CITY OF SASKATOON

Circle Drive West
Clancy Drive to Laurier Drive

Functional Plan
FINAL APPENDICES

CIMA+ file: E00747A
June 2, 2022 – Rev. 4

CITY OF SASKATOON

Circle Drive West
Clancy Drive to Laurier Drive

Functional Plan
FINAL APPENDICES

4th Floor, 333 – 3rd Avenue North, Saskatoon, Saskatchewan
Canada S7K 2M2

CIMA+ file: E00747A
June 2, 2022 – Rev. 4

Confidentiality and ownership

List of Appendices

Appendix J includes the final functional plans and Appendix L includes the noise assessment. The figures included in all other appendices reflect the work-in-progress at the time that they were used and are provided for information only.

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A

Appendix A
Existing Corridor Geometry

E00747A

MEMO 1

DATE	**:**	July 15, 2019
FROM	**:**	Jack Niepsuj, Henry Devos
PROJECT	**:**	City of Saskatoon, Circle Drive West – Functional Planning Study
SUBJECT	**:**	Review of Existing Corridor Geometry

Based on the *target geometric design criteria* for the Circle Drive West project, a review of the existing roadway geometrics within the study area was performed to determine where the target design criteria are met and identify areas where they fall short. The focus is on the horizontal geometry and the entrance and exit ramp terminals.

The results of this review are shown on Figure 1 and summarized in Table 1. **Blue** text on the figure identifies locations where the existing conditions do not meet the target design criteria, while **white** text identifies existing conditions that meet the target criteria. The locations where existing conditions do not meet the target design criteria are summarized in Table 1.

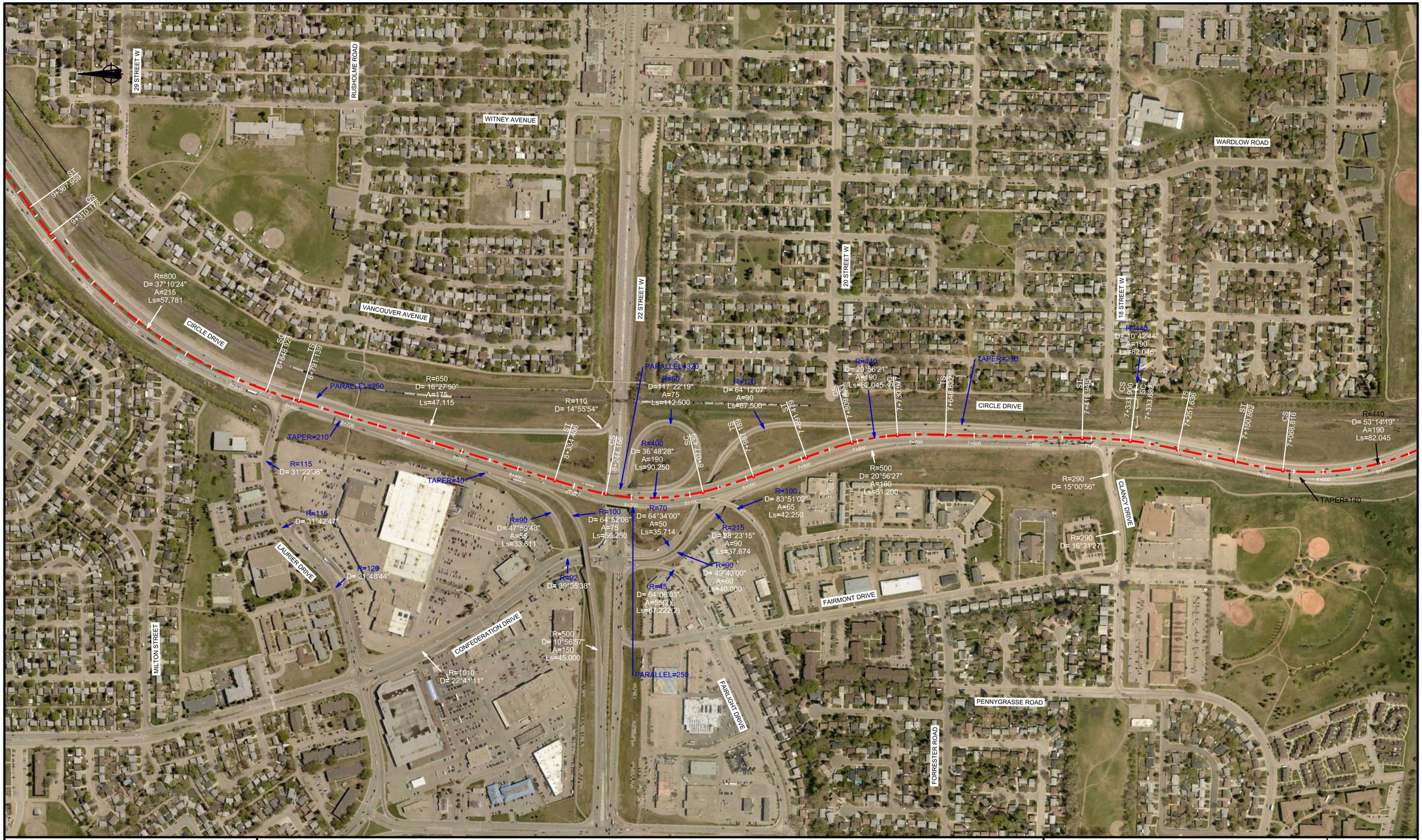
Overall, the current geometry and ramp design along Circle Drive meets the requirements for an 80 km/h design speed and 70 km/h posted speed, with many ramp geometries meeting a 50-60 km/h design speed and 40-50 km/h posted speed due to tight horizontal curvatures.

As the project progresses, opportunities will be explored to meet the target geometric design criteria for the project throughout the study area. However, the roadway geometry is restricted almost throughout by existing roadway and railway bridge structures, or existing development, which would require significant cost, time or impact to address.

Table 1: Existing Geometry: Locations Not Meeting Target Design Criteria

Alignment	Element	Target Value	Actual Value	Actual Design Speed (km/h)	Comments/Notes
Circle Drive	Mainline Radii	570m	400 – 440m	95 – 100	Mainline radii do not meet minimums set out in design criteria. Radius at 22 Street W structure only meets a 95 km/h design speed. Radii are constrained by existing bridge structures.
Laurier Drive	Centreline Radii	250m	115 – 120m	55	Centreline radii do not meet 60 km/h design speed; however they do exceed posted speeds.
Clancy Drive	N/A				Target design criteria met.
Confederation Drive	Centreline Radii	250m	92m	50	Radius approaching 22 Street W does not meet a 70 km/h design speed. Radius is constrained by existing bridge structure.
Northbound Circle Drive to 22 Street / Confederation Drive Ramp	Exit Taper	285m	210m	80	Exit taper ramp length does not meet a 100 km/h design speed for the Circle Drive mainline.
	Centreline Radii	340m	120m (first curve) 70m (second curve)	55 km/h (first) 45 km (second)	Ramp curves do not meet a 70km/h design speed. Radii are restricted by existing bridge structures.
Southbound Circle Drive to 22 Street West Ramp	Exit Taper	285m	210m	80	Exit taper ramp length does not meet a 100 km/h target design speed for the Circle Drive.
	Centreline Radius	340m	100m	50	Curve deflecting to west does not meet minimum radii for target ramp design speed.
Southbound Circle Drive to Confederation Drive Ramp	Exit Taper	205m	40m	N/A	Exit taper does not meet standard for a diverge from a C/D road, even at a 60km/h design speed.
	Centreline Radius	340m	90m	50	Curve deflecting to west does not meet minimum radii for target ramp design speed.
Southbound Circle Drive to Fairmont Drive Ramp	Exit Taper	295m	250m	90	Exit parallel deceleration lane does not meet a 100 km/h target design speed for Circle Drive.
	Centreline Radius	340m	100m	50	Curve deflecting to south does not meet a 70 km/h design speed.

Alignment	Element	Target Value	Actual Value	Actual Design Speed (km/h)	Comments/Notes
Southbound Circle Drive to 11 Street W Ramp	Exit Taper	285m	140m	<60	Exit lane taper does not meet a 100 km/h target design speed for Circle Drive.
Westbound 22 Street W to Northbound Circle Drive Ramp	Entrance Parallel Lane	375m	250m	80	Entrance parallel lane ramp does not meet a 100 km/h target design speed for Circle Drive.
Eastbound 22 Street W to Northbound Circle Drive Loop	Centreline Radius	90m	50m	40	Current loop ramp design meets target criteria for an urbanized loop, however, current configuration is rural.
	Entrance Parallel Lane	375m (or greater)	320m	90	Entrance parallel lane ramp does not meet a 100 km/h target design speed for Circle Drive.
Southbound Confederation Drive to Southbound Circle Drive Ramp	Centreline Radii	340m	90m (first curve) 215m (second curve)	50 (first curve) 75 (second curve)	First two curve radii departing south of 22 Street W do not meet targets ramp radii. First curve does not meet design speed requirements for 70 km/h.
Southbound Confederation Drive to Fairmont Drive Ramp	Centreline Radii	340,	45m	35	Slip ramp radius does not meet design targets for ramps, however, as this operates as more of a free-flow right turn in an urbanized situation, the current radius can be considered acceptable.



LEGEND:

SCALE : NTS

EXISTING STUDY AREA GEOMETRY

FIGURE 1

B

Appendix B
Proposed 11th Street / Circle Drive Interchange Concept (by others)

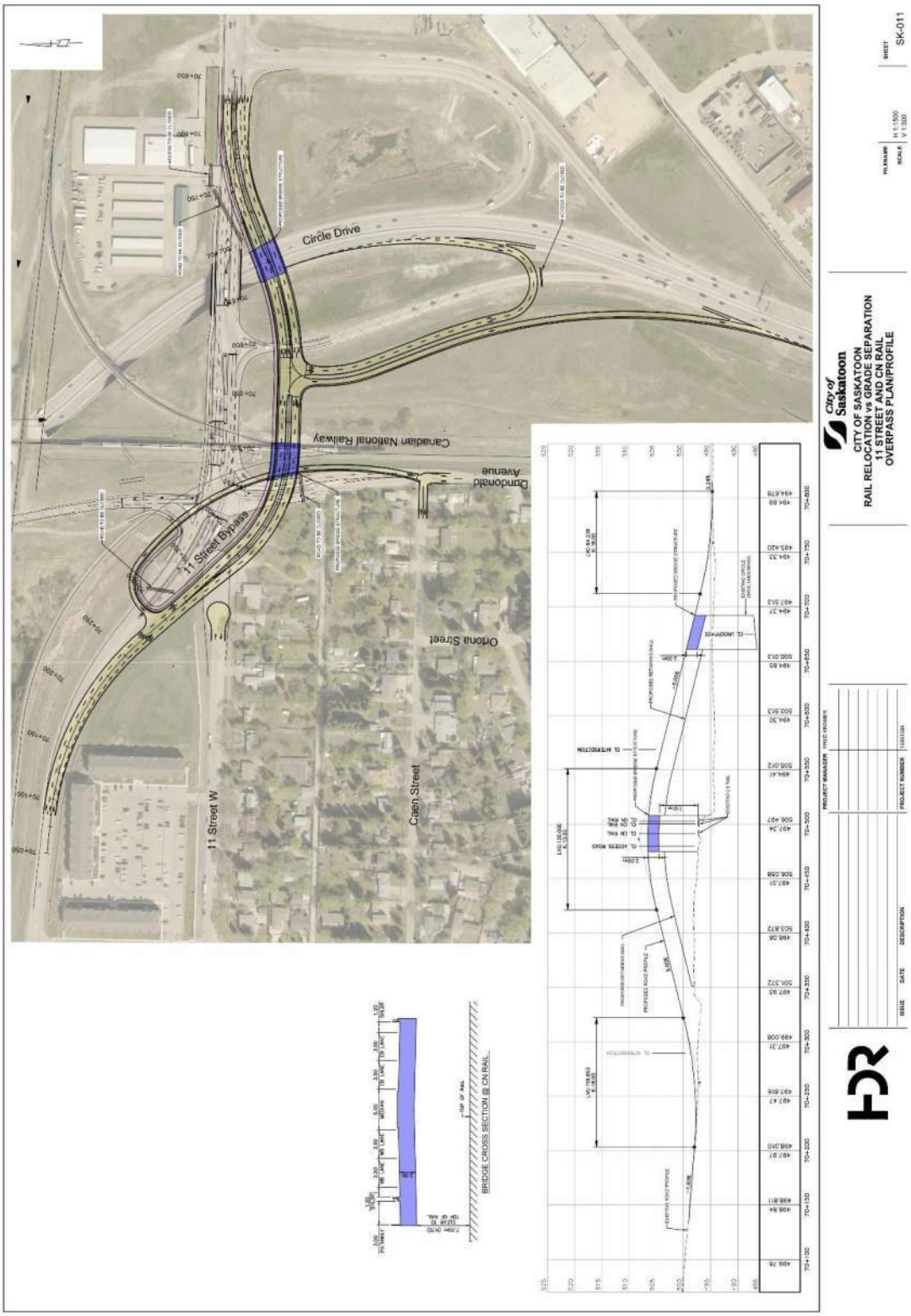


Figure 20: Proposed Conceptual Plan and Profile for 11th Street W @ CN

C

Appendix C
City of Saskatoon – Street Network and Project Growth Concept Plans

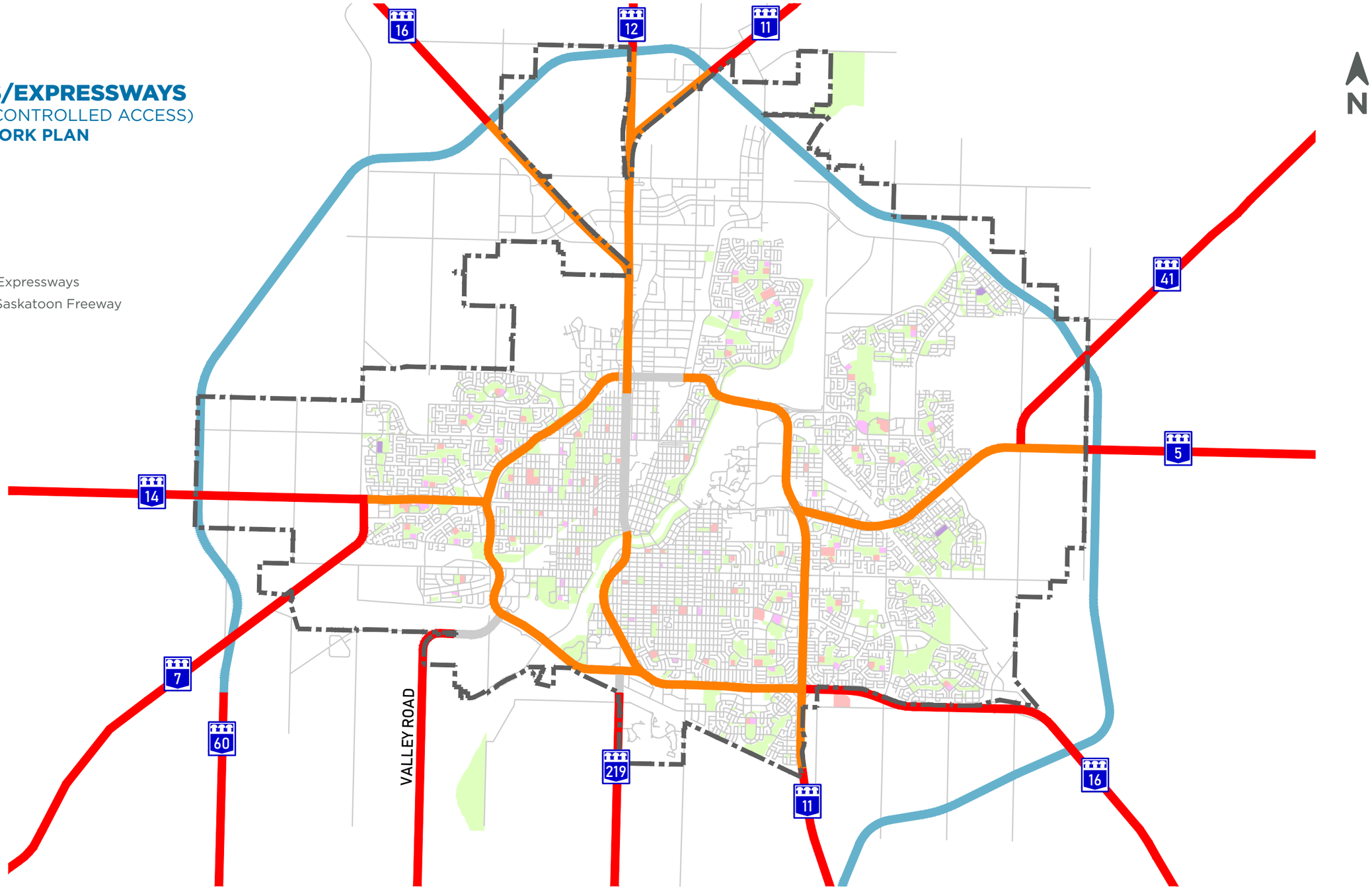
APPENDIX A

1

FREEWAYS/EXPRESSWAYS
(HIGH SPEED CONTROLLED ACCESS)
STREET NETWORK PLAN

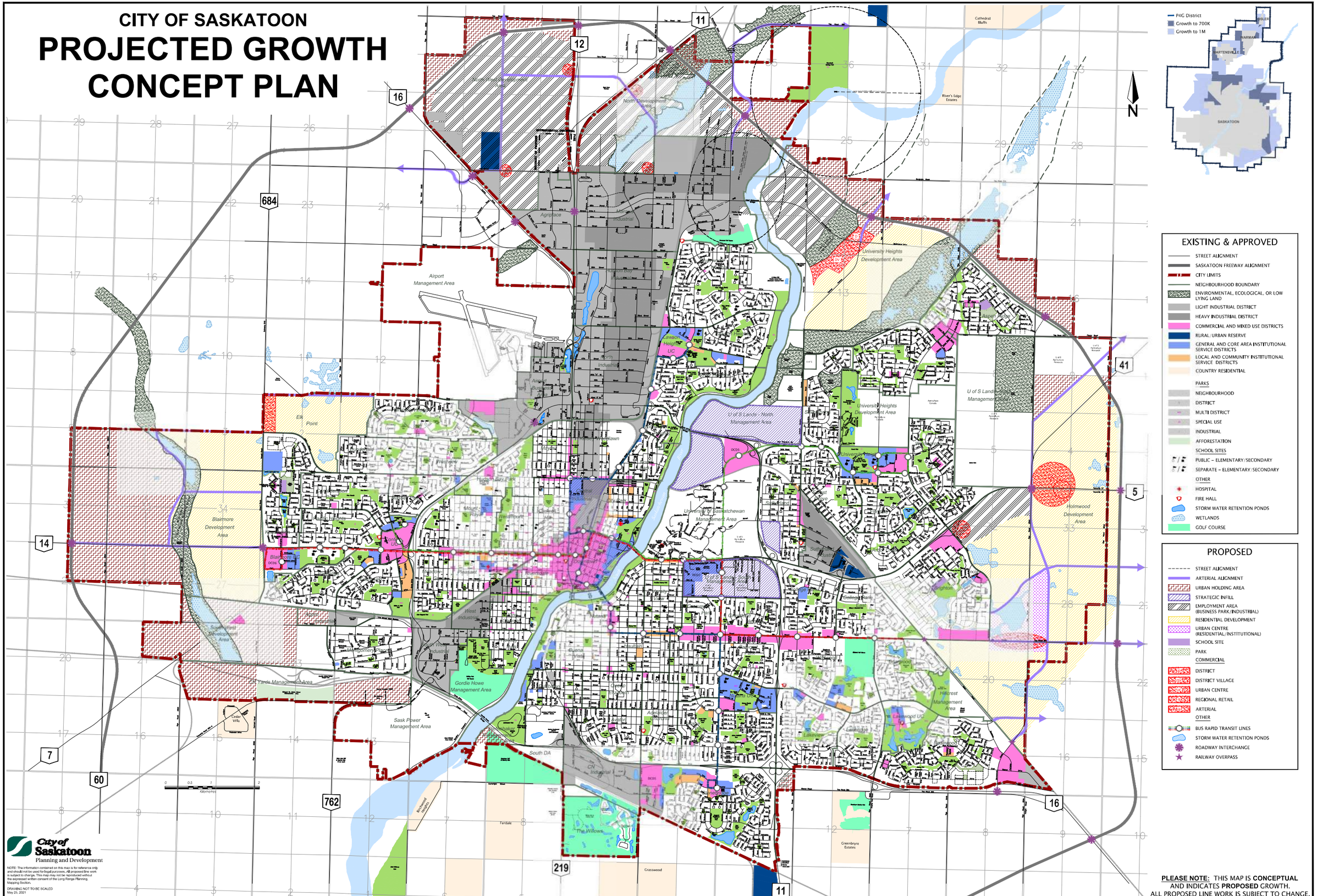
Legend

- City Limits
- Highways
- Freeways/Expressways
- Proposed Saskatoon Freeway



CITY OF SASKATOON

PROJECTED GROWTH CONCEPT PLAN



EXISTING & APPROVED

- STREET ALIGNMENT
- SASKATOON FREEWAY ALIGNMENT
- CITY LIMITS
- NEIGHBOURHOOD BOUNDARY
- ENVIRONMENTAL, ECOLOGICAL, OR LOW LYING LAND
- LIGHT INDUSTRIAL DISTRICT
- HEAVY INDUSTRIAL DISTRICT
- COMMERCIAL AND MIXED USE DISTRICTS
- RURAL/URBAN RESERVE
- GENERAL AND CORE AREA INSTITUTIONAL SERVICE DISTRICTS
- LOCAL AND COMMUNITY INSTITUTIONAL SERVICE DISTRICTS
- COUNTRY RESIDENTIAL

PARKS

- NEIGHBOURHOOD
- DISTRICT
- MULTI DISTRICT
- SPECIAL USE
- INDUSTRIAL
- AFFORESTATION

SCHOOL SITES

- PUBLIC – ELEMENTARY/SECONDARY
- SEPARATE – ELEMENTARY/SECONDARY

OTHER

- HOSPITAL
- FIRE HALL
- STORM WATER RETENTION PONDS
- WETLANDS
- GOLF COURSE

PROPOSED

- STREET ALIGNMENT
- ARTERIAL ALIGNMENT
- URBAN HOLDING AREA
- STRATEGIC INFILL
- EMPLOYMENT AREA (BUSINESS PARK/INDUSTRIAL)
- RESIDENTIAL DEVELOPMENT
- URBAN CENTRE (RESIDENTIAL/INSTITUTIONAL)
- SCHOOL SITE
- PARK

COMMERCIAL

- DISTRICT
- DISTRICT VILLAGE
- URBAN CENTRE
- REGIONAL RETAIL
- ARTERIAL

OTHER

- BUS RAPID TRANSIT LINES
- STORM WATER RETENTION PONDS
- ROADWAY INTERCHANGE
- RAILWAY OVERPASS

PLEASE NOTE: THIS MAP IS **CONCEPTUAL** AND INDICATES **PROPOSED** GROWTH. ALL PROPOSED LINE WORK IS SUBJECT TO CHANGE.

City of Saskatoon
Planning and Development

DRAWING NOT TO BE SCALED
May 25, 2021

N:\Planning\MAPPING\Wall_Maps\Projected_Growth_Map\Projected Growth Concept Plan.dwg

D

Appendix D
Compiled Stormwater Management As-Built Plan

29 STREET W
RUSHOLME ROAD
WITNEY AVENUE
VANCOUVER AVENUE
CIRCLE DRIVE
22 STREET W
20 STREET W
18 STREET W
WARDLOW ROAD
CIRCLE DRIVE
CLANCY DRIVE
LAURIER DRIVE
MILTON STREET
CONFEDERATION DRIVE
FAIRMONT DRIVE
FAIRLIGHT DRIVE
FORRESTER ROAD
PENNYGRASSE ROAD

LEGEND:

- AS-BUILT INFORMATION PROVIDED
- NO AS-BUILT INFORMATION PROVIDED, HOWEVER, SYSTEM ASSUMED TO BE RURAL WITH DITCH DRAINAGE
- AS-BUILT INFORMATION REQUIRED

SCALE : NTS

STORM WATER DRAINAGE AS-BUILT INFORMATION MAPPING

FIGURE

STM-1

E

Appendix E
Proposed Design Criteria

Circle Drive West – Geometric Design Criteria

Design criteria for the Circle Drive west have been established based on the following hierarchy of reference documents:

1. City of Saskatoon Design and Development Standards – Volume 8 Transportation System (Version 11)
   https://www.saskatoon.ca/business-development/development-regulation/specifications-standards/design-development-manual-new-neighbourhoods
2. City of Saskatoon Complete Streets Design & Policy Guide (September 2017)
   https://www.saskatoon.ca/sites/default/files/documents/complete_streets_design_and_policy_guide_.pdf
3. City of Saskatoon Specifications & Standard Drawings (February 2019)
   https://www.saskatoon.ca/business-development/development-regulation/specifications-standards/specifications

Where specific information is not available within the City of Saskatoon's standards and guidelines, the following documents have been utilized to supplement the design criteria for the project:

4. Transportation Association of Canada Geometric Design Guide for Canadian Road (TAC-GDG, 2017)
   https://www.tac-atc.ca/en/publications-and-resources/geometric-design-guide-canadian-roads
5. Saskatchewan Highways and Infrastructure Geometric Design Guide Supplement Interim (September 2018) and Design Manual Volume 2 (October 2017)
   http://www.highways.gov.sk.ca/Doing%20Business%20with%20MHI/Ministry%20Manuals/SK.%20Supplement%20to%20the%20TAC%20Geometric%20Design%20Guide/Manual%20for%20Download/SK%20Supplement%20to%20the%20TAC%20Geometric%20Design%20Guide%20%20(Sep%202018).pdf

   http://www.highways.gov.sk.ca/Doing%20Business%20with%20MHI/ministry%20manuals/design%20manual%20part%202/000%20manual%20for%20download/Design%20Manual%20-%20Part%202%20(Oct%202017).pdf

The initial design criteria are presented in **Table 1** on the following pages. These design criteria will serve as the starting point for the geometric design along the corridor and may be refined as the project progresses.

Table 1: Circle Drive West: Target Geometric Design Criteria

Criteria	Circle Drive Mainline	Multi-Lane Collector/Distributor (C/D) Road	One- Lane Collector/Distributor (C/D) Road	Two Lane Ramp	Single Lane Ramp	Loop Ramp[2]	22 Street W	Laurier Drive / Clancy Drive
Design Speed (km/h)	100	70	70	70	70	50	70	60
Posted Speed (km/h)	90	60	60	60	60	40	60	50
Horizontal Curve Radius Minimum (m) Desirable Range (m)	670	250 400 – 5000	250 400 – 5000	340	340	90 (40 if urbanized)	250 400 – 5000	250 400 – 5000
Minimum Tangent Length (m)[4]	250	250	250				250	250
Minimum Spiral Length (m)	50	50	50	50	50	50	50	50
Maximum Superelevation	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Minimum Crossfall	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Vertical Grade Maximum (%) Minimum (%) Bridge Deck (%)	 4.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max	 5.0% 0.5% 1.0% min, 2.0% max
Minimum Vertical Curve Crest (K) Sag (K) Length (m) PI Spacing (m)	 80 30 250 350	 25 15 150 N/A	 25 15 150 N/A	 20 15 150 N/A	 20 15 100 N/A	 20 10 N/A N/A	 20 15 N/A N/A	 15 10 N/A N/A
Number of Lanes	6 ultimate / 4 interim	2 or 3	1	2	1	1 or 2	6 (BRT in outside lanes)	4
Lane Widths[3] Curbside Lane (m) Standard Travel Lane (m) Inside Shoulder (m) Outside Shoulder (m) Left Turn (m) Right Turn (m)	 Add 0.25 gutter 3.70 1.00[6] 3.00 N/A N/A	 Add 0.25 gutter 3.60 1.00 2.50 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 4.00 1.00 2.50 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 3.60 1.00 2.50 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 4.00 1.00 2.50 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 5.00 1.00 2.50 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 3.60 N/A N/A 3.75 (to FOC) 3.75 (to FOC)	 Add 0.25 gutter 3.60 N/A N/A 3.75 (to FOC) 3.75 (to FOC)
Ramp Taper – Exit	N/A	N/A	N/A	Direct Taper as per TAC-GDG Figure 10.8.2	Direct Taper as per TAC-GDG Figure 10.8.2	Direct Taper as per TAC-GDG Figure 10.8.2	N/A	N/A
Ramp Taper – Entrance	N/A	N/A	N/A	Parallel Lane as per TAC-GDG Figure 10.8.5 (one lane) and 10.8.6 (two lane)	Parallel Lane as per TAC-GDG Figure 10.8.5 (one lane) and 10.8.6 (two lane)	Parallel Lane as per TAC-GDG Figure 10.8.5 (one lane) and 10.8.6 (two lane)	N/A	N/A
Shyline Offset (m) Per TAC-GDG Table 7.6.4	2.40	1.70	1.70	1.70	1.70	1.10	1.70	1.40
Clear Zone (m) Per TAC-GDG Table 7.3.1 and Table 7.3.2	10.0	6.5 (6:1) – 8.5 (4:1)	6.5 (6:1) – 8.5 (4:1)	6.5 (6:1) – 8.5 (4:1)	6.5 (6:1) – 8.5 (4:1)	10.0 (6:1) – 13.0 (4:1)	1.2 – 1.8	1.2 – 1.8
Foreslope Desired Maximum	 6:1 6:1	 5:1 4:1	 5:1 4:1	 5:1 4:1	 5:1 4:1	 5:1 4:1	 4:1 3.5:1	 4:1 3.5:1

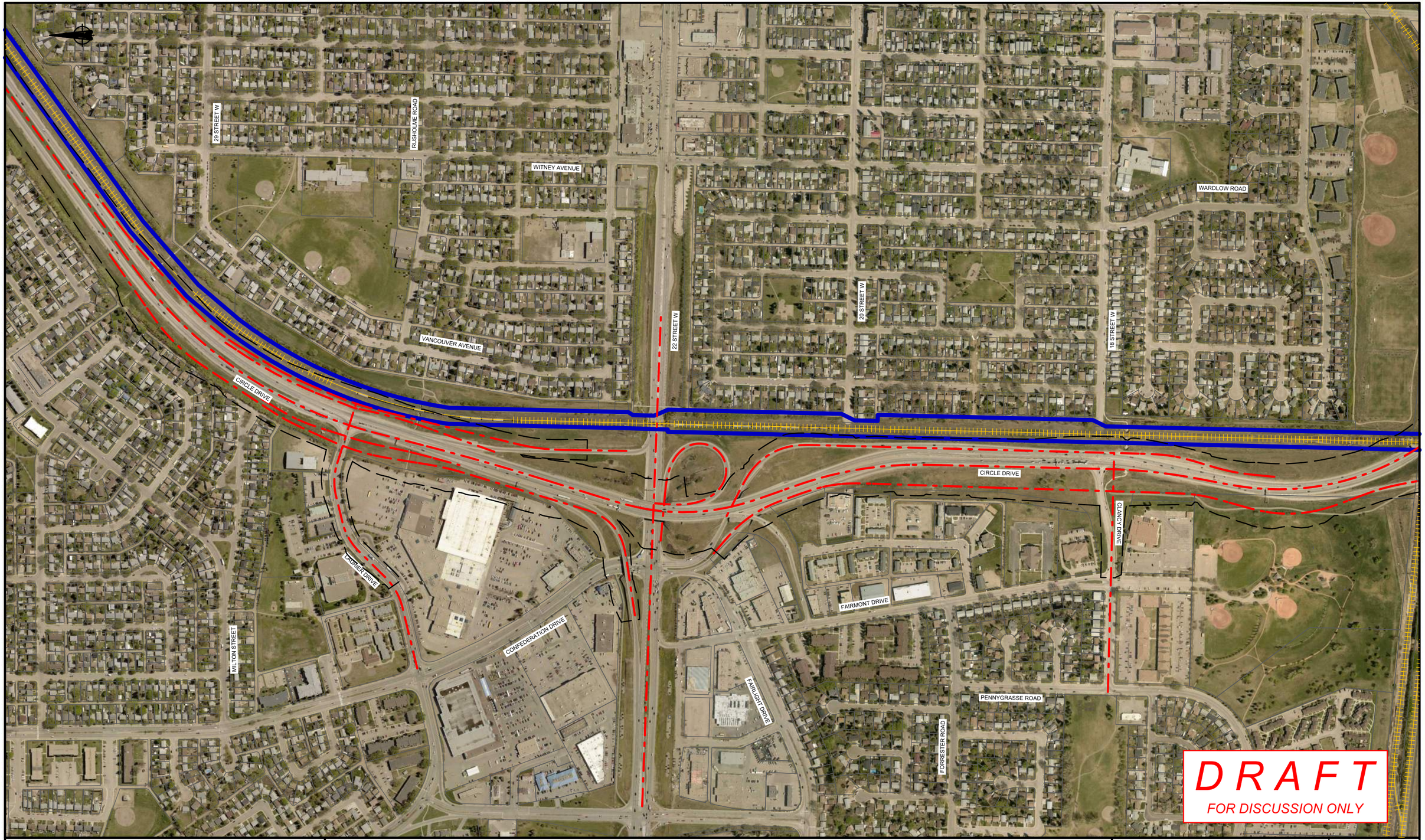
Criteria	Circle Drive Mainline	Multi-Lane Collector/Distributor (C/D) Road	One- Lane Collector/Distributor (C/D) Road	Two Lane Ramp	Single Lane Ramp	Loop Ramp[2]	22 Street W	Laurier Drive / Clancy Drive
		(may be 3.5:1 where curb and gutter used)	(may be 3.5:1 where curb and gutter used)	(may be 3.5:1 where curb and gutter used)	(may be 3.5:1 where curb and gutter used)	(may be 3.5:1 where curb and gutter used)		
Backslope Desired Maximum	 4:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1	 3.5:1 3.5:1
Minimum Ditch Depth (m)[5]	1.00	1.00	1.00	1.00	1.00	1.00	N/A	N/A
Minimum Ditch Bottom Width (m)	3.00	3.00	3.00	3.00	3.00	3.00	N/A	N/A
Turn Bay Bay Length (m) Taper Length (m)	 N/A N/A	 Per Storage Need 37	 Per Storage Need 37	 Per Storage Need 37	 Per Storage Need 37	 Per Storage Need 37	 Per Storage Need 37	 Per Storage Need 37
Minimum Median Width (m) (edge of shoulder to edge of shoulder)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	N/A	N/A	N/A	2.0	2.0
Minimum Outer Separation (m) (edge of shoulder to edge of shoulder)	N/A	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001))	10.0 (depressed, without barrier) 0.61 (with barrier std dwg 102-0006-005r001)	N/A	N/A
Minimum Vertical Clearance (m)	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60
Minimum Intersection Spacing (m)	N/A	450	450	N/A	N/A	N/A	450	250
Minimum Sidewalk Width Along Roadway (m) On Bridge (m)[7]	 N/A	 2.5 (one side) 3.7 (one side)	 2.5 (one side) 3.7 (one side)	 N/A	 N/A	 N/A	 2.5 (one side) 3.7 (one side)	 1.5 (both sides) 2.7 (both sides)
Minimum Shared Pathway Width Along Roadway (m) On Bridge (m)[7]	 3.0 4.2	 3.0 4.2	 3.0 4.2	 N/A	 N/A	 N/A	 3.0 4.2	 3.0 4.2
Minimum Sidewalk Spacing (m)	Outside of clear zone	Outside of clear zone	Outside of clear zone	N/A	N/A	N/A	1.5 from Face of Curb	1.5 from Face of Curb or mono
Stopping Sight Distance Range (m, grade dependent) Target (m, grade 3% or less)	Per TAC 2.5.3 160 – 225 190	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105	Per TAC 2.5.3 95 – 125 105
Decision Sight Distance (m)	365 (TAC, suburban path change)	275 (TAC, urban path change)	275 (TAC, urban path change)	250 (TAC urban stop)	250 (TAC urban stop)	250 (TAC urban stop)	275 (TAC, urban path change)	275 (TAC, urban path change)
Weaving Distance (m)	Per TAC 10.6.5 and 3.7.3 and dependent on volumes 370m Minimum	Per TAC 10.6.5 and 3.7.3 and dependent on volumes 275m Minimum	Per TAC 10.6.5 and 3.7.3 and dependent on volumes 275m Minimum	N/A	N/A	N/A	N/A	N/A
Applicable Standard Drawing(s)	102-0029-002 102-0029-003 102-0029-043 102-0029-044	One half of: 102-0029-002 102-0029-003 102-0029-043 102-0029-044	One half with modified lane width: 102-0029-002 102-0029-003 102-0029-043 102-0029-044	One half of: 102-0029-002 102-0029-003 102-0029-043 102-0029-044	One half with modified lane width: 102-0029-002 102-0029-003 102-0029-043 102-0029-044	One half with modified lane width: 102-0029-002 102-0029-003 102-0029-043 102-0029-044	102-0029-004	102-0029-006

Notes:

1. Highlighted values identify areas where recommended criteria are more conservative than current City of Saskatoon design standards.
2. Loop ramp design based on current 22 Street W EB to Circle Drive NB loop ramp design.
3. Lane widths are measured to face of curb and/or centre of lane marking.
4. Minimum tangent length applies only in the case of back to back reverse curves.
5. Minimum ditch depth is measured from top of subgrade.
6. Minimum mainline shoulder is based on a 4 lane (2 each direction) cross section. A 2.5m shoulder is desirable for a 6 lane (3 each direction) ultimate stage. Shoulder widths will be evaluated based on constraints.
7. Width of sidewalk and pathways on bridges includes additional 0.6m horizontal clearance to barriers per side to provide the minimum required clear through width.

F

Appendix F
CN Encroachment Options



CIMA+

LEGEND:

- EDGE OF CN RIGHT OF WAY
- APPROXIMATE CN RAIL CENTRELINE
- PRELIMINARY LIMIT OF CUT / FILL **
- PRELIMINARY CENTRELINE **

** (SUBJECT TO FURTHER DESIGN AND CONFIGURATION CONFIRMATION)

ASSUMPTIONS:

- CIRCLE DRIVE CENTRELINE SHIFTED APPROX. 20m WEST AT CLANCY DRIVE
- CLANCY DRIVE DROPPED UNDERPASS CIRCLE DRIVE

] LIKELY PREFERED

- CIRCLE DRIVE PROFILE RAISED BY 1.5m AT CLANCY DRIVE
- LAURIER DRIVE DROPPED TO UNDERPASS CIRCLE DRIVE

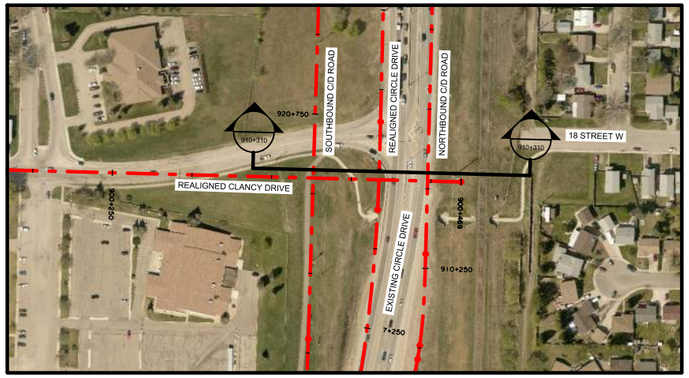
] MAY BE REVERSED

- CIRCLE DRIVE OVERPASSES LAURIER DRIVE AT CURRENT GRADE

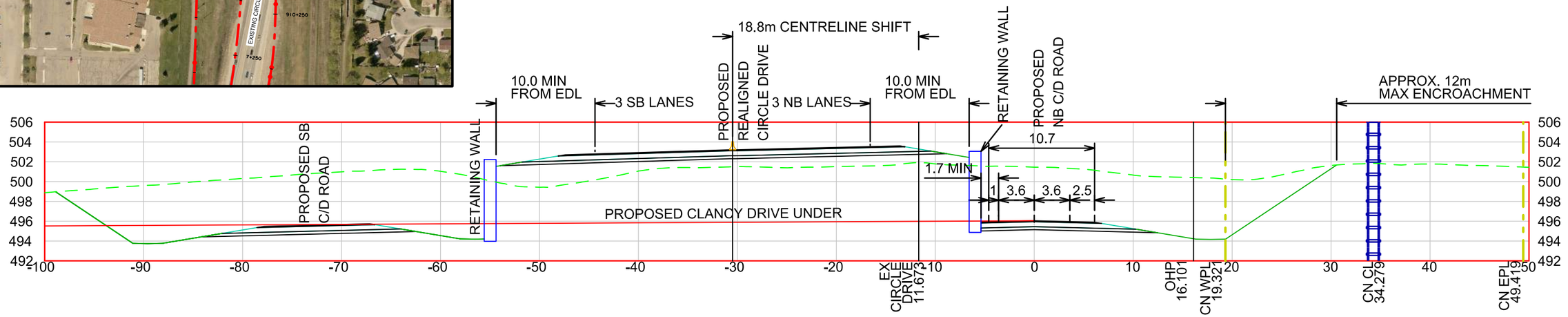
SCALE : NTS

PRELIMINARY CUT / FILL LIMITS

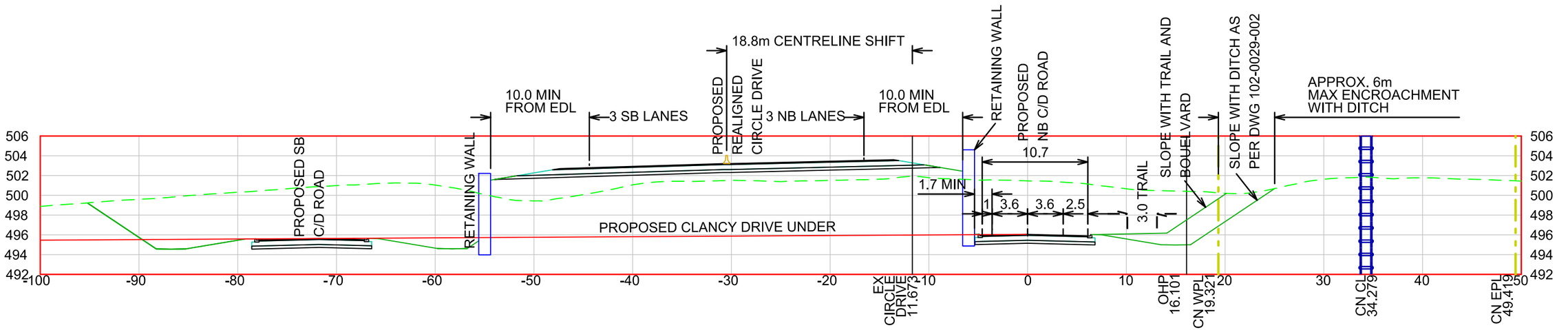
FIGURE
LIM-1



NORTHBOUND CD ROAD
CN BACKSLOPE EASEMENT OR ACQUISITION



CONFIGURATION A1 – SEMI-RURAL CROSS SECTION



CONFIGURATION A2 – URBAN CROSS SECTION

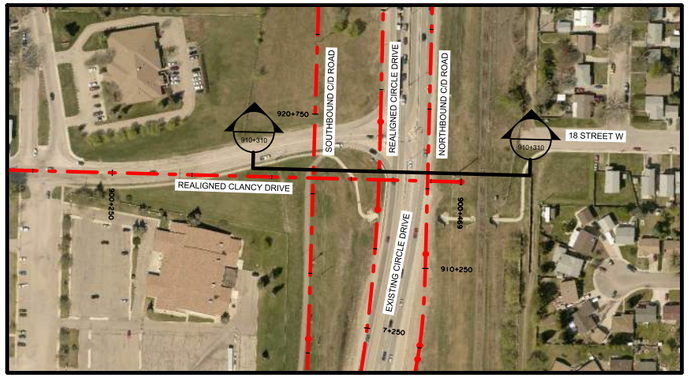
DRAFT
FOR DISCUSSION ONLY

LEGEND:
- existing ground
- existing CN right of way limits
- existing CN track centreline
- proposed roadway and pavement structure
- proposed retaining wall
- proposed grading (cut / fill / ditch / boulevard)
- proposed Clancy Drive roadway profile

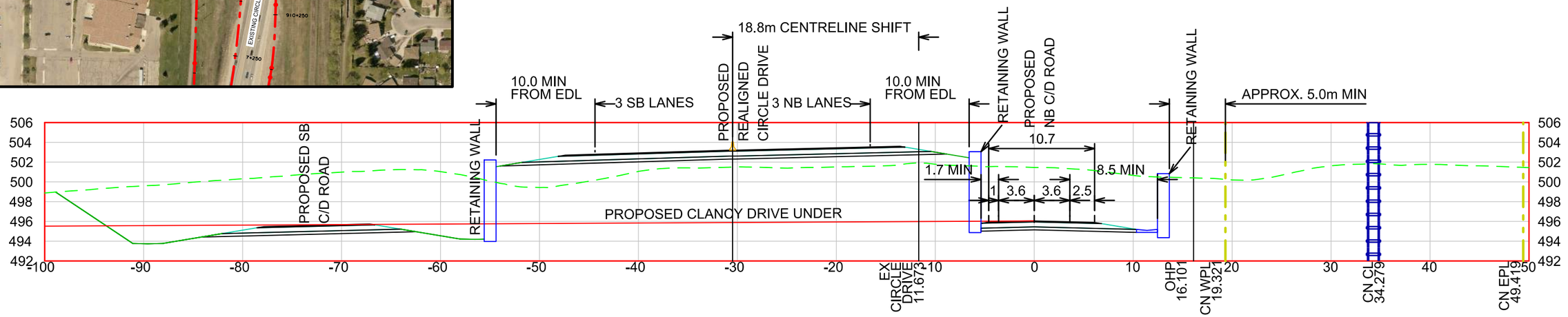
SCALE : NTS

CN IMPACTS AT NORTHBOUND CLANCY CD ROAD
OPTION A: RAIL R/W ENCROACHMENT
(STA 910+310)

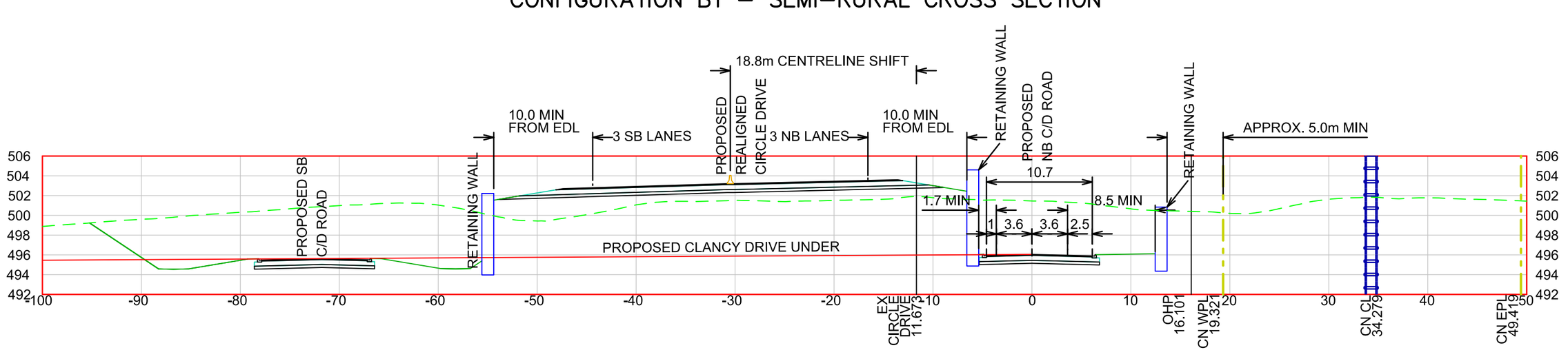
FIGURE
XS-1



NORTHBOUND C/D ROAD
CN RETAINING WALL



CONFIGURATION B1 – SEMI–RURAL CROSS SECTION



CONFIGURATION B2 – URBAN CROSS SECTION

DRAFT
FOR DISCUSSION ONLY

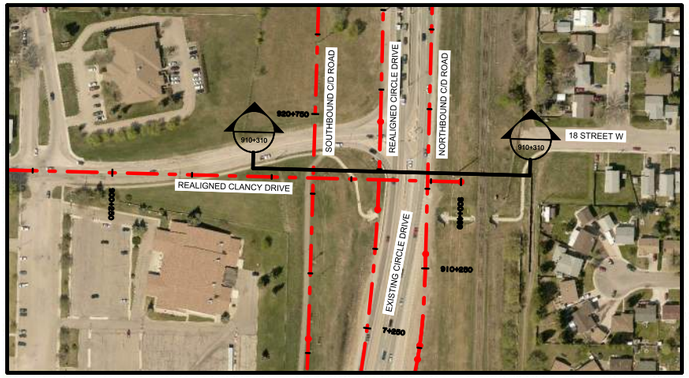
LEGEND:
- existing ground
- existing CN right of way limits
- existing CN track centreline
- proposed roadway and pavement structure
- proposed retaining wall
- proposed grading (cut / fill / ditch / boulevard)
- proposed Clancy Drive roadway profile

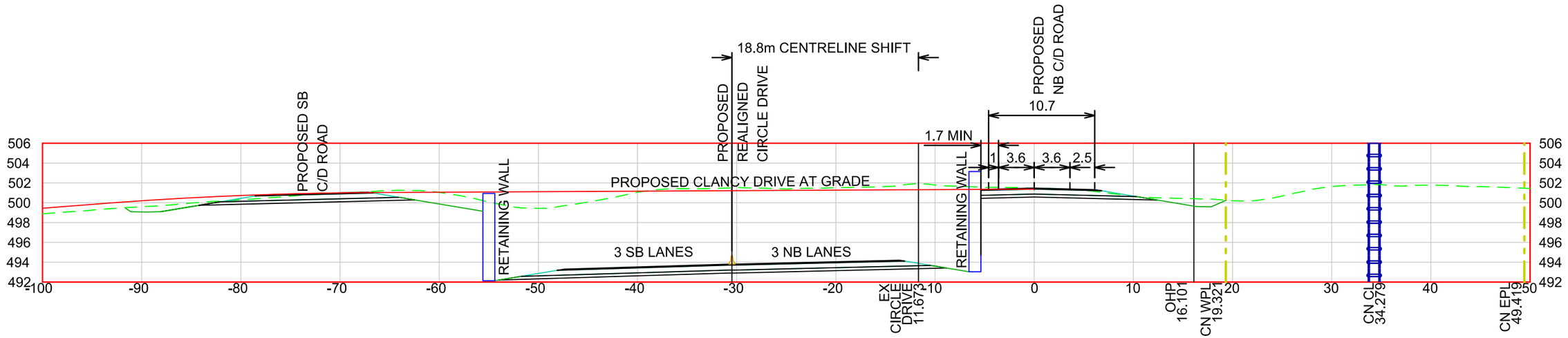
SCALE : NTS

CN IMPACTS AT NORTHBOUND CLANCY CD ROAD
OPTION B: NO RAIL R/W REQUIRED
(STA 910+310)

FIGURE
XS-2

DEPRESSED CIRCLE DRIVE MAINLINE





CONFIGURATION C1 – DEPRESSED CIRCLE DRIVE MAINLINE

DRAFT
FOR DISCUSSION ONLY

LEGEND:
- existing ground
- existing CN right of way limits
- existing CN track centreline
- proposed roadway and pavement structure
- proposed retaining wall
- proposed grading (cut / fill / ditch / boulevard)
- proposed Clancy Drive roadway profile

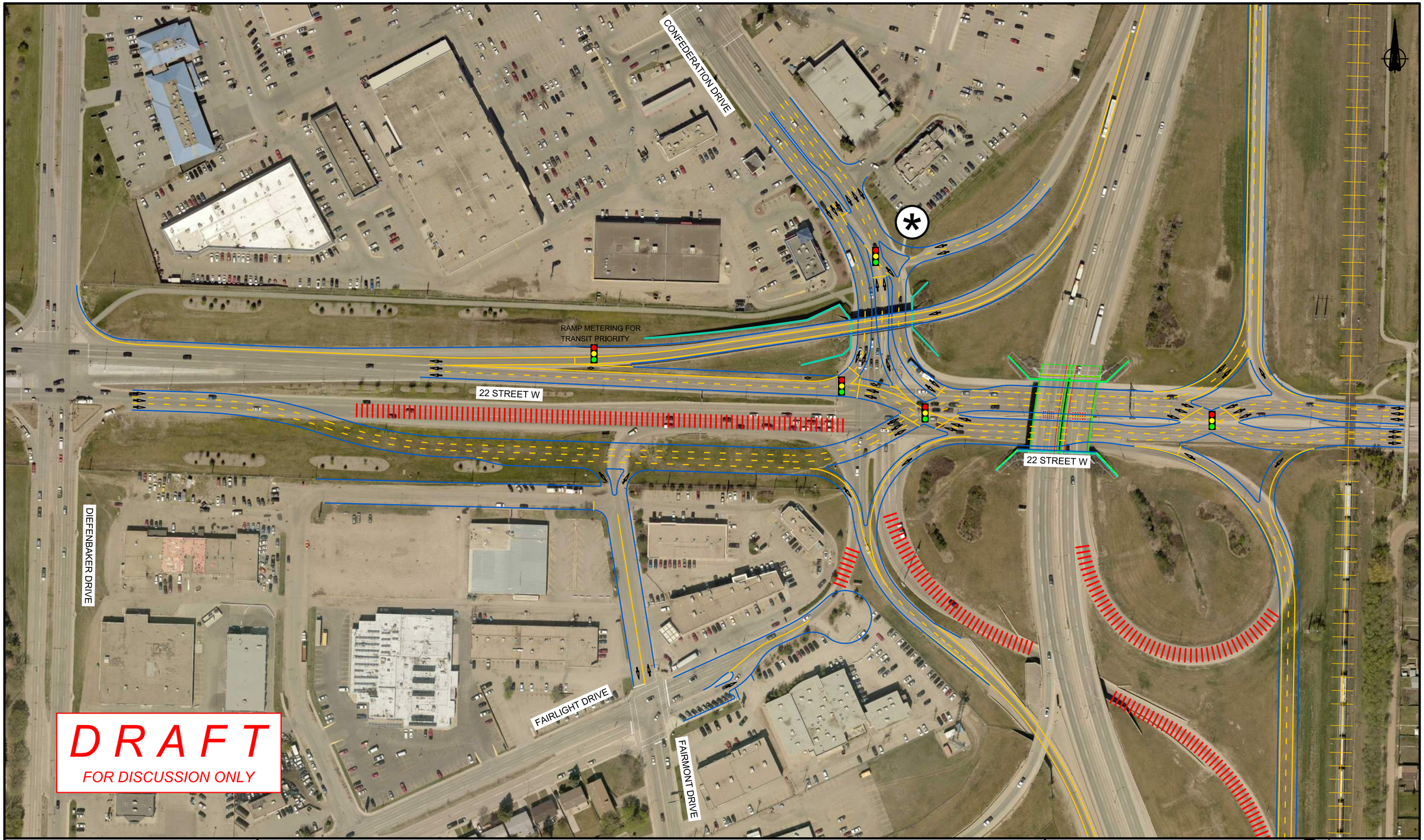
SCALE : NTS

CN IMPACTS AT NORTHBOUND CLANCY CD ROAD
OPTION C: DEPRESSED CIRCLE DRIVE MAINLINE
(STA 910+310)

FIGURE
XS-3

G

Appendix G
Circle Drive West Freeway Options



RESTRICTIONS / LIMITATIONS:

- westbound 22 Street access to south commercial via Diefenbaker
- southbound Confederation to southbound Circle Drive via Laurier
- eastbound 22 Street to north commercial via Diefenbaker
- southbound Confederation to south commercial via Diefenbaker

LEGEND:

- curbline or edge of pavement
- lane dividing line
- lane edge line or direcitonal dividing line
- retaining wall
- existing road to be closed and removed

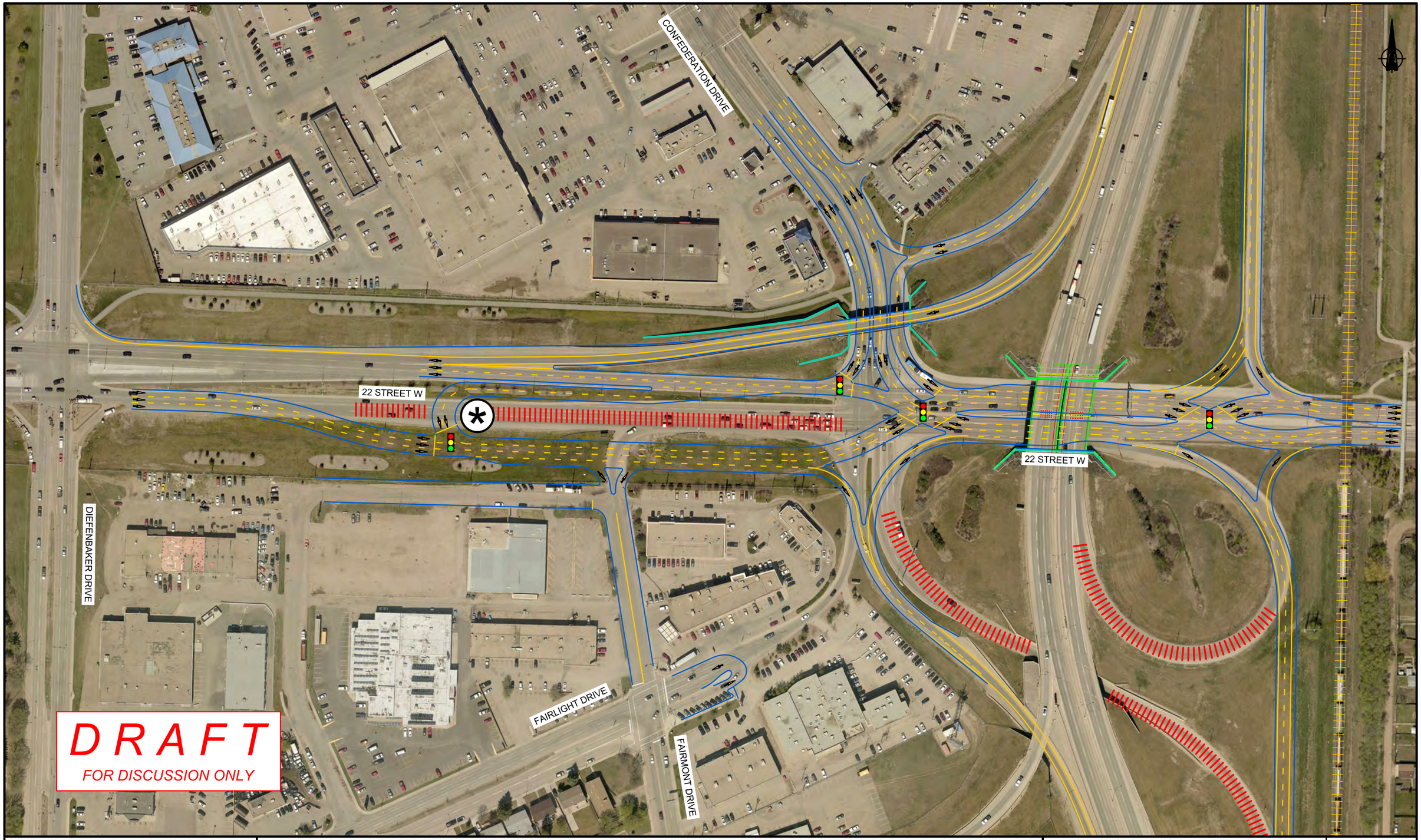
SCALE : NTS

DDI OPTION
CONFEDERATION SLIP LEFT (*)

(for southbound Confederation to eastbound 22 Street + westbound BRT lane)

FIGURE

DDI-1



RESTRICTIONS / LIMITATIONS:

- westbound 22 Street access to south commercial via Michigan left
- southbound Confederation to southbound Circle Drive via Michigan left or Laurier
- eastbound 22 Street to north commercial via Diefenbaker
- southbound Confederation to south commercial via Michigan Left

LEGEND:

- curbline or edge of pavement
- lane dividing line
- lane edge line or direcitonal dividing line
- retaining wall
- existing road to be closed and removed

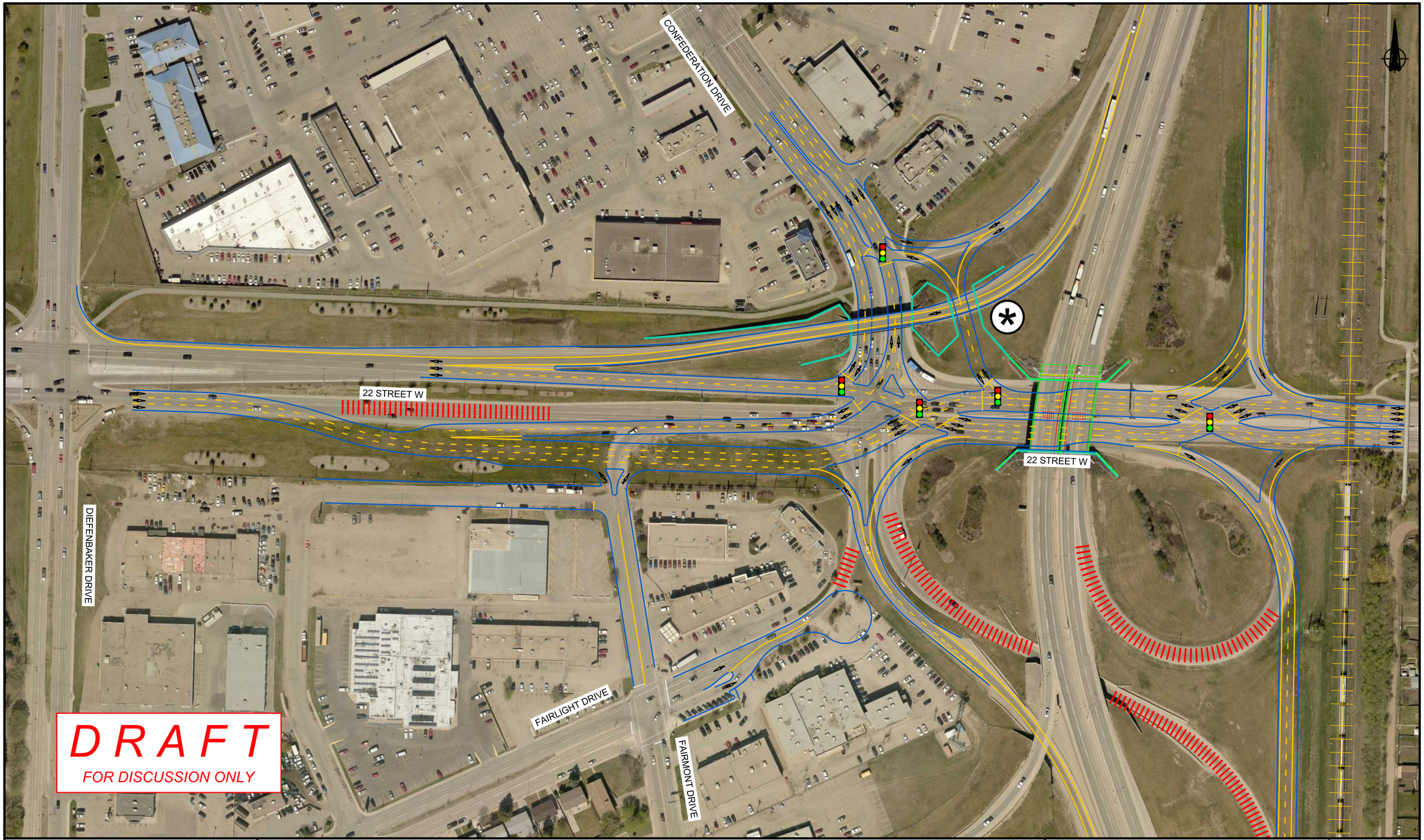
SCALE : NTS

DDI OPTION MICHIGAN LEFT

(for southbound Confederation to southbound Circle Drive + eastbound 22 Street to south commercial)

FIGURE

DDI-2



CIMA+

RESTRICTIONS / LIMITATIONS:

- westbound 22 Street access to south commercial via Diefenbaker
- southbound Confederation to southbound Circle Drive via Laurier
- southbound Confederation to south commercial via Diefenbaker
- RESTORES eastbound 22 Street to north commercial via Confederation

LEGEND:

- curbline or edge of pavement
- lane dividing line
- lane edge line or direcitonal dividing line
- retaining wall
- existing road to be closed and removed

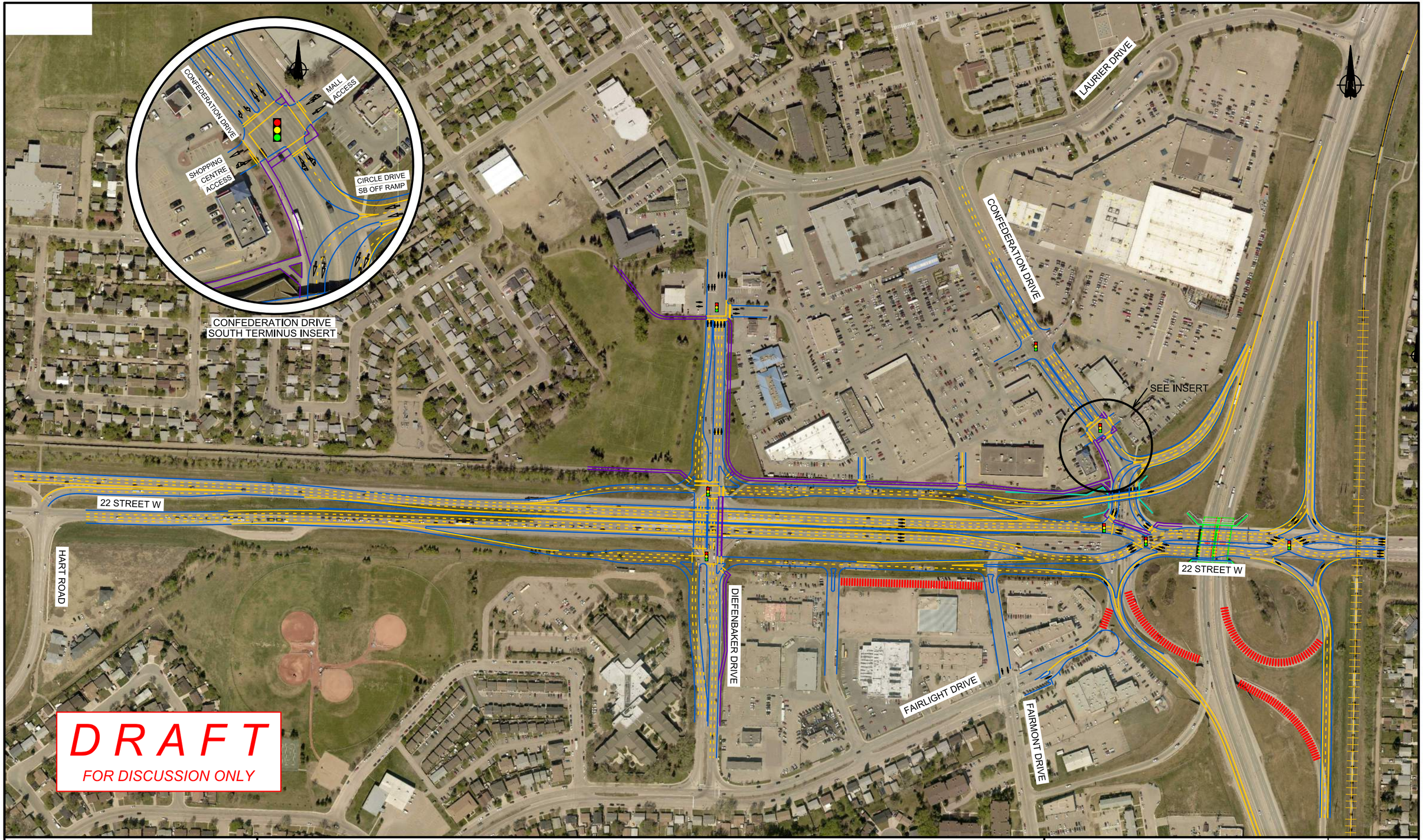
SCALE : NTS

DDI OPTION ADDITIONAL BRIDGE *

(for southbound Confederation to eastbound 22 Street)

FIGURE

DDI-3



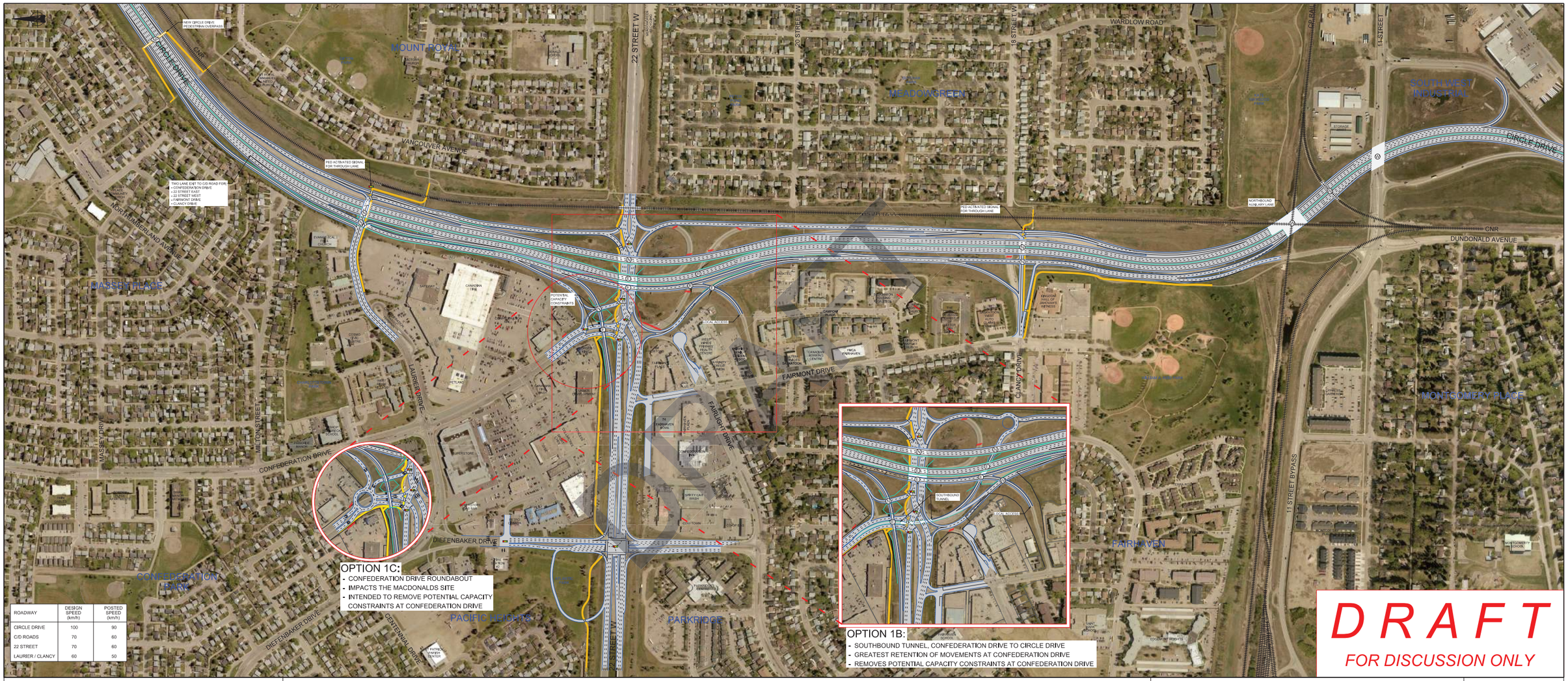
RESTRICTIONS / LIMITATIONS:
- no southbound or northbound connection between Confederation and 22 Street

LEGEND:
- curbline or edge of pavement
- lane dividing line
- lane edge line or direcitonal dividing line
- retaining wall
- existing road to be closed and removed

SCALE : NTS

SIMPLIFIED DDI OPTION
DIEFENBAKER INTERCHANGE
(no connection from Confederation Drive to 22 Street W)

FIGURE
DDI-4



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

DRAFT

FOR DISCUSSION ONLY

CIMA+

NOTES

1. C/D ROADS RESTORE CONNECTION FROM CLANCY DRIVE TO 22 STREET AND 22 STREET TO LAURIER DRIVE.
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.
6. LONG SOUTHBOUND EXIT RAMP TO LAURIER DRIVE TO MEET DRIVER EXPECTATIONS FOR CONSECUTIVE EXITS.

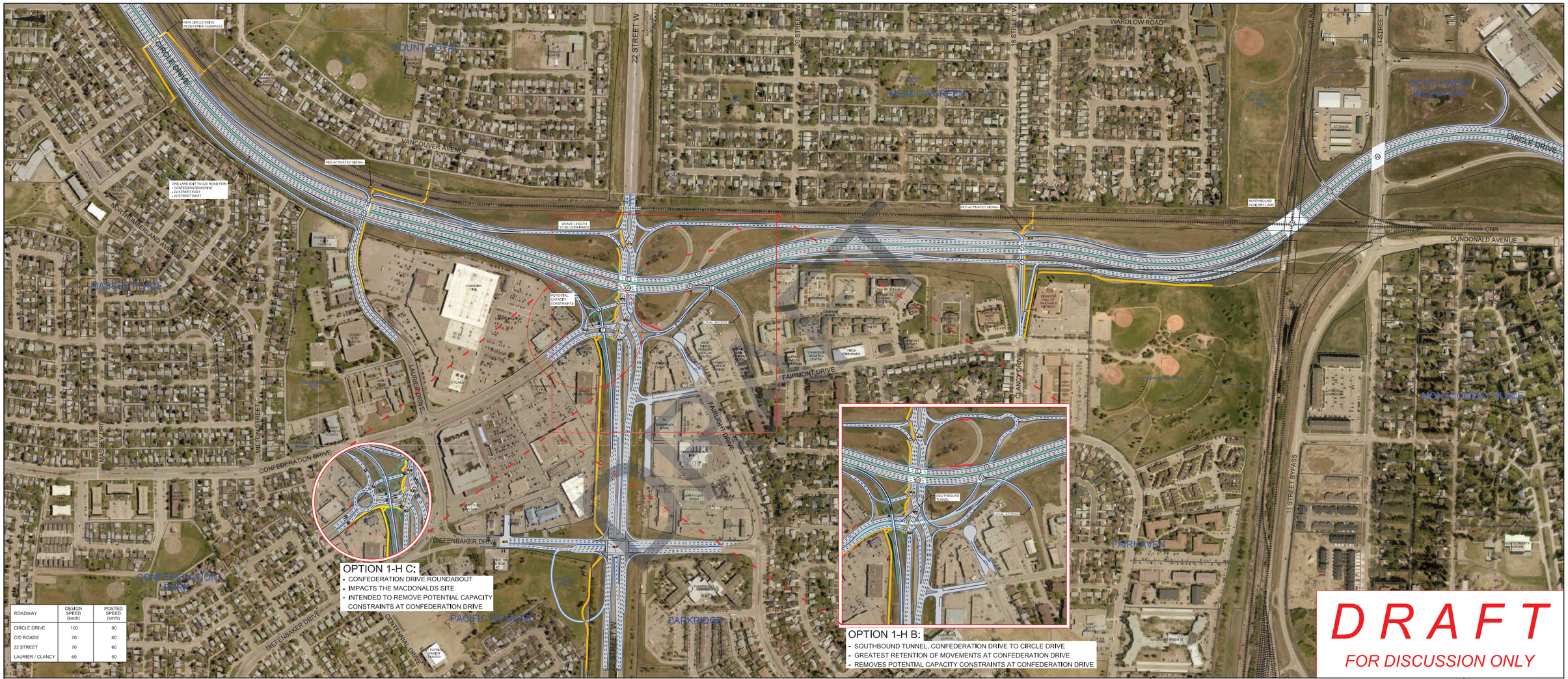
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (R) REDUNDANT STRUCTURE (NO LONGER REQUIRED)
- (NP) NEW PEDESTRIAN STRUCTURE

DATE : 4 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 1
Partial C/D Roads
(Derived from Proposal Configuration 2)
With DDI-3 Configuration at 22 Street (Option 1A)

FIGURE
CIR-1



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

DRAFT

FOR DISCUSSION ONLY

CIMA+

NOTES

1. C/D ROADS RESTORE CONNECTION FROM CLANCY DRIVE TO 22 STREET AND 22 STREET TO LAURIER DRIVE.
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.
6. LONG SOUTHBOUND EXIT RAMP TO LAURIER DRIVE TO MEET DRIVER EXPECTATIONS FOR CONSECUTIVE EXITS.

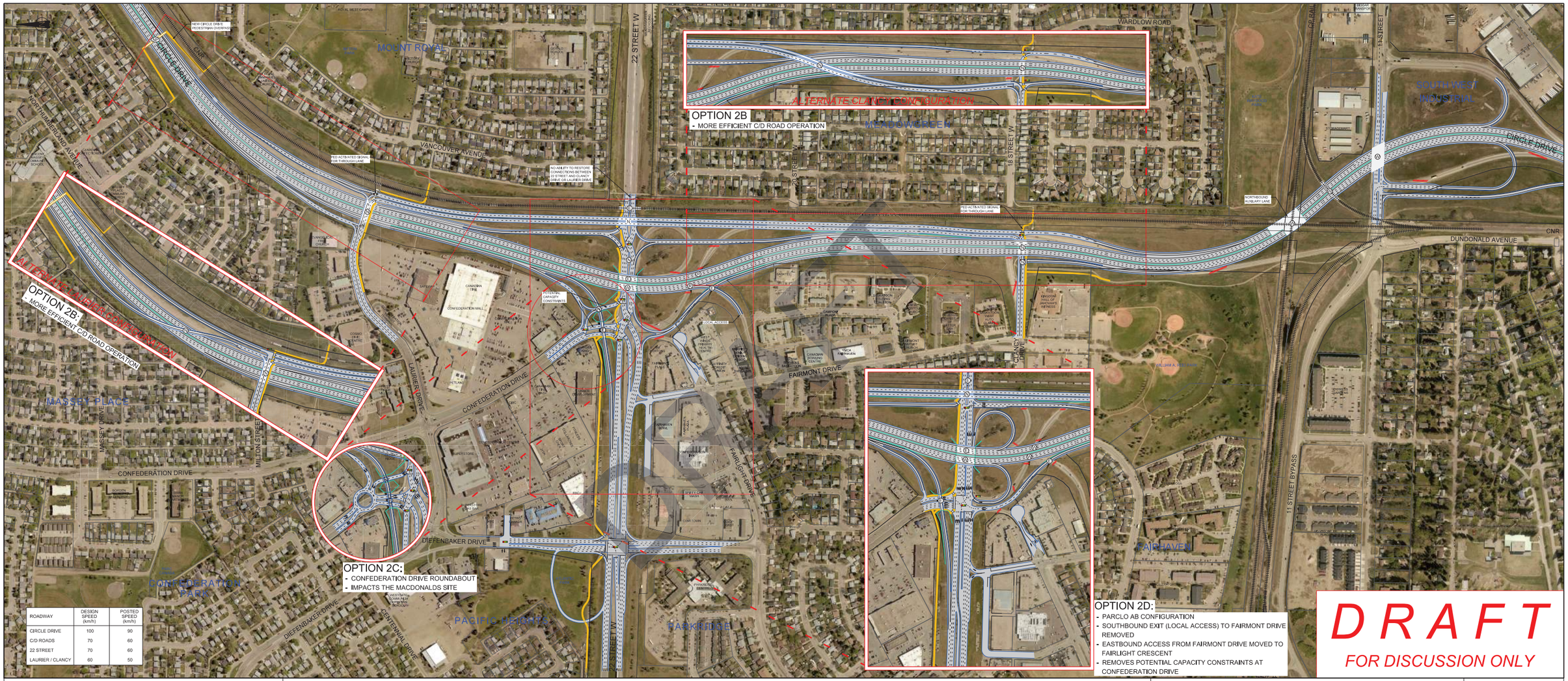
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (R) REDUNDANT STRUCTURE (NO LONGER REQUIRED)
- (NP) NEW PEDESTRIAN STRUCTURE

DATE : 21 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 1-H
Partial C/D Roads with Half Diamond Interchanges
(Derived from Proposal Configuration 2)
With DDI-3 Configuration at 22 Street (Option 1A)

FIGURE
CIR-1H



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

CIMA+

NOTES

1. NO ABILITY TO RESTORE CONNECTIONS FROM CLANCY DRIVE TO 22 STREET OR FROM 22 STREET TO LAURIER DRIVE
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.

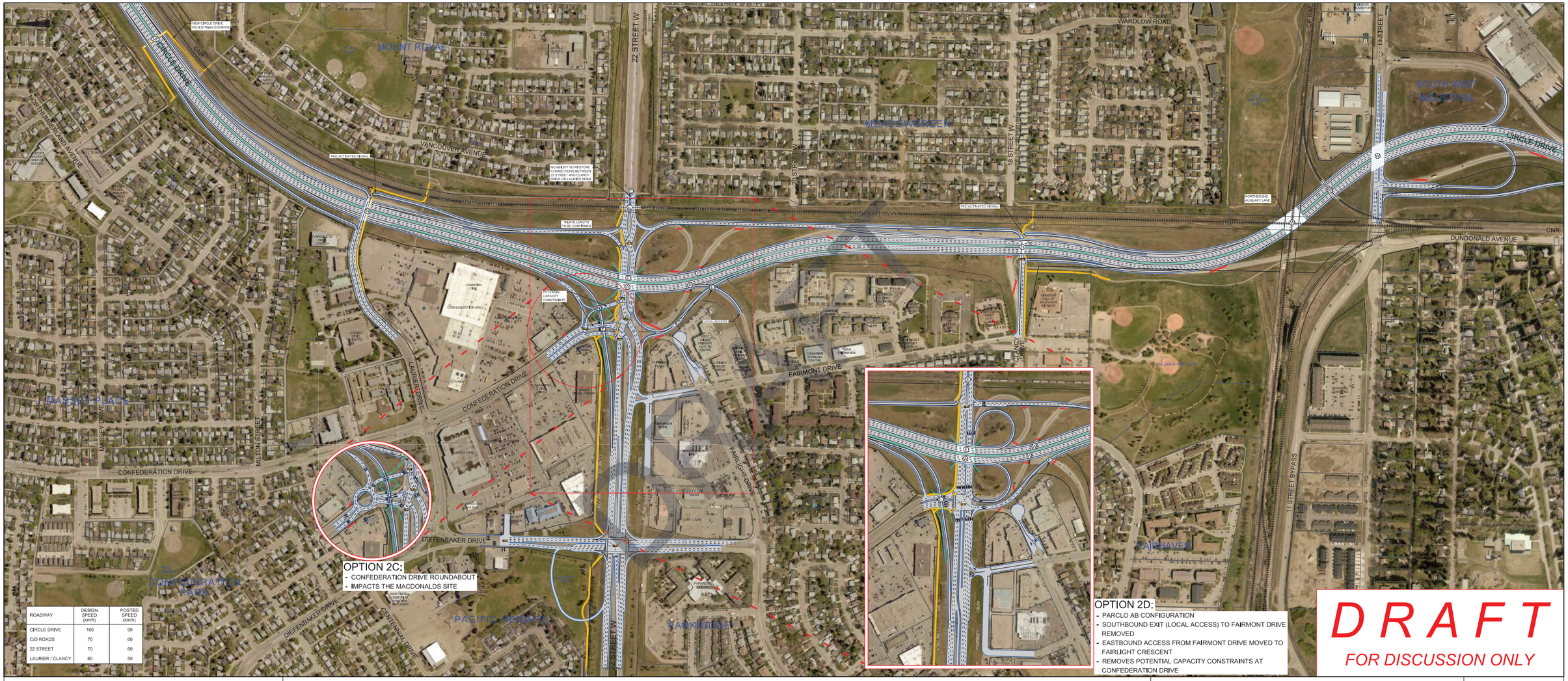
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (R) REDUNDANT STRUCTURE (NO LONGER REQUIRED)
- (NEW) NEW PEDESTRIAN STRUCTURE

DATE : 8 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 2
Two Way C/D Roads
(Derived from Proposal Configuration 4)
With DDI-3 Configuration at 22 Street (OPTION 2A)

FIGURE
CIR-2



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

CIMA+

NOTES

1. NO ABILITY TO RESTORE CONNECTIONS FROM CLANCY DRIVE TO 22 STREET OR FROM 22 STREET TO LAURIER DRIVE
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.

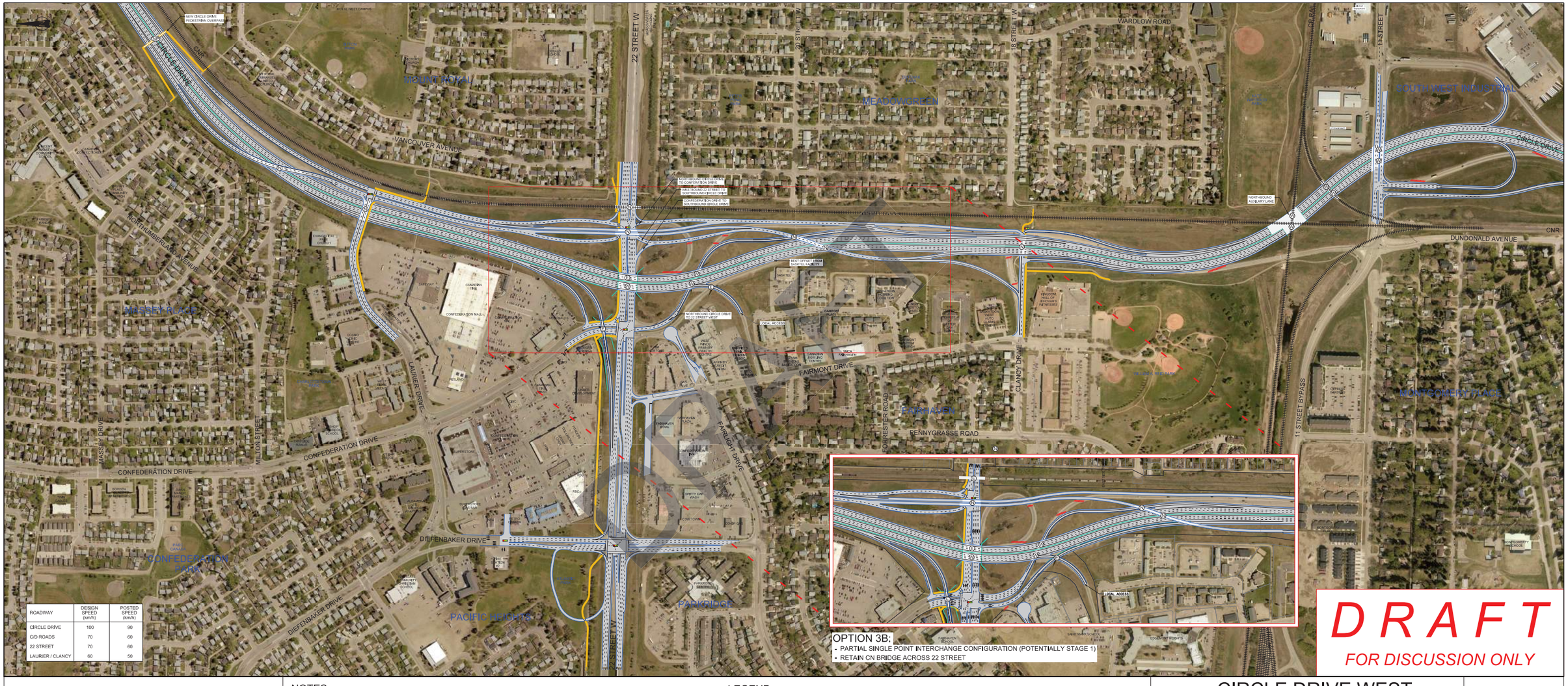
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (R) REDUNDANT STRUCTURE (NO LONGER REQUIRED)
- (NEW) NEW PEDESTRIAN STRUCTURE

DATE : 21 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 2-H
Partial C/D Roads with Reconfigured 11 Street and Half Diamond Interchanges
(Derived from Proposal Configuration 4)
With DDI-3 Configuration at 22 Street (OPTION 2A)

FIGURE
CIR-2H



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

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FOR DISCUSSION ONLY

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NOTES

1. C/D ROADS RESTORE DIRECT ACCESS FROM CLANCY DRIVE TO 22 STREET AND 22 STREET TO LAURIER DRIVE.
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.
6. EARLY REPLACEMENT AT CN BRIDGE ACROSS 22 STREET.

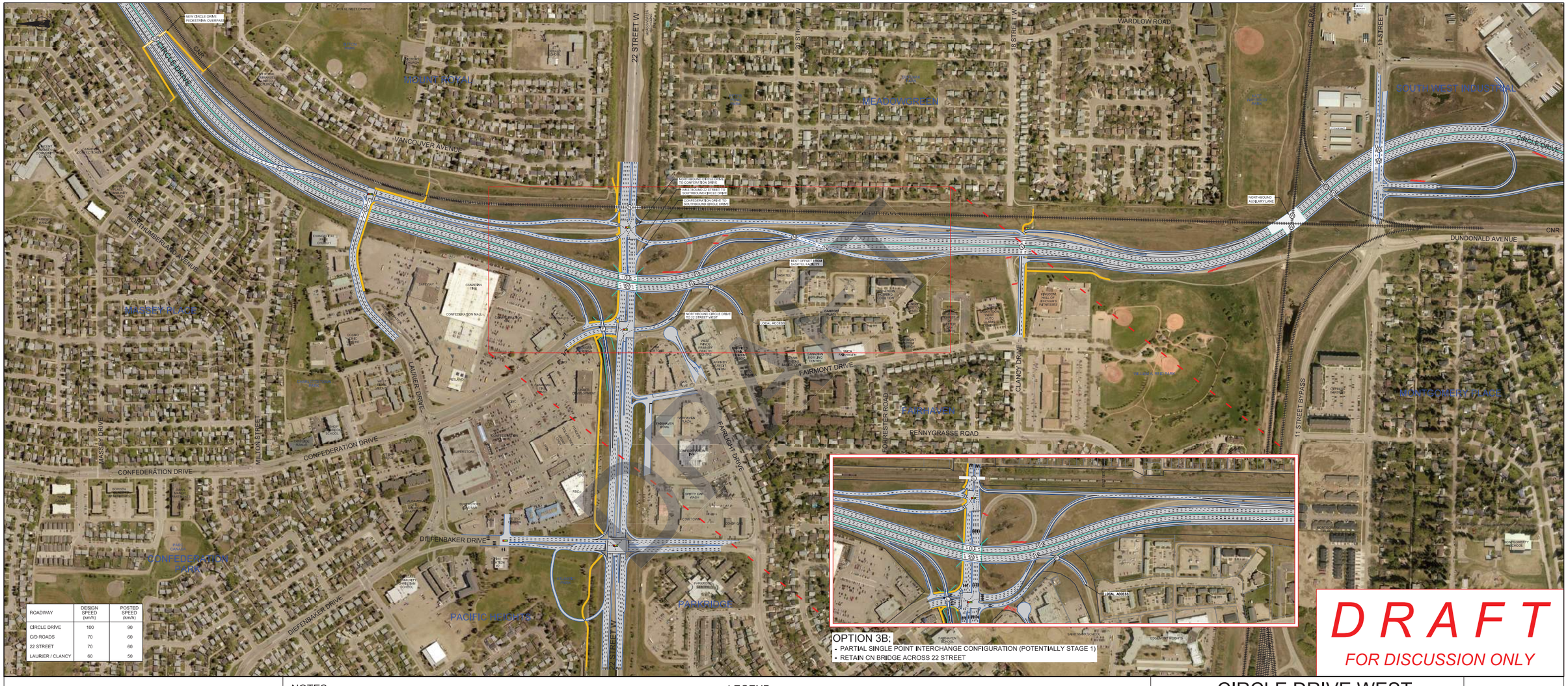
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (NEW) NEW PEDESTRIAN STRUCTURE

DATE : 7 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 3
Two Way C/D Roads
(New Configuration)
With Single Point at 22 Street (OPTION 3A)

FIGURE
CIR-3



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

DRAFT

FOR DISCUSSION ONLY

CIMA+

NOTES

1. C/D ROADS RESTORE DIRECT ACCESS FROM CLANCY DRIVE TO 22 STREET AND 22 STREET TO LAURIER DRIVE.
2. SOUTHBOUND EXIT TO FAIRMONT DRIVE RETAINED FOR LOCAL ACCESS.
3. ALL OPTIONS REMOVE DIRECT ACCESS TO EAST END OF FAIRLIGHT DRIVE.
4. PLAN SUPPORTS ALL APPROVED BRT ROUTING.
5. GUIDE SIGNING PLANS REQUIRED.
6. EARLY REPLACEMENT AT CN BRIDGE ACROSS 22 STREET.

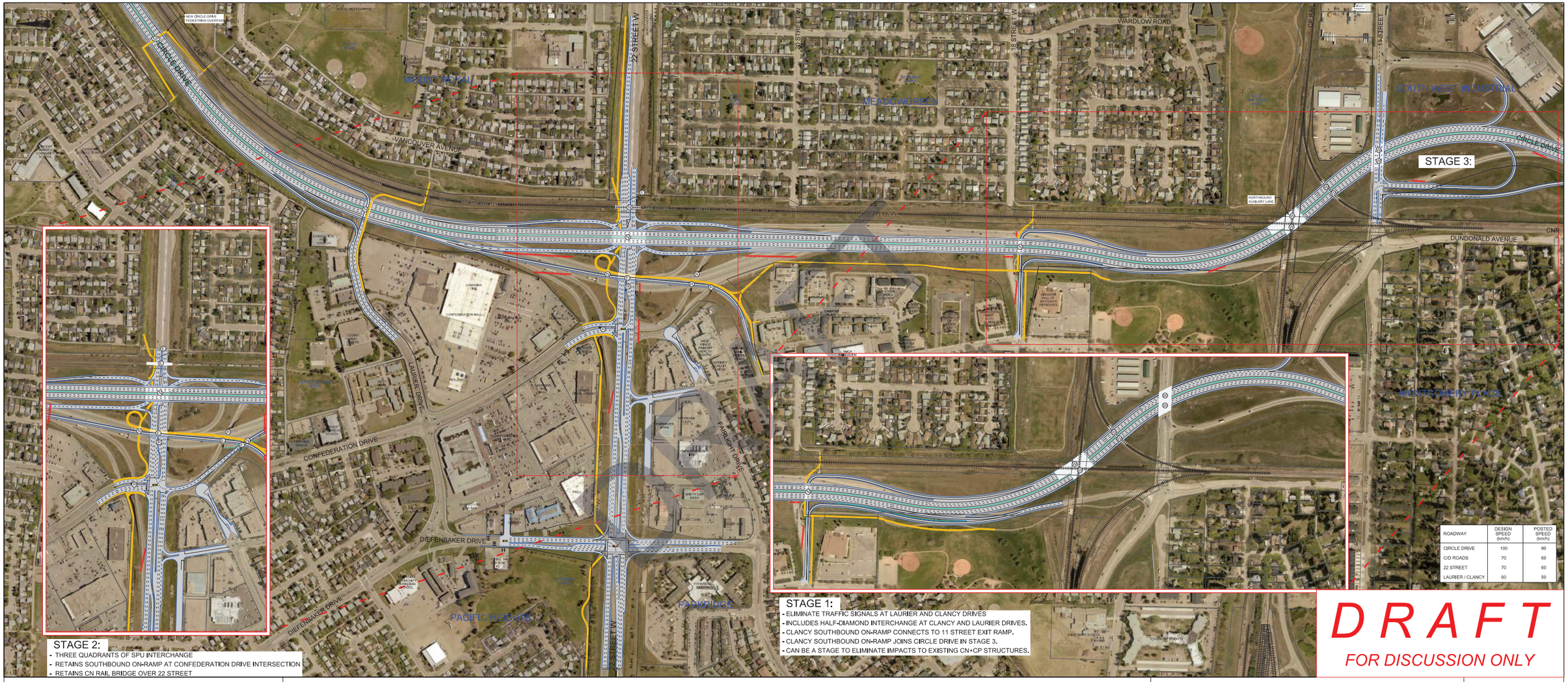
LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (NEW) NEW PEDESTRIAN STRUCTURE

DATE : 21 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 3-H
With Single Point at 22 Street with Half Diamond Interchanges
(New Configuration)
(OPTION 3A)

FIGURE
CIR-3H



ROADWAY	DESIGN SPEED (km/h)	POSTED SPEED (km/h)
CIRCLE DRIVE	100	90
C/D ROADS	70	60
22 STREET	70	60
LAURIER / CLANCY	60	50

DRAFT

FOR DISCUSSION ONLY

CIMA+

NOTES

1. HALF-DIAMOND INTERCHANGES AT LAURIER AND CLANCY DRIVES.
2. RELOCATES 11 STREET RAMPS TO/FROM SOUTHBOUND CIRCLE DRIVE.
3. REQUIRES REPLACEMENT AND WIDENING OF CN BRIDGE ON 22 STREET.
4. REQUIRES MODIFICATIONS TO EXISTING PEDESTRIAN OVERPASS HEADSLOPES ON 22 STREET.
5. SIX CORE LANES OCCUR IN STAGE 4.

LEGEND:

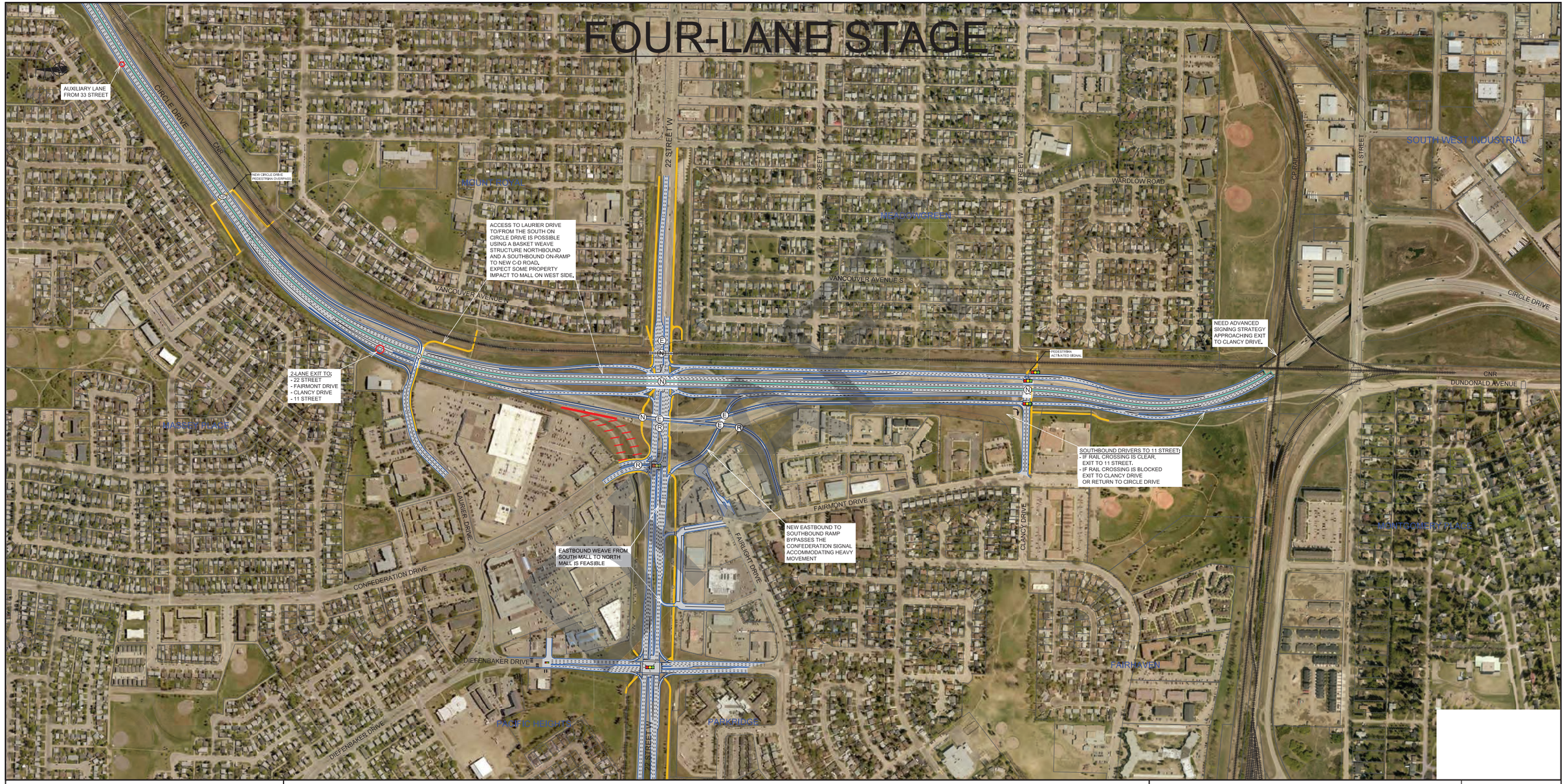
- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECTIONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (NPS) NEW PEDESTRIAN STRUCTURE
- (R) REMOVE EXISTING STRUCTURE

DATE : 21 OCTOBER 2019
SCALE : 1:2000 (36" x 72")
1:4000 (18" x 36")

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY
OPTION 4
Single Point Urban Interchange at 22 Street
Stage 4 (Ultimate) Shown

FIGURE
CIR-4

FOUR-LANE STAGE



CIMA+

PRELIMINARY

FOR DISCUSSION PURPOSES ONLY

LEGEND:

- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (NEW) NEW PEDESTRIAN STRUCTURE
- (R) REMOVE EXISTING STRUCTURE

DATE: 21 FEBRUARY 2020
SCALE: 1:2000 (36" x 72")
1:4000 (18" x 36")

FOUR-LANE STAGE OPTION 5A

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY

FIGURE
CIR-5A

SIX-LANE STAGE

CIMA+

PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

LEGEND:

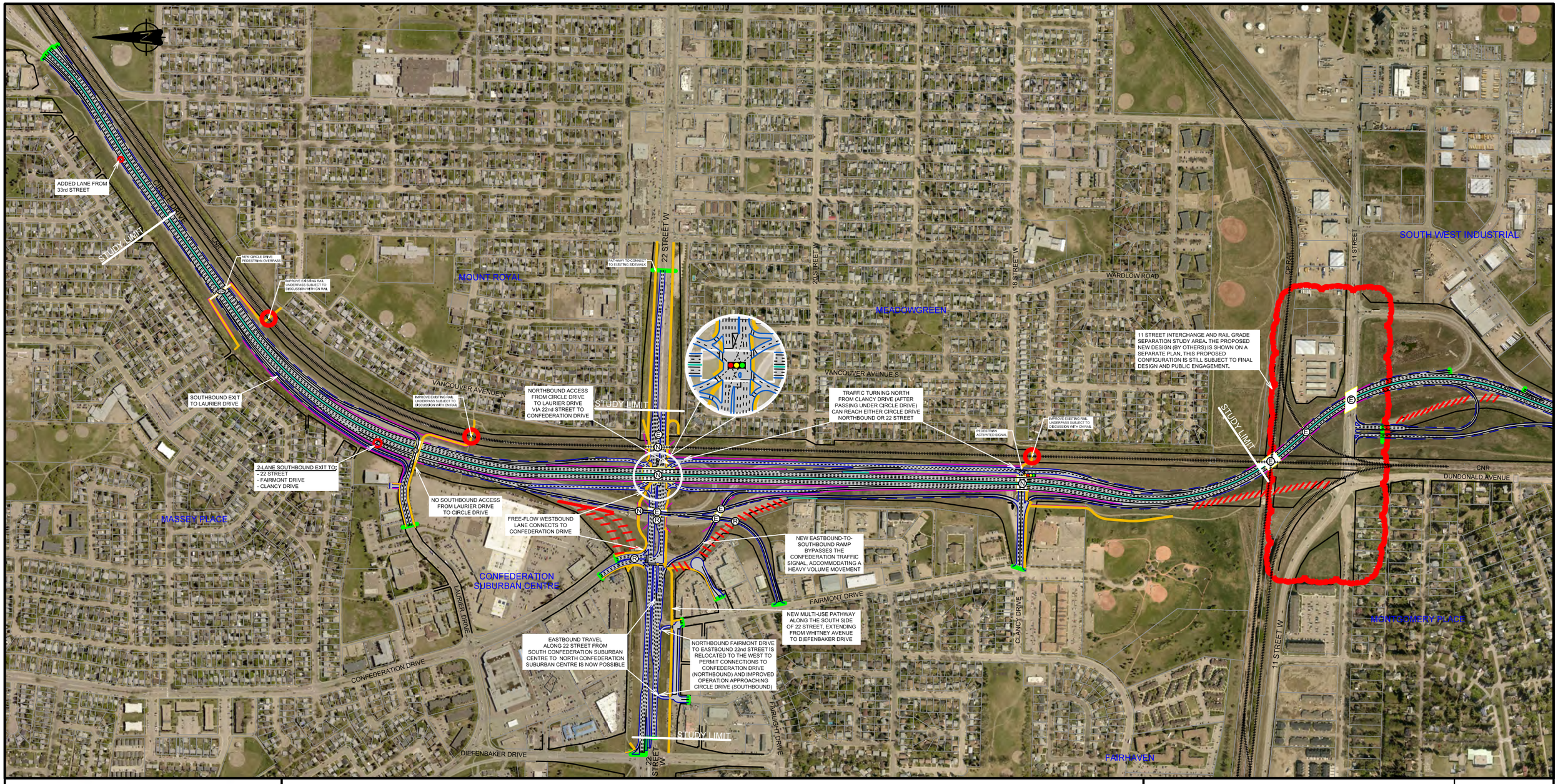
- CURBLINE OR EDGE OF PAVEMENT
- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECITONAL DIVIDING LINE
- BARRIER AND/OR RETAINING WALL
- PATHWAY
- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (W) WIDENED STRUCTURE
- (NP) NEW PEDESTRIAN STRUCTURE
- (R) REMOVE EXISTING STRUCTURE

DATE : 21 FEBRUARY 2020
SCALE : 1:2000 (36" x 72")
1:1000 (18" x 36")

SIX-LANE STAGE OPTION 5B

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY

FIGURE
CIR-5B



LEGEND:

- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECTIONAL DIVIDING LINE
- CONCRETE BARRIER
- PATHWAY
- EDGE OF PAVEMENT (RURAL SECTION)
- CURBLINE
- RETAINING WALL
- PROJECT LIMIT

- (E) EXISTING STRUCTURE
- (N) NEW STRUCTURE
- (R) WIDENED STRUCTURE
- (NEW) NEW PEDESTRIAN STRUCTURE
- (D) REMOVE EXISTING STRUCTURE

DATE: 08 APRIL 2022

SCALE: 0 50 100 150 200

RECOMMENDED PLAN

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY

FIGURE
ES-1

H

Appendix H
Laurier Drive Access Management Options

CIMA+

NOTES:

- requires reconfiguration of Cosmo Civic Centre parking lot
- results in loss of 53 parking spaces at Cosmo Civic Centre
- requires reconfiguration of site operations for four parcels
- results in loss of park space
- consolidates access with new signalized intersection
- aligned access point to Laurier Drive
- no land required from non-City owned parcels
- impacts existing community garden

LEGEND:

- curbline
- lane dividing line
- dividing line
- retaining wall

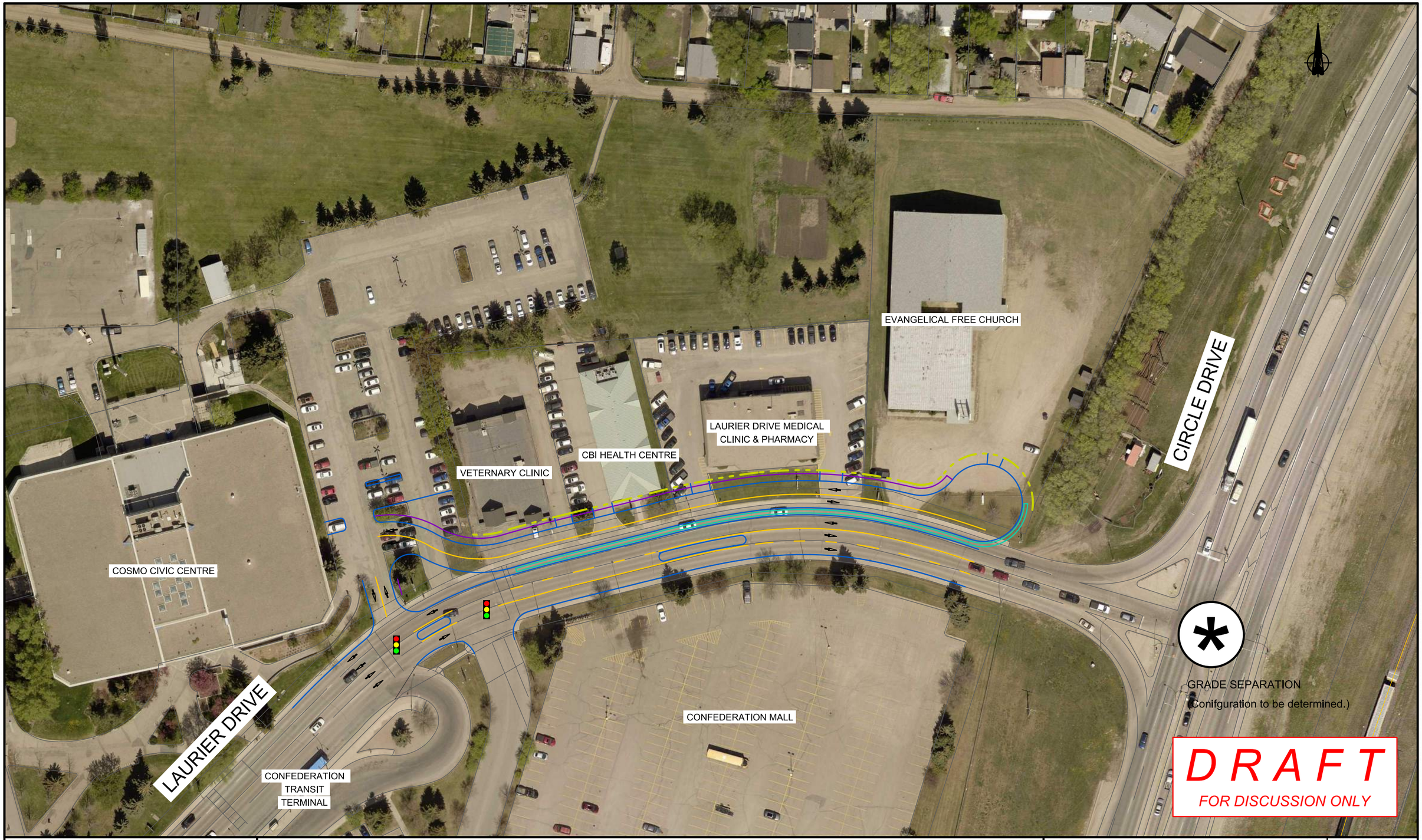
SCALE : NTS

LAURIER ACCESS BACKAGE ROAD OPTION

(to grade separate Circle Drive)

FIGURE

LAU-1



CIMA+

NOTES:

- minimal changes to Cosmo Civic Centre parking lot
- results in loss of 16 parking spaces at Cosmo Civic Centre
- requires reconfiguration of site operations for four parcels
- consolidates access with new access point
- approx. 8m strip of land required from non-City owned parcels
- building setbacks to propertly line reduced substantially
- requires reduction in lanes along Laurier Drive
- staggered T-intersections on Laurier Drive

LEGEND:

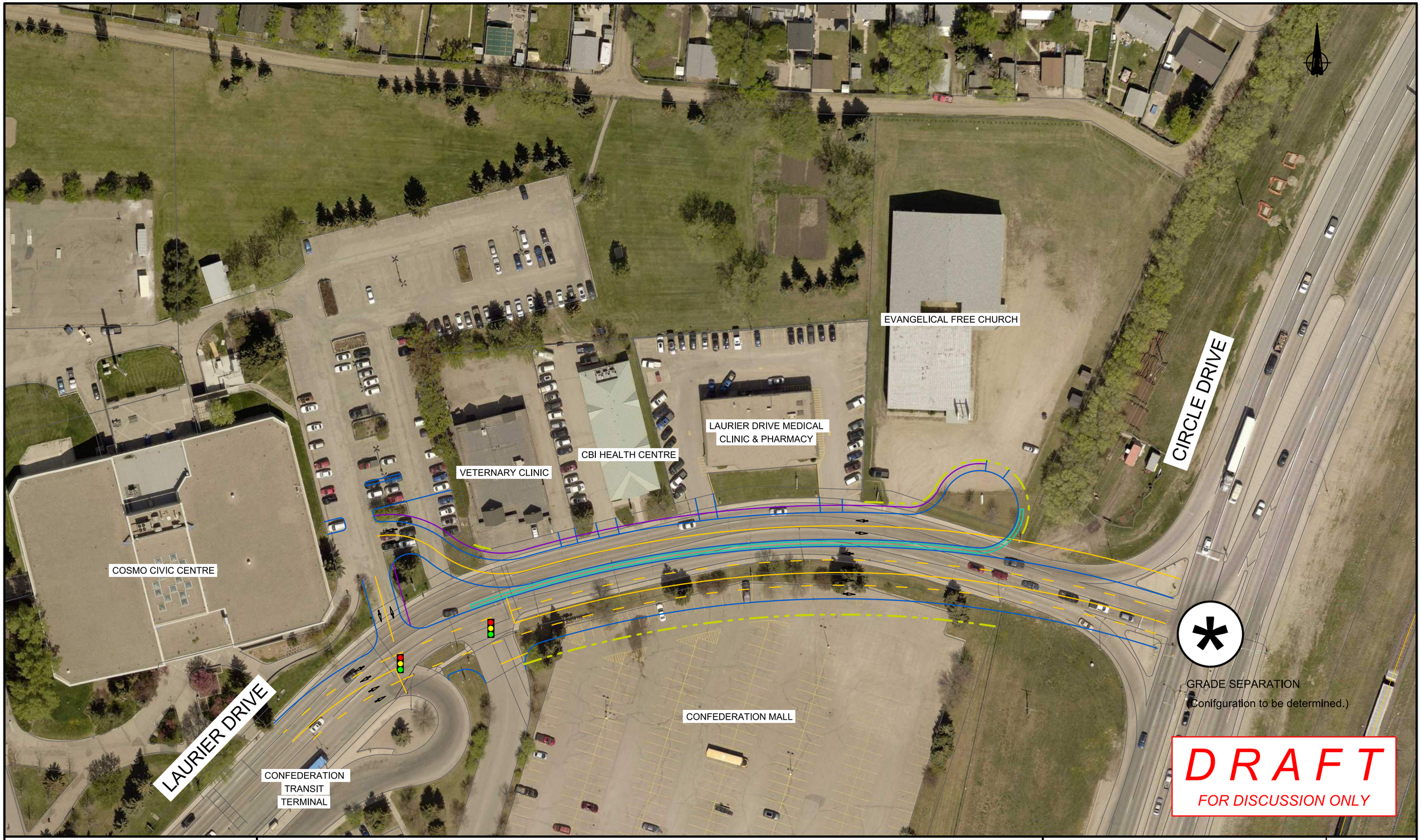
- curbline
- lane dividing line
- dividing line
- retaining wall

SCALE : NTS

LAURIER ACCESS
FRONTAGE ROAD OPTION 1

(to grade separate Circle Drive)

FIGURE
LAU-2



CIMA+

NOTES:

- minimal changes to Cosmo Civic Centre parking lot
- results in loss of 16 parking spaces at Cosmo Civic Centre
- requires reconfiguration of site operations for four parcels
- consolidates access with new access point
- approx. 10.5m shift in Laurier Drive centreline to south
- land required from Confederation Mall property
- staggered T-intersections on Laurier Drive
- single coordinated signal for both intersections on Laurier Drive

LEGEND:

- curbline
- lane dividing line
- dividing line
- retaining wall

SCALE : NTS

LAURIER ACCESS
FRONTAGE ROAD OPTION 2
(to grade separate Circle Drive)

FIGURE
LAU-3

Appendix I
Open House Reports

E00747A

MEMO 2

DATE	:	July 16, 2019
FROM	:	Henry Devos
PROJECT	:	City of Saskatoon, Circle Drive West – Functional Planning Study
SUBJECT	:	Public Engagement Report, Open House 1

Introduction to Study

Circle Drive is a core route (urban ring road) in the City of Saskatoon's road network. It supports mobility not only for City residents, but for inter-regional traffic flows through the City. In response to increasing congestion levels and safety concerns, the City plans to continue upgrading Circle Drive to a freeway standard. The City recently constructed Circle Drive South to a freeway standard from Idylwyld Drive to 11th Street. The City has retained CIMA Canada Inc. (CIMA+) to complete a long-term functional plan for Circle Drive west, between Clancy Drive and Laurier Drive. The goal of this project is to remove the traffic signals at the Clancy and Laurier Drive intersections and upgrade to free-flow standards.

Public Engagement Activities

The public engagement process began by reaching out to the Community Associations in the study area to alert them to the study and invite their input concerning the study corridor. Their input intended to supplement the concerns and issues already identified by the communities through the City's Neighbourhood Traffic Review program. Other stakeholders being contacted during the study process include relevant civic departments, emergency services, Saskatoon Transit, Neighbourhood Planning, Saskatoon Light & Power and CN Rail, among others.

Two public open house events are planned for the Circle Drive, Clancy Drive to Laurier Drive, Functional Planning Study. The first event took place on Wednesday, June 19, 2019. The open house was held at the City of Saskatoon's Shaw Centre, 122 Bowlt Crescent, from 4:00pm to 7:00pm. In advance of the open house, invitations were mailed to all property owners abutting Circle Drive through the study area. The City advertised the open house on their website Engage Page to alert the general public.

The purpose of the first open house was to introduce the project and invite public input regarding existing conditions, constraints and the study's objectives. The second open house is planned for winter 2019 to show the options considered and the preferred upgrading plan.

Comment sheets were provided for attendees to provide feedback on the open house format and information that was presented, and to collect general information on attendee's location of residence, work, and travel patterns. Optional contact information was also collected from those who wished to receive notification of future open house events. Attendees were asked to respond by July 5th.

Open House 1 Attendance

Approximately 25 people attended the first open house. There were 14 written responses received at or following the open house (11 using comment sheets and 3 by email). The open house was an informal drop-in format, no formal presentation was made. Representatives from the City of Saskatoon and the CIMA+ project team were available to discuss the information presented and to answer questions.

The relatively low attendance at this open house does not necessarily indicate that the performance of Circle Drive through the study area is not a more broadly recognized public concern. Some attendees suggested that more should perhaps have been done to raise public awareness ahead of the open house event. In addition, portable roadside signs may have been used to improve public awareness and interest. To offset the effect of low attendance, the input that follows was correlated with the results of the Neighbourhood Traffic Reviews. The summary reflects both written comments and discussions with open house attendees.

Open House Feedback

- Was the information provided in a format that was understandable?

  Yes (9); No (1), however, respondent did not attend the open house; and 1 – 'Sort of', respondent added that the information included details currently unavailable.

- Did the information help you understand study scope?

  Yes (9); No (1), respondent added that the study is not sufficiently advanced to provide complete answers; and 1 'Sort of', respondent added that the information included details currently unavailable

- Were the staff able to answer your questions?

  Yes (8); No (3), one respondent added that the staff indicated details which are not yet available; another added that the study is not sufficiently advanced to provide complete answers; and the third did not attend the open house.

- How did you hear about the open house?

  Notice in Mail (4); Community Association Notice (4); Friend/Neighbour (3); and Learned afterward (1).

- Live in the study area?
  - Mount Royal (4),
  - Meadowgreen (3),
  - Fairhaven (3),
  - Montgomery Place (2), and
  - Massey Place (1).

- Work in the study area?
  - Confederation Suburban Centre (4),
  - Pleasant Hill (3),
  - Hudson Bay Industrial (2),
  - Fairhaven (1),
  - Blairmore Suburban Centre (1)
  - Pacific Heights (1),
  - Airport Business Area (1),
  - Downtown (1),
  - Marquis Industrial (1), and
  - University Heights (1).

- How often do you travel on Circle Drive through the study area?
    - Most weekday peak times (3)
    - 2-3 times/week (3)
    - Occasionally (2)
    - Midday (Monday-Friday) (2)
    - Many different times (1)
    - Every day (1)
    - Weekends (1)
- How often do you travel on 22nd Street through the study area?
    - Most weekday peak hours (4)
    - Occasionally (2)
    - Midday (Monday – Friday) (2)
    - Every day/frequently (2)
    - Weekends (1)
    - 3-4 times/week (1)
    - Weekdays, off-peak (1)
- How did you typically travel through the study area?

  Automobile (10), Walking (2) and Commercial Vehicle (1).

What We Heard

- <u>Circle Drive Congestion Levels and Safety</u>

  Concern regarding traffic congestion and low travel speeds along this section of Circle Drive due to the traffic signals at Clancy and Laurier Drives. Strong desire to see the traffic signals removed and upgrading Circle Drive to free-flow standards.

  This concern is echoed in the Neighbourhood Traffic Review for Parkridge, identifying congestion at Clancy Drive during peak hours. Northbound left-turn traffic volumes often greater than the storage provided in the turn bay, extending queues into the through lanes, sometimes back to 11th Street. This is seen to cause unsafe driving conditions and regular near misses. Northbound through drivers passing Clancy Drive also need to be aware of traffic entering from Clancy Drive merging from the left. Is this movement adequately signed? There is support to remove the left turn movements on/off Circle Drive at Clancy Drive, or the complete closure of this intersection.

  The Neighbourhood Traffic Reviews in Parkridge and Pacific Heights also echo open house feedback regarding the northbound exit from Circle Drive to 22nd Street westbound. Long delays during the peak hours suggest that a dual left turn may be warranted.

  The Confederation Park Neighbourhood Traffic Review reported concern regarding congestion on both Laurier and Circle Drives, and similarly suggested removing the left turn from Circle Drive onto Laurier Drive, or the complete closure of the intersection.

- <u>Sound Attenuation</u>

  From the Comment Sheets and Study Area Map notes gathered at the open house, as well as the Meadowgreen and Westview Neighbourhood Traffic Reviews, improved noise attenuation is a concern for these two neighbourhoods. Residents of Meadowgreen were concerned that upgrading Circle Drive (particularly the possibility of a raised collector-distributor roadway) may exacerbate noise levels.

- Safety of Pedestrian Crossings

  There are three pedestrian tunnels crossing under Circle Drive in the study area, at 18th Street, Rusholme Road and 29th Street. Feedback through the comment sheets, the Study Area Map notes and the Neighbourhood Traffic Review for Massey Place, all indicate concern regarding the safety of the pedestrian tunnel designs. Residents note that criminal activity is enabled by the nature of these walkways and suggest converting to overpass structures for cyclists and pedestrians in the future.

- Merge Distances Entering Circle Drive Northbound from 22nd Street

  Several attendees concerned about the length of the parallel entrance lane (to accommodate merging) from 22nd Street to Circle Drive northbound. The westbound-to-northbound acceleration lane is 250m long, 125m short of a 100 km/h design speed. The eastbound-to-northbound is 320m long and almost meets the desired standard. Some also reported difficulty making this entry and a subsequent lane change for a left-turn at Laurier Drive. It should be noted that the current laning configurations and markings attempt to prevent this movement from westbound 22nd Street.

- Safety of Eastbound Left-Turn onto Circle Drive at Clancy Drive

  Concern here involves the left-hand merging maneuver from Clancy Drive eastbound onto Circle Drive northbound. The distance may not be sufficient at present for a safe merge onto a congested Circle Drive and drivers experience near-misses and often come to a full abrupt stop when unable to merge.

- 22nd Street

  There is concern regarding recurring congestion for eastbound traffic on 22nd Street approaching the traffic signals at Confederation Drive to turn south onto Circle Drive. Drivers approaching the intersection with Confederation Drive will drive along (or even off) the shoulder to avoid waiting behind through traffic stopped at the signal. This also occurs in the westbound direction approaching Diefenbaker Drive. The right turn bays are too short during the peak hours.

  This issue is aggravated in the eastbound direction by the right turn onto 22nd Street from Fairmont Drive, increasing driver frustration and gridlock. The barrier cones help prevent vehicles from changing lanes at this location, although they may not be adequately visible. Should the Fairmont Drive access to 22nd Street be closed? Should Fairlight Crescent (inside the south mall area) access 22nd Street instead of Fairmont Drive? Issues concerning Fairmont Drive were heard through open house feedback, the Fairhaven Neighbourhood Traffic Review and reported by the current review of traffic conditions. Finally, should there be a longer eastbound left-turn lane from 22nd Street onto Confederation Drive, with a barrier protecting this lane?

- Changes to Circle Drive Access

  According to Neighbourhood Traffic Reviews for Montgomery Place, Meadowgreen and Parkridge, there is common desire to improve connections to Circle drive from these areas. However, several comments expressed support for closing Clancy and Laurier Drives due to the congestion and often dangerous conditions they cause.

- 11th Street Interchange

  There were concerns with the at-grade rail crossings affecting the11th Street interchange ramps. Queues on the southbound off-ramp occasionally back up onto Circle Drive during a lengthy rail crossing. Although outside the study area, changes to the 11th interchange may be considered.

- Cost

  One comment conveyed concern regarding the cost for potential upgrading along Circle Drive West. This may reflect concern over the tradeoffs to be made with upgrades to other existing municipal infrastructure.

Summary

Roadway performance and safety concerns have increased since the completion of Circle Drive South and increasing traffic volumes to/from west Saskatoon. The concerns heard both at and following the open house are largely consistent with the feedback from the Neighbourhood Traffic Reviews conducted in the study area and the traffic and collision data analyzed for this study.

Congestion at locations along Circle Drive and 22nd Street/Confederation Drive are increasingly leading to driver frustration and safety concerns for area residents. The identified concerns are being addressed by this study, and will inform the solution finding, including noise attenuation and pedestrian safety.

All open house respondents reported residing within the neighbourhoods directly affected by and included in this study, and most respondents travel through the study area several times per week. The majority of attendees found that the information provided at the open house was helpful in understanding the scope of the study.

Note: This report paraphrased the public input received, requiring some interpretation.

Recommendations

1. The City should consider circulating the public engagement report for Open House 1 to the relevant community associations and potentially posting on the engage website.
2. In addition to the efforts used to alert the public to Open House 1, portable roadside signs should be used to improve public awareness and interest for Open House 2.

E00747A

MEMO 7

DATE	:	March 11, 2020
FROM	:	Henry Devos
PROJECT	:	City of Saskatoon, Circle Drive West – Functional Planning Study
SUBJECT	:	Public Engagement Report, Open House 2

Introduction to Study

Circle Drive is a core route (urban ring road) in the City of Saskatoon's road network. It supports mobility not only for City residents, but for inter-regional traffic flows through the City. In response to increasing congestion levels and safety concerns, the City plans to continue upgrading Circle Drive to a freeway standard. The City recently constructed Circle Drive South to a freeway standard from Idylwyld Drive to 11th Street. The City has retained CIMA Canada Inc. (CIMA+) to complete a long-term functional plan for Circle Drive west, between Clancy Drive and Laurier Drive. The goal of this project is to remove the traffic signals at the Clancy and Laurier Drive intersections and upgrade to free-flow standards.

Key Technical Challenges

Upgrading Circle Drive to freeway standards by removing the traffic signals at Laurier and Clancy Drives is significantly constrained by three conditions:

1. Existing intersection spacing along Circle Drive ranges between 600m and 900m. However, the preferred spacing between interchanges (based on Best Practices) is 2 km, with a 1.6 km minimum.
    - To achieve a cost-effective freeway design meeting Best Practices, the signalized intersections at Laurier and Clancy Drives should simply be removed.
2. The existing interchange configuration at Circle Drive/22nd Street was designed to emphasize traffic movements between Highway 14 (22nd Street) west and Circle Drive north. The addition of Circle Drive south substantially altered the traffic patterns at this junction.
    - To achieve the most practical, technically effective solution, the existing interchange configuration should be replaced, not salvaged.
3. Intersection spacing along 22nd Street is also substandard for an arterial roadway and its intersection with Confederation Drive mixes local access with interchange operations. As a result, roadway performance is generally poor and residents west of Circle Drive have come to rely on the two existing signalized intersections for travel in/out of their neighbourhoods, particularly using Clancy Drive.
    - To achieve freeway standards and retain all current movements along Circle Drive will require complex and costly measures.

The Preferred Plan Presented at Open House 2

The preferred plan (final stage plan was shown) included the following key features:

- The existing unconventional interchange configuration was replaced with a current design (single-point urban) that accommodates all movements on/off Circle Drive.
- The Laurier and Clancy Drive traffic signals were removed and replaced with a grade separation that accommodated partial movements off/on Circle Drive, to/from the north at Laurier Drive and to/from the south at Clancy Drive.
- The southbound exit from Circle Drive to Fairmont Drive was retained.
- Eastbound 22nd Street includes a new right/off movement and retains the existing right/on movement at Fairmont Drive.
- The southbound exit to 11th Street is moved to the south side of 11th Street, converting the interchange to an all-movement Parclo AB configuration. This change was expected to occur at the final stage, e.g. when Circle Drive is widened to six lanes.
- The speed limit along Circle Drive was increased from 80 to 90 km/h, removing the low-speed curves crossing 22nd Street.

This plan balanced two objectives. First, it achieved free-flow (higher-speed) standards and improved traffic safety (eliminating the risk of unsafe movements) along Circle Drive by removing the traffic signals. Second, it retained partial access in the exceptionally short distance between Clancy and Laurier Drives.

Public Engagement Activities

Two public open house events have now been held for the Circle Drive, Clancy Drive to Laurier Drive, Functional Planning Study. Both events were held at the City of Saskatoon's Shaw Centre, 122 Bowlt Crescent, from 4:00pm to 7:00pm.

The first event took place on Wednesday, June 19, 2019. In advance of the open house, invitations were mailed to 371 property owners abutting Circle Drive through the study area. The City advertised the open house on their website Engage Page to alert the general public.

The public engagement process leading to the first open house[1] began by reaching out to the Community Associations within and surrounding the study area to alert them to the study and invite their input concerning the study corridor. Their input was intended to supplement the concerns and issues already identified by the communities through the City's Neighbourhood Traffic Review program.

The second event took place on January 22, 2020. Efforts to advertise the open house were expanded in response to public feedback at the first open house. In advance of the open house, invitations were mailed to the 371 property owners abutting Circle Drive through the study area as well as 13 attendees from Open House 1 who had requested notification. Notifications of the project were also sent to the 110 businesses and institutions in the mall area north and south of 22nd Street. Notifications were also sent to all the Community Associations within and

[1] See the Public Engagement Report for Open House 1 on the City's Engage page.

surrounding the study area. The City advertised the open house on their website Engage Page and also erected roadside billboards to alert the general public.

Comment sheets were provided for attendees to provide feedback on the open house format and information that was presented, and to collect general information on attendee's location of residence, work, and travel patterns. Optional contact information was also collected from those who wished to receive notification of future events. Attendees were asked to respond by February 7th, 2020.

Open House 2 Attendance

The purpose of the second open house was to present the options considered and the preferred upgrading plan and to gather the public's input.

Approximately 50 people attended the second open house. The open house was an informal drop-in format, no formal presentation was made. Representatives from the City of Saskatoon and the CIMA+ project team were available to discuss the information presented and to answer questions. Of the 73 written or called-in responses, ten were from comment sheets filled in at the event, six were comment sheets emailed or mailed-in following the open house, eight were phone calls and 49 were emails sent in with comments.

The higher attendance at the second open house may have resulted from greater public awareness of the event. The exceptionally high response rate following the open house largely resulted from stakeholder concerns with potential impacts to local travel patterns.

Although an extensive effort was made by the City and study team to alert the public and stakeholders to Open House 2, some attendees still suggested that more should have been done to raise public awareness.

Open House Feedback

- Was the information provided in a format that was understandable?

  Yes (13); N/A (2).

  No (1), Street/exit names should have been included in video to improve clarity. (*Not an option using a generic video.*);

- Did the information help you understand study scope?

  Yes (14); N/A (2).

- Were the staff able to answer your questions?

  Yes (13); N/A (2).

  No (1), Staff could not provide answer regarding cost or duration of project. (*Project has not been programed by the City and funding allocations will follow an approved plan*);

- How did you hear about the open house?

  Notice in Mail (4); Community Association Notice (4); Roadside Billboards (3); Friend/Neighbour (3); Shaw Centre (1); Not Informed (1); "Not informed, but was probably not paying attention" (1).

- Live in the study area?
    - Fairhaven (5),
    - Montgomery Place (4)
    - Parkridge (3)
    - Rosewood (2)
    - Mount Royal (1)
    - Meadowgreen (1)
    - Casa Rio (1)
- Work in the study area?
    - Confederation Suburban Centre (1)
    - Pleasant Hill (1)
    - Massey Place (1)
    - No (7)
    - Retired (2)
- How often do you travel on Circle Drive through the study area?
    - Most weekday peak times (7)
    - Weekends (5)
    - Midday (Monday-Friday) (3)
    - Evenings (3)
    - Every day (4)
    - 3-4 times/week (2)
    - Occasionally (1)
- How often do you travel on 22nd Street through the study area?
    - Most weekday peak hours (7)
    - Midday (Monday – Friday) (4)
    - Occasionally (4)
    - Every day (4)
    - Weekends (3)
    - Evenings (1)
    - Avoid it due to congestion (1)
- How do you typically travel through the study area?

  Automobile (16), Walking (1) and Cycling (1).

What We Heard

This summary reflects written comments received at the open house; comment sheets, emails and phone calls received following the open house; and discussions with open house attendees. The focus is on the public's concerns with the preferred plan. The following paraphrases the public input received, requiring some interpretation.

- <u>Neighbourhood Access and Egress</u>

  Respondents expressed concern over reduced access to/from neighbourhoods west of Circle Drive resulting from the proposed changes at the Laurier and Clancy Drive connections, particularly Fairhaven, Parkridge, Montgomery Place, and Pacific Heights. Residents were concerned about potentially increased travel times due to more circuitous connections to Circle Drive for some movements. Many respondents felt that the proposed plan isolates and impacts the Fairhaven and Parkridge communities the greatest.

- <u>Business Access</u>

  Comments concerned the reduced access/egress to the west side of Circle Drive would increase congestion along 22nd Street/Confederation Drive, impacting businesses both north and south of 22nd Street.

  The preferred plan would improve overall performance along 22nd Street through the study area compared with existing conditions.

- 22nd Street and Local Road Network

  22nd Street is the only direct route to downtown from west Saskatoon. There was significant concern that the preferred plan would divert additional traffic along local roads to an already congested 22nd Street, resulting in circuitous travel and increased commute times, further eroding its level-of-service.

  Again, the preferred plan would improve overall performance along 22nd Street through the study area compared with existing conditions.

  The City has identified the intersection of 22nd Street and Diefenbaker Drive for future study to address performance concerns.

- 11th Street Interchange

  There were concerns that the at-grade rail crossings immediately west of the interchange would result in frequent and lengthy travel delays. With increased volumes using 22nd Street, diversion to 11th Street was not seen as an attractive alternative route since it is frequently blocked by rail traffic, leaving drivers with no attractive option.

  The City is examining other railway solutions that may ultimately alleviate rail traffic crossing 11th Street.

  Again, the preferred plan would improve overall performance along 22nd Street through the study area compared with existing conditions.

- Noise Attenuation

  Improved noise attenuation was a concern for residents of Meadowgreen and Montgomery Place. Specific to Montgomery Place, the new southbound off-ramp to 11th Street would bring traffic closer to the neighbourhood and would impact an earth berm that is seen as an existing sound attenuation feature.

  The City is planning to undertake noise analysis in the study area in the near future.

- Safety

  Many respondents supported removing the traffic signals at Clancy and Laurier Drives, since it would improve roadway safety. However, many other respondents did not see any safety issues and supported the status quo; do not upgrade Circle Drive to freeway standards.

  There was concern that more circuitous travel patterns may affect safety through a number of school zones.

- Free-Flow Circle Drive

  Some respondents questioned the rationale for a free-flow standard along Circle Drive. Since it was not prioritized in the past, removing the signalized accesses now is difficult. Some respondents found current operations along Circle Drive acceptable, experiencing wait times at signals that rarely exceed one cycle.

  Other respondents expressed interest in seeing a free-flow standard extended north along Circle Drive passing Airport Drive, Avenue C, Millar Avenue and Warman Road.

- Cost

  Several comments conveyed concern regarding the cost for potential upgrading along Circle Drive West. These may reflect concern over the tradeoffs to be made with upgrades to other existing municipal infrastructure.

- Open House Awareness

  Some respondents felt more could have been done to advertise Open House 2, some suggesting that more public events be held.

  > In advance of the open house, invitations were mailed to all property owners abutting Circle Drive through the study area, as well as to the businesses and institutions in the mall area north and south of 22nd Street. Notifications where also sent to all of the Community Associations within and surrounding the study area. The City advertised the open house on their website Engage Page and also erected roadside billboards to alert the general public.
  >
  > The City's communication branch, the Communications & Public Engagement team, approved the advertising program for Open House 2.

- Miscellaneous Concerns

  A possible reduction in access for emergency responders.

  > EMS will be contacted when a recommended plan has been identified to ensure that the needed access routes for emergency vehicles are maintained.

  An associated environmental impact due to increased travel times was identified by several respondents.

  > Existing conditions will lead to increased congestion and travel times.

Summary

The concerns heard both at and following Open House 2 were largely focused on reduced access to and from Circle Drive and the adjacent neighbourhoods and an expected increase in congestion along 22nd Street and connecting roads. This was seen as leading to circuitous travel and increased travel times for many area residents. Some respondents felt that 11th Street was not a feasible alternative route due to the at-grade rail crossings. Noise attenuation and cost concerns were also identified, as well as a desire for additional or more accessible advertisement for events. The City and study team are assessing the community's concerns and looking for potential solutions. A third open house will be held at a later date to present the revised preferred plan.

Recommendations

1. The City should circulate the public engagement report following Open House 2 (i.e. Memo 7) to the relevant Community Associations and post on the City of Saskatoon's Engage Page website.
2. The City should determine if the cost to provide a more complex solution, that restores more of the existing traffic movements, can be justified.

MEMO 8

DATE	**:**	November 24, 2021
FROM	**:**	Henry Devos
PROJECT	**:**	City of Saskatoon, Circle Drive West – Functional Planning Study
SUBJECT	**:**	Public Engagement Report, Open House 3 (held October 21, 2021)

Introduction to Study

Circle Drive is a core route (urban ring road) in the City of Saskatoon's road network. It supports mobility not only for City residents, but for inter-regional traffic flows through the city. The city recently constructed Circle Drive South to a freeway standard from Idylwyld Drive to 11th Street. As a result, this new river crossing means that Circle Drive West now connects Highways 7 & 14 west and Highway 16 north (via Neault Road) with Highways 11 & 16 south.

In response to increasing congestion levels and safety concerns, the City plans to continue upgrading Circle Drive to a freeway standard. The city retained CIMA Canada Inc. (CIMA+) to complete a long-term functional plan for Circle Drive west, between Clancy Drive and Laurier Drive. The goal of this project is to remove the traffic signals at the Clancy and Laurier Drive intersections and upgrade to free-flow standards.

Key Technical Challenges

Upgrading Circle Drive to freeway standards by removing the traffic signals at Laurier and Clancy Drives is significantly constrained by three conditions:

1. Existing intersection spacing along Circle Drive ranges between 600m and 900m. However, the preferred spacing between interchanges (based on Best Practices) is 1.5 to 2 km.
    - To achieve a cost-effective freeway design meeting Best Practices, the signalized intersections at Laurier and Clancy Drives should simply be removed.
2. The existing interchange configuration at Circle Drive/22nd Street was designed to emphasize traffic movements between Highways 7 & 14 (22nd Street) west and Circle Drive north. The addition of Circle Drive south substantially altered the traffic patterns at this junction.
    - To achieve the most practical, technically effective solution, the existing interchange configuration should be replaced, not salvaged.
3. Intersection spacing along 22nd Street is also substandard for an arterial roadway (less than 100m between Confederation and Circle Drives) and its intersection with Confederation Drive mixes local access with interchange operations. Roadway performance is generally poor and residents west of Circle Drive have come to rely on the two existing signalized intersections for travel in/out of their neighbourhoods, particularly using Clancy Drive.
    - To achieve freeway standards and retain all current movements along Circle Drive would require complex and costly measures.

The Recommended Plan Presented at Open House 3

The Recommended Plan included the following key features:

- The existing unconventional interchange configuration was replaced with a current design (single-point urban) that accommodates all movements on/off Circle Drive.
    - The existing southbound-to-eastbound turning movement using Fairmont Drive (a circuitous Jughandle configuration) has been replaced with a conventional, and efficient, exit ramp.
- The Laurier and Clancy Drive traffic signals were removed and replaced with grade separations that accommodate turning movements off/on Circle Drive, to/from the north at Laurier Drive and to/from both directions at Clancy Drive.
- The southbound exit from Circle Drive to Fairmont Drive is retained.
- Eastbound 22nd Street includes a new right/off movement to Fairmont Drive and the existing right/on movement to Fairmont Drive has been relocated south to Fairlight Crescent.
    - This change permits traffic crossing 22nd Street from the south mall to the north mall to reach Confederation Drive, a movement not currently permitted.
- The southbound exit to 11th Street is moved to the south side of 11th Street, converting the interchange to an all-movement Parclo AB configuration. This change permits restoring all turning movements at the Clancy Drive interchange.
- The speed limit along Circle Drive was increased from 80 to 90 km/h, removing the low-speed curves crossing 22nd Street.

The Recommended Plan balanced two objectives:

1) It achieved free-flow design standards and improved traffic safety. Removing the traffic signals eliminating the risk of unsafe movements along Circle Drive and brings design consistency.
2) It improved access to/from Clancy Drive and retained partial access to/from Laurier Drive in the exceptionally short distances between Clancy, 22nd and Laurier Drives.

Summary: Benefits of Recommended Plan

<u>The Recommended Plan Achieves:</u>

1. Improved 22nd Street roadway performance and safety.
2. Improved Circle Drive West performance and safety.
3. Improved capacity and cross-city travel times.
4. Consistent facility design better meeting driver expectations.
5. Improved multi-use trail pathway network and pedestrian safety.
6. New configuration better supports Circle Drive's long-term role in the provincial highway network.

Summary: Chief Concern with Recommended Plan

<u>One Stakeholder Concern with the Recommended Plan Stands Out:</u>

- The two traffic signals at Clancy and Laurier Drives were retained by Circle Drive's original Stage 1 design to accommodate convenient local access.
- If the traffic signals were to continue to be retained, it would lead to increased traffic congestion and safety concerns as traffic in the city and surrounding region grows. This will include traffic diverted through the city from the south end of the future Saskatoon Freeway's west leg and the regional highways.
- Circle Drive's Stage 1 design unfortunately resulted in area residents and business owners relying on now long-established, but interim, travel patterns.

<u>The Recommended Plan is Long-Term:</u>

- Removing the signals after these many years will change the routes in/out of some neighbourhoods and business areas and is disruptive to affected drivers.
- Upgrading Circle Drive West to free-flow standards is considered a long-term project. The city hopes that preparing the plan at this still early stage will give area residents and business owners time to adjust their plans (where possible) before the changes are implemented.
- Major transportation projects with potential to affect large areas and/or existing development are commonly planned long in advance of anticipated construction timelines. The original plans for Circle Drive West did not foresee the Saskatoon Freeway and the absence of a southwest leg. The city has revisited its plans for Circle Drive West to reflect these changing circumstances.

Public Engagement Activities

Two public open house events were previously held for the Circle Drive, Clancy Drive to Laurier Drive, Functional Planning Study. Both events were held at the City of Saskatoon's Shaw Centre, 122 Bowlt Crescent, from 4:00pm to 7:00pm.

Open House #1[1]: The first event took place on Wednesday, June 19, 2019. In advance of the open house, invitations were mailed to 371 property owners abutting Circle Drive through the study area. The city advertised the open house on their website Engage Page to alert the general public.

The public engagement process leading to the first open house began by reaching out to the Community Associations within and surrounding the study area to alert them to the study and invite their input concerning the study corridor. Their input was intended to supplement the concerns and issues already identified by the communities through the City's Neighbourhood Traffic Review program. Approximately 25 people attended the first open house event.

[1] See the Public Engagement Report for Open House 1 on the City's Engage page.

The purpose of the first open house was to alert the community to the planning study and gather preliminary input regarding the constraints and issues affecting development of the functional plan.

Open House #2[2]: The second event took place on January 22, 2020. Efforts to advertise the open house were expanded in response to public feedback at the first open house. In advance of the open house, invitations were mailed to the 371 property owners abutting Circle Drive through the study area as well as 13 attendees from Open House 1 who had requested notification. Notifications of the project were also sent to the 110 businesses and institutions in the mall area north and south of 22nd Street. Notifications were also sent to all the Community Associations within and surrounding the study area. The city advertised the open house on their website Engage Page and also erected roadside billboards to alert the general public.

Comment sheets were provided for attendees to provide feedback on the open house format and information that was presented, and to collect general information on attendee's location of residence, work, and travel patterns. Optional contact information was also collected from those who wished to receive notification of future events.

The purpose of the second open house was to present the options considered and the preferred upgrading plan and to gather the public's input.

Approximately 50 people attended the second open house. The open house was an informal drop-in format, no formal presentation was made. Representatives from the City of Saskatoon and the CIMA+ project team were available to discuss the information presented and to answer questions. Of the 73 written or called-in responses, ten were from comment sheets filled in at the event, six were comment sheets emailed or mailed-in following the open house, eight were phone calls and 49 were emails sent in with comments.

The higher attendance at the second open house may have resulted from greater public awareness of the event. The exceptionally high response rate following the open house largely resulted from stakeholder concerns with potential impacts to local travel patterns.

Open House #3

The third open house was a Virtual Event and took place on October 21, 2021. The city advertised the open house on their website Engage Page.

The purpose of the third open house was to present the Recommended Plan for upgrading Circle Drive west, to share the changes that were made following Open House 2, and to respond to final questions and gather comments.

Approximately 75 people attended the third open house online, 50% more than the second open house. CIMA+ presented the Recommended Plan and the City of Saskatoon moderated the event, including the question-and-answer period.

[2] See the Public Engagement Report for Open House 2 on the City's Engage page.

Frequently Asked Questions from Open House #3

There was a mix of support and some concerns expressed that will all be considered in the final plan. The following questions & answers capture the range of questions posed during and following the virtual open house.

Pedestrian Connections across Circle Drive:

1) Why are there pedestrian overpasses (over Circle Drive) leading to underpasses (under the CN Rail tracks)? Has this been done elsewhere in Saskatoon?
    - This is the only area in Saskatoon where overpasses would lead to underpasses because of limited options for crossing the rail tracks. The city has committed to continuing to discuss these locations with CN Rail in hopes of improving the remaining underpasses to a more modern design.
    - We did investigate constructing an overpass at Laurier Drive and 29th Street over the CN Rail tracks. Unfortunately, there are power transmission lines that prevent this option from being recommended at this time.
    - The location at Clancy Drive includes the street and sidewalk along the street passing under Circle Drive, so that location is a bit different. The overall crossing length in the underpasses will be shortened, but still exist at all three locations.
2) Are the existing crossings being removed?
    - The proposed plan includes keeping existing pedestrian connections across Circle Drive between Clancy Drive and Laurier Drive.
3) Are the tunnels being removed?
    - This plan recommends removing the pedestrian crossing tunnels under Circle Drive and installing sidewalks along Clancy Drive and Laurier Drive, with a pedestrian overpass near 29th Street. The tunnels under the CN Rail tracks will remain and we will continue to work with CN Rail to make improvements and upgrades.
4) How will you address safety at the ends of the new pedestrian overpasses? The overpass at 29th Street will still lead into the back alley where issues currently exist.
    - Providing safe access for pedestrians is important for all connections. As we enter the detailed design phase, we will do a CPTED (Crime Prevention through Environmental Design) review to evaluate this location for improvements.
5) Can the power lines running along Circle Drive between the road and the CN Rail tracks be raised to accommodate a pedestrian overpass for the road and the rail tracks?
    - Unfortunately, there is a high voltage power transmission line between Circle Drive and the CN Rail tracks that cannot be raised or lowered. This does not leave space for a pedestrian overpass at 29th Street or Laurier Drive. There are operational and safety concerns related to increasing the height of the lines, and regulations that prevent them from being buried underground.

Pedestrian Connections across 22nd Street:

1) How would pedestrians and cyclists cross 22nd Street to get from Confederation Mall to the Tim Horton's on Fairlight Drive (north business area to south business area)?
    - People can cross 22nd Street at the Diefenbaker Drive intersection or use the pedestrian overpass near the CN Rail tracks that will remain in place.
    - We will investigate the impact on the plan to add a pedestrian crossing on the west leg of the intersection at Confederation Drive and 22nd Street.
2) Is the pedestrian overpass crossing 22nd Street just east of Circle Drive West going to remain in place?
    - Yes, this pedestrian structure is not affected by this plan.

Traffic Noise Sound Attenuation:

1) Will there be sound attenuation walls added or improved along Circle Drive within the project's limits?
    - A traffic noise modelling study will be completed as a part of this project with recommendations for addressing future traffic noise sound attenuation locations. Options, which may include sound attenuation walls, will be considered during the detailed design of this project.

Laurier Drive Traffic Movements:

1) Why hasn't a southbound exit been included at Laurier Drive? This does not retain the same functionality that already exists and may cause traffic issues in the neighbourhood.
    - There is not enough room for a Laurier Drive southbound exit, due the proximity of the 22nd Street interchange.
    - Circle Drive exiting traffic and the Laurier Drive entering traffic would not have enough time or opportunity to weave between lanes at high-speed through the area to get to their destinations.
2) What happens to vehicles currently go through Laurier Drive to south Circle Drive?
    - With the proposed plan, vehicles that currently take Laurier Drive to southbound Circle Drive could go westbound on Laurier Drive to Confederation Drive, then and then eastbound on 22nd Street to the Circle Drive southbound ramp.
3) Will removing the movements to and from the south on Laurier Drive increase traffic at Diefenbaker Drive and 22nd Street significantly?
    - Our traffic modeling predicts that re-directing traffic from Laurier Drive to Diefenbaker Drive and Confederation Drive for access to 22nd Street will increase traffic in those areas; however, it will still be within the capacity of the network. Some vehicles will take other routes.

Speed Limits:

1) Will speed limits increase on Circle Drive between 33rd Street and Clancy Drive once this change is completed?
    - Yes, the speed limit on Circle Drive between 33rd Street and Clancy Drive will increase to 90 kilometers per hour.

Diefenbaker Drive:

1) Why isn't an upgrade of the Diefenbaker Drive and 22nd Street intersection not included in the plan? The changes proposed will make the intersection a lot busier.
    - An assessment of Diefenbaker Drive was outside of the scope of this project. The focus of this project is the long-term plan for Circle Drive; however, an assessment and possible upgrades may be required in the future.
    - As more development in Saskatoon's west and the Bus Rapid Transit (BRT) system is implemented, 22nd Street will be widened further west. Once the recommended plan for Circle Drive has been finalized, additional work can be completed to determine the required upgrades to 22nd Street in coordination with BRT, future growth planning and this plan.
2) Will upgrades to Diefenbaker Drive be implemented at the same time as these other recommendations if it is not included in this plan?
    - The Circle Drive West Functional Plan still needs to be finalized and funded, so no work is schedule to implement this long-term plan.
    - Upgrades to Diefenbaker Drive may be coordinated with other upgrades along 22nd Street, either in anticipation of the Circle Drive West Functional Planning Study, or as part of other area projects like the Bus Rapid Transit plans.

11th Street Access:

1) Why can't the current 11th Street exit from Circle Drive southbound be maintained in this plan?
    - Circle Drive is proposed to become a free flow facility rather than including a traffic signal at Clancy Drive. This existing traffic signal separates the movements to Clancy Drive and the 11th Street ramp. The southbound entering movement (to Circle Drive) from Clancy Drive cannot occur safely at the same time as the southbound exiting movement to 11th Street over such a short distance once traffic is operating in free flow on Circle Drive.
2) What will the intersection at the new Circle Drive exit to 11th Street using the loop ramp look like? Will there be capacity to hold enough vehicles on that ramp if trains are blocking 11th Street? I'm concerned that it may back up onto Circle Drive creating safety issues.
    - In the proposed plan, the intersection at 11th Street will be a typical signalized intersection. The exit ramp from Circle Drive is designed as a generous loop, taking into account current and future traffic demands.

3) Why doesn't this plan include a road passing over or under the rail line on 11th Street? Trains are a big issue for access to the Montgomery Place neighbourhood. The new 11th Street access location will require westbound traffic to cross the main rail tracks leading to Chappell Yards and the wait times can be long.

   - The Circle Drive West Functional Planning Study does not include the Rail Grade Separation at 11th Street. Find more information in the *Rail Relocation versus Grade Separation Feasibility Study - January 2021 Update report* that went forward to City Council where it was placed on the Infrastructure Priority List in the *Saskatoon Transportation Master Plan.*
   - The new 11th Street exit ramp from Circle Drive will be a loop ramp which is a conventional interchange design recommendation.
   - Both this Circle Drive West Functional Plan and the 11th Street Rail Grade Separation Project (routing traffic over the rail line) are future long-term projects. Neither of these projects have a timeline attached to them for implementation.

4) If a train on the north/south CN Rail track is blocking 11th Street and another train on the CP Rail track is blocking the crossing at Fairlight Drive and Elevator Road, how will emergency vehicles access Montgomery Place?

   - Trains at these intersections can be problematic for traffic and emergency vehicles. However, emergency services would coordinate their response in a similar fashion as they do today.

5) What is the timeline for building the 11th Street grade separation?

   - There is currently no timeline for the implementation of this project. The project is included on the Infrastructure Priority List in the *Saskatoon Transportation Master Plan.*
   - The infrastructure priority list is updated at minimum every five years and includes all transportation projects city-wide.

6) Have other rail grade separated options to access Montgomery Place been considered, such as an off-ramp and on-ramp between Circle Drive southbound and Dundonald Ave through the proposed solar farm location?

   - Any rail grade separation at 11th Street was outside of the scope of this project. A *Rail Relocation versus Grade Separation Feasibility Study - January 2021 Update report* went forward to City Council where it was placed on the Infrastructure Priority List in the *Saskatoon Transportation Master Plan*. The first phase of this study was presented in March 2018: *Rail Relocation versus Grade Separation feasibility Study – Phase 1 report*.

Other Locations within the Study Area:

1) Why is the ramp over Confederation drive being removed for the movement exiting Circle Drive southbound onto 22nd Street West? Trucks will now have to travel through the 22nd Street and Confederation Drive intersections. Won't this make things more difficult for trucks?
    - Yes, the ramp that currently takes you from Circle Drive southbound to 22nd Street westbound is removed in this configuration. Part of the reason is that 22nd Street will be three lanes wide, plus additional turning lanes. If that ramp were to be retained, drivers could not safely maneuver to make a left turn at Diefenbaker Drive through the additional lanes (this does happen today, but can be challenging at certain times – for both safety and opportunity). Truck traffic will be required to travel through the intersection of Confederation Drive when making this movement.
2) Why not allow access from Fairlight Drive to the 22nd Street off ramp to Circle Drive South?
    - It's not best practice under Transportation national guidelines to connect a local access road to a freeway. Fairlight Dr traffic will take Fairmont Dr southbound and connect to Circle Drive southbound at Clancy Drive.
3) How will westbound traffic on 22nd Street access Parkridge and Fairhaven neighbourhoods?
    - From 22nd Street westbound, drivers will turn left at Diefenbaker Drive intersection to access Parkridge and Fairhaven neighbourhoods at Fairmont Drive.
4) What is the consideration for truck traffic southbound on Circle Drive?
    - There is a bypass ramp proposed for truck traffic entering Circle Drive south from 22nd Street eastbound. Trucks will be able to bypass the Confederation Drive and Circle Drive intersections to access Circle Drive southbound.
5) Is Clancy Drive exit going to be an underpass?
    - Yes, Clancy Drive will access Circle Drive via an underpass.
6) Has there been any thought to allow vehicle access between Fairhaven and Meadow Green at Clancy Drive and 18th Street West under the CN Rail tracks?
    - No. This connection was not included in the scope of this project. This plan was focused on Circle Drive and its operations at Clancy Drive and Laurier Drive.
7) Was any consideration given to people who travel between west-end areas like Parkridge, Fairhaven, and Pacific Heights and downtown, particularly during peak traffic times?
    - Yes. The Consultant reviewed the City's current traffic model in these areas and reassigned those trips in the analysis to evaluate 22nd Street and Circle Drive. The effectiveness of the proposed transportation plan is based on the reassigned volumes.

8) Will it take longer to get from Laurier Drive to Circle Drive southbound once the proposed changes are implemented?

    - The new route is about the same timing, from Laurier Drive to Circle Drive southbound is via Confederation Drive southbound under 22nd Street to the re-aligned Circle Drive South on-ramp.

General Questions and Comments:

1) Will public feedback from the third Open House be considered before the final plan goes forward to the Standing Policy Committee on Transportation (SPCT)?

    - Yes. All new comments and feedback will be incorporated to help draft the report to the SPCT, which is anticipated for spring 2022.

2) Are there additional images and animations to help residents understand the plans?

    - Yes. The presentation from the October 2021 Open House 3 is available and includes many additional images that help describe the changes proposed. Animations were not produced as a part of this project.

3) How will residents in Parkridge and Fairhaven be impacted during construction?

    - There is still more work to finalize and get approval, then funding the project before the construction phasing and detour plans are designed. Those plans would be developed closer to the time of construction and always consider local traffic access.

4) How much will this project cost to build?

    - The third open house completed the public engagement portion of the Circle Drive West Functional Planning Study. The next steps are completing the engineering of the recommended plan, including noise modelling and mitigation, and developing a cost estimate.

5) How long will this take to build?

    - Construction of this project is not yet scheduled. It is also unknown how long construction could take.

6) Can you please post the proposed interchange plans for the 11th Street rail grade separation?

    - Yes. The proposed grade separation plans for 11th Street are included in the *pdf of the Open House 3 presentation* (slide 27) which is also linked in the content of the Engage tab. Information on the grade separation can also be found in the *Rail Relocation versus Grade Separation Feasibility Study - January 2021 Update report* that went forward to City Council where it was placed on the Infrastructure Priority List in the *Saskatoon Transportation Master Plan.*

7) Can construction of an eastbound turn bay on 22nd Street happen sooner to accommodate existing traffic wanting to turn onto Circle Drive?

    - Once the long-term Circle Drive West functional plan is finalized and adopted by City Council, the city will have a road map to start making smart investments in infrastructure over time as required for improving current operations.

8) Can construction of dual left turn lanes from the Circle Drive northbound exit onto 22nd Street be accelerated? The future plan looks like an improvement, but it sounds like construction is a long time in the future.

    - The ultimate phasing of the construction of this plan has not been finalized. That being said, due to the substantial change this plan proposes for the Circle Drive northbound exit onto 22nd Street, it is not likely that this portion alone will be able to be accelerated. Opportunities to make improvements to the existing exit to allow for dual left turn movements here are being evaluated. Completion of this project, and adoption of the recommended plan, will allow us to make good investments in current infrastructure projects.

9) This plan is horrible with only one access point to get into some neighbourhoods.

    - The number of access points to all affected neighbourhoods is the same; however, the particular patterns for access will change.

10) Has Saskatoon Transit been consulted regarding this plan?

    - Yes. The Saskatoon Transit and Bus Rapid Transit planning teams have been included as stakeholders throughout the development of this proposed plan.

11) Can additional pedestrian crossings be implemented around the 11th Street and Dundonald Avenue intersection? Lots of children are crossing here before and after school.

    - Thank you for this comment. It was shared with the appropriate staff within the Transportation Engineering department for review under the correct program. This work is outside of the scope of this project.

12) This work will result in many detours to various areas and effect traffic, emergency vehicles, and businesses. How will the city minimize the effects during construction?

    - There is still more work to finalize and get approval, then funding the project before the construction phasing and detour plans are designed. A construction management and detours plan will be established as a part of the detailed design and construction plan closer to the time of construction and always consider local traffic access.

Emergency Response:

1) Does the current plan ensure compliance of NFPA 1710, fire protection into Montgomery Place? What impact will the changes have on our emergency responders' ability to respond to calls?

    - Fire and Protective Services are a stakeholder on this project and all large-scale transportation projects. Additionally, this project cannot be viewed in isolation. It

needs to be considered alongside the 11th Street grade separation plans. Fire and Protective Services will have a say in implementation to ensure they can respond effectively.

2) Do you consult with 911 emergency services during this process?
    - Yes
3) What comments have emergency services made regarding the changed access to Montgomery Place from Circle Drive southbound?
    - Fire and Protective Services has response plans for the Montgomery Place neighbourhood that include consideration for the possibility of train conflicts. Consultation with Fire regarding these plans indicated that the relocation of the 11th Street ramp is not expected to adversely affect their response and may be an improvement overall.

Other Areas:

1) When will you tackle the issues at Circle Drive and Avenue C?
    - This project is high on the Infrastructure Priority List in the *Saskatoon Transportation Master Plan*; however, there is no funding or timeline identified yet.
2) Is there a recommendation for a rail grade separation for 33rd Street immediately east of Circle Drive to help accommodate the added traffic from newly developed neighbourhoods to the west?
    - No. This location was included in the *Rail Relocation versus Grade Separation Feasibility Study - January 2021 Update report* and was not recommended for future study.
3) Confederation Drive between 22nd Street and 33rd Street is very busy already, making it tough to get out of the Massey Place neighbourhood. How will this plan address this issue?
    - While Confederation Drive north of 22nd Street was not included in the scope of this project, we heard this concern during the *Massey Place Neighbourhood Traffic Review* (NTR).
    - Based on the analysis completed in the NTR, the following recommendations were made for Confederation Drive. These recommendations should resolve access issues for the Massey Place neighbourhood.
        i. Install traffic signals at Confederation Drive and Milton Street - awaiting funding; and
        ii. Confederation Drive and Massey Drive Active Pedestrian Corridor - completed.

J

Appendix J
Circle Drive West Functional Plans

DRAWING INDEX	
PLAN NO.	DESCRIPTION
C-G-0000	DRAWING INDEX
	PROPOSED ROAD GEOMETRICS, PROFILES & SECTIONS
C-R-3000	CIRCLE DRIVE PLAN/PROFILE STA 6+765 TO STA 7+465
C-R-3001	CIRCLE DRIVE PLAN/PROFILE STA 7+465 TO STA 8+165
C-R-3002	CIRCLE DRIVE PLAN/PROFILE STA 8+165 TO STA 8+900
C-R-3003	CIRCLE DRIVE PLAN/PROFILE STA 8+900 TO STA 9+600
C-R-3004	CLANCY DRIVE PLAN/PROFILE NB OFF RAMP
C-R-3005	CLANCY DRIVE PLAN/PROFILE SB ON RAMP
C-R-3006	CLANCY DRIVE PLAN/PROFILE
C-R-3007	CLANCY DRIVE PLAN/PROFILE NB ON RAMP
C-R-3008	CLANCY DRIVE P/P SB CD ROAD STA 910+550 TO STA 911+302.334
C-R-3009	CLANCY DRIVE P/P SB CD ROAD STA 910+000 TO STA 910+550
C-R-3010	22 ST NB OFF RAMP PLAN/PROFILE STA 750+000 TO STA 750+525
C-R-3011	22 ST NB OFF RAMP PLAN/PROFILE STA 750+525 TO STA 751+037.912
C-R-3012	CD ROAD TO FAIRMONT DR PLAN/PROFILE
C-R-3013	22 ST BYPASS PLAN/PROFILE
C-R-3014	22 ST MAINLINE PLAN/PROFILE STA 701+000 TO STA 701+600
C-R-3015	22 ST MAINLINE PLAN/PROFILE STA 701+600 TO STA 701+919.921
C-R-3016	22 ST SB ON RAMP PLAN/PROFILE
C-R-3017	22 ST NB ON RAMP PLAN/PROFILE
C-R-3018	22 ST SB OFF RAMP PLAN/PROFILE
C-R-3019	LAURIER DR MAINLINE PLAN/PROFILE
C-R-3020	LAURIER DR SB OFF RAMP PLAN/PROFILE
C-R-3021	LAURIER DR NB ON RAMP PLAN/PROFILE
C-R-4000	CIRCLE DRIVE ROAD CROSS-SECTIONS
C-R-4001	CLANCY DRIVE STRUCTURAL ARRANGEMENTS
C-R-4002	22 STREET – STRUCTURAL ARRANGEMENT
C-R-4003	LAURIER DRIVE STRUCTURAL ARRANGEMENT

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City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

INDEX

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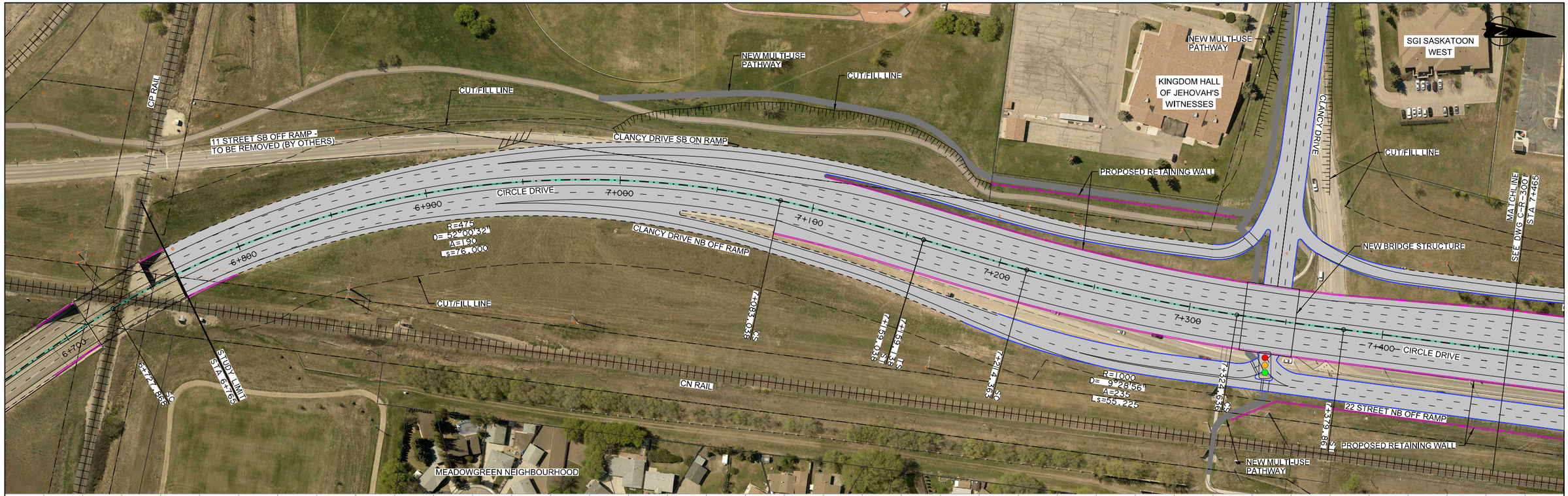

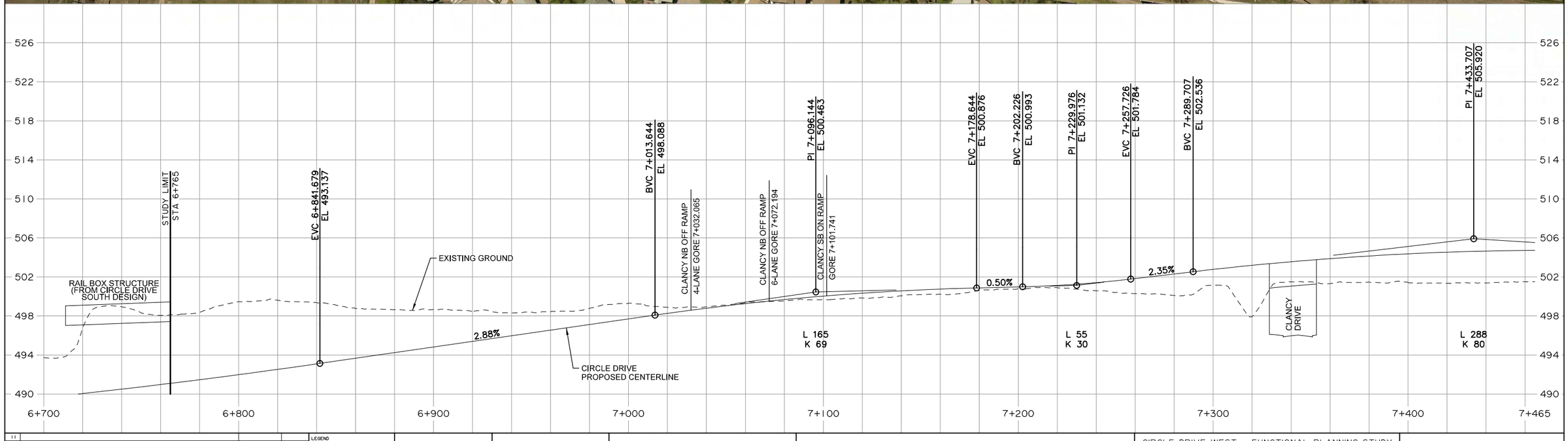

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CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CIRCLE DRIVE – MAINLINE

PLAN/PROFILE

STA 6+765 TO STA 7+465

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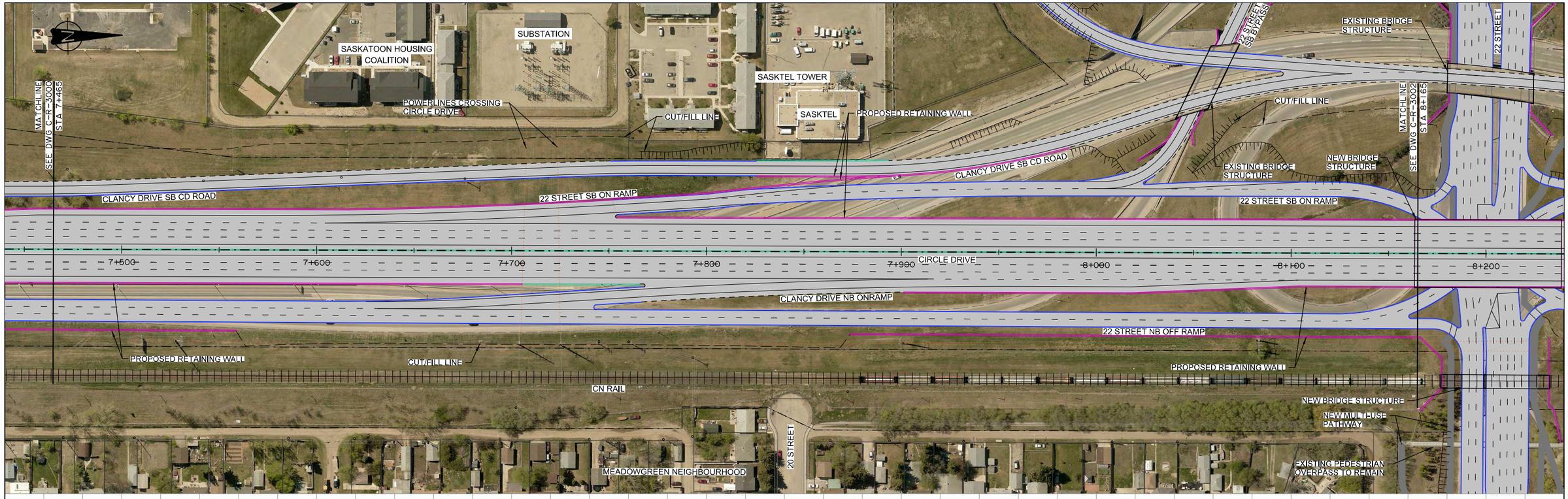

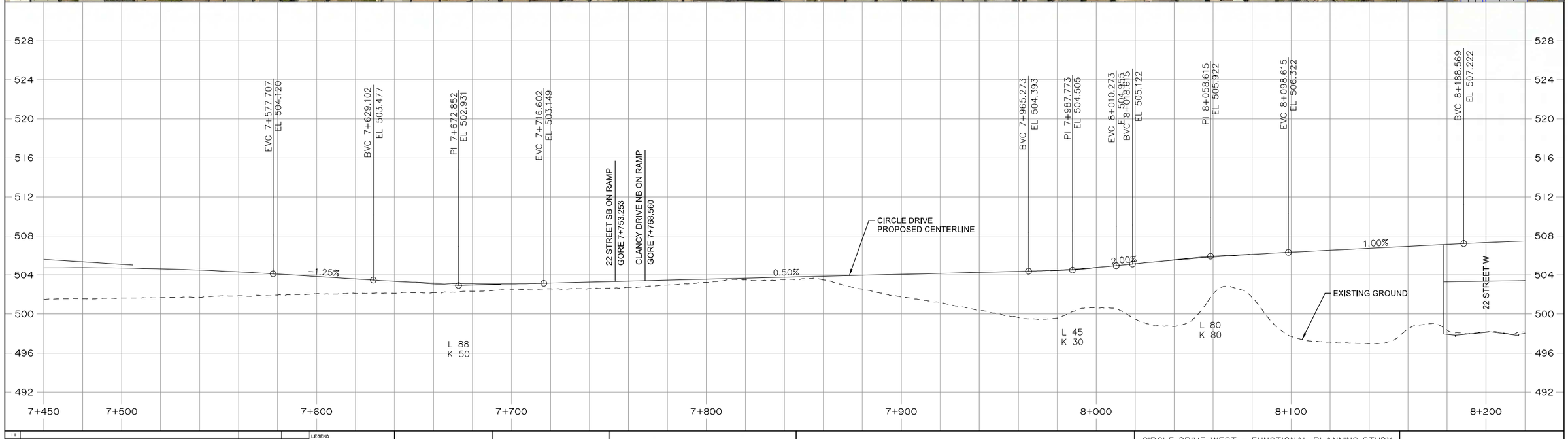

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CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CIRCLE DRIVE – MAINLINE

PLAN/PROFILE

STA 7+465 TO STA 8+165

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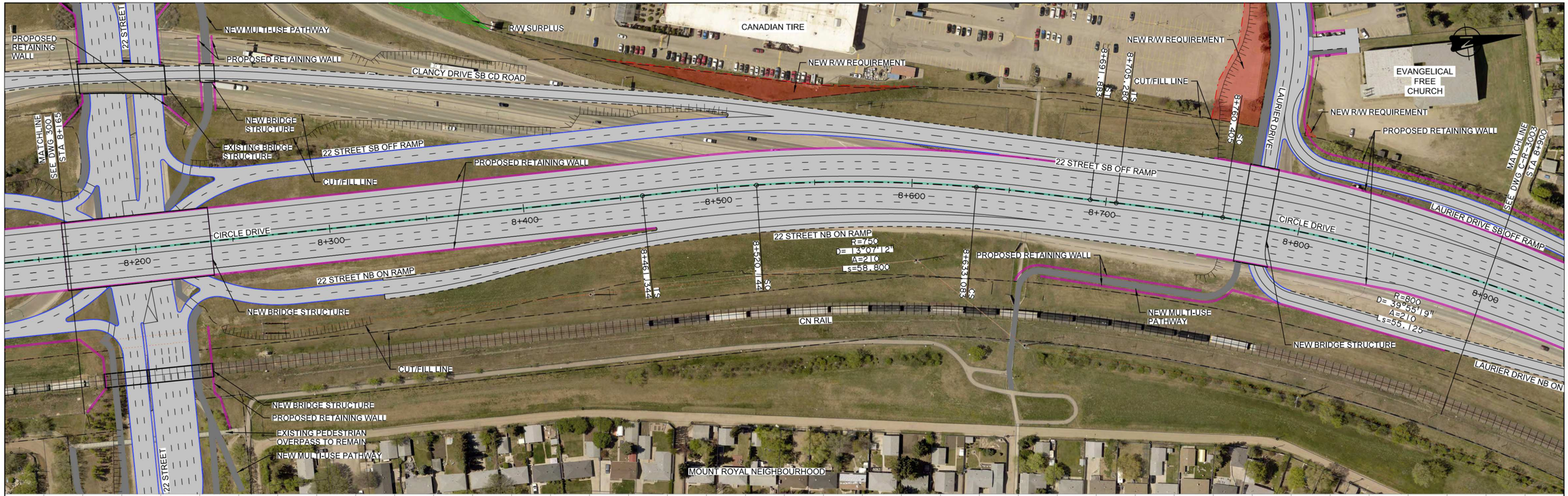

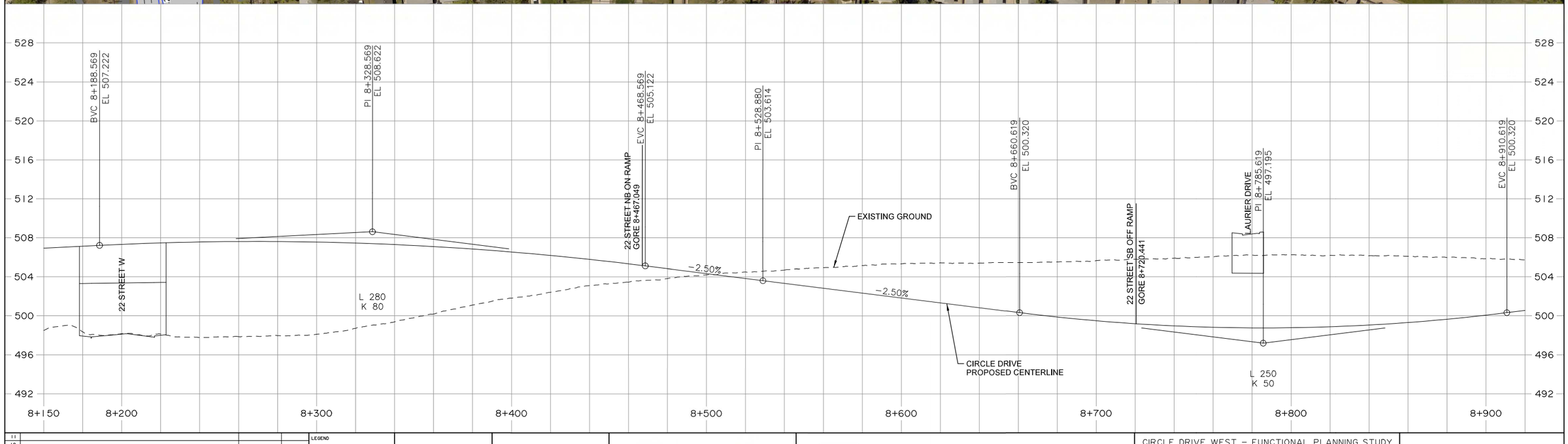

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CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CIRCLE DRIVE – MAINLINE

PLAN/PROFILE

STA 8+165 TO STA 8+900

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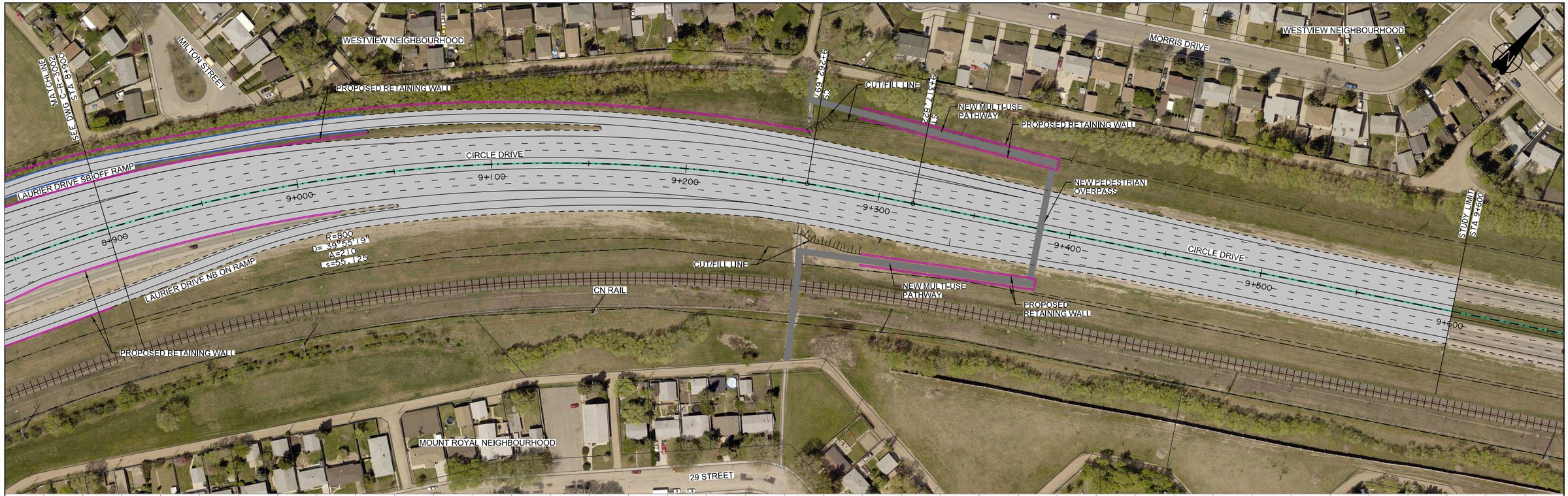

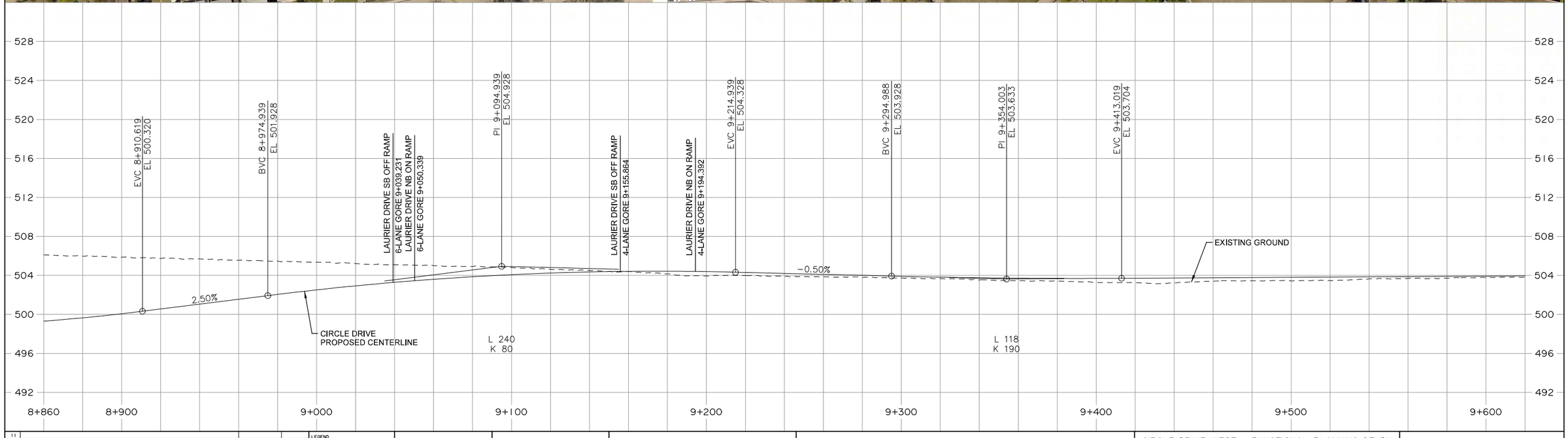

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City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CIRCLE DRIVE – MAINLINE

PLAN/PROFILE

STA 8+900 TO STA 9+600

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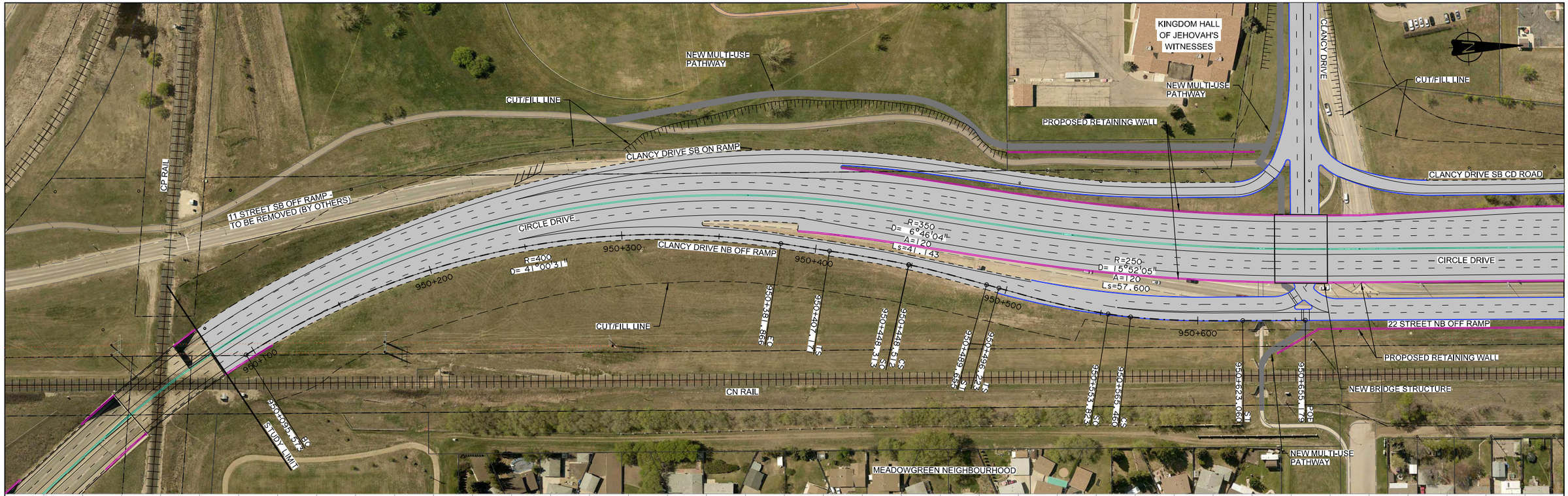

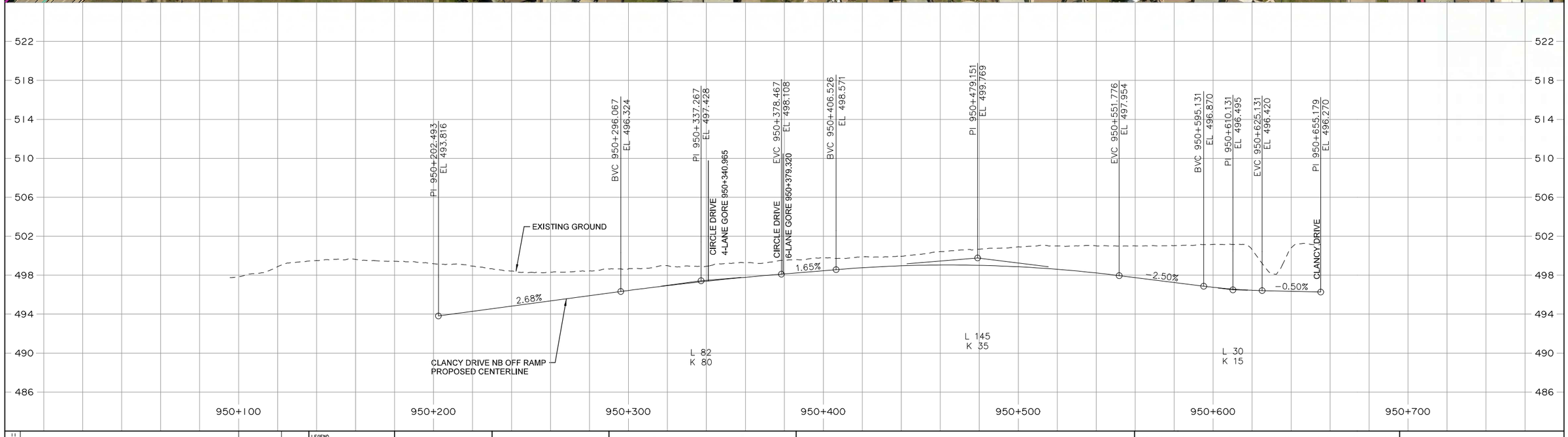

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City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – NB OFF RAMP

PLAN/PROFILE

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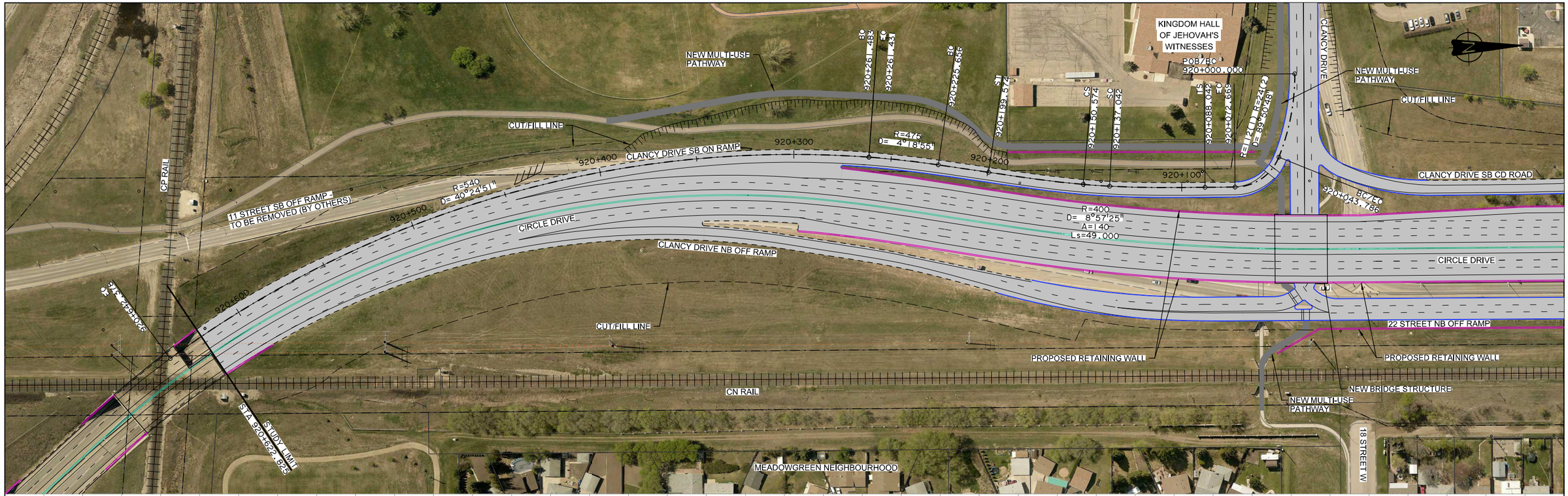

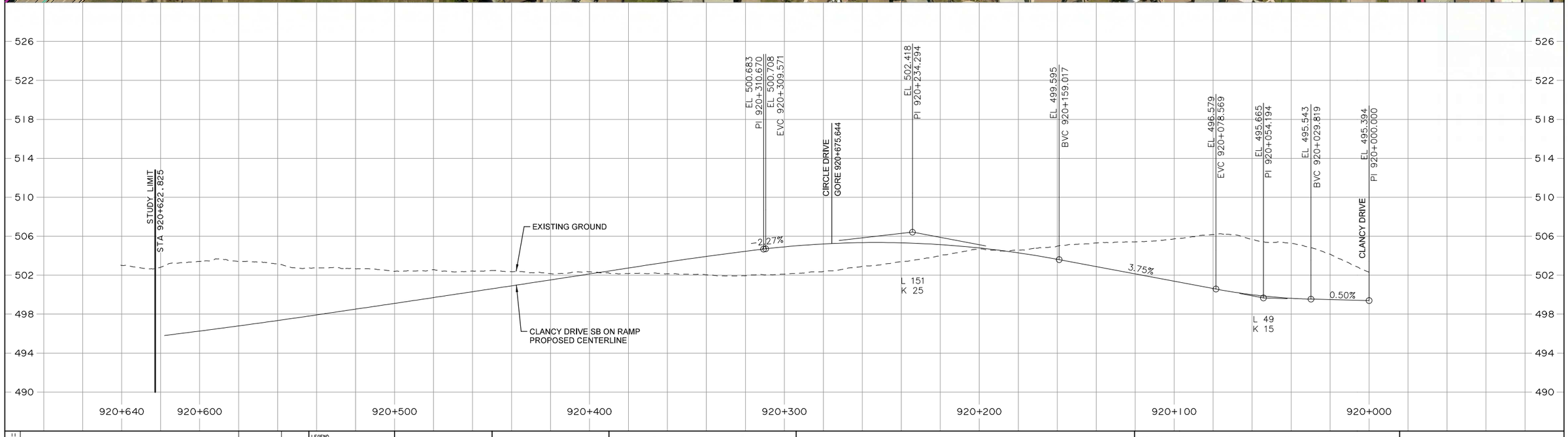

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City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – SB ON RAMP

PLAN/PROFILE

STA 920+000 TO STA 920+622.825

CHIEF ENGINEER

DATE

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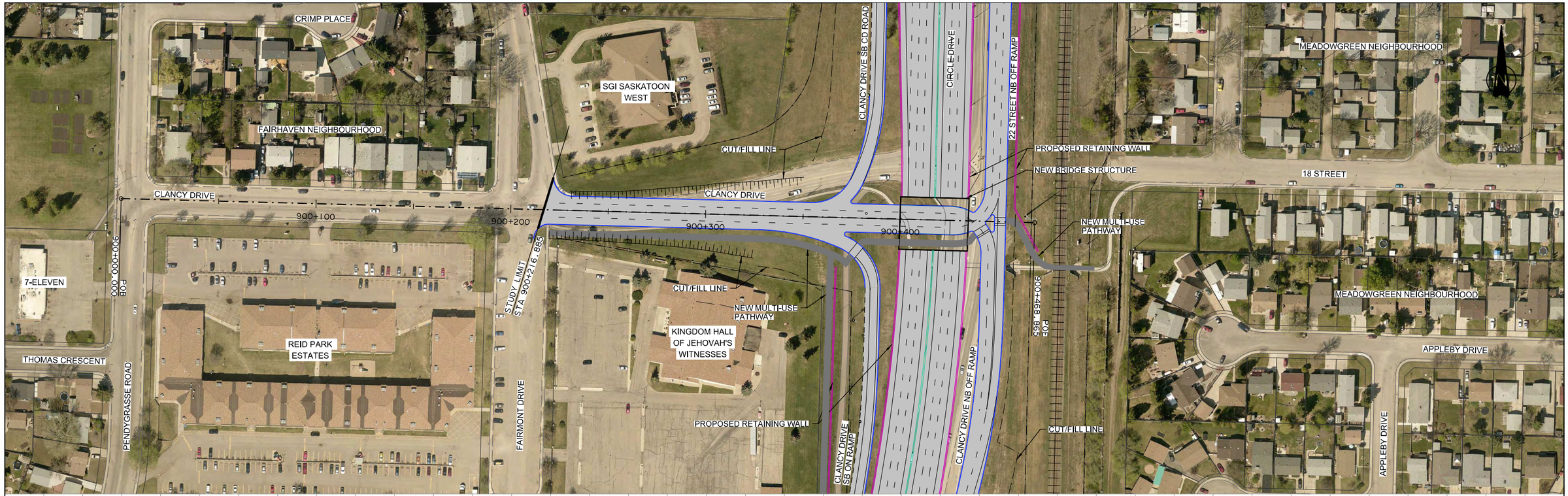
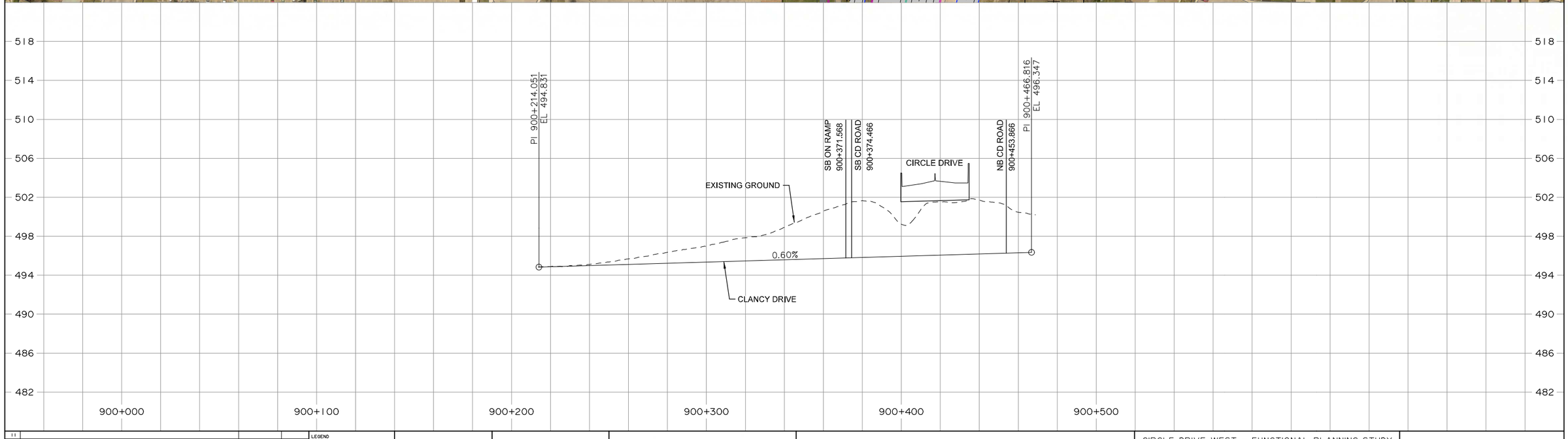
VERT. 1:200

SHEET NO. –

PLAN NO. C-R-3005





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1	ISSUED FOR DRAFT REPORT	02/23/2022	SRD
	PLAN DESCRIPTION/REVISION	DATE	BY

LEGEND
- PROPOSED RETAINING WALL
- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – MAINLINE

PLAN/PROFILE

STA 900+000 TO STA 900+468.865

CHIEF ENGINEER

DATE

SCALES :
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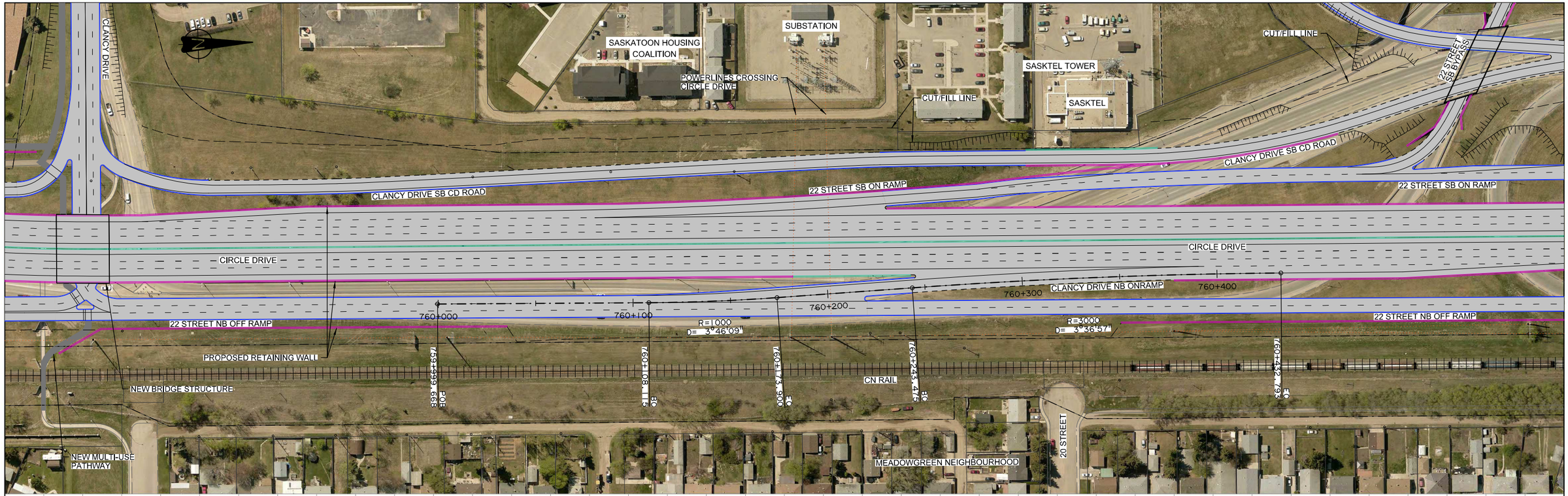
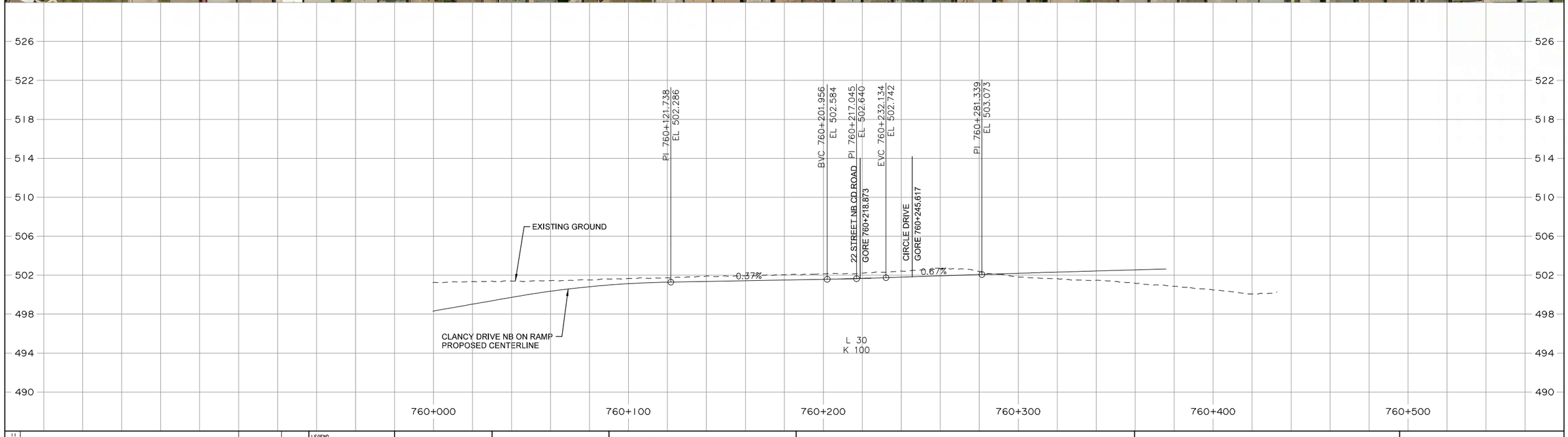
SHEET NO. –

PLAN NO. C-R-3006





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	PLAN DESCRIPTION/REVISION	DATE	BY

LEGEND
- PROPOSED RETAINING WALL
- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – NB ON RAMP

PLAN/PROFILE

STA 760+000 TO STA 760+432.793

CHIEF ENGINEER

DATE

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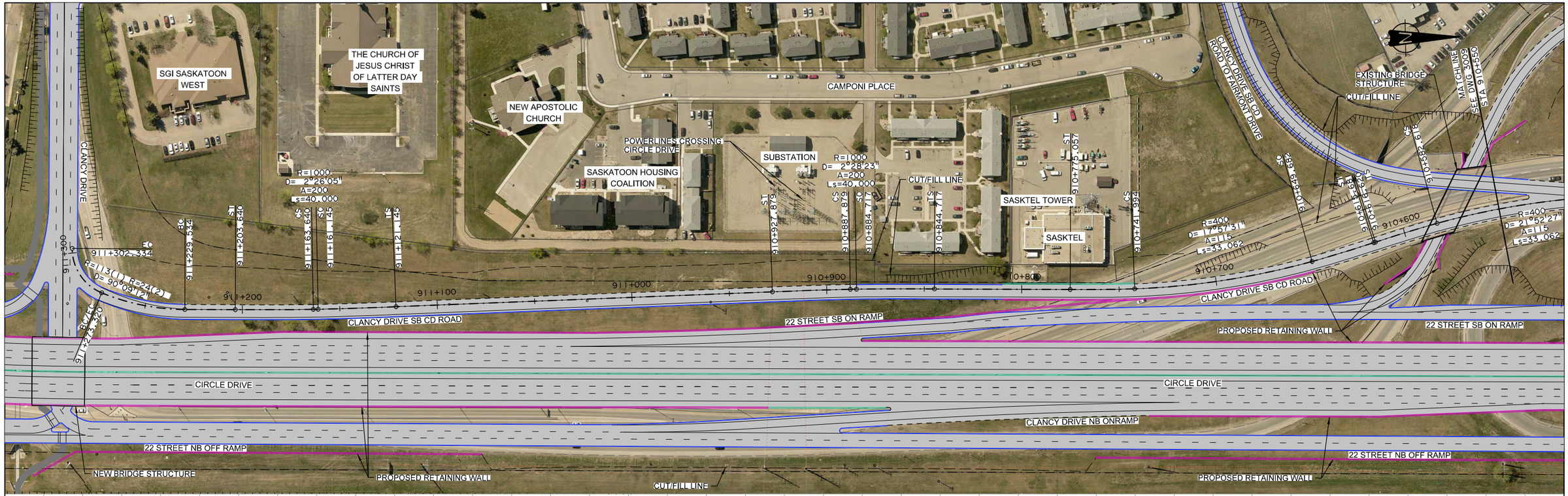
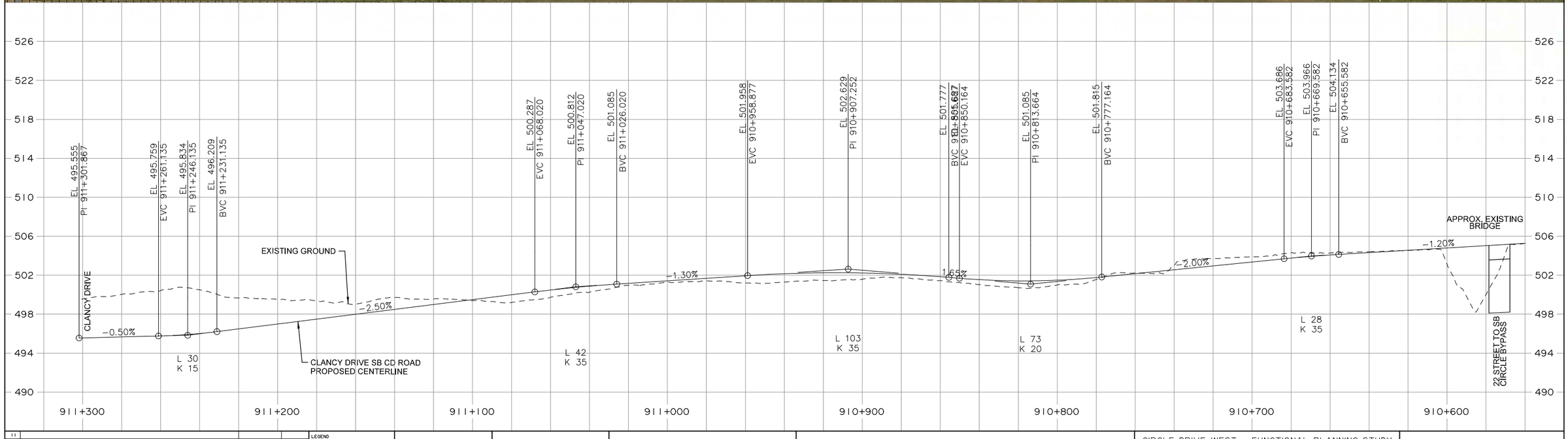
SHEET NO. –

PLAN NO. C-R-3007





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	PLAN DESCRIPTION/REVISION	DATE	BY

LEGEND
- PROPOSED RETAINING WALL
- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – SB CD ROAD

PLAN/PROFILE

STA 910+550 TO STA 911+302.334

CHIEF ENGINEER

DATE

SCALES :
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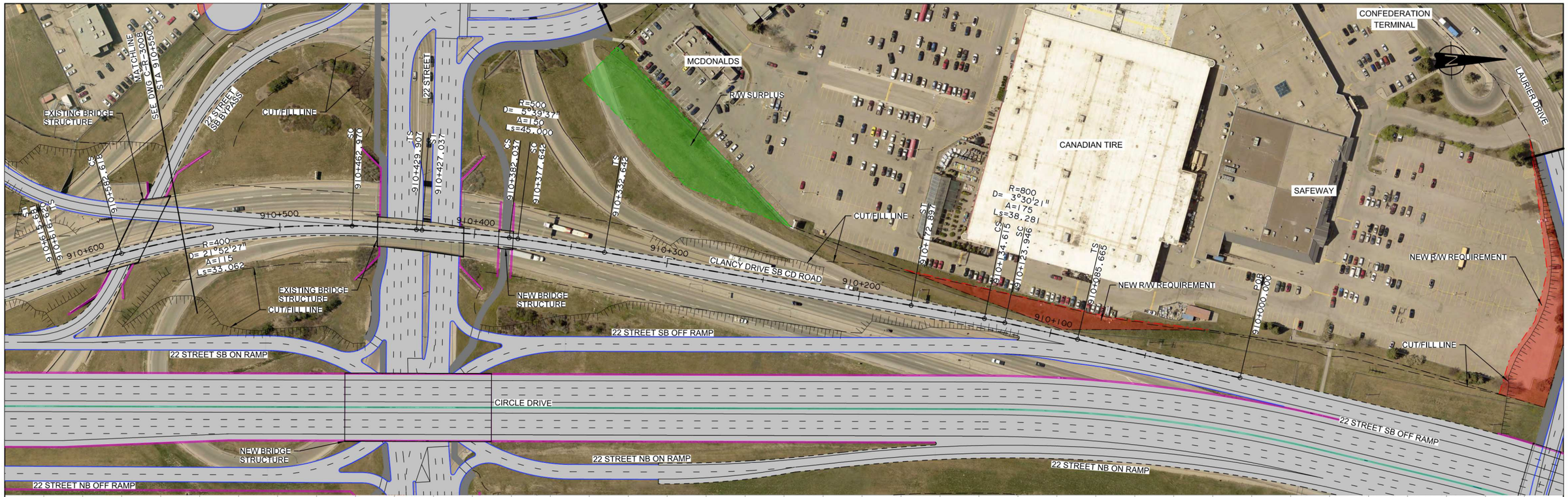
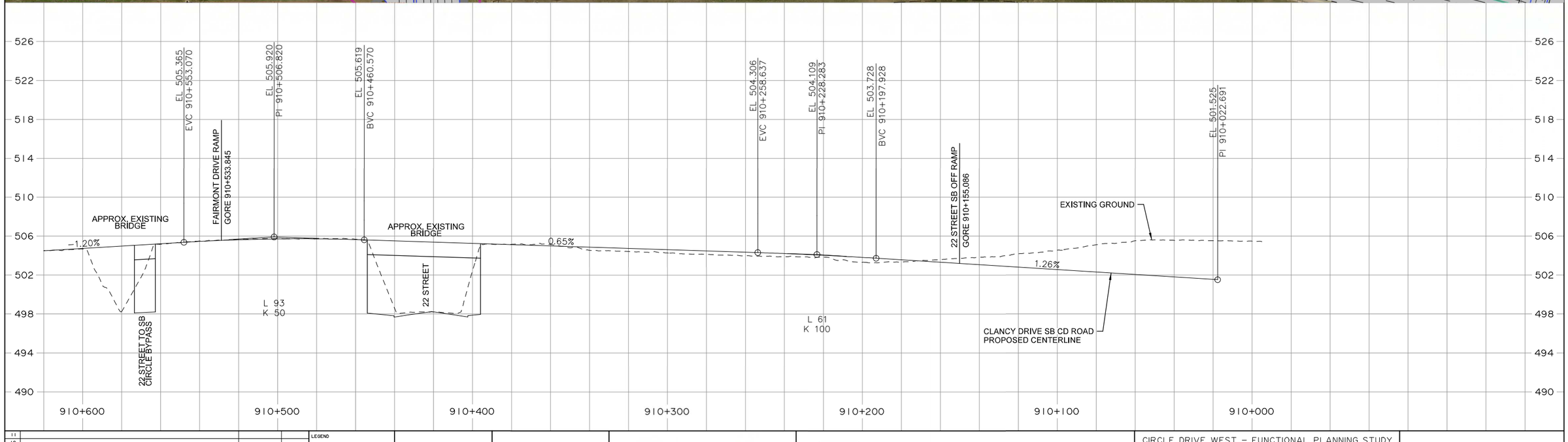
SHEET NO. –

PLAN NO. C-R-3008





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- BARRIER
- PROPOSED CURB LINE
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- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – SB CD ROAD

PLAN/PROFILE

STA 910+000 TO STA 910+550

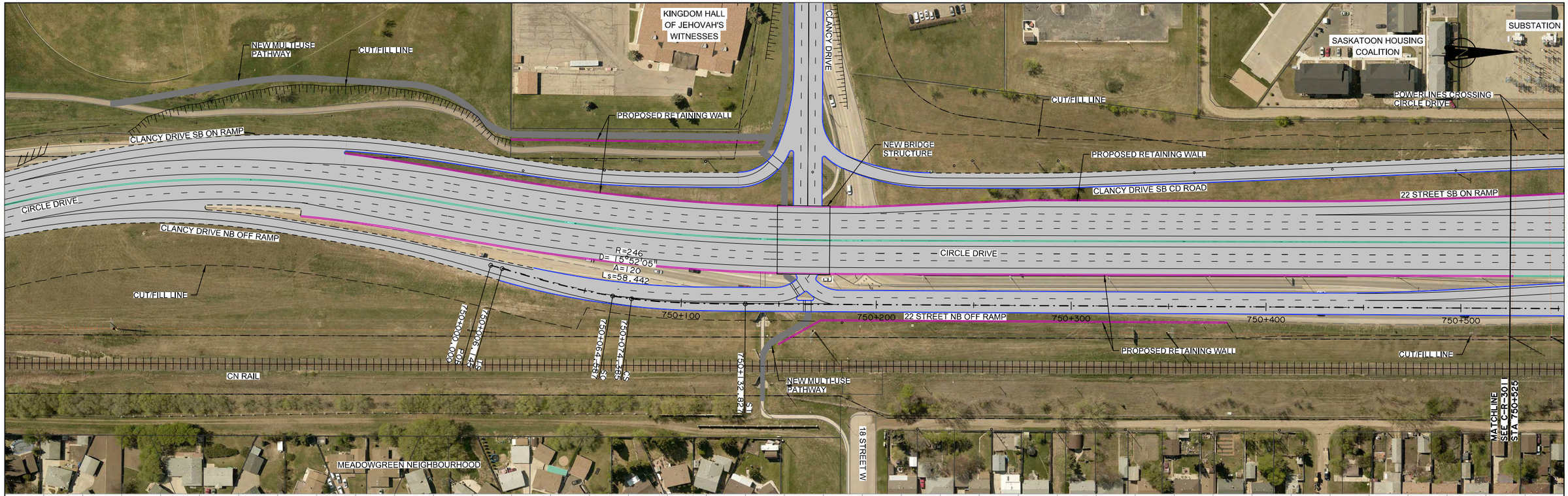
CHIEF ENGINEER

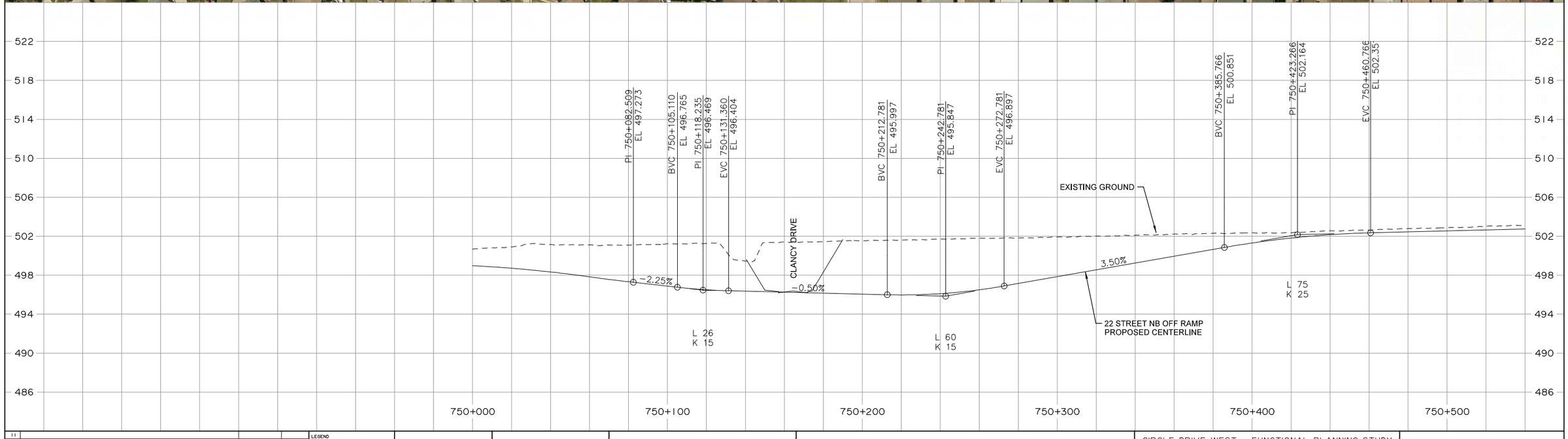
DATE

SCALES :
HOR. 1:1000
VERT. 1:200

SHEET NO. –

PLAN NO. C-R-3009





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- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – NB OFF RAMP

PLAN/PROFILE

STA 750+000 TO STA 750+525

CHIEF ENGINEER

DATE

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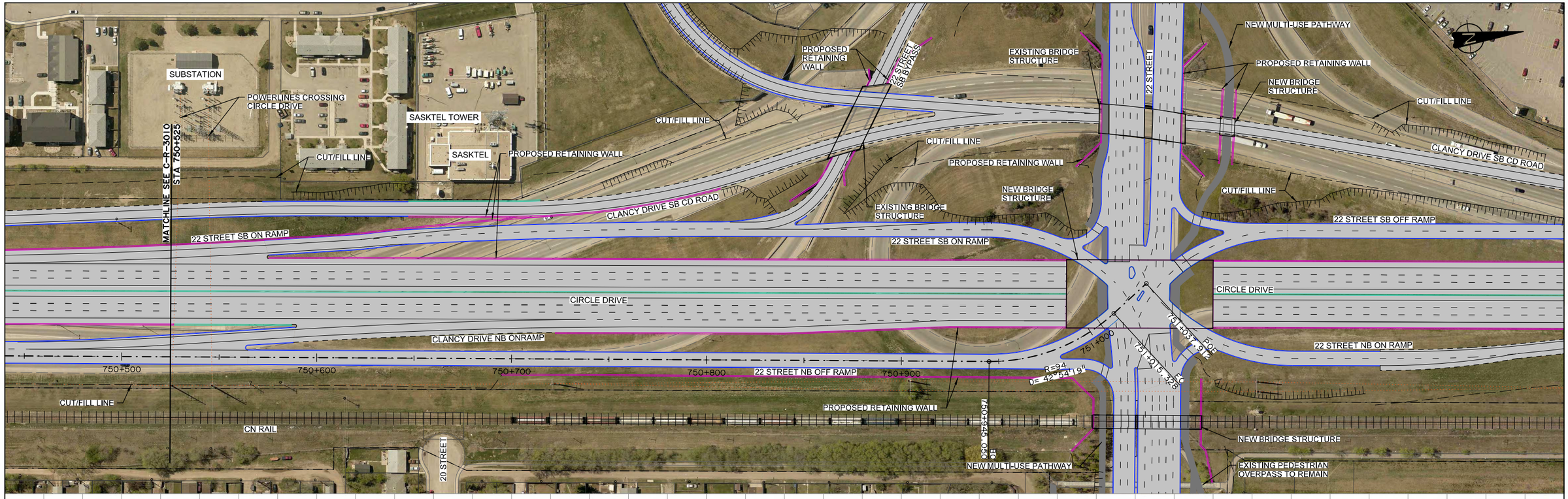
PLAN NO. C-R-3010



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- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – NB OFF RAMP

PLAN/PROFILE

STA 750+525 TO STA 751+037.912

CHIEF ENGINEER

DATE

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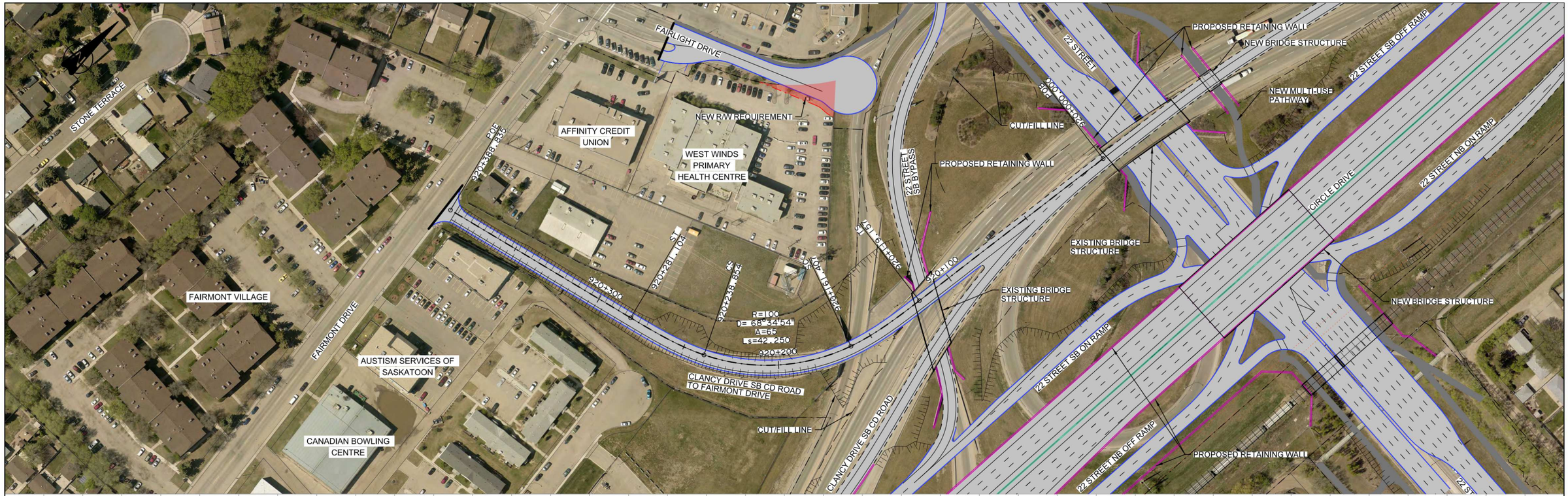
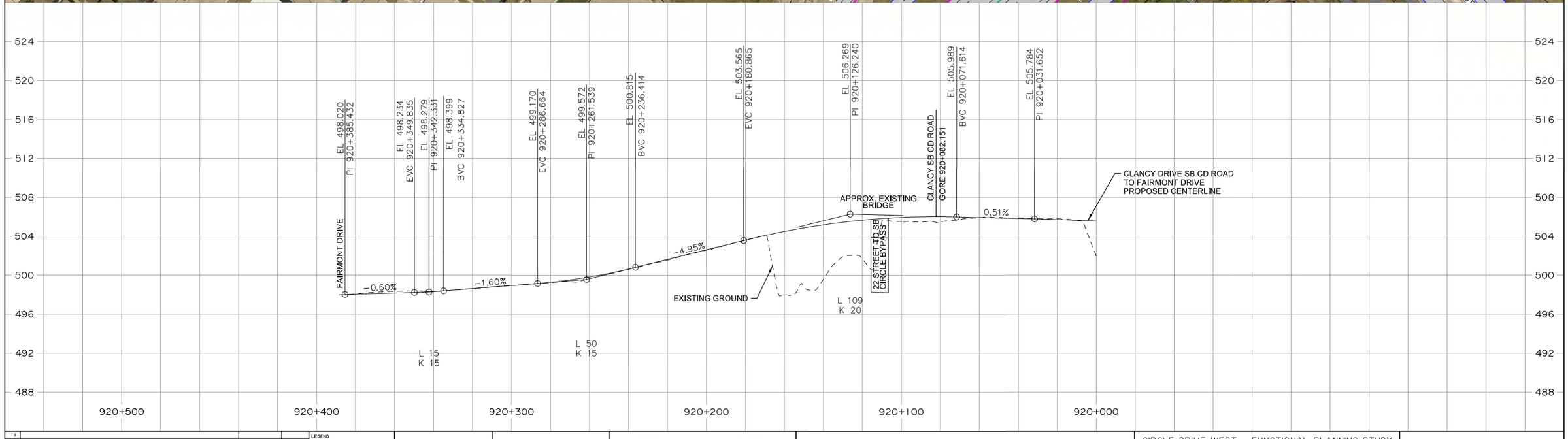
SHEET NO. –

PLAN NO. C-R-3011





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- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE – SB CD ROAD TO FAIRMONT DRIVE

PLAN/PROFILE

STA 920+000 TO STA 920+388.835

CHIEF ENGINEER

DATE

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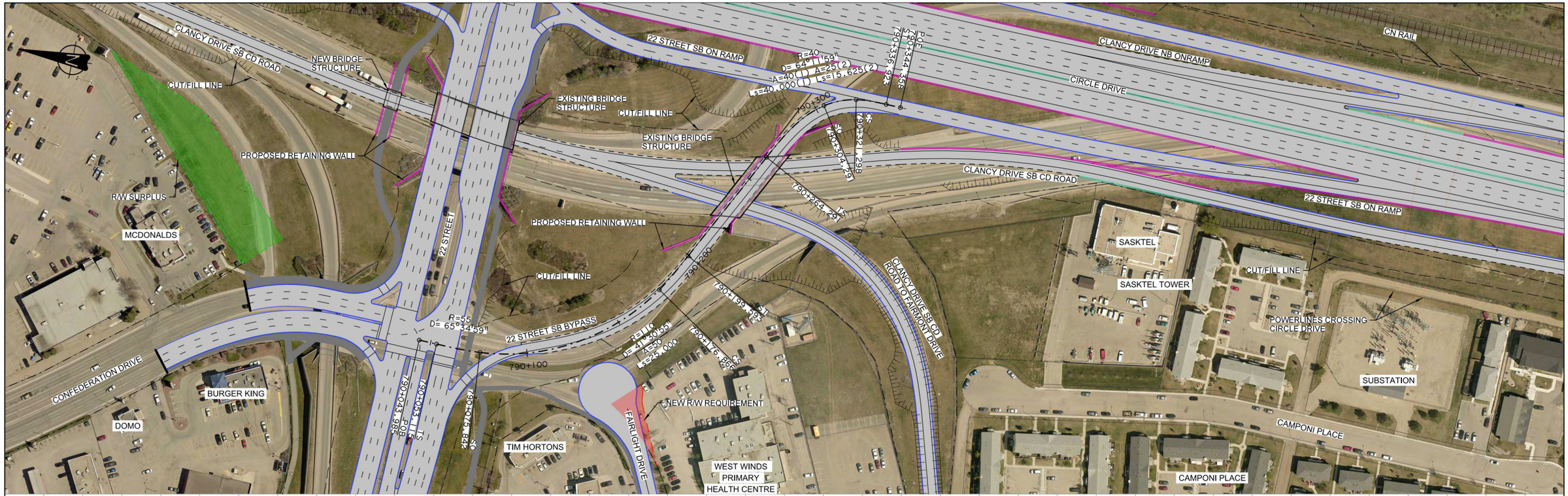
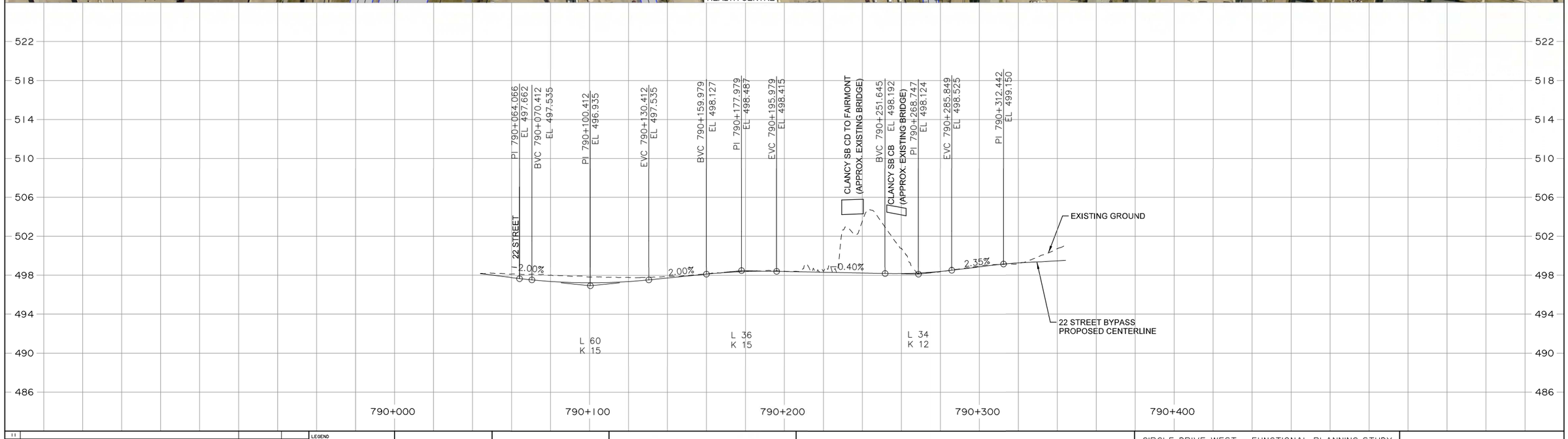
SHEET NO. –

PLAN NO. C-R-3012





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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – BYPASS

PLAN/PROFILE

STA 790+000 TO STA 790+344.358

CHIEF ENGINEER

DATE

SCALES :
HOR. 1:1000
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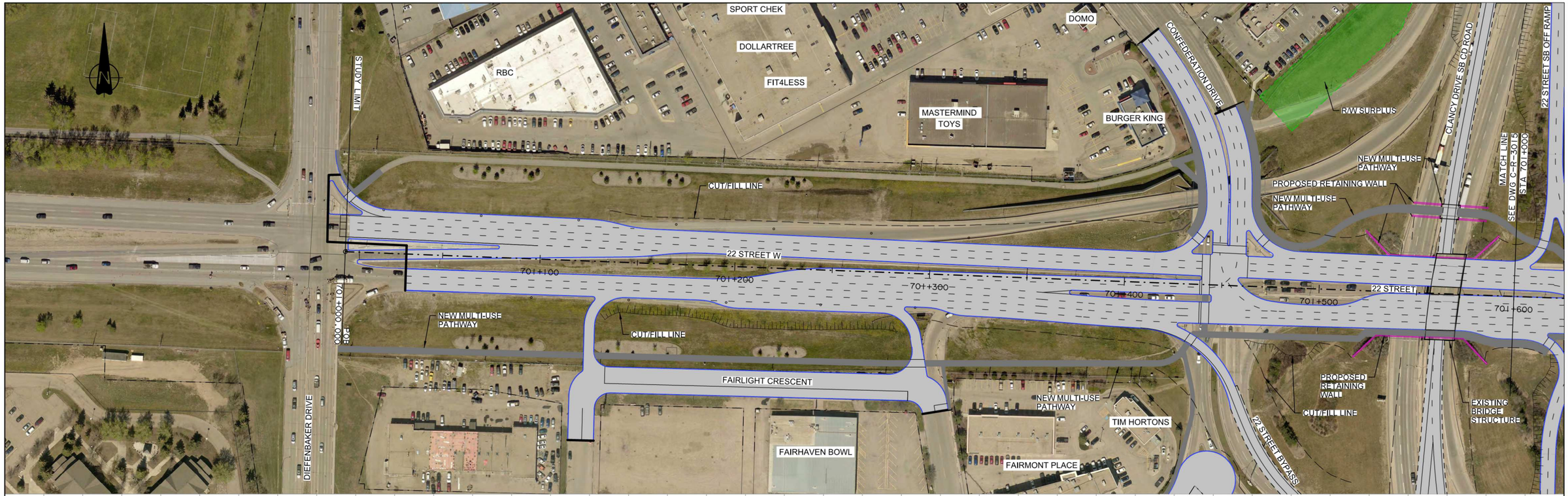
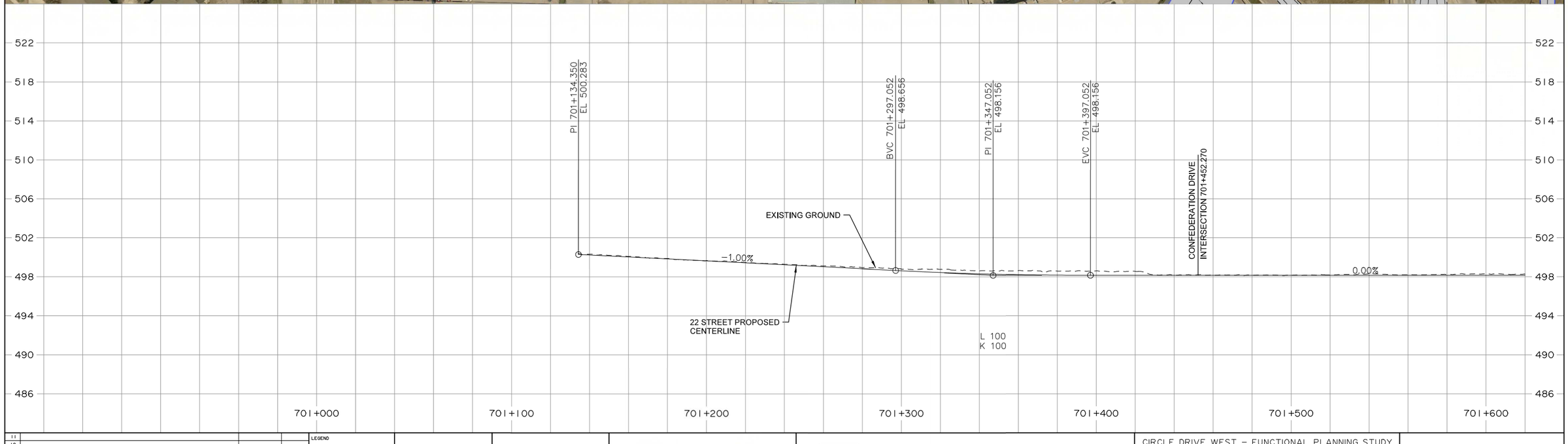
SHEET NO. –

PLAN NO. C-R-3013





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1	ISSUED FOR DRAFT REPORT	02/23/2022	SRD
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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – MAINLINE

PLAN/PROFILE

STA 701+000 TO STA 701+600

CHIEF ENGINEER

DATE

SCALES :
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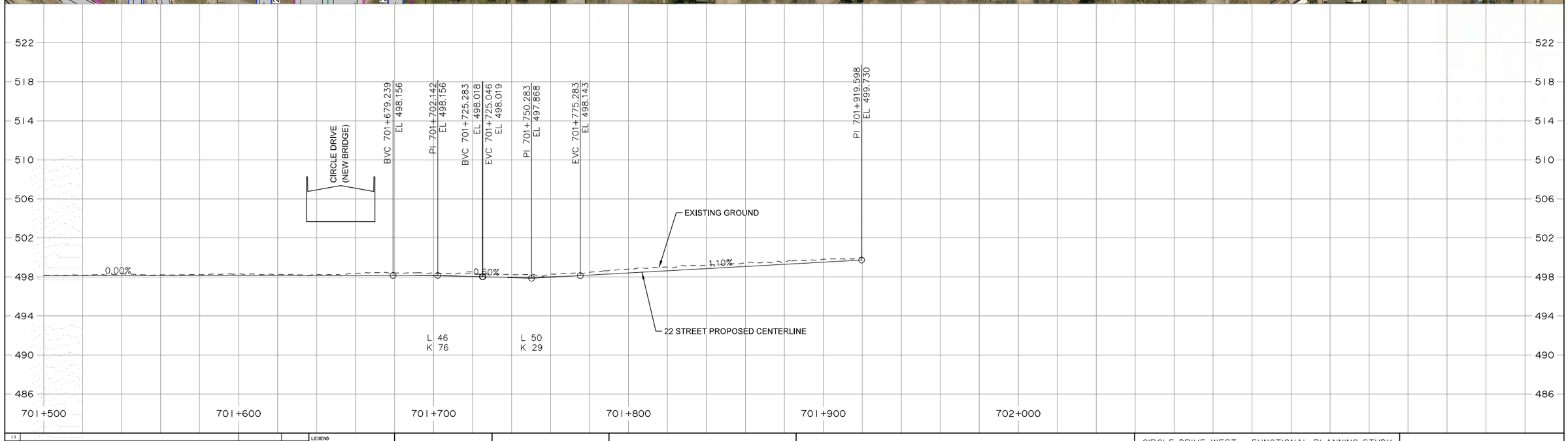
SHEET NO. –

PLAN NO. C-R-3014



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LEGEND
- PROPOSED RETAINING WALL
- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – MAINLINE

PLAN/PROFILE

STA 701+600 TO STA 701+919.921

CHIEF ENGINEER

DATE

SCALES :
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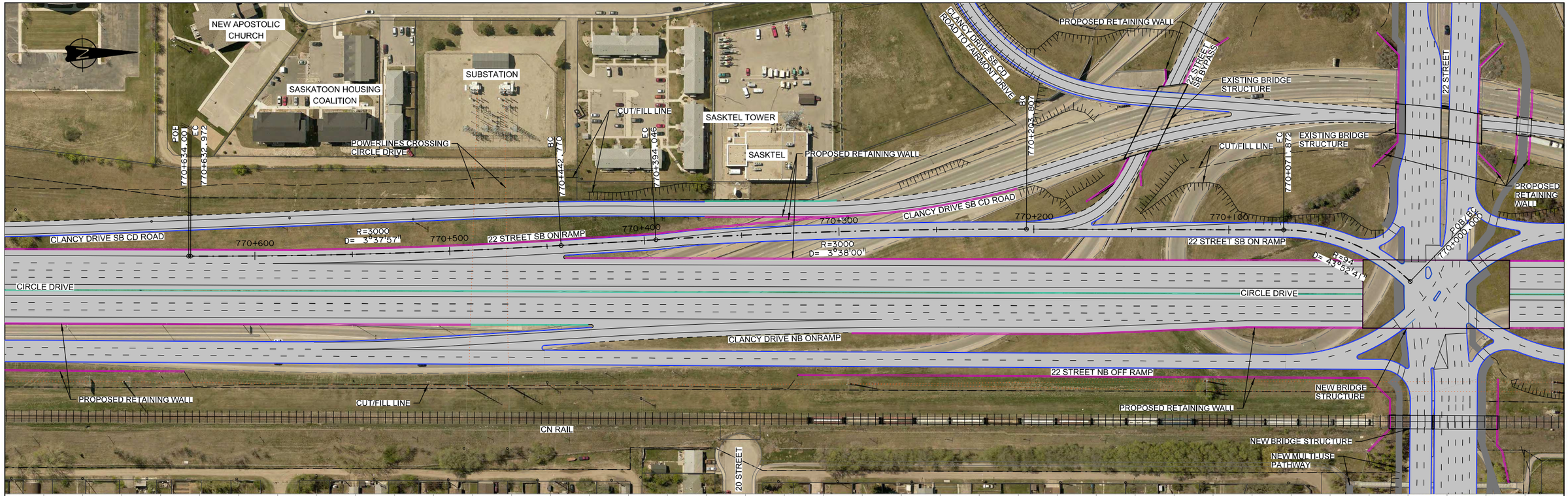
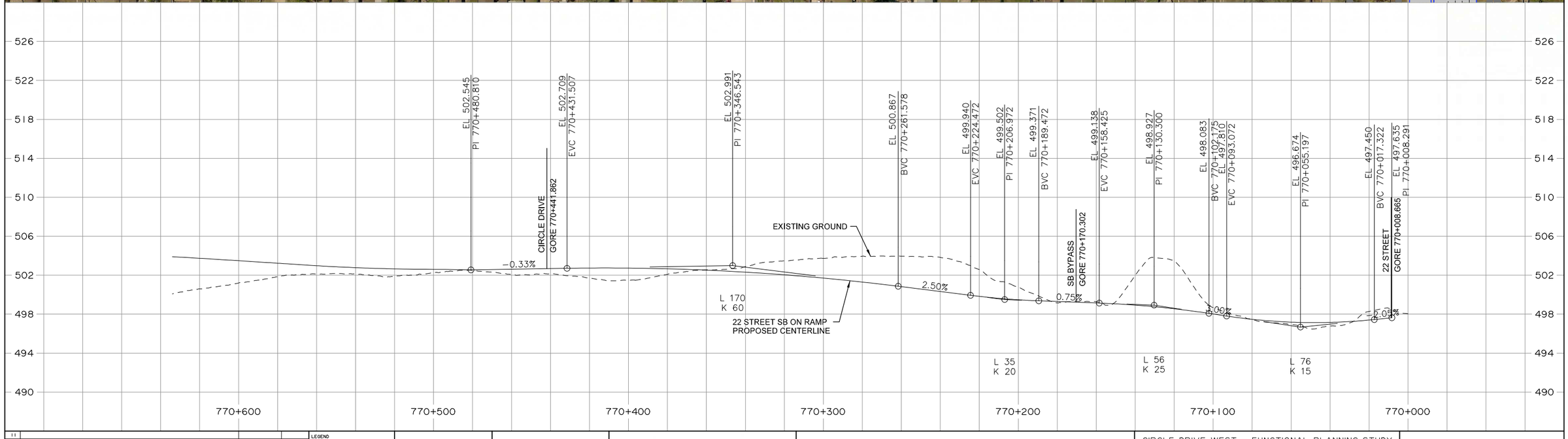
PLAN NO. C-R-3015





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LEGEND
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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – SB ON RAMP

PLAN/PROFILE

STA 770+000 TO STA 770+634.001

CHIEF ENGINEER

DATE

SCALES :
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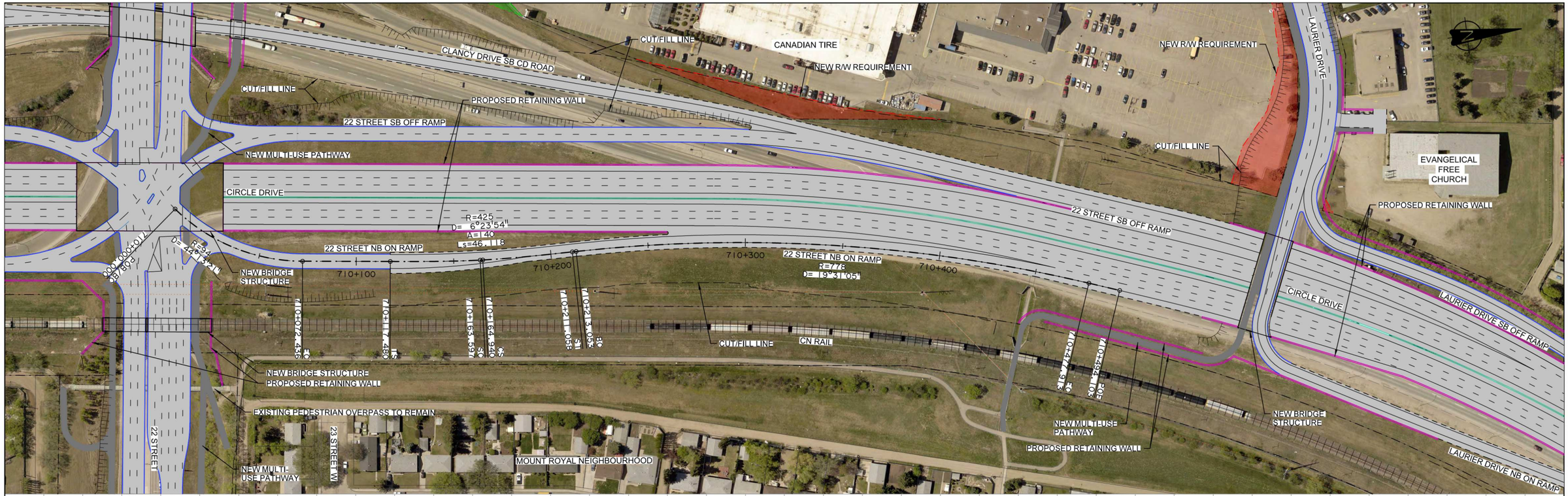
SHEET NO. –

PLAN NO. C-R-3016



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LEGEND
- PROPOSED RETAINING WALL
- BARRIER
- PROPOSED CURB LINE
- RIGHT OF WAY BOUNDARY
- EXIST. EDGE OF PAVEMENT
- POWER TRANSMISSION LINE

SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – NB ON RAMP

PLAN/PROFILE

STA 710+000 TO STA 710+494.103

CHIEF ENGINEER

DATE

SCALES :
HOR. 1:1000
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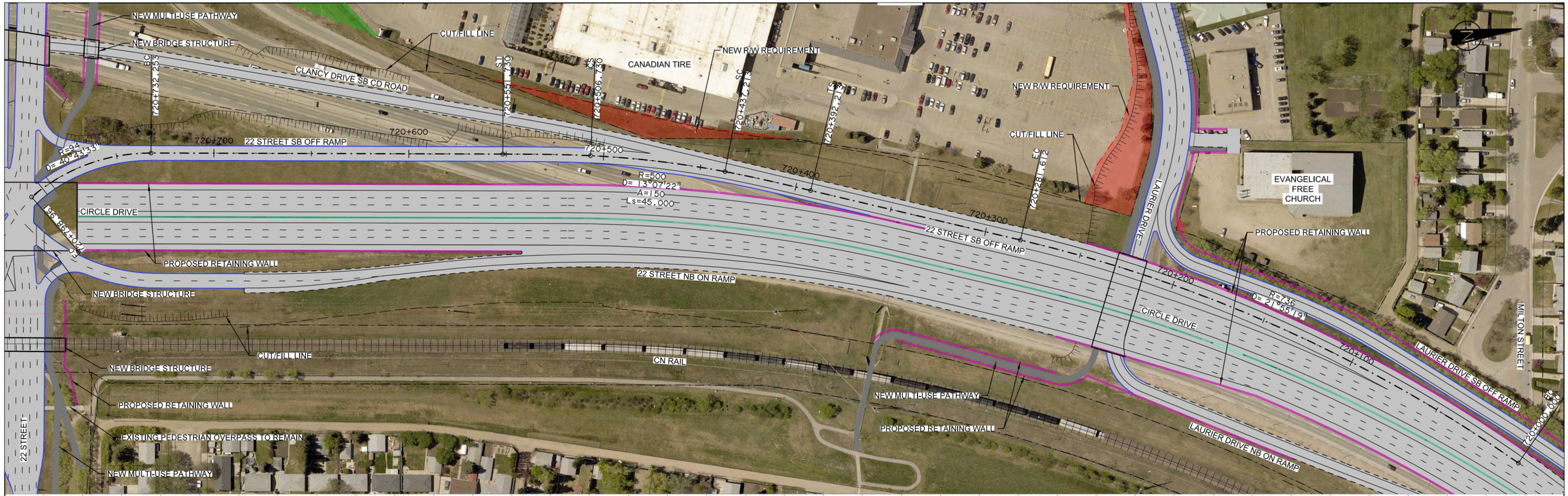
SHEET NO. –

PLAN NO. C-R-3017



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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET – NB ON RAMP

PLAN/PROFILE

STA 720+000 TO STA 720+798.961

CHIEF ENGINEER

DATE

SCALES :
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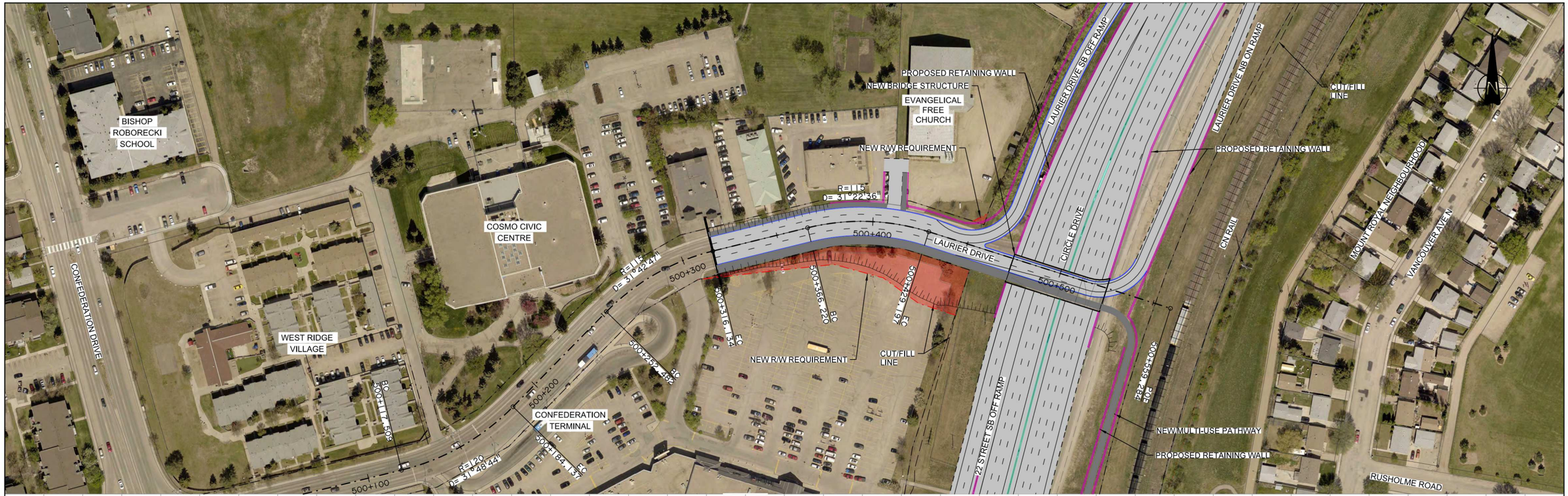
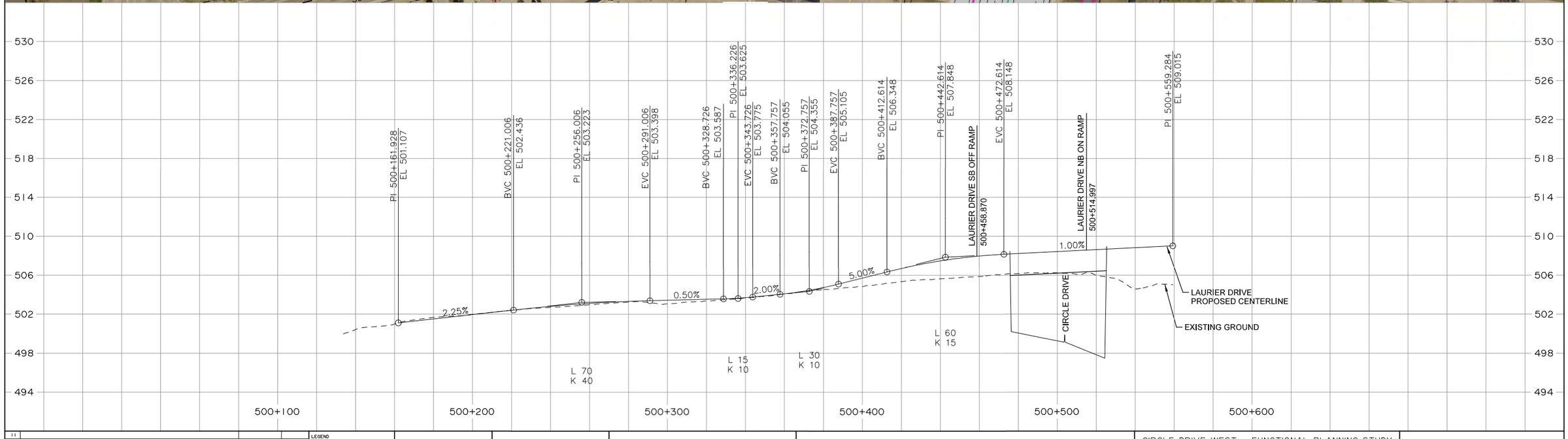
SHEET NO. –

PLAN NO. C-R-3018





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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

LAURIER DRIVE – MAINLINE

PLAN/PROFILE

STA 500+100 TO STA 500+559.284

CHIEF ENGINEER

DATE

SCALES :
HOR. 1:1000
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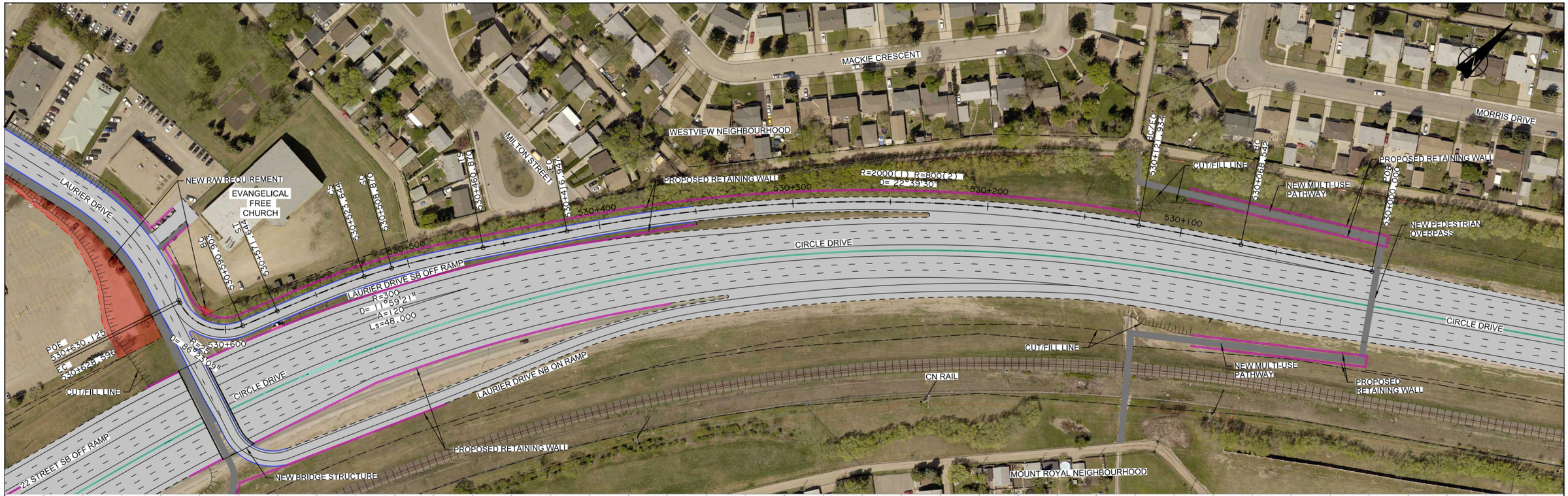
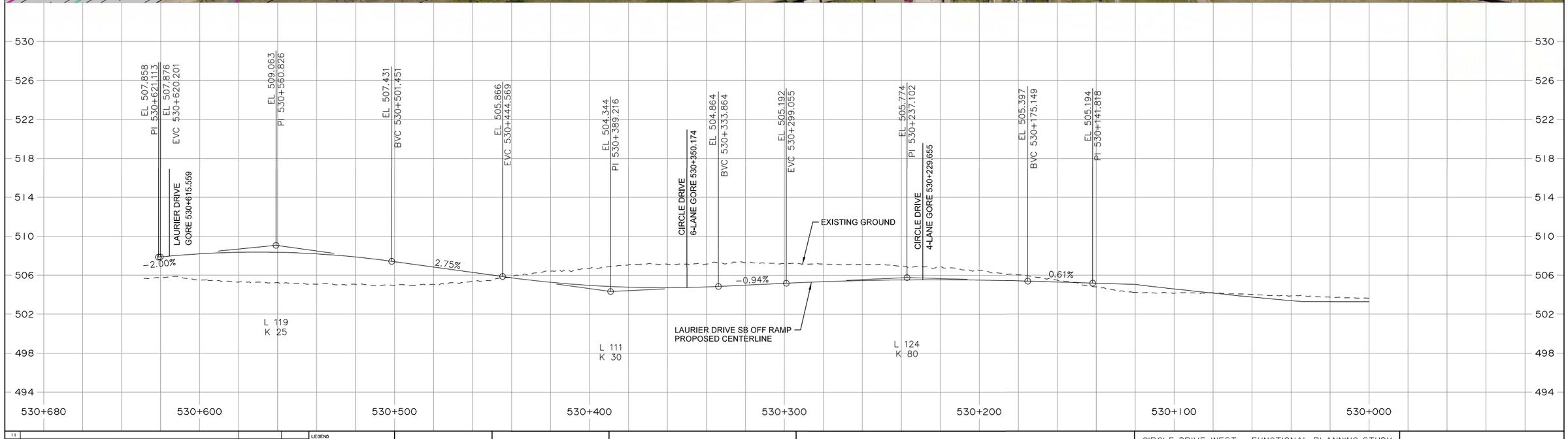
SHEET NO. –

PLAN NO. C-R-3019





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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

LAURIER DRIVE – SB OFF RAMP

PLAN/PROFILE

STA 530+000 TO STA 530+630.125

CHIEF ENGINEER

DATE

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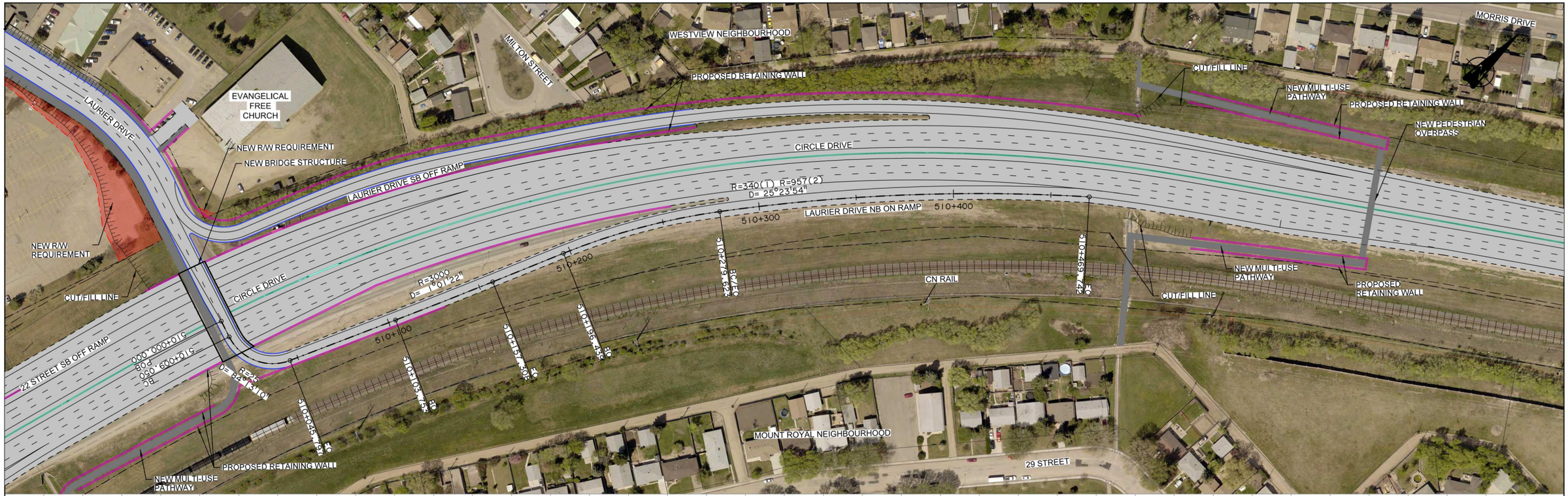
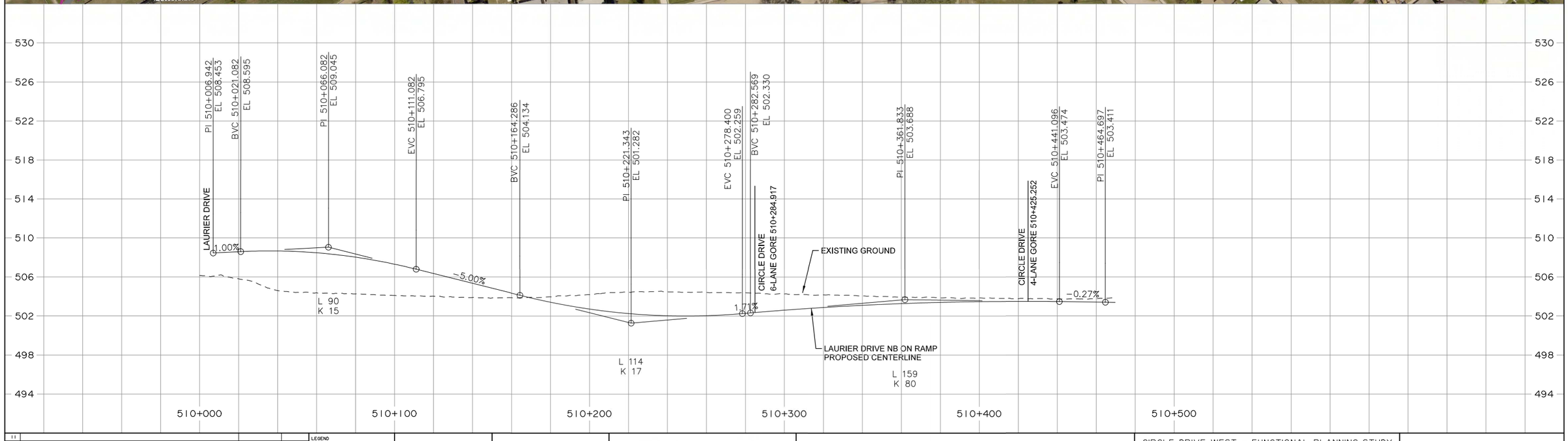
SHEET NO. –

PLAN NO. C-R-3020





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SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

LAURIER DRIVE – NB ON RAMP

PLAN/PROFILE

STA 510+000 TO STA 510+469.742

CHIEF ENGINEER

DATE

SCALES :
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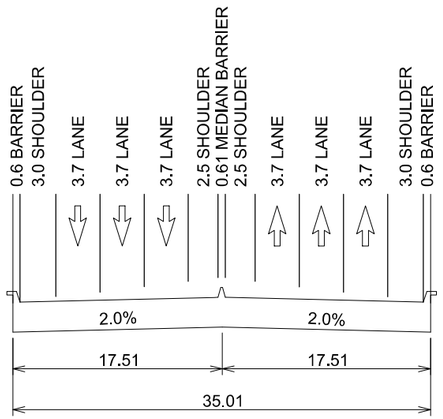
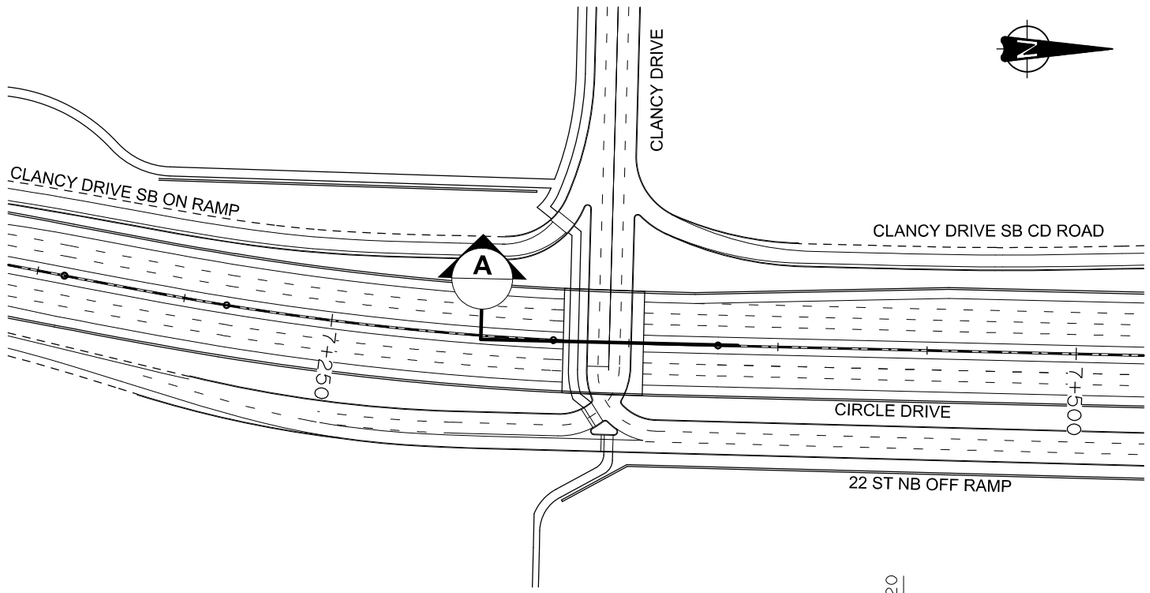
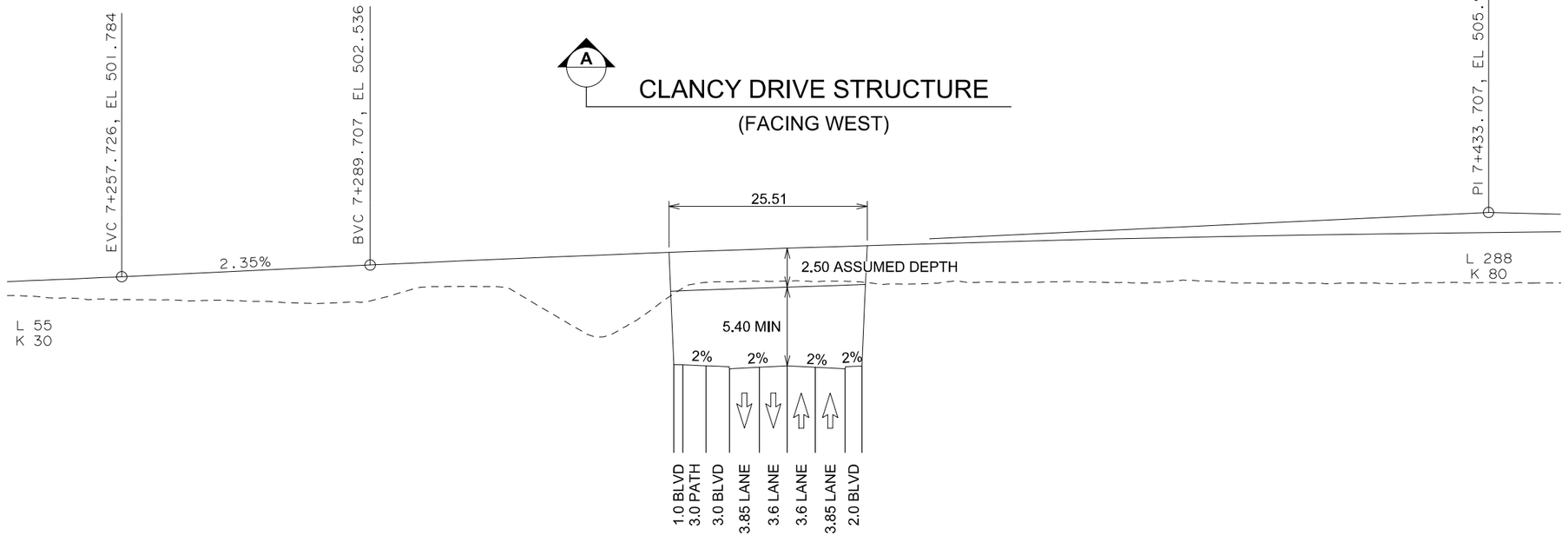
PLAN NO. C-R-3021



CIRCLE DRIVE

LOCATION PLAN





A

CLANCY DRIVE STRUCTURE

(FACING WEST)

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	PLAN DESCRIPTION/REVISION	DATE	BY	SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

CLANCY DRIVE –
STRUCTURAL ARRANGEMENTS

STA 7+840 AND STA 8+285

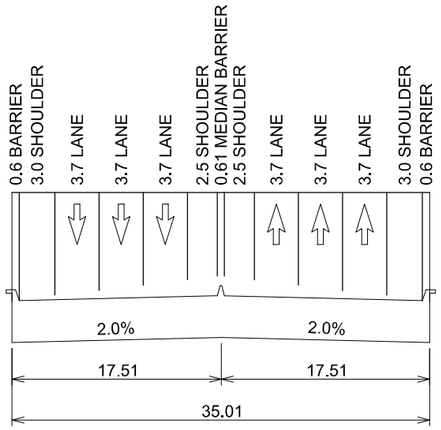
CHIEF ENGINEER

SCALES :
HOR. NTS
VERT. NTS

DATE

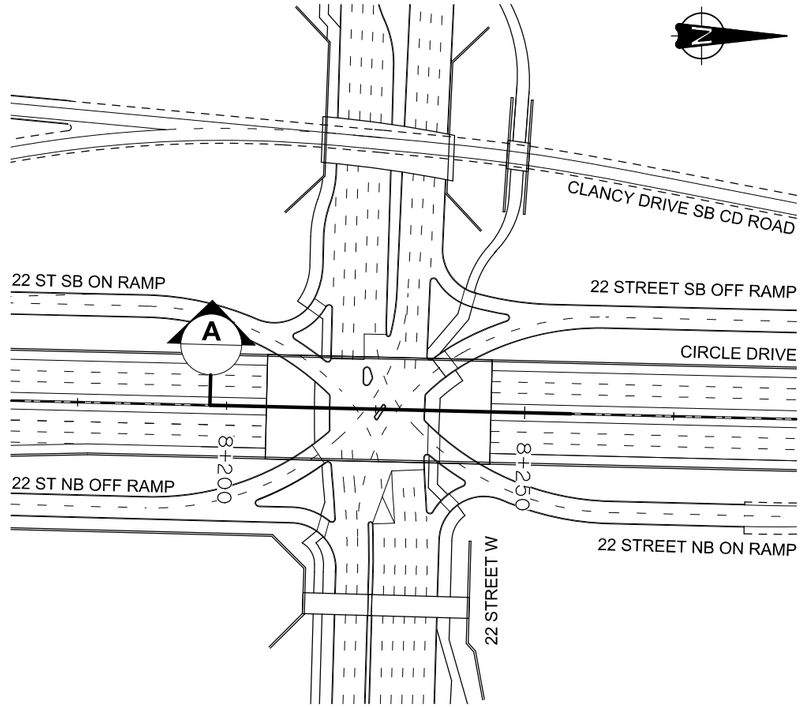
SHEET NO. –

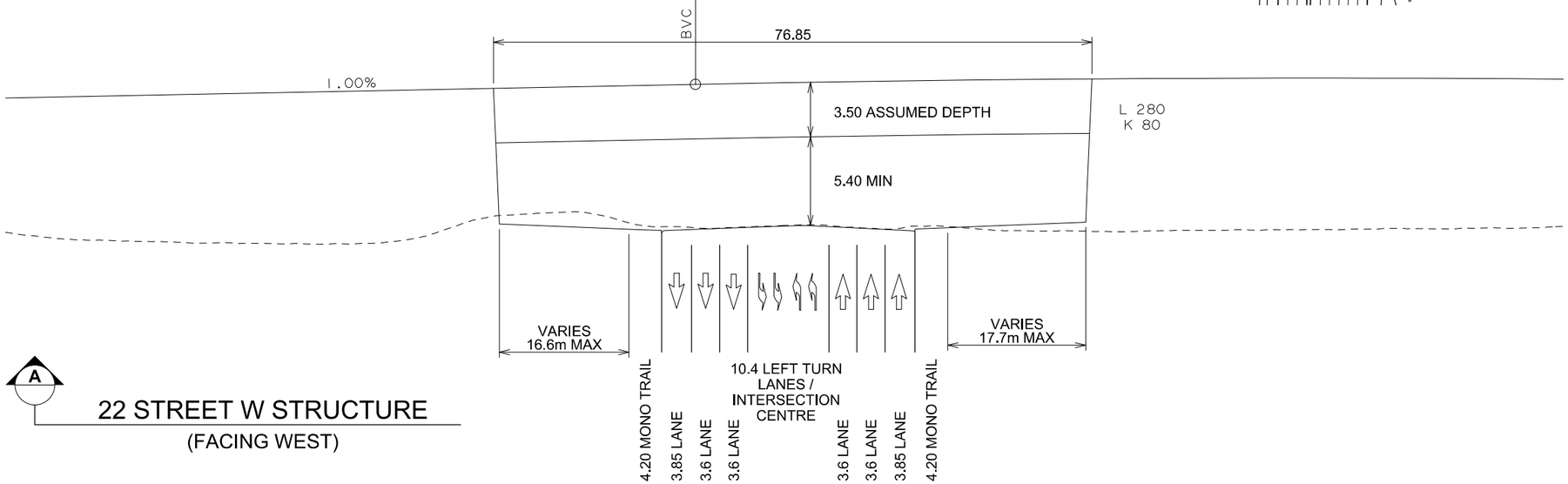
PLAN NO. C-R-4001



CIRCLE DRIVE

LOCATION PLAN





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22 STREET W STRUCTURE

(FACING WEST)

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	PLAN DESCRIPTION/REVISION	DATE	BY	SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

22 STREET W –
STRUCTURAL ARRANGEMENTS

STA 8+100 AND STA 8+300

CHIEF ENGINEER

DATE

SCALES :
HOR. NTS
VERT. NTS

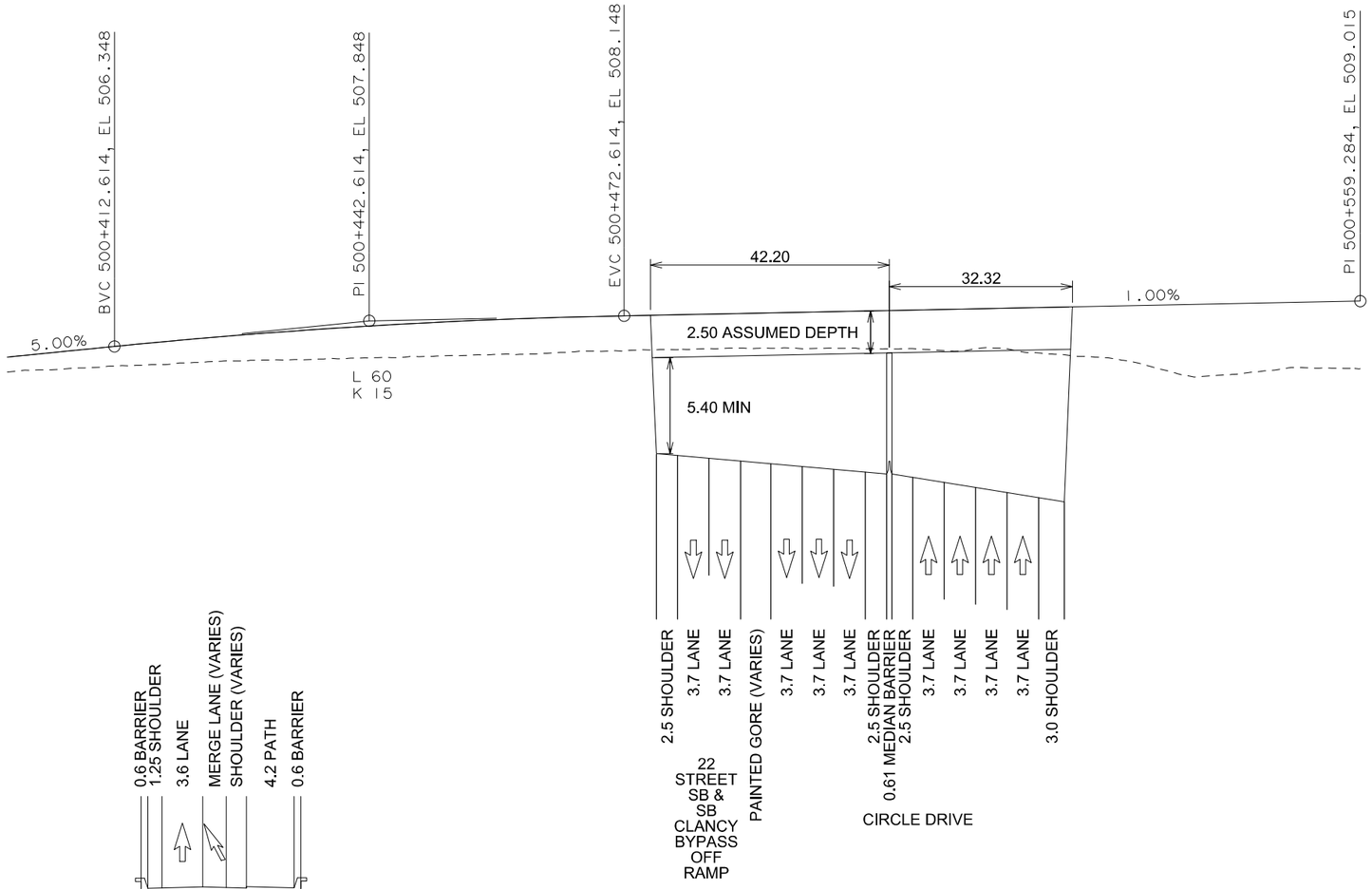
SHEET NO. –

PLAN NO. C-R-4002

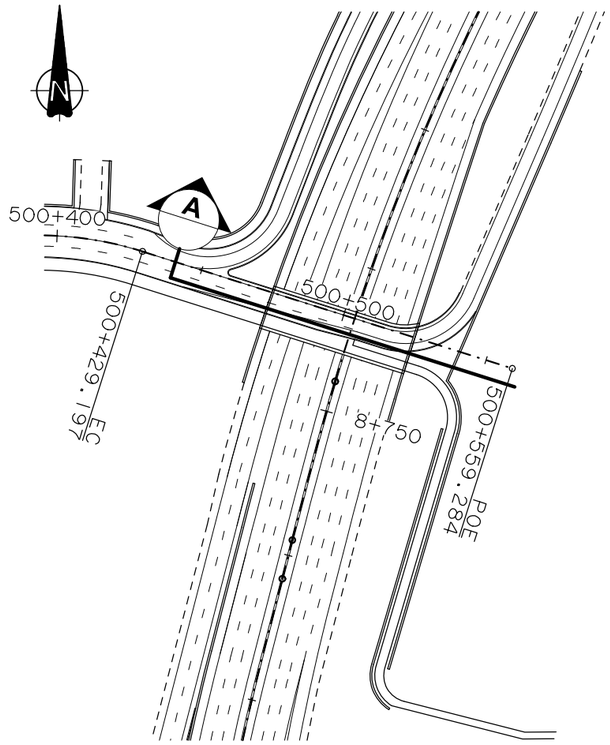
A

LAURIER DRIVE STRUCTURE

(FACING NORTH-EAST)



LOCATION PLAN



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	PLAN DESCRIPTION/REVISION	DATE	BY	SEAL

CERTIFICATE OF AUTHORIZATION

CIMA+

City of Saskatoon
Transportation & Utilities Department

CIRCLE DRIVE WEST – FUNCTIONAL PLANNING STUDY

LAURIER DRIVE –
STRUCTURAL ARRANGEMENTS

STA 500+400 TO STA 500+600

CHIEF ENGINEER

SCALES : HOR. NTS VERT. NTS

DATE

SHEET NO. –

PLAN NO. C-R-4003

K

Appendix K
Multi-Use Pathway Crossing Concept, 22nd Street at Confederation Drive

MEMO 9

DATE	:	January 7, 2022
FROM	:	Henry Devos
PROJECT	:	City of Saskatoon, Circle Drive West – Functional Planning Study
SUBJECT	:	MUT Pathway, Crossing 22nd Street near Confederation Drive

Introduction

Circle Drive is a core route (urban ring road) in the City of Saskatoon's road network. It supports mobility not only for City residents, but for inter-regional traffic flows through the city. The City recently constructed Circle Drive South to a freeway standard from Idylwyld Drive to 11th Street. As a result, the new crossing of the South Saskatchewan River means that Circle Drive West (and 22nd Street West) now connect Highways 7 & 14 west and Highway 16 north (via Neault Road) with Highways 11 & 16 south.

In response to the increasing truck traffic, congestion levels and safety concerns, the City plans to continue upgrading Circle Drive to a freeway standard. The recommended plan for Circle Drive West includes:

1. Replacing the signalized Clancy and Laurier Drive intersections with interchanges using a design which attempts to compensate for the substandard interchange spacing.
2. Replacing the existing unconventional interchange at 22nd Street with a compact Single-Point Urban configuration.
3. Improving the performance of the adjacent intersection of 22nd Street with Confederation Drive to, in part, compensate for its exceptionally short offset from Circle Drive.

Conclusion: The long-term traffic implications for 22nd Street West are similar to the increased demand and associated issues facing Circle Drive West. 22nd Street will continue to experience increasing truck and through traffic. This includes supporting future growth areas in west Saskatoon, e.g., Blairmore Development Area.

Concern with Recommended Plan

Pedestrians wishing to cross 22nd Street between Circle Drive and Diefenbaker Drive (between the Confederation Mall and Fairlight Drive shopping areas) would need to use either the already congested Diefenbaker Drive intersection or the pedestrian overpass near the CNR tracks immediately east of Circle Drive.

Question: Is there an option for pedestrians and cyclists to cross 22nd Street more directly between the north and south business areas?

22nd Street West

22nd Street is part of the City's Major Street Network and one of several spokes connecting the future Saskatoon Freeway and provincial highway network with the Circle Drive Ring Road. Posted at 60 km/h, 22nd Street is a 4-lane divided roadway carrying both local commuter and inter-regional (e.g., Highways 7 & 14 west, Highway 16 north) traffic flows into and through the City.

The City's Transportation Master Plan (Street Network Plan) designates 22nd Street as a Freeway/Expressway facility between Circle Drive and Highways 7/14. Saskatoon's TMP defines 'Freeway/Expressway' as a '*High Speed Controlled Access*' facility. The City is protecting 22nd Street to ultimately achieve six core lanes (3 each way).

Intersection spacing along 22nd Street near Circle Drive is substandard for an expressway, less than 100m between Confederation and Circle Drives (a desirable minimum of 400m is recommended by TAC for signal progression) and its intersection with Confederation Drive mixes local access with interchange operations.

Residents in the neighbourhoods immediately west of Circle Drive have come to rely on the two existing signalized intersections on Circle Drive for travel in/out of their neighbourhoods. The recommended plan to convert the Clancy and Laurier Drive intersections to interchanges was unable to restore all current travel paths, meaning more traffic will follow 22nd Street to Diefenbaker Drive to enter nearby neighbourhoods.

There are two existing pedestrian overpasses crossing 22nd Street near the study area.

- 300m east of Confederation Drive, connecting the Mount Royal and Meadowgreen neighbourhoods.
- 1.75 km west of Confederation Drive, connecting the Pacific Heights neighbourhood with the Shaw Centre.

Conclusion: The City has recognized 22nd Street's role as a high-speed, controlled-access, expressway link in the major street network that will ultimately be 6-lanes wide, including grade-separating the MUT Pathway system.

Provincial Highway Connectors

Given continued urban development along the 22nd Street corridor, and the absence of a southwest leg in the future Saskatoon Freeway (and possibly also without the now delayed northwest leg), it will become increasingly important to have an expressway class connector, or penetrator, through an expanding City to the Circle Drive ring road, connecting the provincial highway network and the region west of the City both into and through the City.

22nd Street is a key urban roadway. The City will need to continue to maintain 22nd Street as a consistent, high standard, access-managed facility, critical to the long-term performance of the City's major street network, and supporting the efficient movement of people and goods and economic development.

Reference: Alberta Transportation established *Penetrator Agreements* with the Cities of Calgary and Edmonton to ensure that traffic generated in the rural and urban areas outside the two Cities will retain efficient, high standard, access to ring roads inside the cities. *Highway Penetrators* refers to the extension of primary or secondary highways and other major arterials with provincial (or regional) significance, which enter the cities to reach the ring road. Without a southwest leg,

the future Saskatoon Freeway will rely on 22nd Street/Circle Drive for this regional role.

West Saskatoon Road Network

There are two east-west routes parallel to 22nd Street that carry traffic into Saskatoon and connect with Circle Drive.

33rd Street West is a four-lane divided roadway, 1.6 km north of 22nd Street. Posted at 50 km/h, 33rd Street supports residential land uses and includes a parallel parking lane in sections. 33rd Street is not an access-controlled roadway, supporting driveways along the first 3 km west of Circle Drive and roundabouts in the final 2 km to Neault Road.

11th Street West is a two-lane undivided roadway, 1.6 km south of 22nd Street, connecting Circle Drive with Highway 7. Posted at 50 km/h, 11th Street supports a mix of residential and industrial land uses and is also not an access-controlled roadway. 11th Street connects to Circle Drive at a problematic interchange, complicated by several rail crossings that introduce frequent traffic delay. The rail crossings have been a long-standing concern for area residents. The City has a proposed interchange plan that would grade separate the rail lines; however, it is an ambitious plan and construction is not anticipated for many decades.

Conclusion: The parallel 11th Street and 33rd Street roadways are collector class facilities. They cannot compensate for reduced capacity along 22nd Street West, the only high-standard, divided, access-controlled roadway and corridor capable of carry increasing traffic volumes in support of city and regional growth.

Proposed Changes to 22nd Street West/Confederation Drive Intersection

To compensate for the exceptionally short offset from Circle Drive and to improve intersection performance consistent with 22nd Street's classification as a high-speed Freeway/Expressway facility, the intersection will be converted from a four-legged to a 'T' configuration. Access to Circle Drive West is focused on the Single Point Urban interchange and the intersection will primarily provide access to Confederation Drive and the mall.

The Confederation Drive traffic signal will be coordinated with the ramp terminal signal at Circle Drive. The short spacing between the two intersections requires additional lanes to accommodate turning and queuing volumes resulting in an 8-lane cross-section between Confederation and Circle Drives.

Impact of an At-Grade Pedestrian Crossing

Performance of the proposed 'T' intersection configuration was assessed based on including an at-grade pedestrian crossing, north-south along the west side of Confederation Drive, as follows:

+ The pedestrians would need to cross 8 traffic lanes plus the median/island widths. This would measure at least 36m, from outside face-of-curb to outside face-of-curb. See attached **Sketch #1**.
+ Total available north-south pedestrian crossing time in the assumed signal timing for the 500,000 population horizon is 30 sec, based on meeting required east-west green signal time along 22nd Street.

- Total north-south pedestrian crossing (walking) time at 1.0 m/s to clear the approximately 36m distance is 36 sec.
- Assuming the relatively fast 1.0 m/s pedestrian crossing speed and a minimum 7 sec leading (green) "walk" indicator (before the last pedestrian steps off the curb, per TAC MUTCD, 6th Edition, Section 2.2), the north-south pedestrian clearance phase (flashing "Don't Walk" indicator) needs to be 36 seconds long (longer phasing would be needed to accommodate persons with mobility issues). This assumes that slower pedestrians may utilize the 6 second signal clearance interval (yellow and all red, "Do Not Walk" indicator) to finish the crossing before conflicting vehicle traffic begins moving. Total available maximum crossing time is (7 + 36 + 6) 49 sec. This is 19 secs (2/3rds) greater than the 30 secs provided by the signal timing for the 500,000 population horizon.
- Increasing the southbound signal phase to allow a single stage pedestrian crossing would worsen intersection operations to the point where traffic demand exceeds intersection capacity, particularly the east-west flows along 22nd Street. This will lead to congestion across multiple signal cycles and queues reaching upstream and beyond the Circle Drive interchange.
- Using a two-stage pedestrian crossing, the island between the dual left and the eastbound-through lanes is 3.6m wide from face-of-curb to face-of-curb. This would separate the crossing into 20.9m (north side to median) and 11.5m (median to south side). Total crossing time would be in excess of 2 minutes (including 110 sec median wait), still assuming a brisk 1.0 m/s pedestrian crossing speed.
- The median refuge would meet TAC minimums (2.4m wide per TAC 6.4.1.1) but would be a very uncomfortable space for many pedestrians given the high traffic volumes, high truck presence and 60 km/h posted speed (average vehicle speeds probably greater). A minimum width to accommodate wheelchairs plus shy distance and ramps is 4.1m. There may be a risk that some pedestrians do not recognize the need (or refuse) to wait in the median, and attempt to complete the crossing against the "Do Not Walk".
- The median refuge could be widened to 4.0m by narrowing the separator between the dual left-turn and westbound-through lanes. The separator island is currently 2.0m from face-to-face, narrowing it to 1.6m. However, it is difficult to recommend a two-stage crossing here unless the median refuge could be made even wider to create a comfortable sense of separation and protection for pedestrians and cyclists. Additional widening is not feasible because of the intersection's proximity to the existing Circle Drive bridge to the east.

Conclusion: The new Confederation Drive intersection with 22nd Street will fail with a single stage pedestrian crossing. A 2-stage pedestrian crossing will be a challenging/unpleasant experience for pedestrians and take more than three times as long as a single stage. An at-grade pedestrian crossing of 22nd Street at Confederation Drive is not recommended. If a pedestrian crossing is warranted, the preferred solution would be an overpass structure.

Comparison with College Drive

The City has developed a corridor plan for College Drive, from Preston Avenue to Clarence Avenue, that incorporates BRT. The proposed BRT lanes will be exclusive using a centre-running contraflow configuration. The plan includes transit stations in the median, between the two directions of travel. The future BRT along 22nd Street West is not intended to run in exclusive lanes.

It has been suggested that since pedestrians along College Drive will be crossing into the median to access transit stations (the pedestrian's destination), it should be similarly acceptable for pedestrians to cross 22nd Street in two stages, however, the median would not be their destination.

- College Drive is an extension of provincial Highway 5 entering the City from the east. College Drive is designated a high-speed Freeway/Expressway facility outside of Circle Drive. However, the section of College Drive incorporating BRT in the median is inside Circle Drive where this designation does not apply.
- The College Drive corridor inside Circle Drive serves a university campus and, together with its proximity to downtown, is an environment lending itself to a more accessible, low-speed, facility, e.g., a complete streets/multi-modal streetscape.
- The affected section of 22nd Street is outside Circle Drive where it is designated a high-speed Freeway/Expressway facility, recognizing its long-term role as an inter-regional arterial-connector moving people and goods. See attached **Sketch #2**.

Conclusion: College Drive and 22nd Street are different roadway classifications, serve very different roles, and the pedestrians' crossing objectives are different. College Drive is evolving into a lower-speed pedestrian-friendly facility. 22nd Street outside Circle Drive West is part of a high-speed, through-route, inter-regional connector. This is supported by the existing pedestrian overpasses that provide community connectivity without disrupting traffic flow.

Diefenbaker Drive / 22nd Street Intersection

The performance of the Diefenbaker Drive intersection with 22nd Street is already poor and expected to worsen as traffic volumes increase, including following Circle Drive West's conversion to freeway standards. If the current configuration is maintained, the intersection would experience LOS 'F' and a v/c ratio of 1.56 in the pm peak hour for the 500,000 population horizon.

Although this intersection was not included in the current study scope, potential improvements were briefly considered. The only apparent and effective solutions involved aggressive upgrading. Removing at-grade pedestrian movements from the Diefenbaker intersection would both simplify the upgrading and improve system performance.

A centrally located pedestrian overpass connecting the two shopping areas would benefit the performance of both the Confederation Drive and Diefenbaker Drive intersections with 22nd Street and would be well received by the two business areas affected by the changes to Circle Drive, as well as the surrounding neighbourhoods.

Other Pedestrian Crossing Options

One option may be to retain the existing southbound Circle Drive structure over 22nd Street as a (exceptionally wide) pedestrian overpass. See attached **Sketch #3**. This would require modifying the proposed alignment of the MUT pathway on the north side of 22nd Street to make room for a path climbing up to the bridge elevation (the grades would need to be checked).

A second option may be to adjust the alignment of the southbound C/D road as crosses the repurposed northbound existing bridge structure and place a 4.2m wide MUT pathway across the same structure, separated from the travel lane by a 0.6m concrete barrier. This would change the geometry of the southbound C/D road and fork design for the slip ramp to Fairmont Drive. In response to City interest, this can be looked at in more detail to confirm that the roadway geometry will work for this option.

However, this optional routing is indirect and would be less inviting to pedestrians than a crossing of 22nd Street opposite Fairlight Drive or Fairlight Crescent, central to the two shopping areas and more central to the adjoining neighbourhoods.

Planning Horizon

The overall plan to upgrade Circle Drive West, including the 22nd Street intersection with Confederation Drive, is considered long-term, potentially decades away. Therefore, the need for the pedestrian crossing should be seen in the same light. The impact on signal performance is not based on today's traffic volumes.

Conclusions

This brief comparison of the pedestrian crossing options to connect the Confederation Mall and Fairlight Drive shopping areas, and possibly the Confederation Park/Pacific Heights and the Fairhaven/Parkridge neighbourhoods, led to the following conclusions:

- 22nd Street West and Circle Drive have an important role in the regional and provincial highway network, connecting Highway 16 West (via Neault Road) and Highways 7 & 14 West with Highways 11 & 219 South and Highway 16 East. In the absence of a northwest leg in the Saskatoon Freeway, 22nd Street West and Circle Drive will also continue to connect Highways 7 & 14 west with Highways 11 & 12 North.
- 22nd Street West (and Circle Drive West) will face increasing demand from municipal growth, from traffic diverted by the loss of some travel paths along Circle Drive West, and from growth in inter-regional through traffic.
- An at-grade pedestrian crossing at Confederation Drive will fail the intersection, affecting east-west flows along 22nd Street, including the long-distance inter-regional flows and the local commuter trips, warranting grade-separation.
- The City has been protecting 22nd Street West, and its' high-speed mandate, by grade-separating the MUT pathway system.
- There is no practical alternative to 22nd Street for traffic entering the City using a parallel route.
- An MUT Pathway overpass connecting the two shopping areas and the surrounding four neighbourhoods, will preserve the long-term performance of 22nd Street and benefit both the

Confederation Drive and Diefenbaker Drive intersections.

- 22nd Street West's classification as a Freeway/Expressway (high-speed controlled-access facility) outside Circle Drive draws no comparison with College Drive's role as a low-speed multi-modal facility inside Circle Drive.
- If 22nd Street's capacity is compromised, flow is unlikely to divert to the parallel, and narrower, 11th and 33rd Street corridors. Instead, traffic will remain on the wide (originally a provincial highway) corridor along 22nd Street.

Confederation Drive / 22nd Street Intersection Improvement

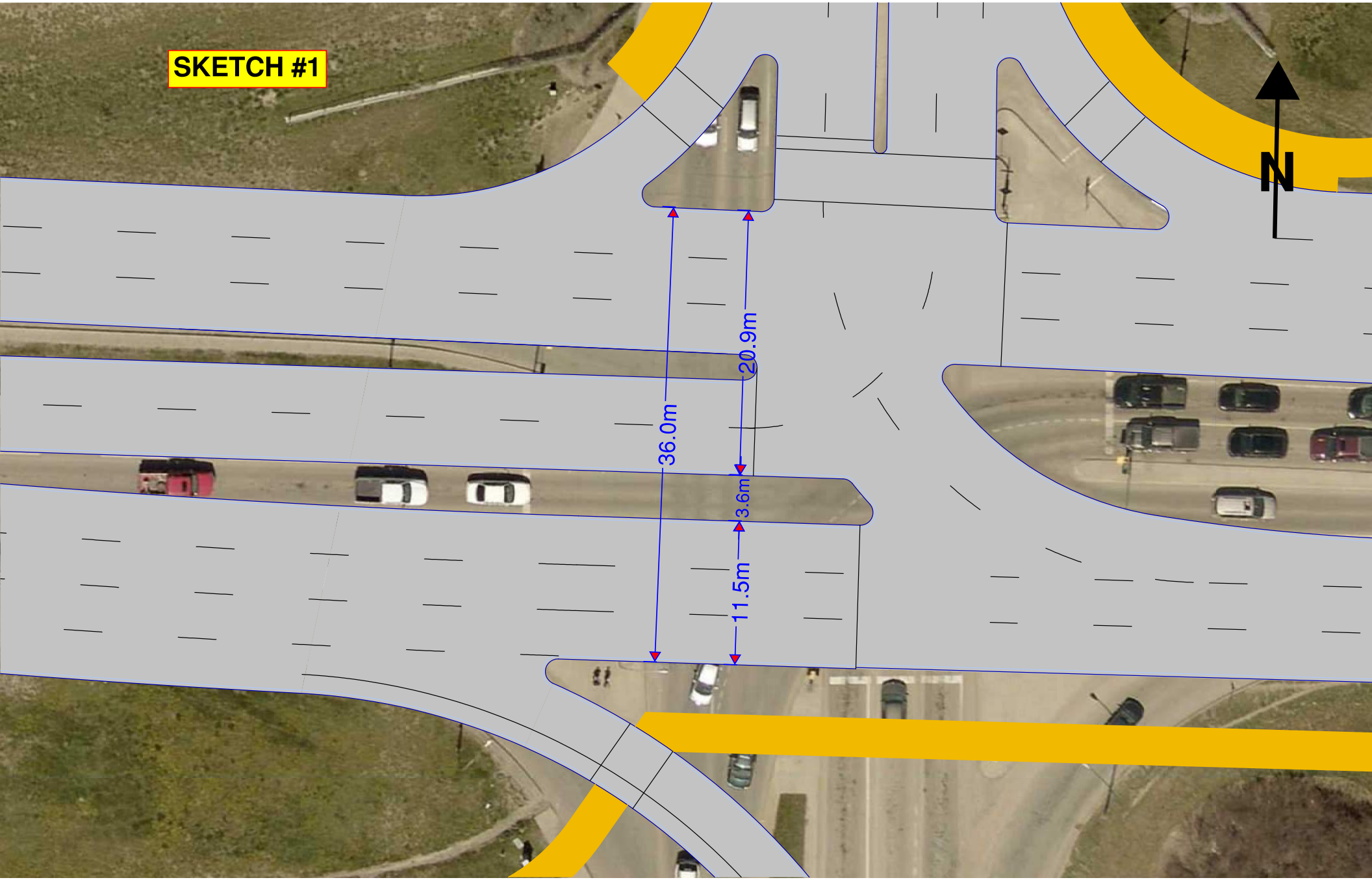
The current plan incorporates an additional change. The right-hand southbound-to-eastbound left-turn lane from Confederation Drive has been changed to a shared left-turn/through lane. The through-lane connects with the currently proposed eastbound-southbound ramp onto Circle Drive. This was considered earlier, however, before the eastbound-to-southbound right-turn was added and saved the two existing underpass structures.

This change would:

1. Not compromise the 3-phase signal operation.
2. Make a small improvement in overall efficiency, reducing congestion/queuing between the Confederation and Circle Drive signals.
3. Require a yield sign for the eastbound-to-southbound right-turn (22nd Street to Circle Drive) to enter this ramp. An acceleration lane through the curve leading to the first underpass would be a poor design and will not be used.
4. Not compromise truck flows. The eastbound-to-southbound bypass of the two traffic signals was included in response to a concern regarding truck traffic. The duration of the eastbound-through movement at the Confederation signal is estimated to be 110 sec. Truck traffic will have a generous unimpeded window to complete the turn onto Circle Drive.
5. Retain the short eastbound-to-southbound right-turn lane approaching the Circle Drive signal should drivers miss the on-ramp at Confederation Drive.

There are two other benefits with this configuration:

1. From a public optics perspective, it retains an existing movement and should help compensate for the loss of the eastbound-to-southbound right-turn from Laurier Drive to Circle Drive.
2. It reduces the perception that a southbound right-turn lane can be added from Fairlight Drive. The interchange configuration still only accommodates turning movements between 22nd Street and Circle Drive.


SKETCH #1
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APPENDIX A

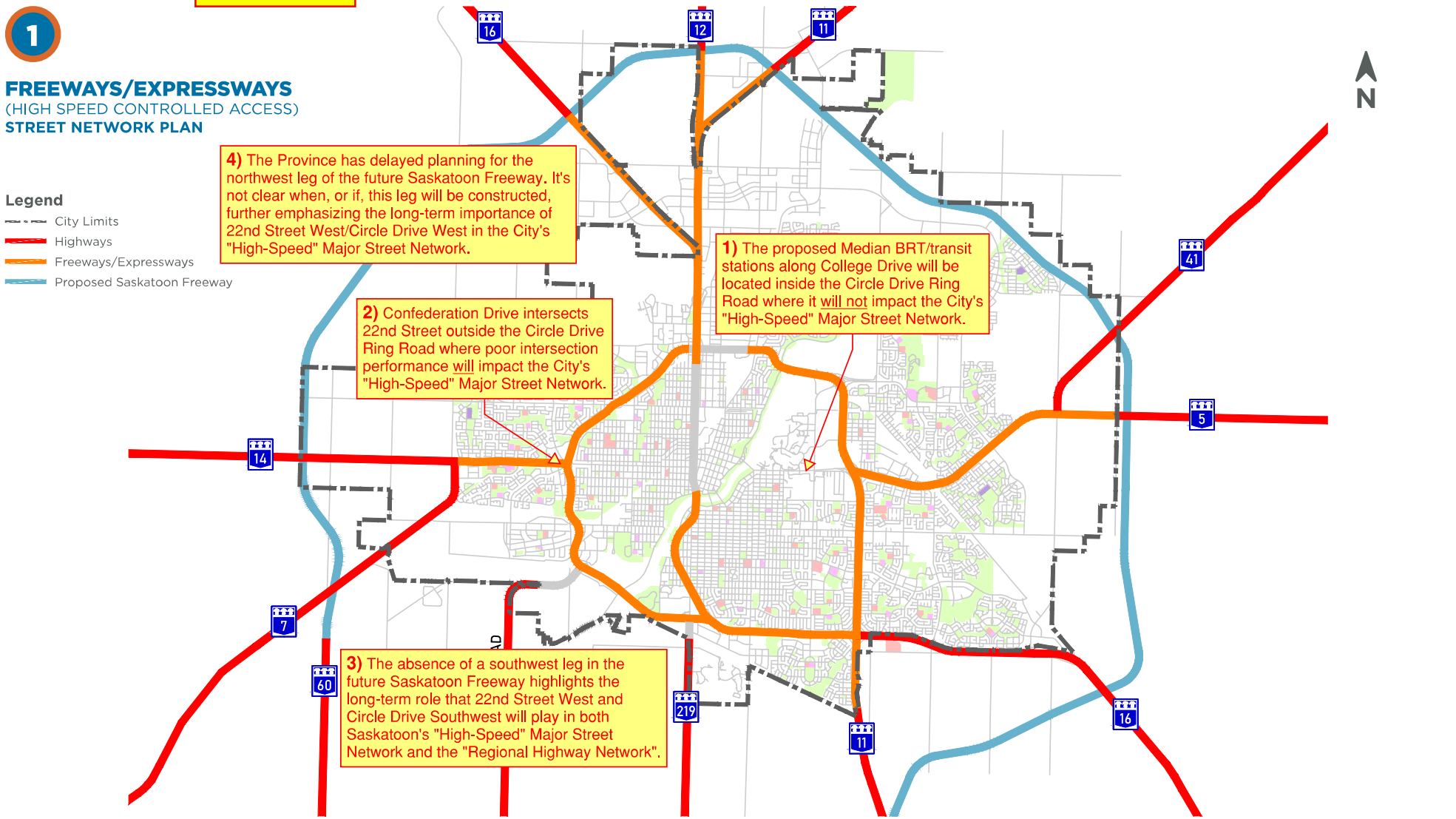
SKETCH #2

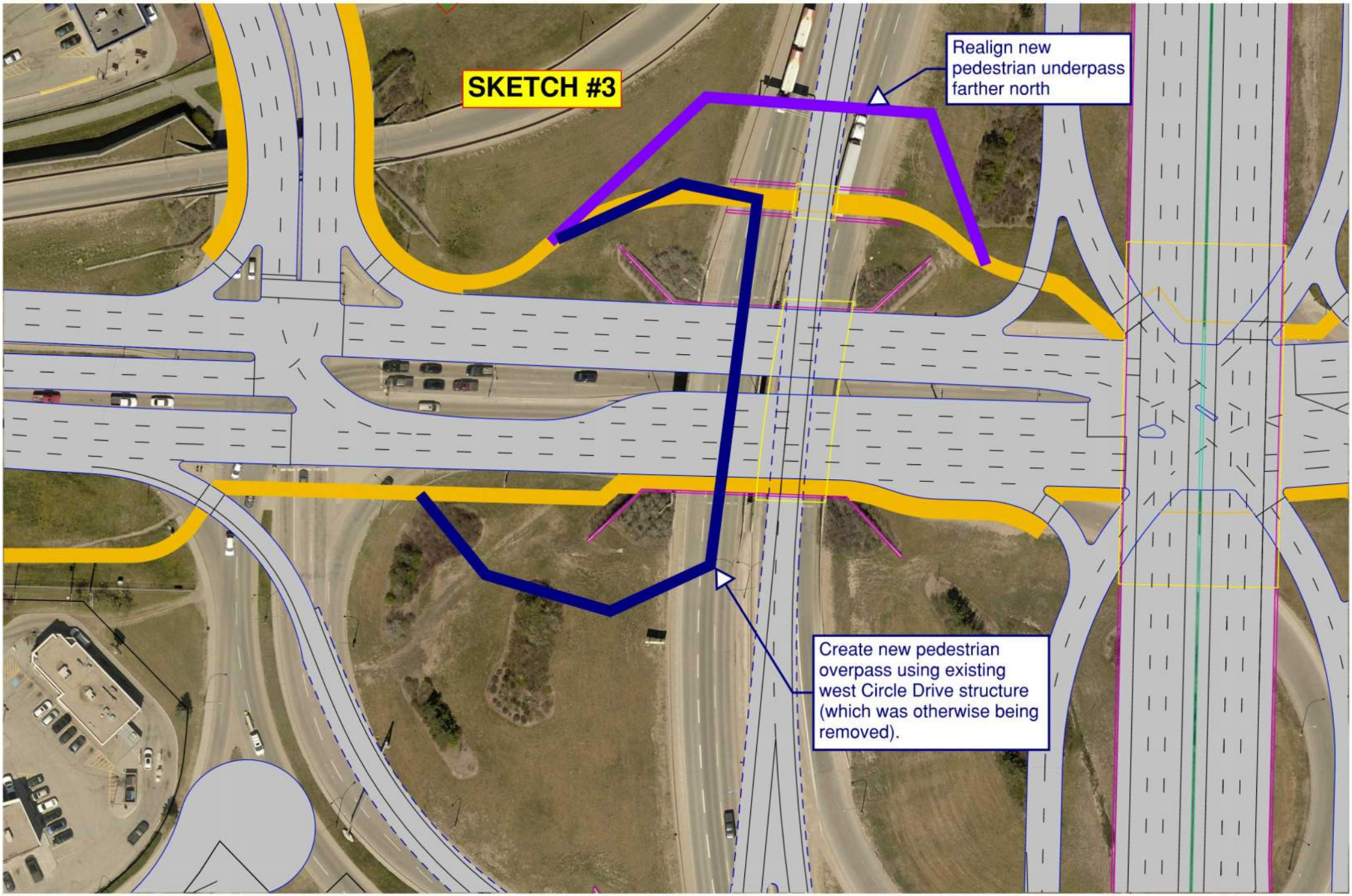
1

FREEWAYS/EXPRESSWAYS

(HIGH SPEED CONTROLLED ACCESS)

STREET NETWORK PLAN




SKETCH #3
Realign new pedestrian underpass farther north
Create new pedestrian overpass using existing west Circle Drive structure (which was otherwise being removed).

L

Appendix L
Traffic Impact Noise Assessment

Traffic Noise Impact Assessment

City of Saskatoon
Circle Drive West Functional Design Study

Saskatoon, Saskatchewan

Prepared for:
Justen McArthur, P. Eng., ENV SP
Associate Partner/Senior Project Manager, Transportation
CIMA+

Prepared by:

Patching Associates Acoustical Engineering Ltd.
Consultants in Acoustics, Noise Control and Vibration

January 17, 2022
Document ID: 5406-NIA-001

Notice

This report has been prepared by Patching Associates Acoustical Engineering Ltd (PAAE) in response to a specific request for service from, and for the exclusive use of, the Client to whom it is addressed. The findings contained in this report are based, in part, upon information provided by others. The information contained in this study is not intended for the use of, nor is it intended to be relied upon, by any person, firm, or corporation other than the Client to whom it is addressed, with the exception of the applicable regulating authority to whom this document may be submitted.

PAAE accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

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Title: Acoustic Engineer	Title: Principal
Name: Philipp Wloka, P. Eng.	Name: Neil Morozumi, P.Eng.

Prepared by:

Technical Lead and Report Author: Ben Adler, EIT.
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Executive Summary

Patching Associates Acoustical Engineering Ltd. (PAAE) was retained by CIMA+ to complete a transportation Noise Impact Assessment (NIA) to assess the future noise impacts for the functional planning study of Circle Drive West. The study area follows Circle Drive between 33rd Street and 11th Street W in Saskatoon, Saskatchewan.

The purpose of this study is to assess Circle Drive's predicted traffic noise levels at the 500k population forecast horizon against the City of Saskatoon's Traffic Noise Sound Attenuation Policy's threshold day-night Design Noise Level (DNL) of 65 dBA L_{DN} and to design noise mitigation if the DNL is exceeded at residential receivers adjacent to Circle Drive. An NIA is warranted for this project as it is an upgraded transportation corridor adjacent to existing developments.

The day-night sound level, or L_{DN}, is the A-weighted equivalent sound level for a 24-hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 PM to 7 AM. Noise predictions for road traffic were developed using SoundPLAN with the TNM 2.5 module corrected for known deficiencies based on the proposed alignment, surface elevation, design speed, and forecasted daytime and nighttime traffic volume data provided by CIMA. The most recent elevation data was collected in 2017, prior to the installation of sound barriers along Circle Drive immediately south of 33rd Street. These barriers were approximated in the predictive model based on their alignment visible in satellite imagery. The barriers east and west of Circle Drive were modelled as 3.0 and 1.83 m high respectively based on sound attenuation design information published by the City of Saskatoon Transportation and Utilities.

Receivers were located in accordance with the policy 1.5 m above ground, 5 m from the adjacent property line, and 3 m away from any obstructions in the outdoor rear amenity area of single family residential or townhouse type multi-family land use in the area. The modelled results indicate that the predicted L_{DN} noise levels meet the 65 dBA DNL at all residences in the area for the forecasted traffic horizon, and that no additional noise attenuation is required.

Table of Contents

Introduction

Patching Associates Acoustical Engineering Ltd. (PAAE) was retained by CIMA+ to complete a transportation Noise Impact Assessment (NIA) to assess the future noise impacts for functional planning of Circle Drive West. The study area follows Circle Drive between 33rd Street and 11th Street W in Saskatoon, Saskatchewan.

The purpose of this study is to assess Circle Drive's predicted traffic noise levels at the 500k population forecast horizon against the City of Saskatoon's Traffic Noise Sound Attenuation Policy's threshold day-night Design Noise Level (DNL) of 65 dBA L_{DN} and to design noise mitigation if the DNL is exceeded at any residential receivers adjacent to Circle Drive. An NIA is warranted for this project as it is an upgraded transportation corridor adjacent to existing developments.

Noise Criteria

Appendix A provides a detailed explanation of other units and descriptors used in most noise analyses.

The most common noise index, $L_{eq,}$ is the A-weighted equivalent-continuous sound level. This index is an energy average of the varying sound level over a specified period. The use of this index permits the description of a varying sound level environment as a single number. As the L_{eq} is an "average" level, the measured sound level may exceed the criterion level, provided the duration is limited. The L_{eq} value considers both the sound level and the length of time that the sound level occurs.

The day-night sound level, or L_{DN}, is the A-weighted equivalent sound level for a 24-hour period with an additional 10 dB imposed on the equivalent sound levels for nighttime hours of 10 PM to 7 AM.

The City of Saskatoon Traffic Noise Sound Attenuation Policy defines a threshold noise limit of L_{DN} 65 dBA, or the logarithmic average A-weighted sound level over a 24-hour period with a 10 dBA penalty applied during the nighttime hours. This L_{DN} 65 dBA Design Noise Level (DNL) is what may be received at dwellings adjacent to transportation corridors measured at a height of 1.5 m above the ground, 5 m from the adjacent property line, and 3 m from any obstructions in the outdoor rear amenity area of any single family residential or townhouse type multi-family land use.

The Federal Highway Administration's Traffic Noise Model (FHWA TNM 2.5) computer program provides results directly in the form of L_{DN} as specified by The City for theoretical receivers adjacent to traffic corridors. For this study, PAAE examined the impact of traffic noise based on the 500k population forecast horizon daytime and nighttime traffic volume projections.

Site Description

The study area follows Circle Drive from south of 33rd Street W to north of 11th Street W in Saskatoon, Saskatchewan and includes the intersections of Circle Drive and Laurier Drive, 22nd Street W, and Clancy Drive. Theoretical receivers were located in accordance with The Policy in the rear outdoor amenity areas of the first row of residential lots directly adjacent to Circle Drive.

Updated road alignments and elevations, existing ground elevations, and legal lot lines were provided by CIMA. This elevation data was collected in 2017, prior to the installation of sound barriers along Circle Drive immediately south of 33rd Street. These barriers were approximated in the predictive model based on their alignment visible in satellite imagery. The barriers east and west of Circle Drive were modelled as 3.0 and 1.83 m high respectively based on sound attenuation design information published by the City of Saskatoon Transportation and Utilities provided in Appendix B.

Receivers were located in accordance with the policy 1.5 m above ground, 5 m from the adjacent property line, and 3 m away from any obstructions in the outdoor rear amenity area of single family residential or townhouse type multi-family land use in the area. Receivers were not included for the Linde Apartments building at 1101 Avenue W North and the Saskatoon Housing Coalition properties along Camponi Place because they do not classify as single-family or townhouse type buildings or they do not have an applicable rear amenity area. To account for sound reflections in the model, building footprints were obtained from Statistics Canada's Open Database of Buildings (ODB) and Microsoft's Canadian Building Footprint Database for Saskatchewan, with all 3D heights assumed to be 6 m.

Figure 1 shows a map of the study area showing the locations of the modeled receivers. Noise levels were only assessed from the roadways in the study area. Although visible in the model and plots, no noise emissions were considered for the railway adjacent to Circle Drive. See Appendix C for detailed study area plots.

Figure 1: Study Area

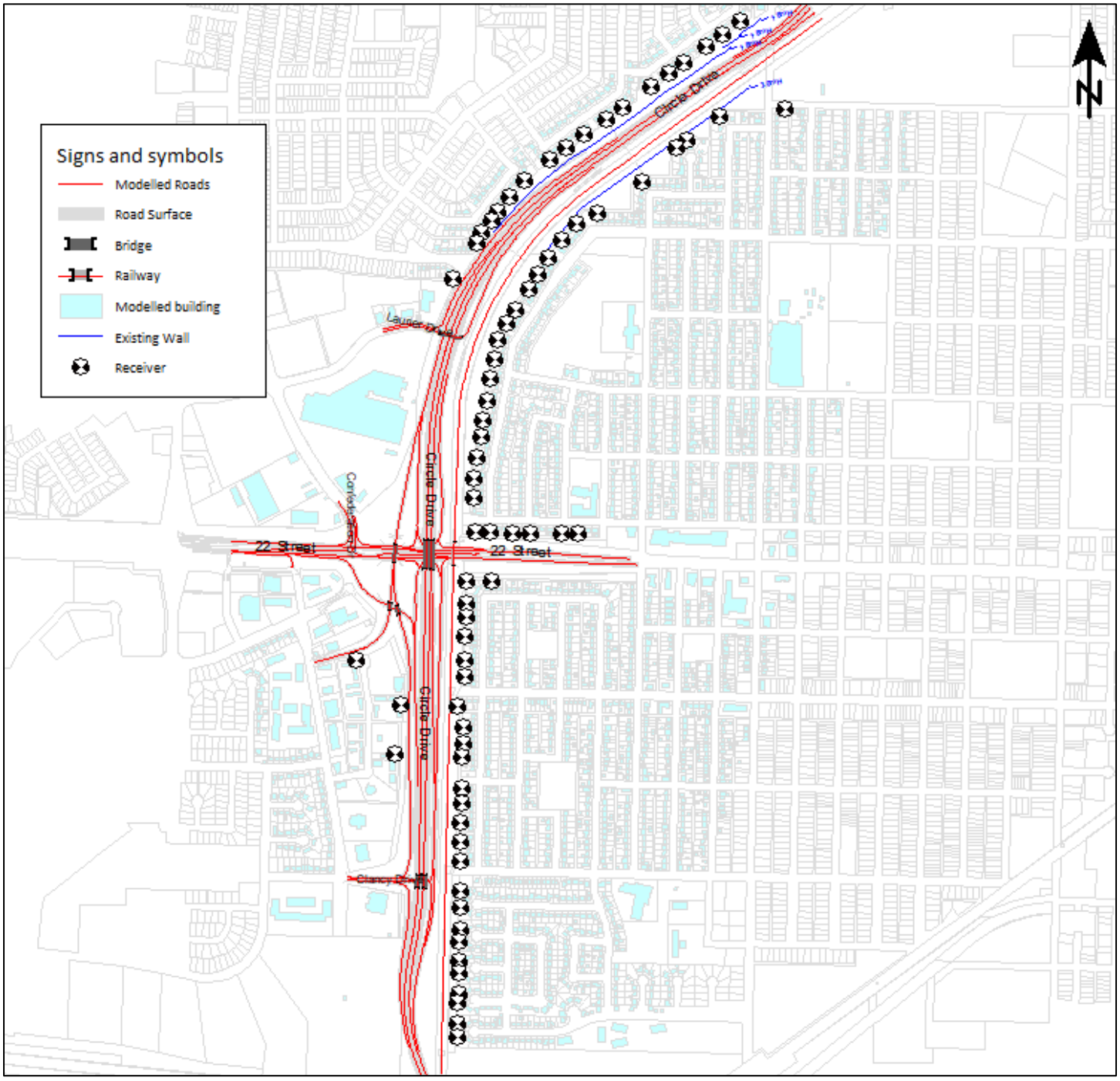
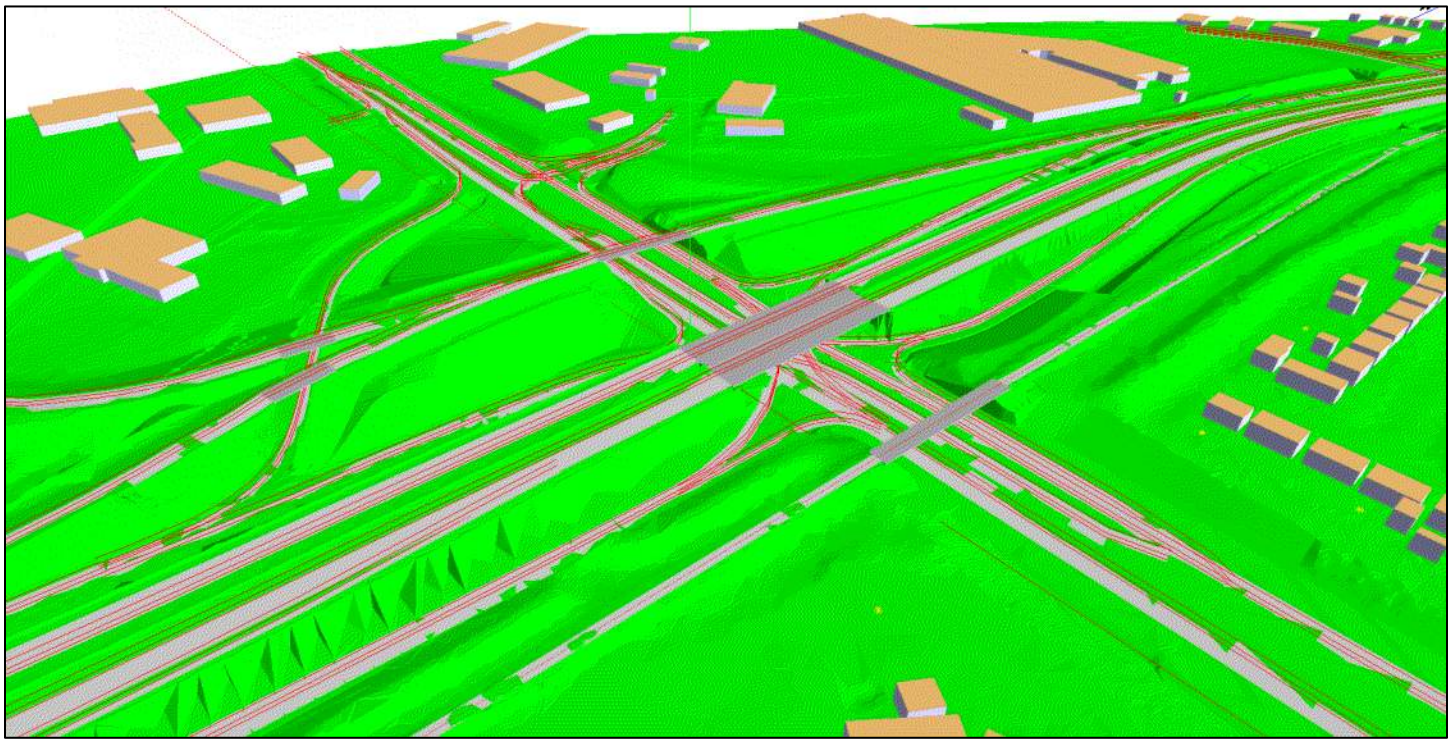


Figure 2 below shows the 3D map at the intersection of Circle Drive and 22nd Street W.

Figure 2: 3D Map



Method

The method used in the study follows the requirements set forth in the City of Saskatoon Traffic Noise Sound Attenuation Policy for the 500k population forecast horizon.

The proposed Circle Drive transportation corridor and all intersections and adjacent residences in the study area were modeled using the FHWA TNM 2.5 module in SoundPLAN 8.2 with alignments and elevations obtained from CIMA. The noise levels were calculated in this study with corrections made for known deficiencies in the TNM algorithms. The modeling parameters are shown in the next section of the report.

Functional planning study traffic data, including total vehicle and truck volumes as shown in Appendix B, was provided by CIMA for the 500k population forecast horizon for both the daytime (7 AM to 10PM) and nighttime (10 PM to 7 AM) periods. A medium to heavy truck ratio of 2:1 was assumed for all roads in the study area. The predicted noise levels include impacts from vehicle acceleration/deceleration and turn volumes. Traffic volumes specific to lane each direction were assumed to be approximately equal.

Design speeds were assumed to be 10 km/h over the posted speed limit for each respective roadway. The modeled design speed for Circle Drive was based on the updated 90 km/h speed limit for the new road alignment. The current Circle Drive speed limit is 80 km/h. Modelled speeds along 22nd Street were based on the existing 70 km/h speed limit, and all other roadways in the study area were assumed to be 60 km/h.

All receivers adjacent to the proposed upgraded Roadways were modeled in the rear outdoor amenity areas as per the Policy approximately 5 metres from the adjacent property line, 3 m from any obstructions, and at a height of 1.5 metres above the ground. The existing noise barriers and the first row of buildings were modelled with reflection loss of 1 dB, which represents a typical smooth façade.

Predicted L_{DN} noise levels obtained from the SoundPLAN model were compared to the Policy DNL of 65 dBA L_{DN} to determine if noise barrier upgrades are warranted for compliance.

Modeling Parameters

The L_{DN} noise levels were predicted using the Federal Highway Administration's Traffic Noise Model (FHWA TNM) 2.5 module in SoundPLAN Version 8.2 (SoundPLAN). SoundPLAN is an advanced noise propagation model that considers geometric spreading, atmospheric sound absorption, ground impedance effects, site topography and geometry, vegetation and environmental conditions. The model calculates the contribution level of each noise source at the receiver location in L_{DN} over a 24-hour period. Table 1 lists the major parameters used in the noise model. These parameters meet the guidelines set forth in the Policy.

Table 1: Modeling Parameters

Parameter	Value	Description
Standards followed	Traffic Noise Model - FHWA 1998 (USA) TNM Version 2.5	Attributed to the Federal Highway Administration (FHWA), Office of Natural and Human Environment, released the FHWA Traffic Noise Model (TNM), a computer model for highway traffic noise prediction and analysis.
TNM Corrections	Included	Corrections were made for known deficiencies in the TNM algorithms.
Atmospheric Conditions	20º Celsius 50% Relative Humidity	Represents the average daytime summer conditions.
Receiver Location	1.5 m above ground, 5 m from the adjacent property line, 3 m from any obstructions	Each receiver location is determined in accordance with the Policy.
Flow Resistivity	10 – 20,000 cgs rayls (depending on ground type)	Enables TNM to compute the ground's effect on propagation. Typical values are as follows- 20,000 cgs rayls for Pavement, 5,000 cgs rayls for Hard Soil, 300 cgs rayls for Residential Lawn, 150cgs rayls for Field Grass, etc.
Ground Absorption	0.0 for road surface	Hard surfaces (road surface, waterbody etc.) have a lower ground absorption than the soft surfaces (grass field, forests etc.). G = 1 is defined as porous ground G = 0 is defined as hard ground
Buildings	Included	Building footprints were obtained from Statistics Canada's Open Database of Buildings and Microsoft's Canadian Building Footprints Database for Saskatchewan. Building heights were assumed.
Orders of Reflection	1	The model calculates reflection effects from the reflective surfaces included in the model such as the existing barriers, as well as any building modelled.
Pavement Type	Average	As recommended by FHWA. It is considered to be the average between DGAC (Dense-Graded Asphaltic Concrete) and PCC (Portland Cement Concrete).
Traffic Control Devices	Traffic Lights	Traffic flow for the 22nd Street and Clancy Drive intersections were modelled as signalized with traffic lights as indicated by CIMA. Percentages of impacted traffic volumes were assumed based on relative traffic volumes in either direction. Other intersections were assumed to be free flow.
Topography	Included	Modeled according to drawings obtained from the client.
Truck Percentages	Based on CIMA Volumes.	Forecast truck volumes provided by CIMA for day and night periods.
Medium to Heavy Truck Ratio	2:1	Assumed 2:1 medium to heavy truck ratio.

Future Noise Level Predictions

Based on the projected traffic volumes, road alignment and profile, speeds, and land topography, predictions can be made for the noise levels that will be generated by the traffic at given receiver points.

Table 2 below shows the predicted day-night equivalent sound levels, or $L_{DN,}$ for the study area at the 500k population forecast horizon compared to the City of Saskatoon Design Noise Limit (DNL).

Receiver location maps and contour plots are available in Appendix C.

Table 2: Predicted 500k Population Forecast Day-Night Traffic Noise Levels

Receiver Number	L_{DN} (dBA) Existing Attenuation	City of Saskatoon DNL (LDN dBA)
R01	57.8	65.0
R02	58.8	65.0
R03	56.0	65.0
R04	55.8	65.0
R05	56.2	65.0
R06	56.4	65.0
R07	56.4	65.0
R08	57.0	65.0
R09	57.7	65.0
R10	58.1	65.0
R11	59.3	65.0
R12	59.0	65.0
R13	59.0	65.0
R14	58.7	65.0
R15	58.3	65.0
R16	56.6	65.0
R17	57.5	65.0
R18	55.7	65.0
R19	55.7	65.0
R20	59.8	65.0
R21	60.4	65.0
R22	56.3	65.0
R23	59.1	65.0
R24	59.0	65.0
R25	58.7	65.0
R26	56.7	65.0
R27	58.5	65.0
R28	57.8	65.0
R29	58.3	65.0

Receiver Number	L_{DN} (dBA) Existing Attenuation	City of Saskatoon DNL (LDN dBA)
R30	57.8	65.0
R31	55.9	65.0
R32	53.5	65.0
R33	53.4	65.0
R34	53.5	65.0
R35	53.2	65.0
R36	52.7	65.0
R37	53.4	65.0
R38	52.6	65.0
R39	53.9	65.0
R40	55.6	65.0
R41	58.3	65.0
R42	59.1	65.0
R43	57.5	65.0
R44	64.1	65.0
R45	63.3	65.0
R46	62.2	65.0
R47	61.9	65.0
R48	60.5	65.0
R49	60.0	65.0
R50	61.4	65.0
R51	61.6	65.0
R52	59.3	65.0
R53	59.5	65.0
R54	59.6	65.0
R55	60.0	65.0
R56	60.2	65.0
R57	62.1	65.0
R58	60.5	65.0
R59	60.5	65.0
R60	60.9	65.0
R61	60.7	65.0
R62	60.9	65.0
R63	61.3	65.0
R64	61.2	65.0
R65	60.6	65.0
R66	60.1	65.0
R67	59.3	65.0
R68	59.6	65.0

Receiver Number	L_{DN} (dBA) Existing Attenuation	City of Saskatoon DNL (LDN dBA)
R69	59.7	65.0
R70	60.5	65.0
R71	60.3	65.0
R72	59.0	65.0
R73	58.7	65.0
R74	54.1	65.0
R75	52.4	65.0

These results include existing noise barriers along Circle Drive immediately south of 33rd Street W. These barriers' heights and alignment were not available in the most recent design drawings and contour elevations. Therefore, the existing barriers were approximately located in the model based on satellite imagery and were assumed to follow the existing berms in the area. The barriers east and west of Circle Drive were modelled as 3.0 and 1.83 m high respectively based on sound attenuation design information published by the City of Saskatoon Transportation and Utilities provided in Appendix B.

The modeled results indicate that the 24-hour L_{DN} noise levels without additional attenuation for the developments in the study area range from 52.4 to 64.1 dBA for the 500k population forecast horizon. Therefore, the 65 dBA L_{DN} noise target will not be exceeded for the first row of residential lots within the study area adjacent to the upgraded Circle Drive and no additional noise attenuation is required.

Appendix C provides the resulting noise contour plots corresponding to the above results. The noise contour plots are based on interpolation for a range of grid points with 10 m spacing. The predictions for individual locations are specific to that receiver location, and as such the individual predicted levels should be taken as more accurate in the event of any discrepancies.

Conclusion

This transportation Noise Impact Assessment (NIA) was conducted to assess the future noise impacts for the functional planning study of Circle Drive. The study area follows Circle Drive between 33rd Street and 11th Street W in Saskatoon, Saskatchewan. Circle Drive's predicted traffic noise levels at the 500k population forecast horizon were compared against the City of Saskatoon's Traffic Noise Sound Attenuation Policy's threshold day-night Design Noise Level (DNL) of 65 dBA L_{DN} at residential receivers adjacent to Circle Drive. An NIA is warranted for this project as it is an upgraded transportation corridor adjacent to existing developments.

Noise predictions for road traffic were developed using SoundPLAN with the TNM 2.5 module corrected for known deficiencies based on the proposed alignment, surface elevation, design speed, and forecasted daytime and nighttime traffic volume data provided by CIMA. The most recent elevation data was collected in 2017, prior to the installation of sound barriers along Circle Drive immediately south of 33rd Street. These barriers were approximated in the predictive model based on their alignment visible in satellite imagery. The barriers east and west of Circle Drive were modelled as 3.0 and 1.83 m high respectively based on sound attenuation design information published by the City of Saskatoon Transportation and Utilities. Receivers were located in accordance with the policy 1.5 m above ground, 5 m from the adjacent property line, and 3 m away from any obstructions in the outdoor rear amenity area of any single family residential or townhouse type multi-family land use in the area.

The modeled results indicate that the 24-hour L_{DN} noise levels without additional attenuation for the developments in the study area range from 52.4 to 64.1 dBA for the 500k population forecast horizon. Therefore, the 65 dBA L_{DN} noise target will not be exceeded for the first row of residential lots within the study area adjacent to the upgraded Circle Drive and no additional noise attenuation is required.

References

The City of Saskatoon Council Policy Number C07-028, Traffic Noise Sound Attenuation. February 27, 2017.

Statistics Canada Open database of Buildings, Version 2.0.

Microsoft Canadian Building Footprints database.

GmbH SoundPLAN Acoustics [Version 8.2]

Google Earth Pro, licensed to Patching Associates Acoustical Engineering Ltd.

APPENDIX A

Explanation of Technical Details Regarding Sound Measurement and Analysis

Technical Details

Sound is the phenomena of vibrations transmitted through air, or other medium such as water or a building structure. The range of pressure amplitudes, intensities, and frequencies of the sound energy is very wide, and many specialized fields have developed using different ranges of these variables, such as room acoustics and medical ultrasound.

Due to the wide range of intensities, which are perceived as sound, standard engineering units become inconvenient. Sound levels are commonly measured on a logarithmic scale, with the level (in decibels, or dB) being proportional to ten times the common logarithm of the sound energy or intensity. Normal human hearing covers a range of about twelve to fourteen orders of magnitude in energy, from the threshold of hearing to the threshold of pain. On the decibel scale, the threshold of hearing is set as zero, written as 0 dB, while the threshold of pain varies between 120 to 140 dB. The most usual measure of sound is the sound pressure level (SPL), with 0 dB SPL set at 2.0×10^{-5} N/m^2 (also written 20 μPa), which corresponds to a sound intensity of 10^{-12} Watts/m^2 (or 1 picoWatt/m^2, written 1 pW/m^2).

Normal human hearing spans a frequency range from about 20 Hertz (Hz, or cycles per second) to about 20,001 Hz (written 20 KHz). However, the sensitivity of human hearing is not the same at all frequencies. To accommodate the variation in sensitivity, various frequency-weighting scales have been developed. The most common is the A-weighting scale, which is based on the sensitivity of human hearing at moderate levels; this scale reflects the low sensitivity to sounds of very high or very low frequencies. Sound levels measured on the A-weighted scale are written in A-weighted decibels, commonly shown as dBA or dB(A).

When sound is measured using the A-weighting scale, the reading is often called the “Noise level”, to confirm that human sensitivity and reactions are being addressed. A table of some common noise sources and their associated noise levels are shown in Table A1.
When the A-weighting scale is not used, the measurement is said to have a “linear” weighting, or to be unweighted, and may be called a “linear” level. As the linear reading is an accurate measurement of the physical (sound) pressure, the term “Sound Pressure Level”, or SPL, is usually (but not universally) reserved for unweighted measurements.

Noise is usually defined as “unwanted sound”, which indicates that it is not just the physical sound that is important, but also the human reaction to the sound that leads to the perception of sound as noise. It implies a judgment of the quality or quantity of sound experienced. As a human reaction to sound is involved, noise levels are usually given in A-weighted decibels (dBA). An alternate definition of noise is “sound made by somebody else”, which emphasizes that the ability to control the level of the sound alters the perception of noise.

Table A1- Noise Levels of Familiar Sources

Source Or Environment	Noise Level (dBA)
High Pressure Steam Venting To Atmosphere (3m)	121
Steam Boiler (2m)	90-95
Drilling Rig (10m)	80-90
Pneumatic Drill (15m)	85
Pump Jack (10m)	68-72
Truck (15m)	65-70
Business Office	65
Conversational Speech (1m)	60
Light Auto Traffic (30m)	50
Living Room	40
Library	35
Soft Whisper (5m)	20-35

The single number A-weighted level is often inadequate for engineering purposes, although it does supply a good estimate of people's reaction to a noise environment. As noise sources, control measures, and materials differ in the frequency dependence of their noise responses or production, sound is measured with a narrower frequency bandwidth; the specific methodology varies with the application. For most work, the acoustic frequency range is divided into frequency bands where the center frequency of each band is twice the frequency of the next lower band; these are called "Octave" bands, as their frequency relation is called an "Octave" in music, where the field of acoustics has its roots. For more detailed work, the octave bands, and certain standard octave and 1/3 octave bands have been specified by international agreements.

Where the noise at the receiver is steady, it is easy to assess the noise level. However, both the production of noise at the source and the transmission of noise can vary with time; most noise levels are not constant, either because of the motion of the noise source (as in traffic noise), because the noise source itself varies, or because the transmission of sound to the receiver location is not steady as over long distances. This is almost always the case for environmental noise studies. Several single number descriptors have been developed and are used to assess noise in these conditions.

The most common is the measurement of the "equivalent continuous" sound level, or L_{eq}, which is the level of a hypothetical source of a constant level which would give the same total sound energy as is measured during the sampling period. This is the "energy" average noise level. Typical sampling periods are one hour, nighttime (9 hours) or one day (24 hours); the sampling period used must be reported when using this unit.

The greatest value of the L_{eq} is that the contributions of different sources to the total noise level can be assessed, or in a case where a new noise source is to be added to an existing environment, the total noise level from new and old sources can be easily calculated. It is also sensitive to short term high noise levels.

Statistical noise levels are sometimes used to assess an unsteady noise environment. They indicate the levels that are exceeded a fixed percentage of the measurement time period measured. For example, the 10%-ile level, written L_{10}, is the levels exceeded 10% of the time; this level is a good measure of frequent noisy occurrences such as steady road traffic. The 90% level, L_{90}, is the level exceeded 90% of the time, and is the background level, or noise floor. A steady noise source will modify the background level, while an intermittent noise source such as road or rail traffic will affect the short-term levels only.

One disadvantage with the L_{eq} measure, when used alone, is that nearby loud sources (e.g. dogs barking, or birds singing) can confuse the assessment of the situation when it is the noise from a distant plant that is the concern. For this reason, the equivalent level and the statistical levels can be used together to better understand the noise environment. One such indication is the difference between the L_{eq} and the L_{90} levels. A large difference between the L_{eq} and L_{90}, greater than 10 dB, indicates the intrusion of short-term noise events on the general background level. A small difference, less than 5 dB, indicates a very steady noise environment. If the L_{eq} value exceeds the L_{10} value this indicates the presence of significant short-term loud events.

For most noise measurement, instruments are adjusted so that the time response of the instrument is similar to the response of the human ear; this is the "Fast" setting. Measurement with the "Fast" setting therefore assesses the sound environment according to the way humans would hear it and react to it. Where the noise level varies substantially and an average level is wanted without the complexity of and L_{eq} or statistical measurement, the "Slow" setting is used on the sound level meter. The "Slow" setting is also typically used in industrial settings where hearing damage is a concern. Where the noise level changes very rapidly, for example due to impacts or detonations, the "Fast" and "Slow" settings do not respond quickly enough to assess the maximum levels, and the "Impulse" meter setting us used.

The Sound Power Level (abbreviated L_w, SWL or PWL) is the decibel equivalent of the total energy emitted from a source in the form of noise. The reference level for the sound power is 10^{-12} Watts, or 1 picoWatt (abbreviated pW). The sound power level is given by:

L_w, SWL, PWL = 10 x $\log_{10}$ (Emitted Power / 1 pW) dB

Therefore, a source emitting 1 Watt of power in the form of sound would have a sound power level of 120 dB. Sound power levels can be expressed in terms of frequency bands, an overall linear-weighted level or A-weighted, as is the case for sound pressure levels. However, sound power levels are inherent to the source of noise, whereas the sound pressure level is dependent on the source, but also on the distance from the source and other environmental factors.

APPENDIX B

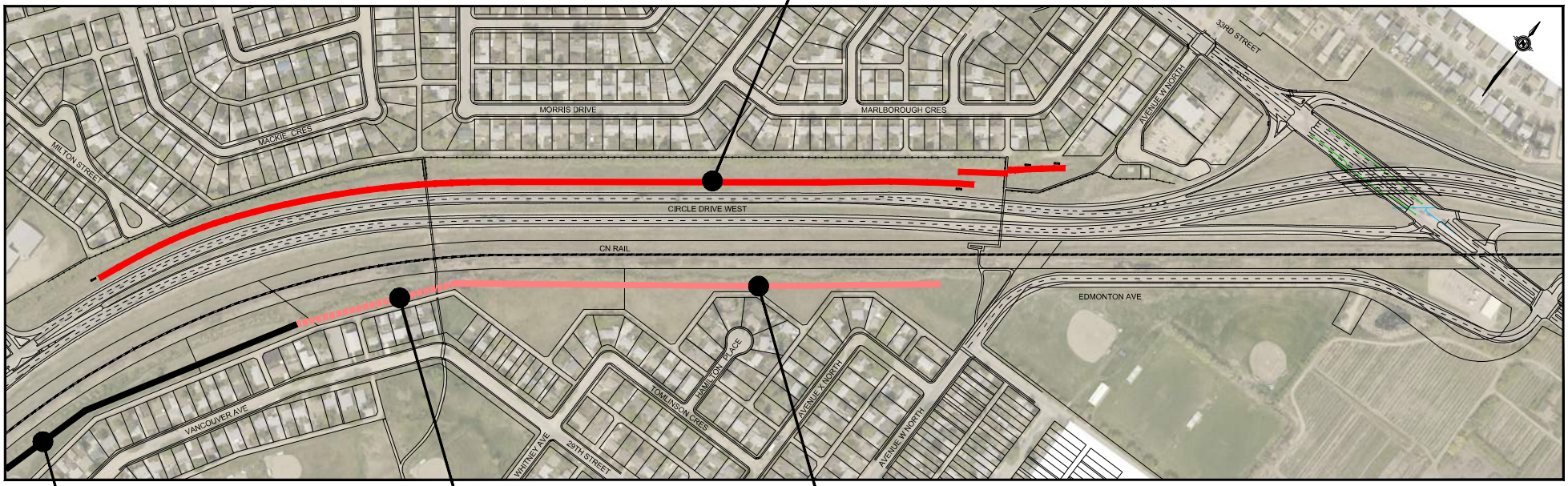
Traffic Volume Forecasts and Existing Sound Barrier Heights

REVISED

2016 SOUND ATTENUATION PROJECT

MASSEY PLACE: CIRCLE DRIVE WEST (MILTON STREET TO AVENUE W NORTH)

MOUNT ROYAL: CIRCLE DRIVE WEST (29TH STREET TO 31ST STREET)



PROPOSED HEIGHT OF NEW SOUND WALL

1.83 m

3.00 m

NOTE: WALL LOCATION SUBJECT TO CHANGE DUE TO UTILITY AND GEOTECHNICAL CONSTRAINTS

LEGEND

EXISTING CHAIN LINK FENCE —x—x—

EXISTING SOUND WALL ■■■■■■

City of Saskatoon
Transportation & Utilities

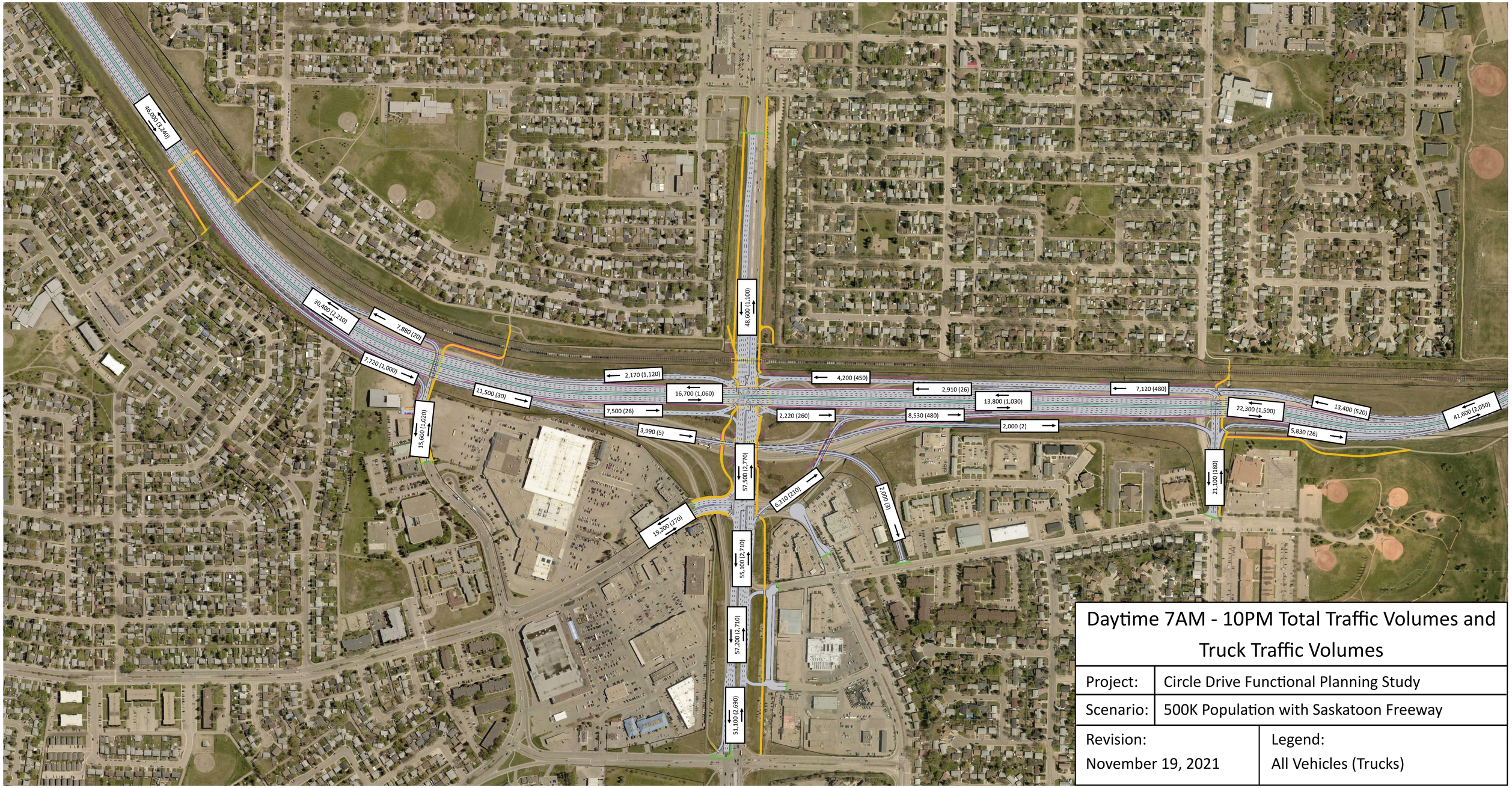
NOVEMBER 2016

Annual Average Daily Traffic (AADT) and Annual Average Daily Truck Traffic (AADTT)

Project:	Circle Drive Functional Planning Study
Scenario:	500K Population with Saskatoon Freeway
Revision: October 12, 2021	Legend: AADT (AADTT)

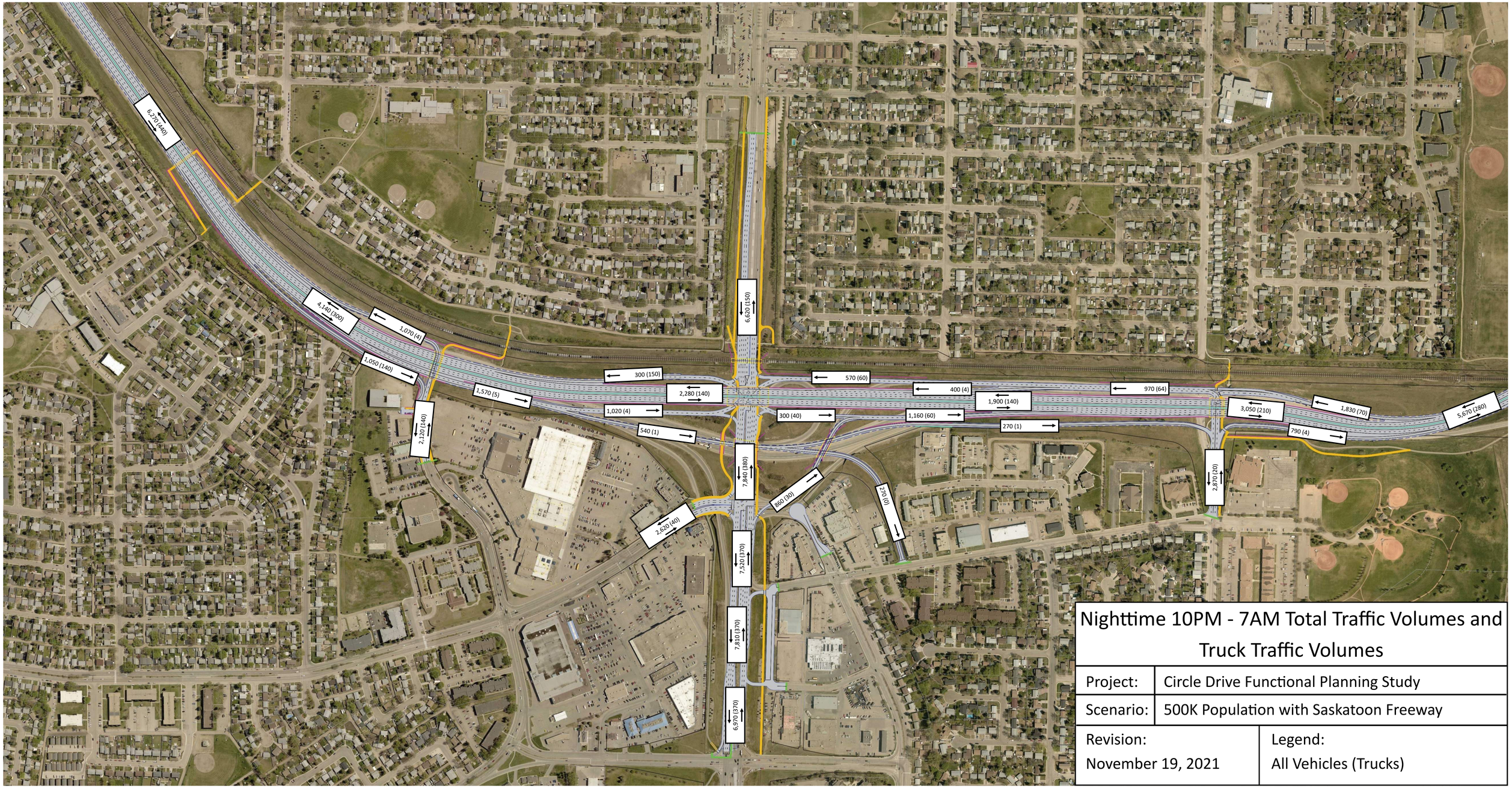
AM Peak Hour (AMPH) Turning Volumes and PM Peak Hour (PMPH) Turning Volumes

Project:	Circle Drive Functional Planning Study
Scenario:	500K Population with Saskatoon Freeway
Revision: October 12, 2021	Legend: AMPH (PMPH)



Daytime 7AM - 10PM Total Traffic Volumes and Truck Traffic Volumes

Project:	Circle Drive Functional Planning Study
Scenario:	500K Population with Saskatoon Freeway
Revision: November 19, 2021	Legend: All Vehicles (Trucks)



Nighttime 10PM - 7AM Total Traffic Volumes and Truck Traffic Volumes

Project:	Circle Drive Functional Planning Study
Scenario:	500K Population with Saskatoon Freeway
Revision: November 19, 2021	Legend: All Vehicles (Trucks)

APPENDIX C

Site Plan and Noise Contour Maps

Noise Study

City of Saskatoon
Circle Drive

Existing Attenuation
500k Popoulation Horizon

Figure C01
Study Area

City of Saskatoon
Traffic Noise Attenuation Policy

Design Noise Level (DNL):
65 dB(A) L_{DN}

Signs and symbols

- Modelled Roads
- Road Surface
- Bridge
- Railway
- Modelled building
- Existing Wall
- Receiver

Length scale 1:10900

0 50100 200 300 m

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Tel: 1.403.274-5882 | Fax: 1.403.516.0544
www.patchingassociates.com

Transportation Noise Study

City of Saskatoon
Circle Drive

Existing Attenuation
500k Population Horizon

Figure C02
Predicted Noise Contour Map
Circle Drive North of 22nd Street

City of Saskatoon
Traffic Noise Sound Attenuation Policy

Design Noise Level (DNL):
65 dB(A) L_{DN}

Sound Levels
L_{10} (Peak Hour) in

	<=	45.0	
45.0	-	50.0	
50.0	-	55.0	
55.0	-	60.0	
60.0	-	65.0	
65.0	-	70.0	
70.0	-	75.0	
75.0	-	80.0	
80.0	-	85.0	
85.0	-	90.0	
90.0	-	95.0	
	>	95.0	

Length scale 1:6000

0 45 90 180 270 m

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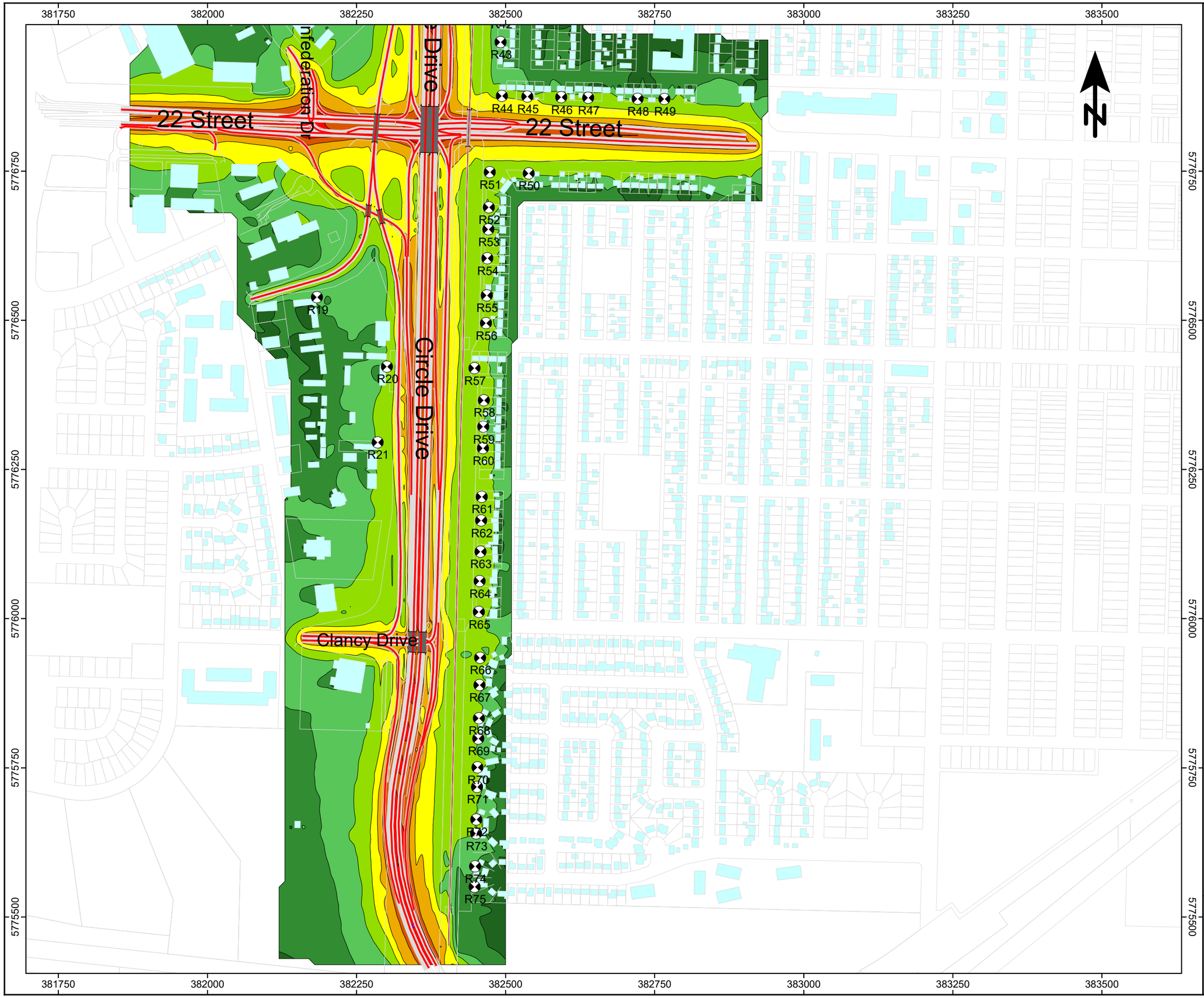

Transportation Noise Study

City of Saskatoon
Circle Drive

Existing Attenuation
500k Population Horizon

Figure C03
Predicted Noise Contour Map
Circle Drive South of 22nd Street

City of Saskatoon
Traffic Noise Sound Attenuation Policy

Design Noise Level (DNL):
65 dB(A) L_{DN}

Sound Levels
L_{10} (Peak Hour) in

<=	45.0
45.0 -	50.0
50.0 -	55.0
55.0 -	60.0
60.0 -	65.0
65.0 -	70.0
70.0 -	75.0
75.0 -	80.0
80.0 -	85.0
85.0 -	90.0
90.0 -	95.0
>	95.0

Length scale 1:6000

0 45 90 180 270 m

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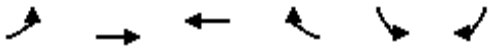
M

Appendix M
Synchro and HCM Results for Recommended Plan

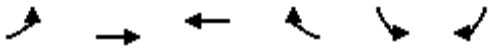
Lanes, Volumes, Timings

10: 22 Street West & Confederation Drive

04/06/2022



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	278	1998	1867	510	559	272
Future Volume (vph)	278	1998	1867	510	559	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0			0.0	0.0	0.0
Storage Lanes	2			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.97	1.00
Ped Bike Factor	1.00			0.98		0.99
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3541	4812	5043	1601	3437	1633
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3532	4812	5043	1574	3437	1611
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				211		
Link Speed (k/h)		60	60		50	
Link Distance (m)		49.7	198.3		187.1	
Travel Time (s)		3.0	11.9		13.5	
Confl. Peds. (#/hr)	16			16		4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	9%	4%	2%	3%	0%
Adj. Flow (vph)	302	2172	2029	554	608	296
Shared Lane Traffic (%)						
Lane Group Flow (vph)	302	2172	2029	554	608	296
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		10.0	10.0		9.0	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Number of Detectors	1	0	0	1	1	1
Detector Template				Right	Left	Right
Leading Detector (m)	6.1	0.0	0.0	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	1.8	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Free	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				Free		2 4
Detector Phase	5	2	6		4	2 4
Switch Phase						

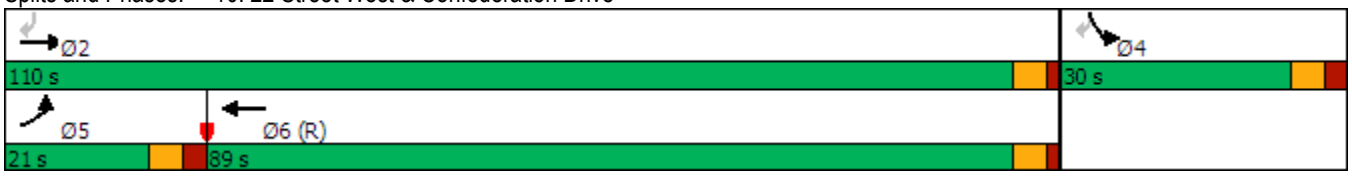


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Initial (s)	9.0	15.0	15.0		9.0	
Minimum Split (s)	15.0	20.0	22.0		15.0	
Total Split (s)	21.0	110.0	89.0		30.0	
Total Split (%)	15.0%	78.6%	63.6%		21.4%	
Maximum Green (s)	15.0	105.0	84.0		24.0	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	2.5	1.5	1.5		2.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	6.0	5.0	5.0		6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	Min	C-Min		None	
Walk Time (s)			7.0			
Flash Dont Walk (s)			10.0			
Pedestrian Calls (#/hr)			16			
Act Effct Green (s)	16.0	96.6	74.6	140.0	32.4	140.0
Actuated g/C Ratio	0.11	0.69	0.53	1.00	0.23	1.00
v/c Ratio	0.75	0.65	0.76	0.35	0.77	0.18
Control Delay	67.6	10.8	23.0	0.5	57.5	0.2
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	67.6	10.9	23.0	0.5	57.5	0.2
LOS	E	B	C	A	E	A
Approach Delay		17.8	18.2		38.8	
Approach LOS		B	B		D	
Queue Length 50th (m)	35.5	185.5	171.7	0.0	80.6	0.0
Queue Length 95th (m)	m34.8	m156.8	168.3	0.0	#118.1	0.0
Internal Link Dist (m)		25.7	174.3		163.1	
Turn Bay Length (m)						
Base Capacity (vph)	414	3609	3025	1574	794	1607
Starvation Cap Reductn	0	0	20	0	0	0
Spillback Cap Reductn	0	467	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.69	0.68	0.35	0.77	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 26 (19%), Referenced to phase 6:WBT, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 21.2		Intersection LOS: C	
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			

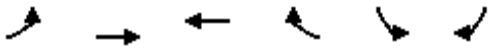
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 22 Street West & Confederation Drive

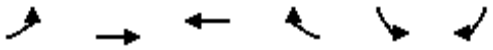


Lanes, Volumes, Timings
10: 22 Street West & Confederation Drive

04/06/2022



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	278	1998	1867	510	559	272
Future Volume (vph)	278	1998	1867	510	559	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0			0.0	0.0	0.0
Storage Lanes	2			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.97	1.00
Ped Bike Factor	1.00			0.95		0.99
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3541	4812	5043	1601	3437	1633
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3532	4812	5043	1520	3437	1611
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				414		
Link Speed (k/h)		60	60		50	
Link Distance (m)		49.7	198.3		187.1	
Travel Time (s)		3.0	11.9		13.5	
Confl. Peds. (#/hr)	16			16		4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	9%	4%	2%	3%	0%
Adj. Flow (vph)	302	2172	2029	554	608	296
Shared Lane Traffic (%)						
Lane Group Flow (vph)	302	2172	2029	554	608	296
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		10.0	10.0		9.0	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Number of Detectors	1	0	0	1	1	1
Detector Template				Right	Left	Right
Leading Detector (m)	6.1	0.0	0.0	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	1.8	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		2 4
Detector Phase	5	2	6	6	4	2 4
Switch Phase						

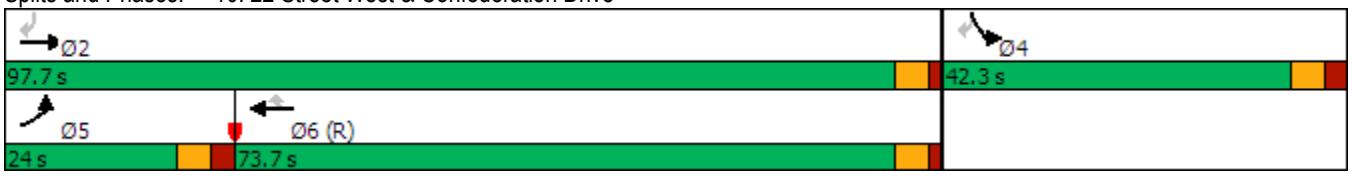


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Initial (s)	9.0	15.0	15.0	15.0	9.0	
Minimum Split (s)	15.0	20.0	22.0	22.0	42.3	
Total Split (s)	24.0	97.7	73.7	73.7	42.3	
Total Split (%)	17.1%	69.8%	52.6%	52.6%	30.2%	
Maximum Green (s)	18.0	92.7	68.7	68.7	36.3	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	2.5	1.5	1.5	1.5	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	5.0	5.0	5.0	6.0	
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	C-Min	C-Min	None	
Walk Time (s)			7.0	7.0	7.0	
Flash Dont Walk (s)			10.0	10.0	29.3	
Pedestrian Calls (#/hr)			16	16	4	
Act Effct Green (s)	16.4	98.4	76.0	76.0	30.6	140.0
Actuated g/C Ratio	0.12	0.70	0.54	0.54	0.22	1.00
v/c Ratio	0.73	0.64	0.74	0.55	0.81	0.18
Control Delay	83.9	4.1	21.5	5.0	60.7	0.2
Queue Delay	0.0	0.2	0.0	0.1	0.0	0.0
Total Delay	83.9	4.3	21.6	5.0	60.7	0.2
LOS	F	A	C	A	E	A
Approach Delay		14.0	18.0		40.9	
Approach LOS		B	B		D	
Queue Length 50th (m)	45.0	19.8	105.4	9.5	82.9	0.0
Queue Length 95th (m)	m38.2	m21.3	110.2	27.6	99.1	0.0
Internal Link Dist (m)		25.7	174.3		163.1	
Turn Bay Length (m)						
Base Capacity (vph)	460	3382	2736	1014	891	1604
Starvation Cap Reductn	0	0	16	25	0	0
Spillback Cap Reductn	0	452	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.74	0.75	0.56	0.68	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 0 (0%), Referenced to phase 6:WBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 19.8		Intersection LOS: B	
Intersection Capacity Utilization 75.9%		ICU Level of Service D	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

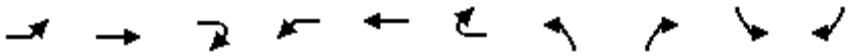
Splits and Phases: 10: 22 Street West & Confederation Drive



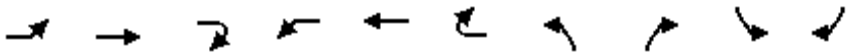
AM Peak - Single Point

Lanes, Volumes, Timings

65: SB On-Ramp/NB On-Ramp & NB Off-Ramp/SB Off-Ramp & 22 Street West 04/06/2022



Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Configurations										
Traffic Volume (vph)	158	2260	100	69	1568	54	227	87	39	580
Future Volume (vph)	158	2260	100	69	1568	54	227	87	39	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	90.0			80.0			0.0		0.0	
Storage Lanes	2			2			2		2	
Taper Length (m)	2.5			2.5			2.5		2.5	
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	1.00	0.97	1.00
Frt			0.850			0.850		0.850		0.850
Flt Protected	0.950			0.950			0.950		0.950	
Satd. Flow (prot)	3278	4856	1512	3437	5092	1585	3052	1408	3506	1617
Flt Permitted	0.950			0.950			0.950		0.950	
Satd. Flow (perm)	3278	4856	1512	3437	5092	1585	3052	1408	3506	1617
Right Turn on Red			Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			101			101		95		144
Link Speed (k/h)		60			60					
Link Distance (m)		198.3			121.7					
Travel Time (s)		11.9			7.3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	8%	8%	8%	3%	3%	3%	16%	16%	1%	1%
Adj. Flow (vph)	172	2457	109	75	1704	59	247	95	42	630
Shared Lane Traffic (%)										
Lane Group Flow (vph)	172	2457	109	75	1704	59	247	95	42	630
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(m)		12.0			7.4					
Link Offset(m)		0.0			0.0					
Crosswalk Width(m)		1.6			1.6					
Two way Left Turn Lane										
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24	14	24	14
Number of Detectors	1	2	1	1	2	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Right	Left	Right
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7					
Detector 2 Size(m)		1.8			1.8					
Detector 2 Type		Cl+Ex			Cl+Ex					
Detector 2 Channel										
Detector 2 Extend (s)		0.0			0.0					
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	Perm	Prot	Free
Protected Phases	7	4		3	8		5		1	

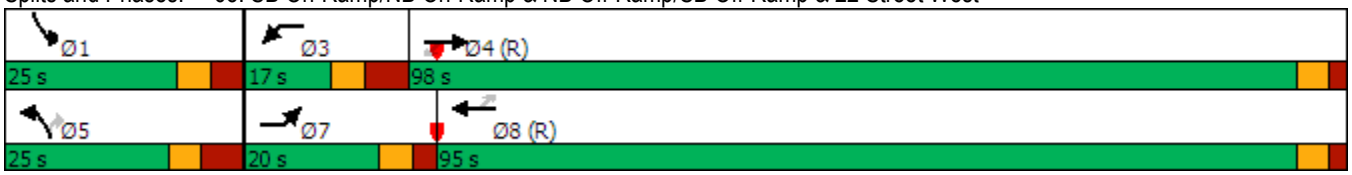


Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Permitted Phases			4			8		5		Free
Detector Phase	7	4	4	3	8	8	5	5	1	
Switch Phase										
Minimum Initial (s)	9.0	15.0	15.0	9.0	15.0	15.0	9.0	9.0	9.0	
Minimum Split (s)	15.0	36.5	36.5	17.0	36.5	36.5	17.0	17.0	16.0	
Total Split (s)	20.0	98.0	98.0	17.0	95.0	95.0	25.0	25.0	25.0	
Total Split (%)	14.3%	70.0%	70.0%	12.1%	67.9%	67.9%	17.9%	17.9%	17.9%	
Maximum Green (s)	14.0	92.5	92.5	9.0	89.5	89.5	17.0	17.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	2.5	2.0	2.0	4.5	2.0	2.0	4.5	4.5	3.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	5.5	5.5	8.0	5.5	5.5	8.0	8.0	7.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	
Walk Time (s)		7.0	7.0		7.0	7.0				
Flash Dont Walk (s)		24.0	24.0		24.0	24.0				
Pedestrian Calls (#/hr)		5	5		5	5				
Act Effct Green (s)	12.2	94.1	94.1	9.0	92.9	92.9	15.4	15.4	15.6	140.0
Actuated g/C Ratio	0.09	0.67	0.67	0.06	0.66	0.66	0.11	0.11	0.11	1.00
v/c Ratio	0.60	0.75	0.10	0.34	0.50	0.05	0.74	0.40	0.11	0.39
Control Delay	80.7	15.7	1.2	67.2	12.9	0.4	73.6	15.4	54.9	0.7
Queue Delay	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.7	16.0	1.2	67.2	12.9	0.4	73.6	15.4	54.9	0.7
LOS	F	B	A	E	B	A	E	B	D	A
Approach Delay		19.5			14.7					
Approach LOS		B			B					
Queue Length 50th (m)	25.5	248.0	1.2	10.4	84.3	0.0	34.3	0.0	5.4	0.0
Queue Length 95th (m)	m34.4	137.3	m3.9	18.6	99.4	0.9	48.7	16.3	11.1	0.0
Internal Link Dist (m)		174.3			97.7					
Turn Bay Length (m)	90.0		40.0	80.0				30.0		35.0
Base Capacity (vph)	327	3262	1049	220	3378	1085	370	254	450	1617
Starvation Cap Reductn	0	267	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	83	0	0	0	0	26
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.82	0.10	0.34	0.52	0.05	0.67	0.37	0.09	0.40

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 12 (9%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 18.4		Intersection LOS: B	
Intersection Capacity Utilization 76.6%		ICU Level of Service D	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 65: SB On-Ramp/NB On-Ramp & NB Off-Ramp/SB Off-Ramp & 22 Street West

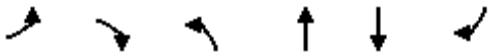


AM Peak - Clancy / NB C/D Road

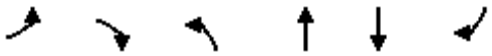
Lanes, Volumes, Timings

81: NB Circle to Clancy Ramp/NB On-Ramp & Clancy Drive Overpass

04/06/2022



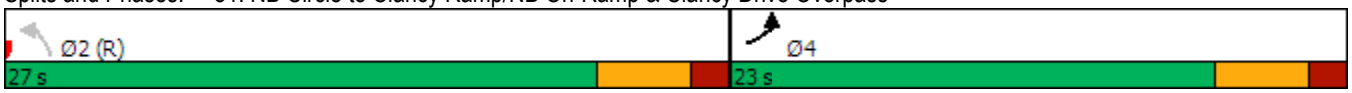
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	308	0	814	0	0	0
Future Volume (vph)	308	0	814	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	1.00
Frt						
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3471	0	3471	0	0	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3471	0	3471	0	0	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	50			60	50	
Link Distance (m)	82.5			133.6	67.2	
Travel Time (s)	5.9			8.0	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	4%	2%	4%	4%	4%
Adj. Flow (vph)	335	0	885	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	335	0	885	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Turn Type	Prot		Perm			
Protected Phases	4					
Permitted Phases			2			
Minimum Split (s)	23.0		10.0			
Total Split (s)	23.0		27.0			
Total Split (%)	46.0%		54.0%			
Maximum Green (s)	18.0		22.0			
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	1.5		1.5			
Lost Time Adjust (s)	0.0		0.0			
Total Lost Time (s)	5.0		5.0			
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	6.0					
Flash Dont Walk (s)	12.0					
Pedestrian Calls (#/hr)	0					
Act Effct Green (s)	18.0		22.0			
Actuated g/C Ratio	0.36		0.44			
v/c Ratio	0.27		0.58			
Control Delay	12.1		12.4			
Queue Delay	0.0		0.0			



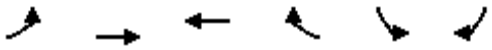
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	12.1		12.4			
LOS	B		B			
Approach Delay	12.1			12.4		
Approach LOS	B			B		
Queue Length 50th (m)	10.5		28.4			
Queue Length 95th (m)	17.7		42.3			
Internal Link Dist (m)	58.5			109.6	43.2	
Turn Bay Length (m)						
Base Capacity (vph)	1249		1527			
Starvation Cap Reductn	0		0			
Spillback Cap Reductn	0		0			
Storage Cap Reductn	0		0			
Reduced v/c Ratio	0.27		0.58			

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Pretimed			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 12.3		Intersection LOS: B	
Intersection Capacity Utilization 71.2%		ICU Level of Service C	
Analysis Period (min) 15			

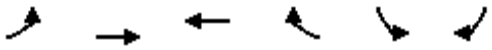
Splits and Phases: 81: NB Circle to Clancy Ramp/NB On-Ramp & Clancy Drive Overpass



Lanes, Volumes, Timings
10: 22 Street West & Confederation Drive 04/06/2022



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	322	1656	2722	1061	504	130
Future Volume (vph)	322	1656	2722	1061	504	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0			0.0	0.0	0.0
Storage Lanes	2			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.97	1.00
Ped Bike Factor	1.00			0.95		0.99
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3541	4768	5193	1601	3506	1633
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3538	4768	5193	1520	3506	1611
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				670		
Link Speed (k/h)		60	60		50	
Link Distance (m)		49.7	198.3		187.1	
Travel Time (s)		3.0	11.9		13.5	
Confl. Peds. (#/hr)	16			16		4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	10%	1%	2%	1%	0%
Adj. Flow (vph)	350	1800	2959	1153	548	141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	350	1800	2959	1153	548	141
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		10.0	10.0		9.0	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Number of Detectors	1	0	0	1	1	1
Detector Template				Right	Left	Right
Leading Detector (m)	6.1	0.0	0.0	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	1.8	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		2 4
Detector Phase	5	2	6	6	4	2 4
Switch Phase						

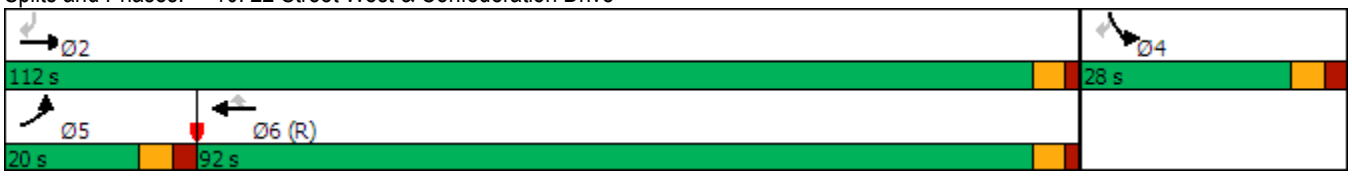


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Initial (s)	9.0	15.0	15.0	15.0	9.0	
Minimum Split (s)	15.0	20.0	22.0	22.0	15.0	
Total Split (s)	20.0	112.0	92.0	92.0	28.0	
Total Split (%)	14.3%	80.0%	65.7%	65.7%	20.0%	
Maximum Green (s)	14.0	107.0	87.0	87.0	22.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	2.5	1.5	1.5	1.5	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	5.0	5.0	5.0	6.0	
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	C-Min	C-Min	None	
Walk Time (s)			7.0	7.0		
Flash Dont Walk (s)			10.0	10.0		
Pedestrian Calls (#/hr)			16	16		
Act Effct Green (s)	14.0	107.0	87.0	87.0	22.0	140.0
Actuated g/C Ratio	0.10	0.76	0.62	0.62	0.16	1.00
v/c Ratio	0.99	0.49	0.92	0.96	1.00	0.09
Control Delay	98.9	1.5	19.5	22.2	95.9	0.1
Queue Delay	0.0	0.1	1.8	2.3	0.0	0.0
Total Delay	98.9	1.6	21.3	24.5	95.9	0.1
LOS	F	A	C	C	F	A
Approach Delay		17.5	22.2		76.3	
Approach LOS		B	C		E	
Queue Length 50th (m)	47.1	7.6	111.9	87.6	79.1	0.0
Queue Length 95th (m)	m39.4	m5.8	175.5	m#123.7	#116.5	0.0
Internal Link Dist (m)		25.7	174.3		163.1	
Turn Bay Length (m)						
Base Capacity (vph)	354	3644	3227	1198	550	1611
Starvation Cap Reductn	0	0	149	20	0	0
Spillback Cap Reductn	0	635	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.60	0.96	0.98	1.00	0.09

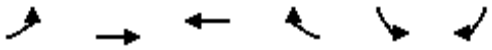
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 0 (0%), Referenced to phase 6:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 26.1		Intersection LOS: C	
Intersection Capacity Utilization 90.3%		ICU Level of Service E	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

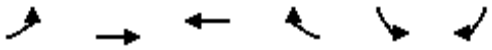
Splits and Phases: 10: 22 Street West & Confederation Drive



Lanes, Volumes, Timings
10: 22 Street West & Confederation Drive 04/06/2022



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	322	1656	2722	1061	504	130
Future Volume (vph)	322	1656	2722	1061	504	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0			0.0	0.0	0.0
Storage Lanes	2			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	0.91	0.91	1.00	0.97	1.00
Ped Bike Factor	1.00			0.98		0.99
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3541	4768	5193	1601	3506	1633
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3538	4768	5193	1574	3506	1611
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				301		
Link Speed (k/h)		60	60		50	
Link Distance (m)		49.7	198.3		187.1	
Travel Time (s)		3.0	11.9		13.5	
Confl. Peds. (#/hr)	16			16		4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	10%	1%	2%	1%	0%
Adj. Flow (vph)	350	1800	2959	1153	548	141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	350	1800	2959	1153	548	141
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		10.0	10.0		9.0	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Number of Detectors	1	0	0	1	1	1
Detector Template				Right	Left	Right
Leading Detector (m)	6.1	0.0	0.0	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	1.8	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Free	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases				Free		2 4
Detector Phase	5	2	6		4	2 4
Switch Phase						



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Initial (s)	9.0	15.0	15.0		9.0	
Minimum Split (s)	15.0	20.0	22.0		42.3	
Total Split (s)	15.0	103.0	88.0		37.0	
Total Split (%)	10.7%	73.6%	62.9%		26.4%	
Maximum Green (s)	9.0	98.0	83.0		31.0	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	2.5	1.5	1.5		2.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	6.0	5.0	5.0		6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	Min	C-Min		None	
Walk Time (s)			7.0		7.0	
Flash Dont Walk (s)			10.0		29.3	
Pedestrian Calls (#/hr)			16		4	
Act Effct Green (s)	13.2	102.2	83.0	140.0	26.8	140.0
Actuated g/C Ratio	0.09	0.73	0.59	1.00	0.19	1.00
v/c Ratio	1.05	0.52	0.96	0.73	0.82	0.09
Control Delay	108.2	1.9	26.4	4.5	64.6	0.1
Queue Delay	0.0	0.1	6.7	0.0	0.0	0.0
Total Delay	108.2	2.1	33.1	4.5	64.6	0.1
LOS	F	A	C	A	E	A
Approach Delay		19.4	25.1		51.4	
Approach LOS		B	C		D	
Queue Length 50th (m)	~52.8	9.0	159.4	11.0	75.6	0.0
Queue Length 95th (m)	m#51.5	m7.8	237.7	m25.3	92.7	0.0
Internal Link Dist (m)		25.7	174.3		163.1	
Turn Bay Length (m)						
Base Capacity (vph)	334	3481	3078	1574	776	1599
Starvation Cap Reductn	0	0	134	0	0	0
Spillback Cap Reductn	0	594	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.62	1.01	0.73	0.71	0.09

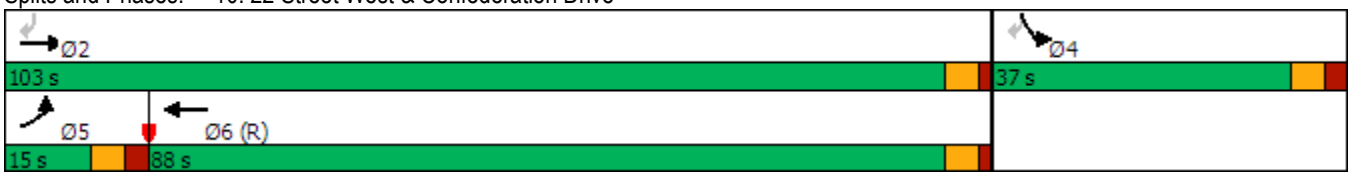
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 0 (0%), Referenced to phase 6:WBT, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.05			
Intersection Signal Delay: 25.9		Intersection LOS: C	
Intersection Capacity Utilization 92.3%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

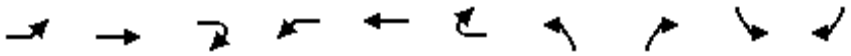
Splits and Phases: 10: 22 Street West & Confederation Drive



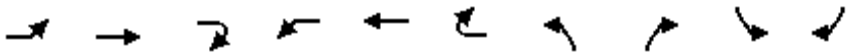
PM Peak - Single Point

Lanes, Volumes, Timings

65: SB On-Ramp/NB On-Ramp & NB Off-Ramp/SB Off-Ramp & 22 Street West 04/06/2022



Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Configurations										
Traffic Volume (vph)	177	1847	193	58	2847	21	309	173	174	627
Future Volume (vph)	177	1847	193	58	2847	21	309	173	174	627
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	90.0			80.0			0.0		0.0	
Storage Lanes	2			2			2		2	
Taper Length (m)	2.5			2.5			2.5		2.5	
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	1.00	0.97	1.00
Frt			0.850			0.850		0.850		0.850
Flt Protected	0.950			0.950			0.950		0.950	
Satd. Flow (prot)	3278	4856	1512	3506	5193	1617	3309	1526	3541	1633
Flt Permitted	0.950			0.950			0.950		0.950	
Satd. Flow (perm)	3278	4856	1512	3506	5193	1617	3309	1526	3541	1633
Right Turn on Red			Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			135			101		115		144
Link Speed (k/h)		60			60					
Link Distance (m)		198.3			121.7					
Travel Time (s)		11.9			7.3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	8%	8%	8%	1%	1%	1%	7%	7%	0%	0%
Adj. Flow (vph)	192	2008	210	63	3095	23	336	188	189	682
Shared Lane Traffic (%)										
Lane Group Flow (vph)	192	2008	210	63	3095	23	336	188	189	682
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(m)		12.0			7.4					
Link Offset(m)		0.0			0.0					
Crosswalk Width(m)		1.6			1.6					
Two way Left Turn Lane										
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24	14	24	14
Number of Detectors	1	2	1	1	2	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Right	Left	Right
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	6.1	6.1	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	6.1	6.1	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7					
Detector 2 Size(m)		1.8			1.8					
Detector 2 Type		Cl+Ex			Cl+Ex					
Detector 2 Channel										
Detector 2 Extend (s)		0.0			0.0					
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	Perm	Prot	Free
Protected Phases	7	4		3	8		5		1	

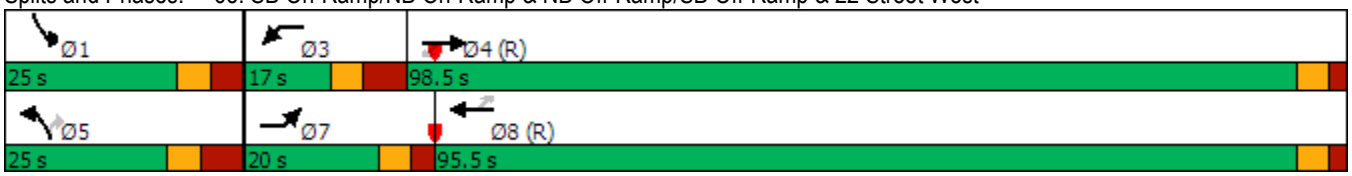


Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Permitted Phases			4			8		5		Free
Detector Phase	7	4	4	3	8	8	5	5	1	
Switch Phase										
Minimum Initial (s)	9.0	15.0	15.0	9.0	15.0	15.0	9.0	9.0	9.0	
Minimum Split (s)	15.0	36.5	36.5	17.0	36.5	36.5	17.0	17.0	16.0	
Total Split (s)	20.0	98.5	98.5	17.0	95.5	95.5	25.0	25.0	25.0	
Total Split (%)	14.2%	70.1%	70.1%	12.1%	68.0%	68.0%	17.8%	17.8%	17.8%	
Maximum Green (s)	14.0	93.0	93.0	9.0	90.0	90.0	17.0	17.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	2.5	2.0	2.0	4.5	2.0	2.0	4.5	4.5	3.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	5.5	5.5	8.0	5.5	5.5	8.0	8.0	7.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	
Walk Time (s)		7.0	7.0		7.0	7.0				
Flash Dont Walk (s)		24.0	24.0		24.0	24.0				
Pedestrian Calls (#/hr)		5	5		5	5				
Act Effct Green (s)	12.6	96.8	96.8	9.0	91.7	91.7	16.6	16.6	17.6	140.5
Actuated g/C Ratio	0.09	0.69	0.69	0.06	0.65	0.65	0.12	0.12	0.13	1.00
v/c Ratio	0.65	0.60	0.19	0.28	0.91	0.02	0.86	0.67	0.43	0.42
Control Delay	72.5	13.3	3.7	66.1	26.6	0.0	81.8	36.0	59.9	0.8
Queue Delay	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.5	14.0	3.7	66.1	26.6	0.0	81.8	36.0	59.9	0.8
LOS	E	B	A	E	C	A	F	D	E	A
Approach Delay		17.7			27.2					
Approach LOS		B			C					
Queue Length 50th (m)	26.8	109.8	6.9	8.7	260.9	0.0	47.8	19.0	25.3	0.0
Queue Length 95th (m)	39.5	123.2	16.0	16.3	287.5	0.0	#71.2	45.6	37.5	0.0
Internal Link Dist (m)		174.3			97.7					
Turn Bay Length (m)	90.0		40.0	80.0				30.0		35.0
Base Capacity (vph)	326	3345	1083	224	3390	1091	400	285	453	1633
Starvation Cap Reductn	0	863	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.81	0.19	0.28	0.91	0.02	0.84	0.66	0.42	0.42

Intersection Summary			
Area Type:	Other		
Cycle Length: 140.5			
Actuated Cycle Length: 140.5			
Offset: 12 (9%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 25.1		Intersection LOS: C	
Intersection Capacity Utilization 87.6%		ICU Level of Service E	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 65: SB On-Ramp/NB On-Ramp & NB Off-Ramp/SB Off-Ramp & 22 Street West

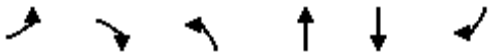


PM Peak - Clancy / NB C/D Road

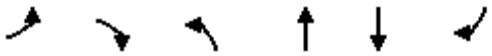
Lanes, Volumes, Timings

81: NB Circle to Clancy Ramp/NB On-Ramp & Clancy Drive Overpass

04/06/2022



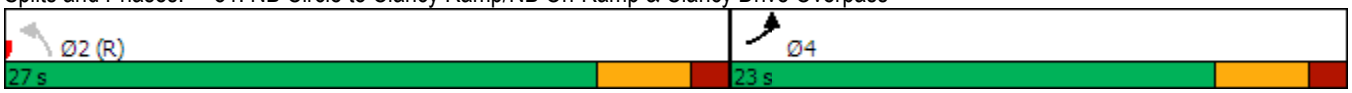
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	354	0	1035	0	0	0
Future Volume (vph)	354	0	1035	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	1.00
Frt						
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3506	0	3506	0	0	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3506	0	3506	0	0	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (k/h)	50			60	50	
Link Distance (m)	82.5			133.6	67.2	
Travel Time (s)	5.9			8.0	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	4%	4%	4%
Adj. Flow (vph)	385	0	1125	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	385	0	1125	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	7.4			7.4	7.4	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Turn Type	Prot		Perm			
Protected Phases	4					
Permitted Phases			2			
Minimum Split (s)	23.0		10.0			
Total Split (s)	23.0		27.0			
Total Split (%)	46.0%		54.0%			
Maximum Green (s)	18.0		22.0			
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	1.5		1.5			
Lost Time Adjust (s)	0.0		0.0			
Total Lost Time (s)	5.0		5.0			
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	6.0					
Flash Dont Walk (s)	12.0					
Pedestrian Calls (#/hr)	0					
Act Effct Green (s)	18.0		22.0			
Actuated g/C Ratio	0.36		0.44			
v/c Ratio	0.31		0.73			
Control Delay	12.3		15.0			
Queue Delay	0.0		0.0			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	12.3		15.0			
LOS	B		B			
Approach Delay	12.3			15.0		
Approach LOS	B			B		
Queue Length 50th (m)	12.2		39.7			
Queue Length 95th (m)	20.2		58.1			
Internal Link Dist (m)	58.5			109.6	43.2	
Turn Bay Length (m)						
Base Capacity (vph)	1262		1542			
Starvation Cap Reductn	0		0			
Spillback Cap Reductn	0		0			
Storage Cap Reductn	0		0			
Reduced v/c Ratio	0.31		0.73			

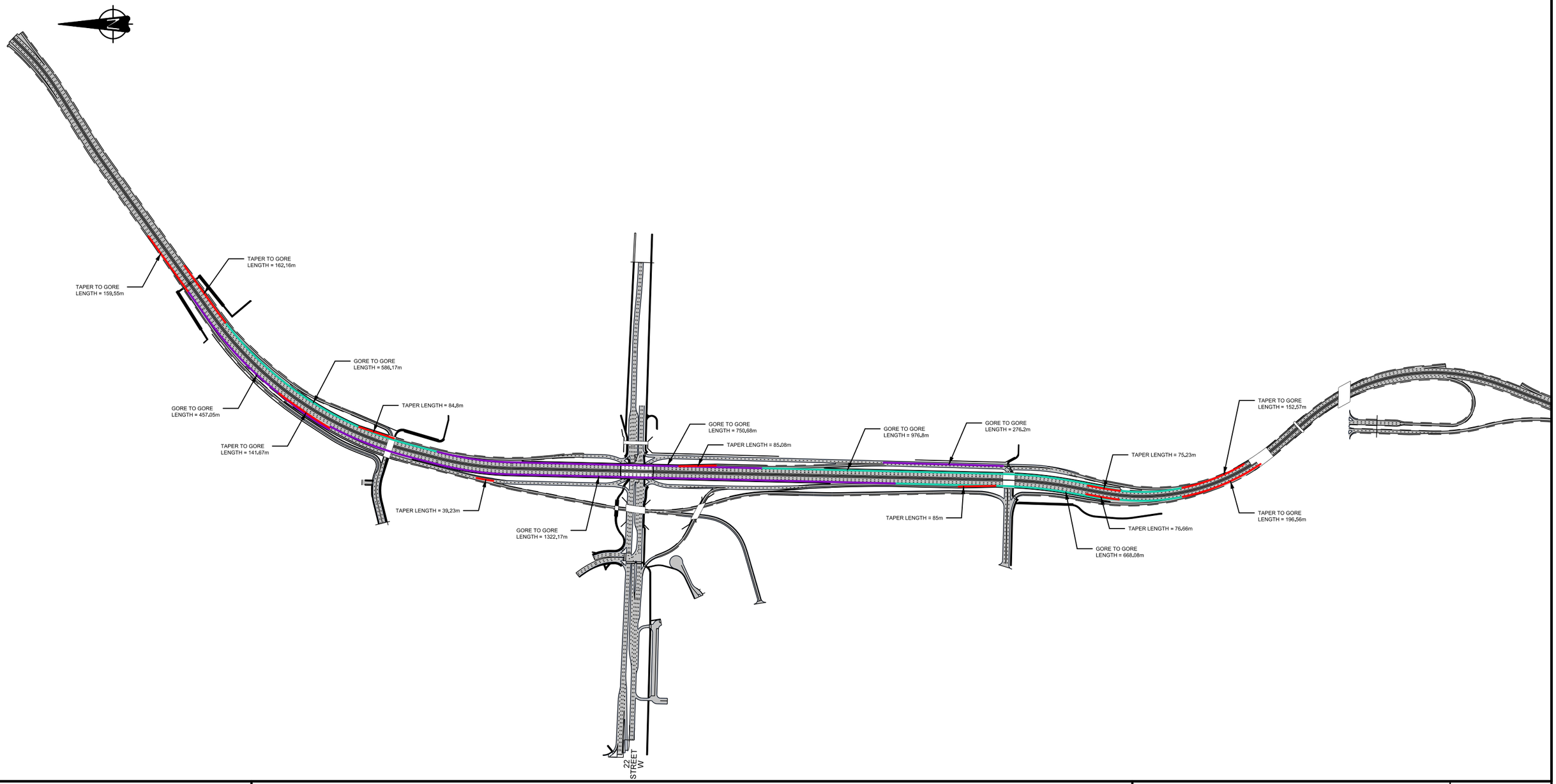
Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 14.3		Intersection LOS: B	
Intersection Capacity Utilization 80.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 81: NB Circle to Clancy Ramp/NB On-Ramp & Clancy Drive Overpass



CIRCLE DRIVE WEST - HCS INPUTS

	Freeway					Ramp							Upstream Ramp					Downstream Ramp					All			LOS	
Circle Drive	**Lanes**	**FFS**	**Terrain**	**AM**	**PM**	**Lanes**	**Ramp FFS**	**Terrain**	**AM**	**PM**	**LD**	**Side**	**Type**	**Distance**	**Terrain**	**AM**	**PM**	**Type**	**Distance**	**Terrain**	**AM**	**PM**	**PHF**	**Driver Population**	**Total % Trucks**	**Adjustment Factors**	**AM**	**PM**
D1 – SB Circle Drive to Laurier Drive	3	55.9	Level	1928	3022	1	37.3	Level	397	1065	523	Right	None	N/A	Level	N/A	N/A	Diverge	1500	Level	979	1197	0.92	All Familiar	4	None	B	C
D2 – SB Circle Drive to 22 Street, Fairmont Drive & Clancy Drive	3	55.9	Level	1531	1957	2	37.3	Level	979	1197	465	Right	Diverge	1500	Level	397	1065	Merge	4338	Level	732	884	0.92	All Familiar	4	None	B	B
M1 – 22 Street to SB Circle Drive	3	55.9	Level	552	760	1	37.3	Level	732	884	279	Right	Diverge	4338	Level	979	1197	Merge	2192	Level	544	560	0.92	All Familiar	4	None	B	B
M2 – Fairmont Drive & Clancy Drive to SB Circle Drive	2	55.9	Level	1284	1644	1	37.3	Level	544	560	645	Right	Merge	2192	Level	732	884	None	N/A	Level	N/A	N/A	0.92	All Familiar	4	None	B	C
D3 – NB Circle Drive to Clancy Drive & 22 Street	2	55.9	Level	1590	2249	1	37.3	Level	1092	1443	501	Right	None	N/A	Level	N/A	N/A	Merge	3205	Level	272	280	0.92	All Familiar	4	None	B	C
M3 – Clancy Drive to NB Circle Drive	3	55.9	Level	498	908	1	37.3	Level	272	280	279	Right	Diverge	3205	Level	1092	1443	Merge	2463	Level	212	198	0.92	All Familiar	4	None	A	B
M4 – 22 Street to NB Circle Drive	3	55.9	Level	770	1086	1	37.3	Level	212	198	278	Right	Merge	2463	Level	272	280	Merge	1923	Level	878	615	0.92	All Familiar	4	None	A	B
M5 – Laurier Drive to NB Circle Drive	3	55.9	Level	982	1284	1	37.3	Level	878	615	532	Right	Merge	1923	Level	212	198	None	N/A	Level	N/A	N/A	0.92	All Familiar	4	None	B	B
	Freeway					**Ramp**							**Upstream Ramp**					**Downstream Ramp**					All				
CD Roads	**Lanes**	**FFS**	**Terrain**	**AM**	**PM**	**Lanes**	**Ramp FFS**	**Terrain**	**AM**	**PM**	**LD**	**Side**	**Type**	**Distance**	**Terrain**	**AM**	**PM**	**Type**	**Distance**	**Terrain**	**AM**	**PM**	**PHF**	**Driver Population**	**Total % Trucks**	**Adjustment Factors**		
D4 – SB CD to Fairmont Drive & Clancy Drive	2	37.3	Level	979	1197	1	45	Level	360	396	129	Right	None	N/A	Level	N/A	N/A	None	N/A	Level	N/A	N/A	0.92	All Familiar	4	None	B	B
D5 – NB CD to Circle Drive	2	37.3	Level	586	762	1	45	Level	272	280	906	Right	None	N/A	Level	N/A	N/A	None	N/A	Level	N/A	N/A	0.92	All Familiar	4	None	A	A



CIMA+

LEGEND:

- LANE DIVIDING LINE
- LANE EDGE LINE OR DIRECTIONAL DIVIDING LINE
- CONCRETE BARRIER
- PATHWAY
- EDGE OF PAVEMENT (RURAL SECTION)
- CURBLINE
- RETAINING WALL
- PROJECT LIMIT

DATE : 18 FEBRUARY 2022

SCALE : 0 50 100 150 200

RAMP MEASUREMENTS

CIRCLE DRIVE WEST
FUNCTIONAL PLANNING STUDY

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA +	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Diverge from SB Circle Drive to Laurier Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	523
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1928	397
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	2178	449
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.32	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.439
Downstream Equilibrium Distance (L_{EQ}), ft	1210.0	Flow Outer Lanes (v_{OA}), pc/h/ln	545
Distance to Downstream Ramp (L_{DOWN}), ft	1500	Off-Ramp Influence Area Speed (S_R), mi/h	49.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.685	Outer Lanes Freeway Speed (S_O), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	1633	Ramp Junction Speed (S), mi/h	52.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	13.9
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	13.6

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Diverge from SB Circle Drive to Laurier Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	523
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	3022	1065
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	3415	1203
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.51	0.60

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.506
Downstream Equilibrium Distance (L_{EQ}), ft	2267.3	Flow Outer Lanes (v_{OA}), pc/h/ln	761
Distance to Downstream Ramp (L_{DOWN}), ft	1500	Off-Ramp Influence Area Speed (S_R), mi/h	48.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.656	Outer Lanes Freeway Speed (S_O), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2654	Ramp Junction Speed (S), mi/h	51.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	22.2
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	22.4

HCS7 Freeway Diverge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Diverge from SB Circle Drive to 22nd Street, Fairmont Drive & Clancy	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	2
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	930
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i)	1531	979
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	1730	1106
Capacity (c), pc/h	6750	4000
Volume-to-Capacity Ratio (v/c)	0.26	0.28

Density and LOS			
Average Density (D), pc/mi/ln	10.1	Average Speed (S), mi/h	55.9
Density in Ramp Influence Area (D_{MD}), pc/mi/ln	10.1	Level of Service (LOS)	B

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Diverge from SB Circle Drive to 22nd Street, Fairmont Drive & Clancy	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	2
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	930
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	1957	1197
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	2211	1352
Capacity (c), pc/h	6750	4000
Volume-to-Capacity Ratio (v/c)	0.33	0.34

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	1500	Speed Index (DS)	0.520
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	472
Distance to Downstream Ramp (LDOWN), ft	4338	Off-Ramp Influence Area Speed (SR), mi/h	48.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.450	Outer Lanes Freeway Speed (SO), mi/h	61.3
Flow in Lanes 1 and 2 (v12), pc/h	1739	Ramp Junction Speed (S), mi/h	50.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	14.5

Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	10.8

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Diverge from NB Circle Drive to Clancy Drive & 22 Street	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	501
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1590	1092
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	1797	1234
Capacity (c), pc/h	4500	2000
Volume-to-Capacity Ratio (v/c)	0.40	0.62

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.509
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	48.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	1797	Ramp Junction Speed (S), mi/h	48.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	18.4
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	15.2

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Diverge to NB Circle Drive to CLancy Drive & 22 Street	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	501
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	2249	1443
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	2541	1630
Capacity (c), pc/h	4500	2000
Volume-to-Capacity Ratio (v/c)	0.56	0.82

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.545
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	48.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	61.3
Flow in Lanes 1 and 2 (v_{12}), pc/h	2541	Ramp Junction Speed (S), mi/h	48.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	26.3
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	21.6

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Diverge from SB CD to Fairmont Drive & Clancy Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	129
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	979	360
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1106	407
Capacity (c), pc/h	3800	2000
Volume-to-Capacity Ratio (v/c)	0.29	0.20

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.435
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	43.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	49.4
Flow in Lanes 1 and 2 (v12), pc/h	1106	Ramp Junction Speed (S), mi/h	43.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	12.7
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	12.6

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Diverge from SB CD to Fairmont Drive & Clancy Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	129
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1197	396
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.962	0.962
Flow Rate (v_i),pc/h	1352	447
Capacity (c), pc/h	3800	2000
Volume-to-Capacity Ratio (v/c)	0.36	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.438
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	43.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	49.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	1352	Ramp Junction Speed (S), mi/h	43.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	15.5
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	14.7

HCS7 Freeway Diverge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Diverge from NB CD to Circle Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	906
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	586	272
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	662	307
Capacity (c), pc/h	3800	2000
Volume-to-Capacity Ratio (v/c)	0.17	0.15

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.426
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	43.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	49.4
Flow in Lanes 1 and 2 (v12), pc/h	662	Ramp Junction Speed (S), mi/h	43.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	7.6
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	1.8

HCS7 Freeway Diverge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Diverge from NB CD to Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	37.3
Segment Length (L) / Deceleration Length (LA),ft	1500	906
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Highway/CD Roadway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	762	280
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	861	316
Capacity (c), pc/h	3800	2000
Volume-to-Capacity Ratio (v/c)	0.23	0.16

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.427
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	43.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	49.4
Flow in Lanes 1 and 2 (v12), pc/h	861	Ramp Junction Speed (S), mi/h	43.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	9.9
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	3.5

HCS7 Freeway Merge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Merge from 22 Street to SB Circle Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	279
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	552	732
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	624	827
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.21	0.41

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	0.0	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	4338	Speed Index (MS)	0.313
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	259
Distance to Downstream Ramp (LDOWN), ft	2192	On-Ramp Influence Area Speed (SR), mi/h	51.5
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	365	Ramp Junction Speed (S), mi/h	52.2
Flow Entering Ramp-Infl. Area (vR12), pc/h	1192	Average Density (D), pc/mi/ln	9.3
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	12.7

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Merge from 22 Street to SB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	279
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	760	884
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	859	999
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.50

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	70.0	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	4338	Speed Index (MS)	0.318
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	356
Distance to Downstream Ramp (LDOWN), ft	2192	On-Ramp Influence Area Speed (SR), mi/h	51.5
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	503	Ramp Junction Speed (S), mi/h	52.3
Flow Entering Ramp-Infl. Area (vR12), pc/h	1502	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	15.1

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Merge from Fairmont Drive & Clancy Drive to SB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	645
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1284	544
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1451	615
Capacity (c), pc/h	4500	2000
Volume-to-Capacity Ratio (v/c)	0.46	0.31

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.304
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	51.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	1451	Ramp Junction Speed (S), mi/h	51.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	2066	Average Density (D), pc/mi/ln	20.0
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	17.3

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Merge from Fairmont Drive & Clancy Drive to SB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	645
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1644	560
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1858	633
Capacity (c), pc/h	4500	2000
Volume-to-Capacity Ratio (v/c)	0.55	0.32

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.320
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	51.5
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	1858	Ramp Junction Speed (S), mi/h	51.5
Flow Entering Ramp-Infl. Area (vR12), pc/h	2491	Average Density (D), pc/mi/ln	24.2
Level of Service (LOS)	C	Density in Ramp Influence Area (DR), pc/mi/ln	20.6

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Merge from Clancy Drive to NB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	279
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	498	272
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	563	307
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.13	0.15

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	0.0	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	3205	Speed Index (MS)	0.308
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	234
Distance to Downstream Ramp (LDOWN), ft	2463	On-Ramp Influence Area Speed (SR), mi/h	51.6
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	329	Ramp Junction Speed (S), mi/h	52.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	636	Average Density (D), pc/mi/ln	5.5
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	8.6

HCS7 Freeway Merge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Merge from Clancy Drive to NB Circle Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	279
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	908	280
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1026	316
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.20	0.16

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	0.0	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	3205	Speed Index (MS)	0.310
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	426
Distance to Downstream Ramp (LDOWN), ft	2463	On-Ramp Influence Area Speed (SR), mi/h	51.6
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	600	Ramp Junction Speed (S), mi/h	52.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	916	Average Density (D), pc/mi/ln	8.5
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	10.8

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Merge from 22nd Street to NB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	278
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	770	212
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	870	240
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.16	0.12

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	2463	Speed Index (MS)	0.308
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	361
Distance to Downstream Ramp (LDOWN), ft	1923	On-Ramp Influence Area Speed (SR), mi/h	51.6
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	509	Ramp Junction Speed (S), mi/h	52.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	749	Average Density (D), pc/mi/ln	7.0
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	9.5

HCS7 Freeway Merge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Merge from 22nd Street to NB Circle Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	278
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	1086	198
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1227	224
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.21	0.11

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	2463	Speed Index (MS)	0.310
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	509
Distance to Downstream Ramp (LDOWN), ft	1923	On-Ramp Influence Area Speed (SR), mi/h	51.6
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.585	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	718	Ramp Junction Speed (S), mi/h	53.0
Flow Entering Ramp-Infl. Area (vR12), pc/h	942	Average Density (D), pc/mi/ln	9.1
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	11.0

HCS7 Freeway Merge Report

Project Information			
Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	AM
Project Description	Merge from Laurier Drive to NB Circle Drive	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	532
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	982	878
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1110	992
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.31	0.50

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	1923	Speed Index (MS)	0.302
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	453
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	51.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.592	Outer Lanes Freeway Speed (SO), mi/h	55.9
Flow in Lanes 1 and 2 (v12), pc/h	657	Ramp Junction Speed (S), mi/h	52.6
Flow Entering Ramp-Infl. Area (vR12), pc/h	1649	Average Density (D), pc/mi/ln	13.3
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	14.6

HCS7 Freeway Merge Report

Project Information

Analyst	Rene Rosvold	Date	4/7/2022
Agency	CIMA+	Analysis Year	500K Population All Stages (Ultimate)
Jurisdiction	Saskatoon	Time Period Analyzed	PM
Project Description	Merge from Laurier Drive to NB Circle Drive	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	55.9	37.3
Segment Length (L) / Acceleration Length (LA),ft	1500	532
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (Vi)	1284	615
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	4.00	4.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.962	0.962
Flow Rate (vi),pc/h	1451	695
Capacity (c), pc/h	6750	2000
Volume-to-Capacity Ratio (v/c)	0.32	0.35

Speed and Density

Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	1923	Speed Index (MS)	0.300
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	592
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	51.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.592	Outer Lanes Freeway Speed (SO), mi/h	55.6
Flow in Lanes 1 and 2 (v12), pc/h	859	Ramp Junction Speed (S), mi/h	52.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	1554	Average Density (D), pc/mi/ln	13.6
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	14.0

N

Appendix N
Class ‘C’ Planning Level Cost Estimate

Circle Drive West - Functional Planning Study
Reconnaissance-Level Cost Estimate

Construction Item (Ultimate Stage)	Length (m)	Width or Max Ht (m)	Unit	Unit Rate	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Stage 6		TOTAL ($M)
					22 Street Rail GS		NB 22 Street Ramps Laurier Ramps 29 Street Ped Bridge Clancy SB Ramps		22 Street SPUI NB Circle @ Laurier SB Circle @ Clancy CN MUT Bridges		SB Circle @ Laurier NB Circle @ Clancy 22 Street Upgrades Complete C/D Roads		Laurier Structure Clancy Structure		Final Transitions		
					Qty	Cost ($M)	Qty	Cost ($M)	Qty	Cost ($M)	Qty	Cost ($M)	Qty	Cost ($M)	Qty	Cost ($M)	Cost ($M)
Roadway - Removals																	
Remove Existing Asphalt Surface - Assume 200mm			m2	$ 5.00	0	$ -	5700	$ 0.03	45900	$ 0.23	91800	$ 0.46	6200	$ 0.03	6400	$ 0.03	$ 0.78
Remove Existing Granular Base Course - Assume 450mm			m2	$ 8.00	0	$ -	5700	$ 0.05	28900	$ 0.23	43500	$ 0.35	6200	$ 0.05	400	$ 0.00	$ 0.68
Remove Curb & Gutter			lm	$ 50.00	0	$ -	0	$ -	1190	$ 0.06	5685	$ 0.28	1095	$ 0.05	400	$ 0.02	$ 0.42
Remove Sidewalk/MUP			m2	$ 100.00	0	$ -	60	$ 0.01	0	$ -	2505	$ 0.25	605	$ 0.06	170	$ 0.02	$ 0.33
Remove Concrete Barrier			lm	$ 100.00	0	$ -	1150	$ 0.12	1550	$ 0.16	1855	$ 0.19	415	$ 0.04	0	$ -	$ 0.50
Remove SB Circle to WB 22 Street Structure			ea.	$ 250,000.00	0	$ -	0	$ -	0	$ -	1	$ 0.25	0	$ -	0	$ -	$ 0.25
Remove SB Circle Mainline Structure			ea.	$ 250,000.00	0	$ -	0	$ -	0	$ -	1	$ 0.25	0	$ -	0	$ -	$ 0.25
Remove SB Circle to Fairmont Drive Structure			ea.	$ 250,000.00	0	$ -	0	$ -	0	$ -	1	$ 0.25	0	$ -	0	$ -	$ 0.25
Remove Pedestrian Underpass of Circle Drive			ea.	$ 100,000.00	0	$ -	1	$ 0.10	0	$ -	0	$ -	2	$ 0.20	0	$ -	$ 0.30
Roadways - New Construction																	
Topsoil Stripping			m2	$ 10.00	0	$ -	43250	$ 0.43	22600	$ 0.23	100250	$ 1.00	10400	$ 0.10	6300	$ 0.06	$ 1.83
Common Excavation			m3	$ 15.00	0	$ -	53000	$ 0.80	94250	$ 1.41	126300	$ 1.89	7600	$ 0.11	13200	$ 0.20	$ 4.42
Surplus Excavation - Haul Off Site			m3	$ 30.00	0	$ -	45200	$ 1.36	41050	$ 1.23	149550	$ 4.49	16500	$ 0.50	6300	$ 0.19	$ 7.76
Topsoil & Seeding			m2	$ 10.00	0	$ -	34400	$ 0.34	26100	$ 0.26	88200	$ 0.88	6700	$ 0.07	9600	$ 0.10	$ 1.65
Granular Base Course - Assume 500mm + Subgrade Prep			m2	$ 50.00	0	$ -	11750	$ 0.59	39700	$ 1.99	68950	$ 3.45	5600	$ 0.28	1300	$ 0.07	$ 6.37
Asphalt Concrete Pavement - Assume 200mm			m2	$ 80.00	0	$ -	13000	$ 1.04	39800	$ 3.18	94700	$ 7.58	5600	$ 0.45	9300	$ 0.74	$ 12.99
Curb and Gutter			lm	$ 175.00	0	$ -	1420	$ 0.25	0	$ -	8590	$ 1.50	835	$ 0.15	1570	$ 0.27	$ 2.17
3.0m MUP c/w Base Course + Subgrade Prep			m2	$ 75.00	0	$ -	2050	$ 0.15	0	$ -	5230	$ 0.39	1145	$ 0.09	0	$ -	$ 0.63
4.2m Mono MUP/Sidewalk c/w Base Course + Subgrade Prep			m2	$ 95.00	0	$ -	0	$ -	0	$ -	1795	$ 0.17	835	$ 0.08	0	$ -	$ 0.25
1.5m Sidewalk c/w Base Course + Subgrade Prep			m2	$ 240.00	0	$ -	0	$ -	0	$ -	3.5	$ 0.00	265	$ 0.06	315	$ 0.08	$ 0.14
Line Painting			ln km	$ 1,100.00	0	$ -	2.82	$ 0.00	16.45	$ 0.02	27.65	$ 0.03	1.53	$ 0.00	1.385	$ 0.00	$ 0.05
Concrete Fill			m2	$ 125.00	0	$ -	135	$ 0.02	0	$ -	7405	$ 0.93	0	$ -	175	$ 0.02	$ 0.96
Concrete Median Barrier			lm	$ 600.00	0	$ -	35	$ 0.02	1850	$ 1.11	1535	$ 0.92	0	$ -	0	$ -	$ 2.05
Barrier End Treatment			ea.	$ 30,000.00	0	$ -	4	$ 0.12	1	$ 0.03	7	$ 0.21	0	$ -	2	$ 0.06	$ 0.42
Retaining Structures (Including Integrated Barrier @ Top As Required)																	
NB Circle Drive S Clancy	245	7.5	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	1350	$ 6.08	0	$ -	0	$ -	$ 6.08
SB Circle Drive S Clancy	225	7.5	m2 face	$ 4,500.00	0	$ -	0	$ -	900	$ 4.05	0	$ -	0	$ -	0	$ -	$ 4.05
NB Circle Drive N Clancy	410	8.5	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	2200	$ 9.90	0	$ -	0	$ -	$ 9.90
SB Circle Drive N Clancy	400	8.5	m2 face	$ 4,500.00	0	$ -	0	$ -	2100	$ 9.45	0	$ -	0	$ -	0	$ -	$ 9.45
SB Clancy On Ramp	130	7	m2 face	$ 4,500.00	0	$ -	600	$ 2.70	0	$ -	0	$ -	0	$ -	0	$ -	$ 2.70
NB 22 Street C/D Road @ Clancy	220	6	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	1000	$ 4.50	0	$ -	0	$ -	$ 4.50
NB 22 Street C/D Road @ 22 Street	295	8	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	1500	$ 6.75	0	$ -	0	$ -	$ 6.75
SB 22 Street Circle Drive On Ramp	105	3.5	m2 face	$ 3,000.00	0	$ -	0	$ -	0	$ -	400	$ 1.20	0	$ -	0	$ -	$ 1.20
SB Clancy C/D Road @ SaskTel (West Side)	55	2.5	m2 face	$ 3,000.00	0	$ -	75	$ 0.23	0	$ -	75	$ 0.23	0	$ -	0	$ -	$ 0.45
SB Clancy C/D Road @ SaskTel (East Side)	165	2.5	m2 face	$ 3,000.00	0	$ -	212.5	$ 0.64	0	$ -	212.5	$ 0.64	0	$ -	0	$ -	$ 1.28
NB Circle Drive S 22 Street	250	11	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	1900	$ 8.55	0	$ -	0	$ -	$ 8.55
SB Circle Drive S 22 Street	405	11	m2 face	$ 4,500.00	0	$ -	0	$ -	2200	$ 9.90	0	$ -	0	$ -	0	$ -	$ 9.90
NB Circle Drive N 22 Street	250	11	m2 face	$ 4,500.00	0	$ -	0	$ -	1800	$ 8.10	0	$ -	0	$ -	0	$ -	$ 8.10
SB Circle Drive N 22 Street	480	11	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	2650	$ 11.93	0	$ -	0	$ -	$ 11.93
Laurier MUT (Both Sides)	175	10.5	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	0	$ -	175	$ 0.79	0	$ -	$ 0.79
Circle Drive NB N Laurier	290	12	m2 face	$ 4,500.00	0	$ -	0	$ -	1950	$ 8.78	0	$ -	0	$ -	0	$ -	$ 8.78
Circle Drive SB N Laurier	314	10	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	1800	$ 8.10	0	$ -	0	$ -	$ 8.10
Laurier NB On Ramp	95	6	m2 face	$ 4,500.00	0	$ -	500	$ 2.25	0	$ -	0	$ -	0	$ -	0	$ -	$ 2.25
Laurier SB Off Ramp	550	5	m2 face	$ 3,000.00	0	$ -	150	$ 0.45	0	$ -	0	$ -	0	$ -	0	$ -	$ 0.45
Laurier North Wall	45	2	m2 face	$ 3,000.00	0	$ -	0	$ -	0	$ -	0	$ -	50	$ 0.15	0	$ -	$ 0.15
Bridges																	
CN Rail Over 22 Street (1 Track over 8 Lanes + 2 MUP)	7	56	m2	$ 10,000.00	392	$ 3.92	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ 3.92
Remove Existing Structure			LS	$ 250,000.00	1	$ 0.25	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ 0.25
22 Street CN Rail North Side Headslope Retaining Wall	50	3	m2 face	$ 3,000.00	225	$ 0.68	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ 0.68
22 Street CN Rail South Side Headslope Retaining Wall	55	5	m2 face	$ 3,000.00	125	$ 0.38	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ 0.38
Circle Drive Over Clancy (6 Lanes over 2 Lanes + 1 MUP)	30	35	m2	$ 10,000.00	0	$ -	0	$ -	0	$ -	0	$ -	1050	$ 10.50	0	$ -	$ 10.50
Clancy North Headslope Retaining Wall	35	8.5	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	0	$ -	300	$ 1.35	0	$ -	$ 1.35
Clancy South Headslope Retaining Wall	35	7.5	m2 face	$ 4,500.00	0	$ -	0	$ -	0	$ -	0	$ -	275	$ 1.24	0	$ -	$ 1.24
Circle Drive Over 22 Street (6 Lanes over 8 Lanes + 2 MUP)	35	110	m2	$ 10,000.00	0	$ -	0	$ -	1925	$ 19.25	1925	$ 19.25	0	$ -	0	$ -	$ 38.50
22 Street North Headslope Retaining Wall	35	11	m2 face	$ 4,500.00	0	$ -	0	$ -	200	$ 0.90	200	$ 0.90	0	$ -	0	$ -	$ 1.80
22 Street South Headslope Retaining Wall	35	11	m2 face	$ 4,500.00	0	$ -	0	$ -	200	$ 0.90	200	$ 0.90	0	$ -	0	$ -	$ 1.80
Circle Drive Under Laurier (8 Lanes under 2 Lanes + 1 MUP)	15	50	m2	$ 10,000.00	0	$ -	0	$ -	0	$ -	0	$ -	750	$ 7.50	0	$ -	$ 7.50
22 Street North Side MUP Under CD Road	30	35	m2	$ 10,000.00	0	$ -	525	$ 5.25	0	$ -	525	$ 5.25	0	$ -	0	$ -	$ 10.50
North Retaining Wall	35	8.5	m2 face	$ 4,500.00	0	$ -	150	$ 0.68	0	$ -	150	$ 0.68	0	$ -	0	$ -	$ 1.35
South Retaining Wall	35	7.5	m2 face	$ 4,500.00	0	$ -	137.5	$ 0.62	0	$ -	137.5	$ 0.62	0	$ -	0	$ -	$ 1.24
29 Street MUP Over Circle Drive (MUP over 8 Lanes)	5.4	60	m2	$ 10,000.00	0	$ -	324	$ 3.24	0	$ -	0	$ -	0	$ -	0	$ -	$ 3.24
29 Street MUP Overpass East Side Approach Retaining W	190	9.5	m2 face	$ 5,000.00	0	$ -	900	$ 4.50	0	$ -	0	$ -	0	$ -	0	$ -	$ 4.50
29 Street MUP Overpass West Side Approach Retaining W	215	9	m2 face	$ 5,000.00	0	$ -	1300	$ 6.50	0	$ -	0	$ -	0	$ -	0	$ -	$ 6.50
Utilities & Signage																	
Overhead Power Transmission Crossing Relocation			LS	$ 2,000,000.00	0	$ -	0	$ -	1	$ 2.00	0	$ -	0	$ -	0	$ -	$ 2.00
Remove Existing Streetlighting			lm	$ 20.00	0	$ -	620	$ 0.01	1790	$ 0.04	6275	$ 0.13	420	$ 0.01	100	$ 0.00	$ 0.18
New Streetlighting (Bases, Davits, Cable)			lm	$ 50.00	0	$ -	2130	$ 0.11	3290	$ 0.16	10330	$ 0.52	440	$ 0.02	840	$ 0.04	$ 0.85
Major Overhead Sign Structure (Bridge or Cantilever)			ea.	$ 200,000.00	0	$ -	1	$ 0.20	0	$ -	20	$ 4.00	1	$ 0.20	0	$ -	$ 4.40
Minor Ground Mount Signage			LS	$ 75,000.00	0	$ -	0.225	$ 0.02	0.4	$ 0.03	0.825	$ 0.06	0.1	$ 0.01	0.15	$ 0.01	$ 0.13
Signals			ea.	$ 150,000.00	0	$ -	0	$ -	0	$ -	2	$ 0.30	1	$ 0.15	0	$ -	$ 0.45
Stormwater Upgrades																	
Catchbasin/Manholes			ea.	$ 10,000.00	0	$ -	35	$ 0.35	66	$ 0.66	207	$ 2.07	9	$ 0.09	17	$ 0.17	$ 3.33
Storm Leads			lm	$ 600.00	0	$ -	1730	$ 1.04	3290	$ 1.97	10330	$ 6.20	440	$ 0.26	840	$ 0.50	$ 9.98
Underground Storage			LS	$ 5,000,000.00	0	$ -	0	$ -	0	$ -	1	$ 5.00	0	$ -	0	$ -	$ 5.00
Right of Way Acquisition																	
Land Acquisition			LS	$ 500,000.00	0	$ -	1	$ 0.50	0	$ -	0	$ -	0	$ -	0	$ -	$ 0.50
Sub Total - Construction						**$ 5.22**		**$ 34.68**		**$ 76.32**		**$ 129.44**		**$ 24.59**		**$ 2.59**	**$ 272.84**
Engineering				*12%*		*$ 0.63*		*$ 4.16*		*$ 9.16*		*$ 15.53*		*$ 2.95*		*$ 0.31*	*$ 32.74*
Staging & Detours (incl. rail detours)				*10%*		*$ 0.52*		*$ 3.47*		*$ 7.63*		*$ 12.94*		*$ 2.46*		*$ 0.26*	*$ 27.28*
Contingency				*40%*		*$ 2.09*		*$ 13.87*		*$ 30.53*		*$ 51.78*		*$ 9.83*		*$ 1.04*	*$ 109.14*
Grand Total - Construction						**$ 8.46**		**$ 56.18**		**$ 123.64**		**$ 209.70**		**$ 39.83**		**$ 4.19**	**$ 442.00**