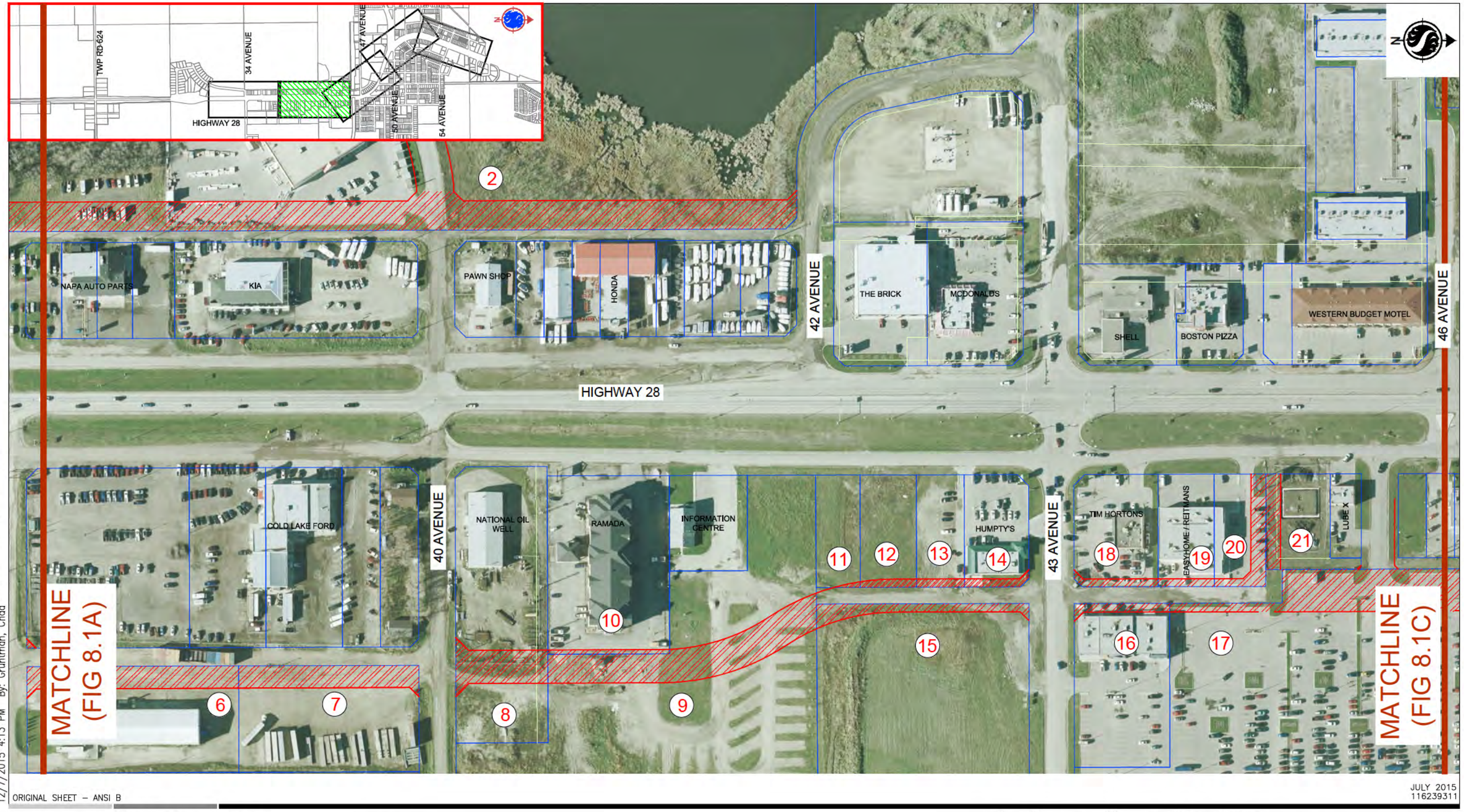
0 20 60 100m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1A

Title
LAND ACQUISITION
AUXILIARY LANE ALTERNATIVE



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City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1B

Title
LAND ACQUISITION
AUXILIARY LANE ALTERNATIVE

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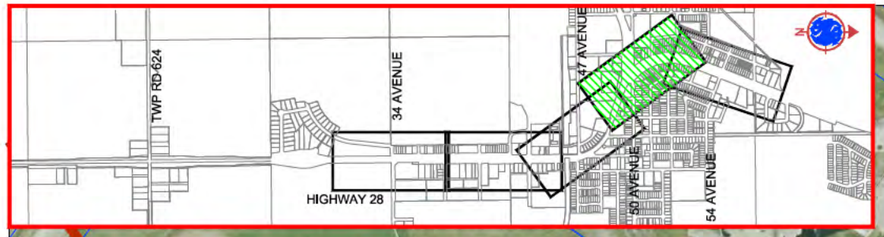
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1C

Title
LAND ACQUISITION
AUXILIARY LANE ALTERNATIVE



MATCHLINE (FIG 8.1C)

CENTRE AVENUE

HIGHWAY 28

51 AVENUE

56 STREET

52 AVENUE

50 AVENUE

53 STREET

MATCHLINE (FIG 8.1E)

A&W

OK TIRE

ARMSTRONG HEATING & COOLING PRODUCTS

CHIROPRACTOR

VOGUE

CYR-DYCK & ASSOCIATES

ANSELL'S REFRIGERATION & HEATING LTD.

QUINN PUMPS

COMMUNITY

KENTUCKY FRIED CHICKEN

TRINITY UNITED CHURCH

LAKE CITY MOTOR PRODUCTS

FIRE RESCUE SERVICE

DAIRY KING

COLD LAKE

CONTRACTING & SUPPLIES

TRI-TOWN DENTAL CENTRE

ASSUMPTION JUNIOR/SENIOR HIGH SCHOOL

SUBWAY

40 41 47 48 49 50 51 52

N

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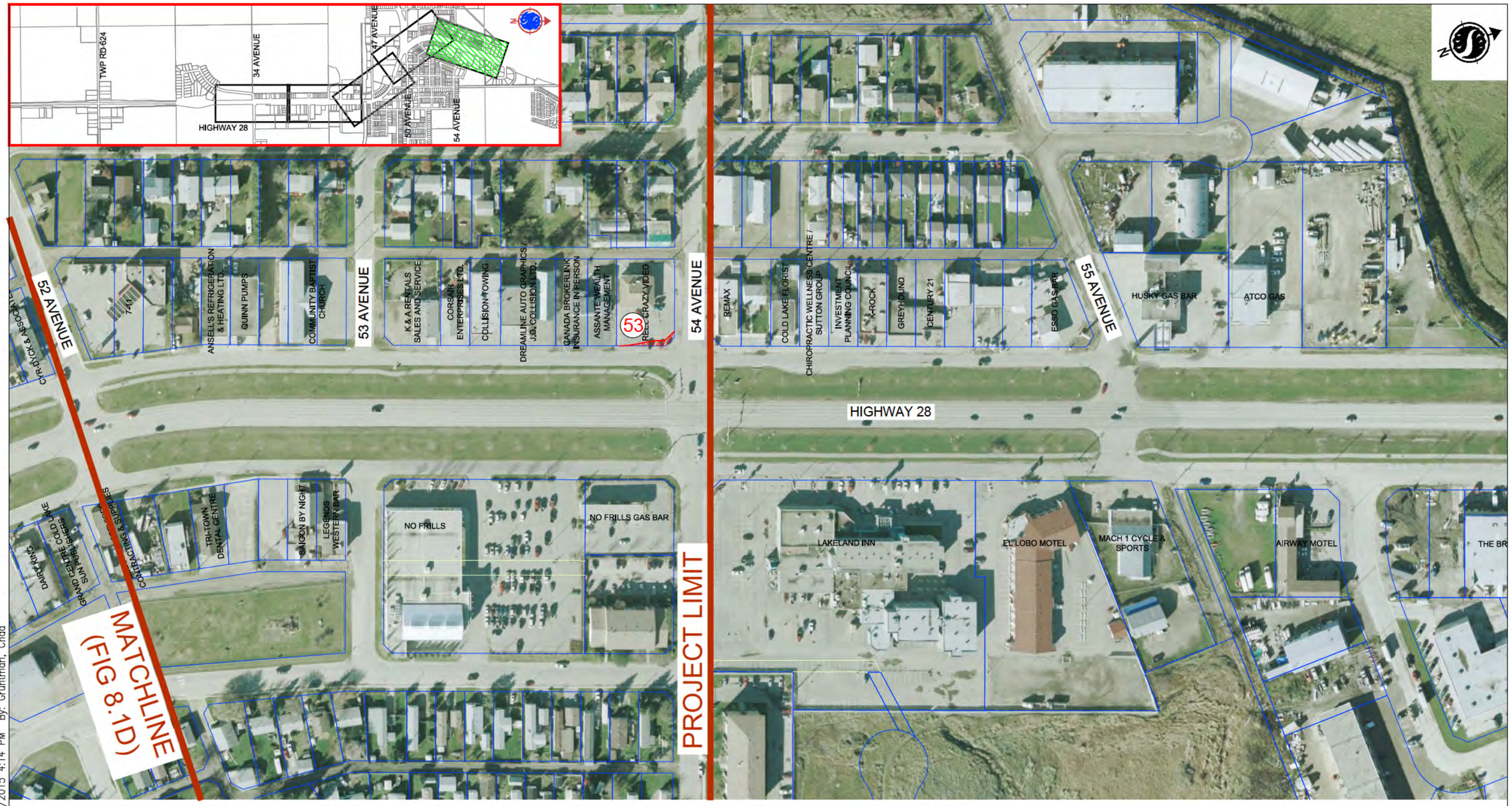
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1D

Title
LAND ACQUISITION AUXILIARY LANE/ SERVOCE ROAD ALTERNATIVE



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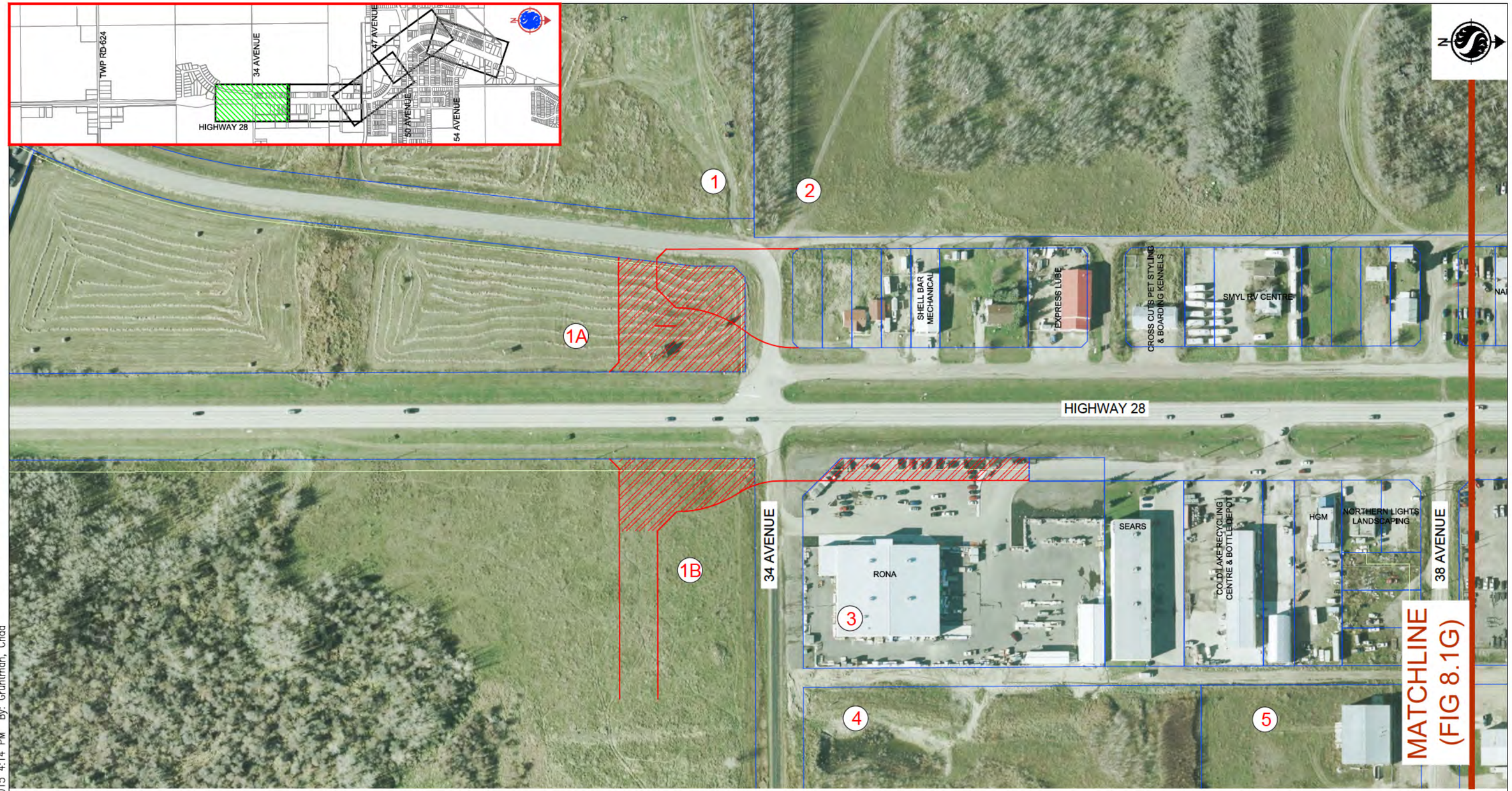
Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1E

Title
LAND ACQUISITION AUXILIARY LANE/ SERVICE ROAD ALTERNATIVE



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1 LANDOWNER IDENTIFIER

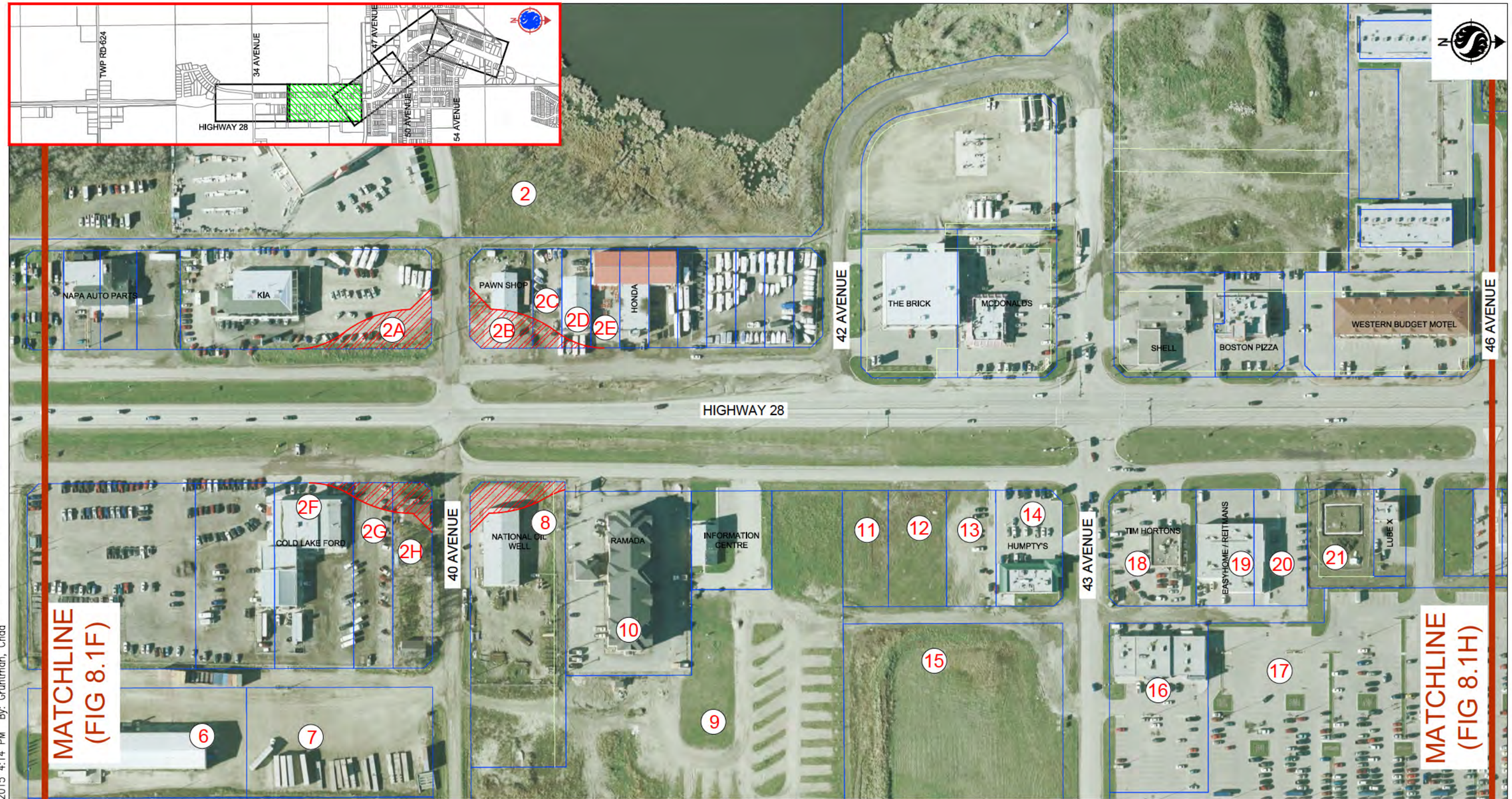
0 20 60 100m

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1F

Title
LAND ACQUISITION SERVICE ROAD ALTERNATIVE



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Client/Project
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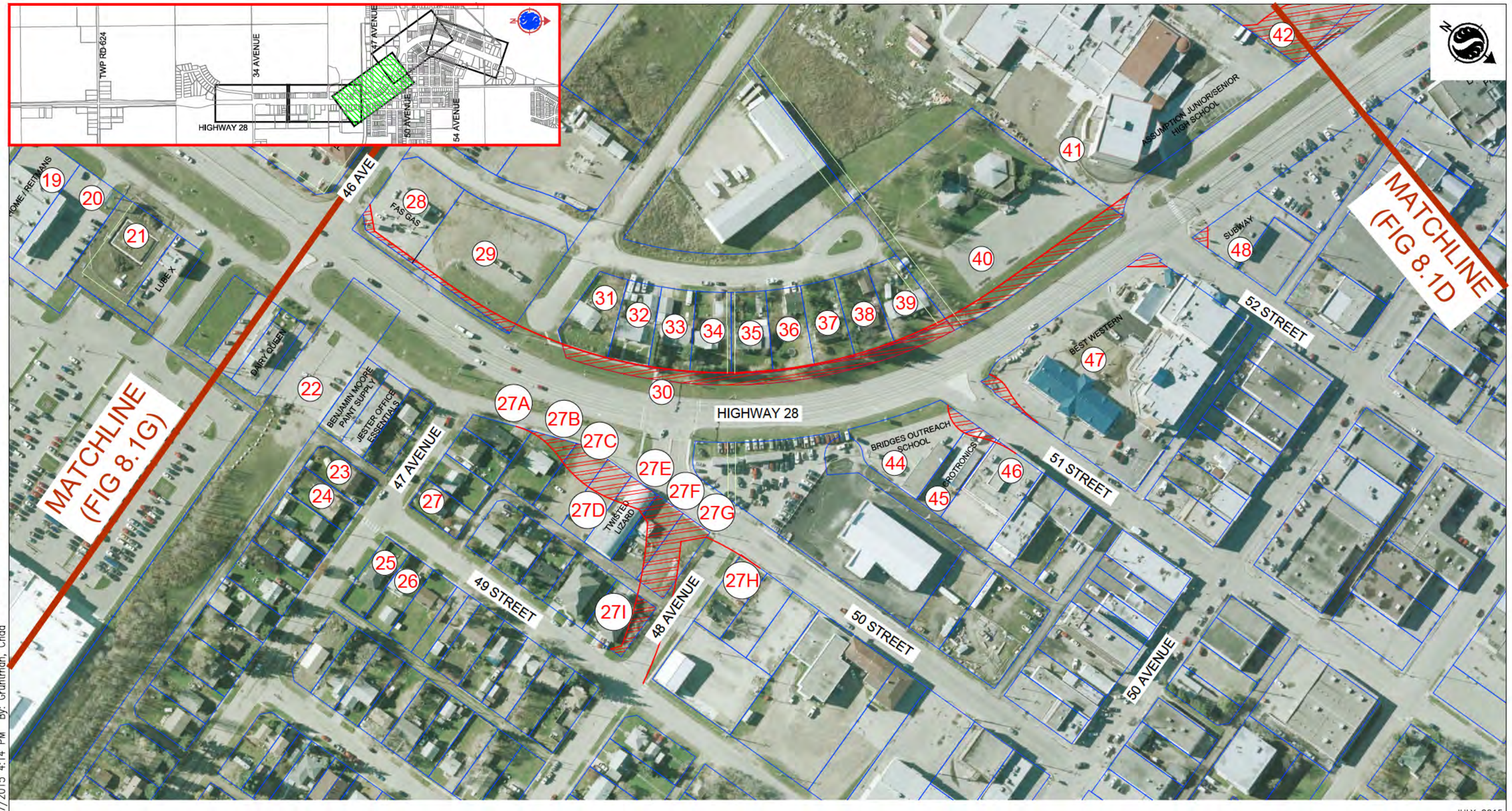
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1G

Title
LAND ACQUISITION SERVICE ROAD ALTERNATIVE



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RIGHT–OF–WAY REQUIRED

1 LANDOWNER IDENTIFIER

0 20 60 100m

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CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
8.1H

Title
LAND ACQUISITION SERVICE ROAD ALTERNATIVE

9.0 Public Engagement Overview

Prior to engaging the public, Stantec and the City undertook a series of tasks including assessing the existing conditions/design constraints, developing design criteria and analyzing future design traffic requirements. With the above in mind, Stantec developed several preliminary alternatives.

In order to reduce the number of alternatives and arrive at a final design, Stantec and the City conducted two public open houses. The purpose of the open houses was to present the preliminary plans to the public and gather input and feedback to incorporate into the design. Summaries of each of the open houses are provided in the sections below.

9.1 PUBLIC OPEN HOUSE #1

On March 12, 2014 at the Lakeland Inn, Stantec and the City conducted Public Open House #1 and presented two alternatives via PowerPoint. Lunch and evening presentations were followed by face-to-face question and answer periods for the stakeholders and general public. Display boards of the Functional Design Drawings, turning movement diagrams, and Transportation Master Plan were set up in the room for reference.

An attendance list was filled out, and everyone was encouraged to fill out and submit a feedback form. Stantec received feedback from numerous business owners, residents, and the general public. The feedback forms are included in a separate document which can be requested by the City for information purposes.

On April 7, 2014 Stantec issued a memorandum which summarized the questions comments, and recommendations that were received. This memorandum is located in Appendix F. Following this submission, Stantec met with the City to address the feedback items and review if they could be incorporated into the functional design.

9.2 PUBLIC OPEN HOUSE #2

On October 8, 2014, Stantec presented the preferred plan for the Highway 28 Functional Design project at Public Open House #2. Similar to Open House #1, the presentation was followed by face-to-face interaction with the stakeholders and general public. Display boards of the Function Design Drawings were set up throughout the room for reference.

An attendance list was filled out, and everyone was encouraged to fill out and submit a feedback form. Stantec received feedback from several business owners and the general public. The feedback forms are included in a separate document which can be requested by the City for reference.

On November 4, 2014, Stantec issued a memorandum to summarize the questions, comments, and recommendations that were received. Stantec met with the City to address the feedback items and finalize the functional design.

10.0 Opinion of Probable Cost

10.1 METHODOLOGY

In our effort to provide a reasonably accurate "Opinion of Probable Cost" for this project, we have analyzed available information based on existing conditions. We have provided "Lump Sum" costs for streetlights and traffic lights. The "Opinion of Probable Costs" included for Zone 2 includes costs for the construction of new circulation roadways where existing Service Roads are being removed. The cost of a 3.0 m wide Multi-modal Trail along the west side of Highway 28 from 46 Avenue to Centre Avenue has also been included.

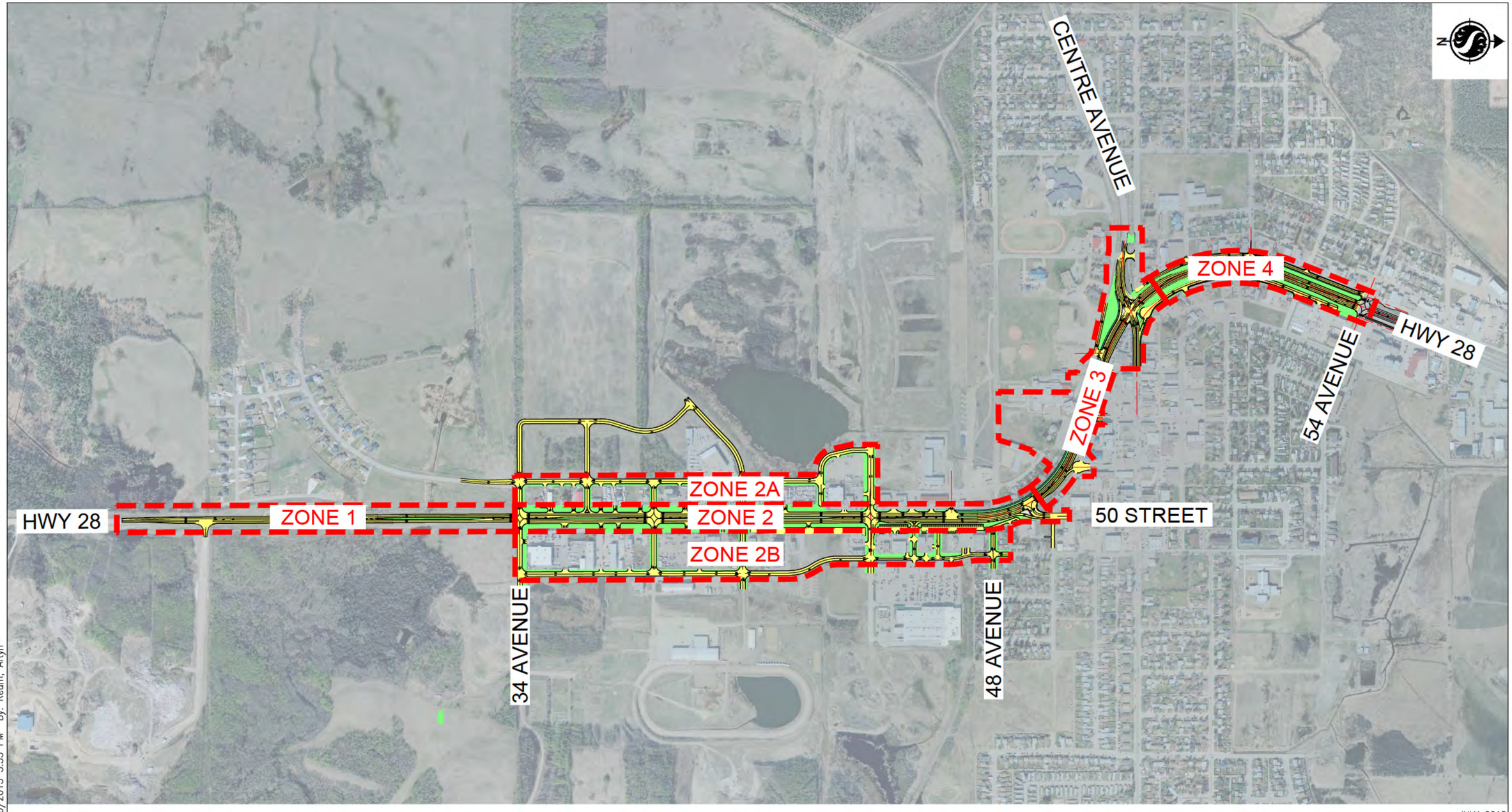
Referring to Section 7, we have included costs for new storm main infrastructure from 34 Avenue to 54 Avenue based on the drainage standards in the Cold Lake Design Guidelines. We have also included and allowance for any required relocation of existing shallow utilities (gas, telephone and/or cable TV facilities). Should this project include extension of Shallow Utility Infrastructure to service development areas adjacent to the project, additional costs will apply to the project, subject to provisions of the various Franchise Agreement between Cold Lake and the respective service providers. Discussions have not been held with the various companies to confirm relocation costs.

As a Geotechnical Investigation has not been completed, we have assumed the roadway structure used by 2007 Functional Planning Report Study completed by UMA Engineering Ltd (Table 2.3). We have assumed an overlay strategy where existing roads can remain in place to reduce reconstruction costs. The pavement design and overlay strategy would be refined during detail design phase of the project.

Table 10.1 summarizes opinion of probable cost, which includes a 20% contingency amount and a 10% engineering services amount. Land costs have not been included due to the lack of applicable land values for each type of land use, impact on existing access and impact on existing building. Detailed cost calculations are attached in Appendix G. Limits of opinion of probable cost for different sections are shown in Figure 10. A more detailed breakdown of the opinion of probable cost is attached in Appendix G.

Table 10.1: Summary of Opinion of Probable Costs

Subtotal - Construction Cost	$33,900,000.00
Contingencies (20%)	$6,780,000.00
Subtotal - Construction Costs and Contingencies	$40,680,000.00
Engineering (10%)	$4,068,000.00
Subtotal - Construction Costs, Contingencies and Engineering Services	$44,748,000.00
Work by Others	$550,000.00
Project Land Acquisition Costs	TBD
Total Estimated Cost	**$45,297,000.00**



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LIMITS OF SCHEDULES

0 20 60 100m

Stantec

City of Cold Lake

Client/Project
CITY OF COLD LAKE
HIGHWAY 28 FUNCTIONAL DESIGN

Figure No.
10

Title
LIMITS OF OPINION OF PROBABLE COST