DRAINAGE SERVICING REPORT

Jasper House – New Tower
Victoria Promenade and Jasper Avenue
Edmonton, AB

DURRANCE
THOMPSON Engineers & Contractors Ltd.

SEPTEMBER – 2022

Drainage Servicing Report

Prepared For:
TBD ARCHITECTURE + URBAN PLANNING
9916-81 Ave NW
Edmonton, AB

Prepared By:



DURRANCE
THOMPSON Engineers & Contractors Ltd.

September 2022

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1.0 Introduction

1.1 Purpose of Report and Site Information

This report was prepared to evaluate the drainage servicing requirements for rezoning the subject property to DC2. The report provides an overview of existing storm and sanitary outlets from the property and considers the capacity of the downstream of the surrounding servicing system. The subject property is a group of 5 lots located at 12021 Jasper Avenue (Lots 9-13, Block 19, Plan 3549AE) in Edmonton, AB. The development area is situated in the Oliver Neighbourhood. Overall area of the site is 0.34 ha, with approximately 0.18 ha proposed for re-development. The site is currently zoned DC1 in the City of Edmonton. The sanitary and storm servicing report has been prepared on behalf of TBD Architecture + Urban Planning for the development area.

1.2 Existing Conditions and Proposed Land Use Description

The subject property consist of an existing 12-storey building with 115 units with adjacent parking area on the east portion and a large parking lot with landscaping on the remaining area. The overall development area is surrounded by Jasper Avenue on the north, 121th Street on the west, 100th Avenue on the south and existing development on the eastside of the property. The adjacent developments around the subject property consist of condominiums and commercial retail spaces.

The proposed re-development is for a new 28± storey residential building accommodating 224± units with 10,765 ft^2 of commercial space and 5± storey underground parkade for 232± stalls. There is a potential for a future commercial development (2470 ft^2) on the east portion of the property on the north side. Refer to **Appendix A** for the TIA report for land use areas. The proposed building is to be built in the existing parking lot area on the west portion of the property. See Figure 1 for an aerial photo of the development area and proposed new building location.

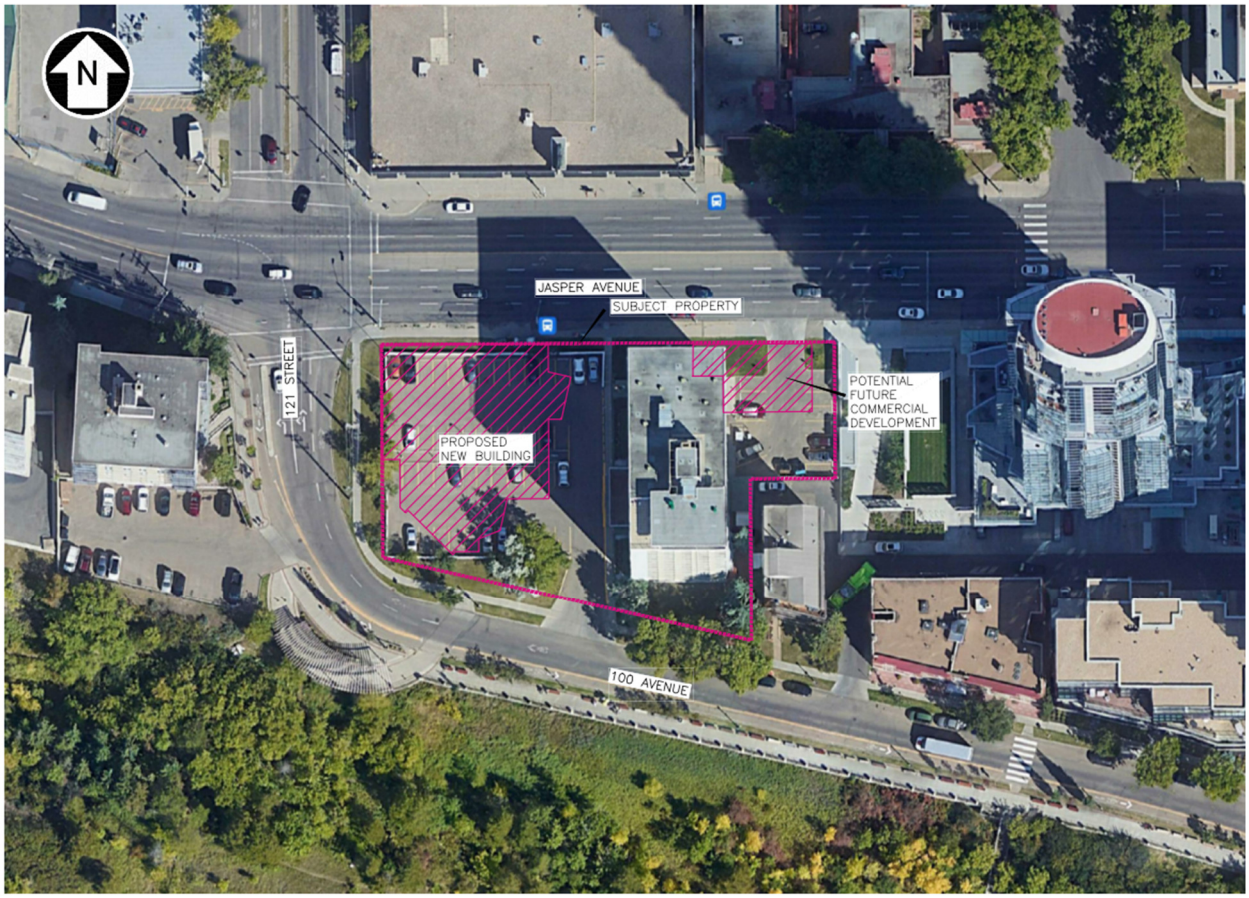


Figure 1. Aerial Photo of Development Area and Proposed New Building Location

1.3 Relevant Planning Documents

City of Edmonton existing servicing information for sanitary and storm sewers was reviewed and utilized to determine the storm water discharge requirements and available capacity of the subject properties. Please refer to the **Appendix B** for copies of the supplied data.

2.0 Storm Servicing

2.1 Approach to Storm Capacity Review

Currently the subject properties are serviced by underground storm sewer systems. This report will analyze the existing storm sewer capacities available

in the vicinity of the properties and assess the suitability of allowing for service to be made available for the subject sites.

2.2 Existing Storm Servicing

The current subject property and area consists of grass and imperious surfaces. The imperious surfaces are roof top, concrete, and asphalt. The existing overland drainage of the parking lot on the west portion of the property is directed towards a catch basin at the center of the parking area. For the existing building it is assumed the roof top will be tied in to the existing underground storm sewer service. The remaining parking area east of the existing building surface drains off the property to Jasper Ave. The underground storm sewer system for the pre-development property is serviced by an existing storm service, connected from the existing 525mm concrete storm sewer main on 121th Street at the east property line. It is assumed that the on-site storm water flow is controlled via an orifice plate before discharging into the storm sewer main. The existing on-site storm volume storage would be from the roof top and parking areas. The existing 525mm storm main along 121th Street can be considered for future servicing required for the post-development of the property.

The capacity of the existing 525mm storm sewer main was reviewed from the information provided and determined to be the following:

$Q = (1/n) \times A \times R^{2/3} \times S^{1/2}$

Q = Storm Sewer capacity (m^3/s)
n = Channel Roughness Coefficient (dimensionless) = 0.013
A = Cross Sectional Flow Area (m^2) = $((\pi \times 0.525^2)/4)$ = 0.216 m^2
R = Hydraulic Radius of the Channel (m) = (0.525/4) = 0.131 m
S = Slope of the Channel Bottom (dimensionless) = 0.022

Therefore, Q = 0.635 m^3/s = 635 L/s

The existing adjacent 525mm storm sewer main along 121th Street has a current capacity of 635 L/s.

The current property consist of building/asphalt/concrete on approximately 82% of the site and the remaining 18% estimated to be landscaping. The current property storm water flows generation for a typical 1:5 year and 1:100 year storm event are as follows:

1:5 year storm event
C (runoff coefficient for current site) = 0.80
T_{CONC} = 5 mins
Intensity = 89.0 mm/hr
Area of Total Site = 0.34 Ha

1:5 year total calculated uncontrolled storm water flows for the current developed property = 0.067 m^3/s = 67.24 L/s

1:100 year storm event
C (runoff coefficient for current site) = 0.80
T_{CONC} = 5 mins
Intensity = 188.4 mm/hr
Area of Total Site = 0.34 Ha

1:100 year total calculated uncontrolled storm water flows for the current developed property = 0.14 m^3/s = 142.35 L/s

2.3 Proposed Storm Servicing and Post Development Flows

The subject property is proposed to be developed with a High Rise Apartment density that will include building/asphalt/concrete on approximately 85% of the site and the remaining 15% estimated to be a landscaping finish. The subject property, once developed, will generate the following storm water flows for a typical 1:5 year and 1:100 year storm event:

C (runoff coefficient for developed site) = (0.85)(0.95)+(0.15)(0.10)
= 0.83

1:5 year storm event
C (runoff coefficient for developed site) = 0.83
T_{CONC} = 5 mins
Intensity = 89.0 mm/hr
Area of Total Site = 0.34 Ha

1:5 year total calculated uncontrolled storm water flows for the fully re-developed property = 0.069 m^3/s = 69.35 L/s

1:100 year storm event
C (runoff coefficient for developed site) = 0.83
T_{CONC} = 5 mins
Intensity = 188.4 mm/hr
Area of Total Site = 0.34 Ha

1:100 year total calculated uncontrolled storm water flows for the fully re-developed property = 0.146 m^3/s = 146.80 L/s

However, the development is proposed to be designed with an on-site Storm Water Management Plan (SWMP), with a controlled release of storm water based on 35 L/s/Ha and accommodating the 100-year return frequency. The total controlled release from the fully re-developed properties is as follows:

$Q_{ALLOWABLE}$ = (35 L/s/Ha) (Site Area)
= (35 L/s/Ha) (0.34 Ha)
= 11.9 L/s

Therefore, the controlled release of the fully re-developed properties will result in 11.9 L/s of storm water flowing from the existing service connection to the 525mm storm sewer main (635 L/s). Connecting the new proposed development to the existing 525mm storm sewer main will use 1.9% of its existing capacity. Further analysis is not required as the proposed peak controlled storm contribution represents less than 10% of the existing capacity, as per the Edmonton City Drainage Servicing Report - Terms of Reference.

2.4 Proposed Site Storage Volume Requirements

The newly rezoned development will be design with Storm Water Management Plan to ensure the controlled release is maintained at a maximum of 11.9 L/s as outlined above.

The required on-site storage volume has been determined and calculated based on the 4 hour Chicago Distribution, referenced to "EPCOR Drainage Services: Guideline for Storm Water Management; Requirements for Individual Lot Development Areas Between 0.16 ha to 3.0 ha". Based on calculations provided from the above reference, the required storage volume for 1:100 year storm events is determined to be as follows:

1:100 year storm event
C (runoff coefficient for developed site) = 0.83
$Q_{ALLOWABLE}$ = 11.9 L/s
Area of Total Site = 0.34 Ha
Storage Volume 100 year = 332m³/Ha
Required Storage Volume = 113m³

The on-site storage volume requirement is approximately 113m². To provide on-site storm water storage volume a combination of rooftop storage, surface storage and underground storage will be implemented. A flow control system (orifice plate) will be utilized for flow control prior to tie-in to the city storm system. Data utilized and calculations are shown in **Appendix C**.

2.5 Impact to Existing Storm Drainage Network

As outlined above, the managed release of storm water from the property will increase the capacity of the existing storm sewer main by 1.9% therefore this development will have a minimal impact on the existing storm drainage system.

3.0 Sanitary Servicing

3.1 Approach to Sanitary Sewer Capacity Review

A review of the existing sanitary sewer capacities currently servicing the subject properties was completed to ensure increasing the development intensity from DC1 to DC2 would not pose any potential issues.

3.2 Existing Sanitary Sewer Servicing

There are currently 4 existing sanitary sewer services connecting to each of the individual lots that makes up the subject property. Services ranged between 150 to 200mm in size and is connected to the 200mm combined sewer main along 100th Avenue.

The capacity of the existing 200mm combined sewer main along 100th Avenue was reviewed from the information provided and determined to be the following:

$Q = (1/n) \times A \times R^{2/3} \times S^{1/2}$

Q = Combined Sewer capacity (m^3/s)
n = Channel Roughness Coefficient (dimensionless) = 0.013
A = cross sectional flow area (m^2) = $((\pi \times 0.2^2)/4)$ = 0.031 m^2
R = hydraulic radius of the channel (m) = (0.2/4) = 0.050 m
S = slope of the channel bottom (dimensionless) = 0.0046

Therefore, Q = 0.022 m^3/s = 22.2 L/s

The existing adjacent 200mm combined sewer main along 100th Avenue has a current capacity of 22.2 L/s.

3.3 Proposed Sanitary Sewer Servicing and Post Development Flows

The proposed new 28± storey building to the property with 10,765 ft^2 (1000m^2) of commercial space and a potential for a future 2470 ft^2 (229m^2) commercial

development on the east porting of the property, will result in an increase to the total number of people potentially contributing to the sanitary sewer system. This proposed development will be the only development that will be contributing to the 200mm combined sewer main within 100th Avenue.

The current residential sanitary flow generation calculations applying RA9 zoning is:

Current Residential Sanitary Flows Generation (RA9 Zoning)

$Q_{PDW} = (G \times P \times PF)/86400$

G = per capita daily sewage flow generation = 220 L/day/person
P = design contributing population = 1.89 people/unit = 217 people (equivalent of 115 units)
PF = peaking factor = 2.65

$Q_{PDW} = 1.67$ L/s

This value represents 7.5% of the total capacity of the existing 200mm combined sewer main.

The proposed residential sanitary flow generation calculation applying RA9 zoning is:

Proposed Residential and Commercial Sanitary Flows Generation (RA9 Zoning)

Residential

$Q_{PDW} = (G \times P \times PF)/86400$

G = per capita daily sewage flow generation = 220 L/day/person
P = design contributing population = 1.89 people/unit = 641people (equivalent of the combined buildings total of 339 Units)
PF = peaking factor = 2.72

Q_{PDW} = 4.43 L/s

Commercial

Total Commercial Area = 1000 + 229
= 1229m²

Future Average Flow Generation Based on Land Use
- Assuming 50% of commercial space is for restaurants and 50% is for office building/department stores

G_{avg} = (20 L/day/m²)(0.5) + (8 L/day/m²)(0.5)
= 14 L/day/m²

G = per land use daily sewage flow generation = 14 L/day/m²
P = design contributing commercial area = 1229m²
PF = peaking factor = 20.67

Q_{PDW} =4.12 L/s

Total Dry Weather Flow (Q) = 4.43 + 4.12
= 8.55 L/s

Inflow/Infiltration

Site Area = 0.34Ha
Assume Q = 0.28L/s/Ha (no sag)

Total Wet Weather Flow (Q) = 0.10 L/s

Total Future Sanitary Flow Generation (Q) = 8.55 + 0.10
= 8.65 L/s

This value represents 39% of the total capacity of the existing 200mm combined sewer main (22.2 L/s). The proposed peak sanitary flow contributions are greater than 10% of the existing receiver sewer main's pipe-

full capacity, therefore a hydraulic analysis was conducted. The EPCOR modelling group conducted a hydraulic assessment and the findings are as follows:

- The existing property located southeast of the proposed development was originally identified to have the sewer servicing connected to the main combined sewer between MH 255600 and MH 255601. This property does not have on-site controlled storm water discharge. This would have significant contribution to the existing combined sewer pipe section upstream.

- However, with further investigation, this existing servicing connection had been abandoned and the current connection is directly to MH 255601. Therefore the existing contribution does not have a significant effect on the upstream combined sewer pipe section; which included the contribution from the proposed development.

Data utilized and calculations are shown in **Appendix D**.

3.4 Impact to Existing Combined Sewer Network

Rezoning of the subject properties from DC1 to DC2 with the proposed new development will have minimal impact on the existing sanitary sewer network and services for the subject properties. The existing services may be reused or potentially abandoned and new services brought to the property, depending on the ultimate design of the new development.

4.0 Conclusions and Findings

From the Drainage Servicing review that was conducted, we have the following conclusions and findings:

- The subject property is proposed to be rezoned from DC1 to DC2. For the purposes of this report, we considered 339 units (641 people) with 10,765 ft^2 of commercial space and a potential for a future 2470 ft^2 (229m^2) commercial development as the basis of the servicing study.

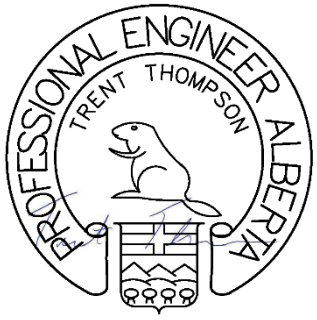
- The existing 525mm storm sewer main located along 121th Street is deemed to be suitable to service the proposed new development. It is recommended that the design parameters for the new development be for the controlled release of storm water based on a 35 L/s/ha design criteria and storage requirements for a 1:100 year storm event.

- The on-site storage volume requirement is approximately 113m^2. Site storage will be a combination of rooftop storage, surface storage and underground storage.

- The proposed peak sanitary flow contribution to the existing 200mm combined sewer main located on 100th Avenue exceeds 10% pipe-full.

- Our review has determined that the existing sewer infrastructure for the subject property is within the allowable limit for the proposed development.

We trust that this is the information you require. Please contact the undersigned if you have any questions.



Trent Thompson, P. Eng.

APPENDICES:

SUPPLEMENTAL INFORMATION

APPENDIX A:

- TIA Report – Proposed Lase Use Areas

3.3 Description of Proposed Development

Jasper House GP Inc. intends to construct a 30-storey mixed-use building accommodating about 224 residential units and about 10,765 ft² of commercial floor area along Jasper Avenue. The site plan could accommodate an additional 2,470 ft² of commercial spaces along the Jasper Avenue frontage (in front of the existing Jasper House Building). At this time, the potential commercial development area in front of the Jasper House Building has not been included in the analysis. The land use schedule summarized in **Table 3.1** reflects the most current land use concept statistics available at the time of rezoning application submission.

Table 3.1: Land Use Schedule

LAND USE	VARIABLE	RESIDENTIAL UNITS/COMMERCIAL FLOOR AREA
Residential	One Bedroom	84
	One Bedroom + Den	28
	Two Bedroom	84
	Three Bedroom	28
	Subtotal	**224**
Commercial	Ground Floor	10,765 ft²
	Subtotal	**10,765 ft²**

Huberman Transportation Consultants Inc. 15

APPENDIX B:

- Slim Map of Site
- 100 Ave. Storm Sewer Line Profile
- 121 St. Storm Sewer Line Profile
- Jasper Ave. Storm Sewer Line Profile
- 100 Ave. Combined Sewer Line Profile
- Lane Combined Sewer Line Profile
- Existing Servicing Plan
- Proposed Servicing Plan



Legend

☐ Title Lots A Address Labels

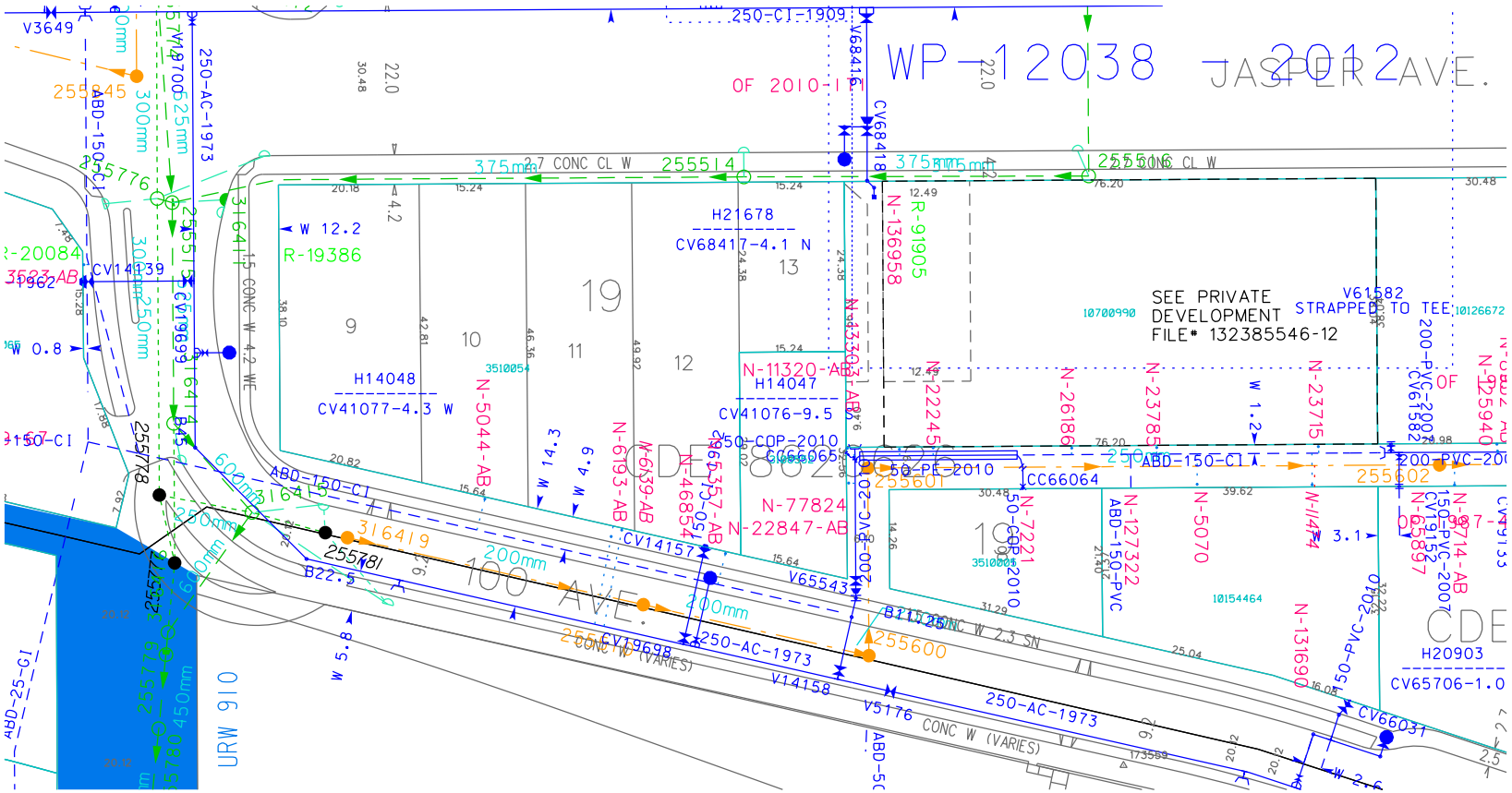
12021 - JASPER AVENUE NW, T5K0P2

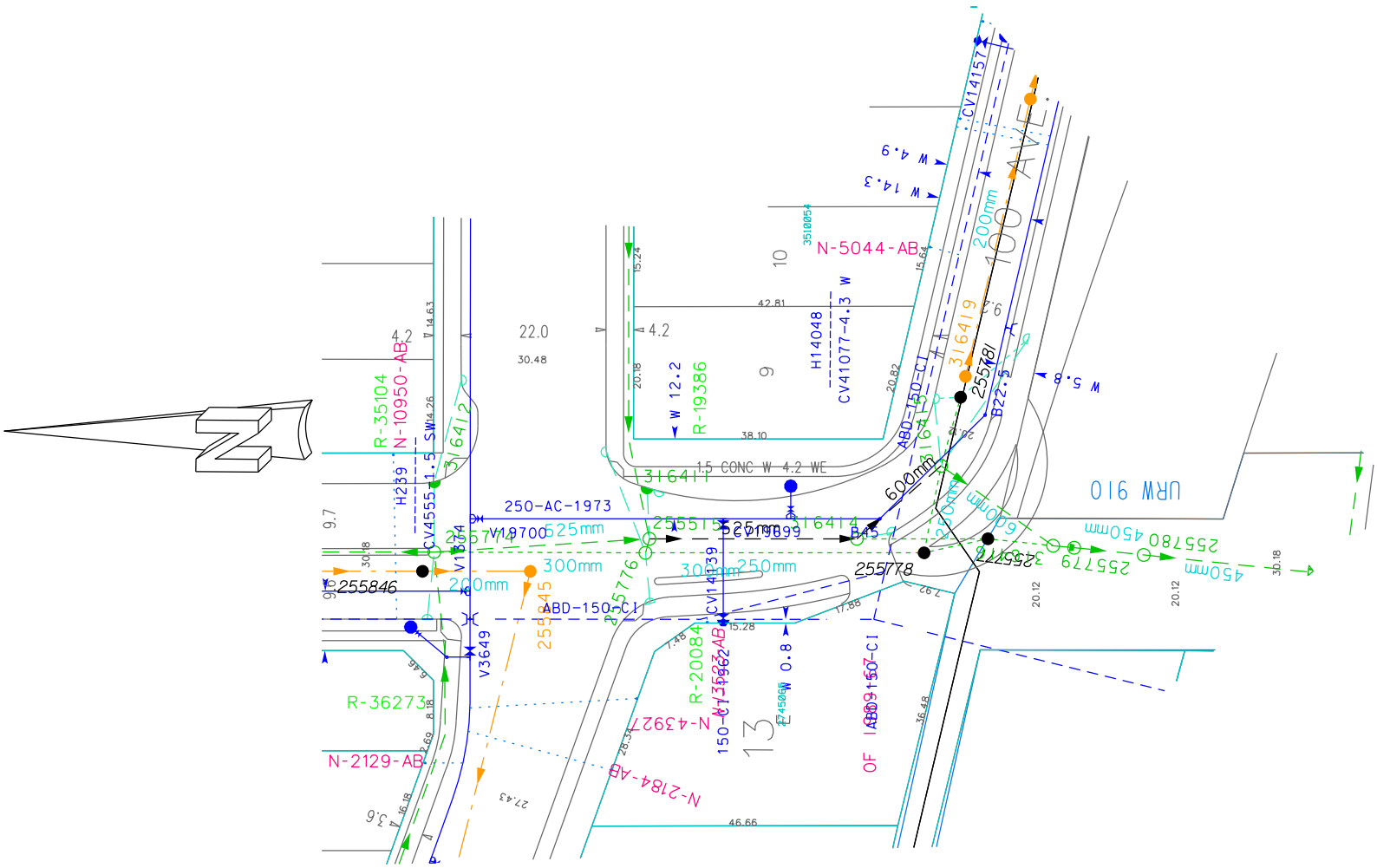
Address:	12021 - JASPER AVENUE NW, T5K0P2
Legal Description for Title Lot:	Lot 13, Block 19, Plan 3549AE Lot 12, Block 19, Plan 3549AE Lot 11, Block 19, Plan 3549AE Lot 10, Block 19, Plan 3549AE Lot 9, Block 19, Plan 3549AE
Area:	3,387.534 m^2
Year Built:	1963
Neighbourhood:	Oliver
Ward:	O-day'min Ward
Community League:	Oliver Community League
Waste Collection:	More Information
Current Zone:	Direct Development Control Provision (DC1 (12800))
Current Bylaw:	12800
Proposed Applications:	None
Proposed Zone:	None
Proposed Bylaw:	None
Overlays:	Mature Neighbourhood Overlay Main Streets Overlay
Plan in Effect:	Oliver ARP

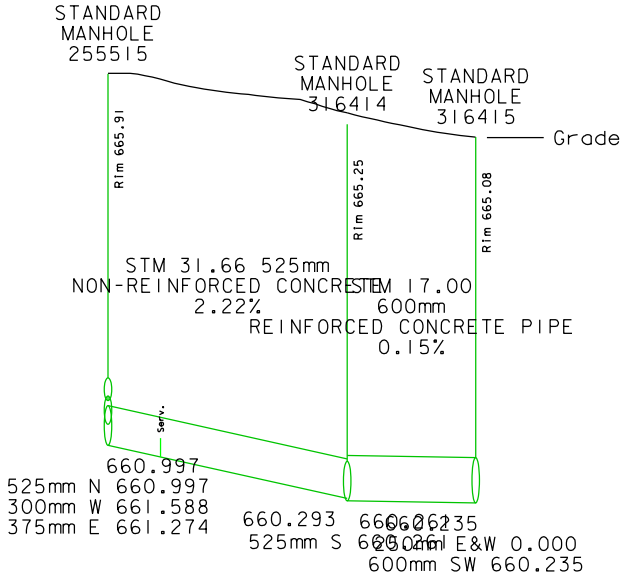
Other Property Information: Residential Parking Reductions

Assessment Information

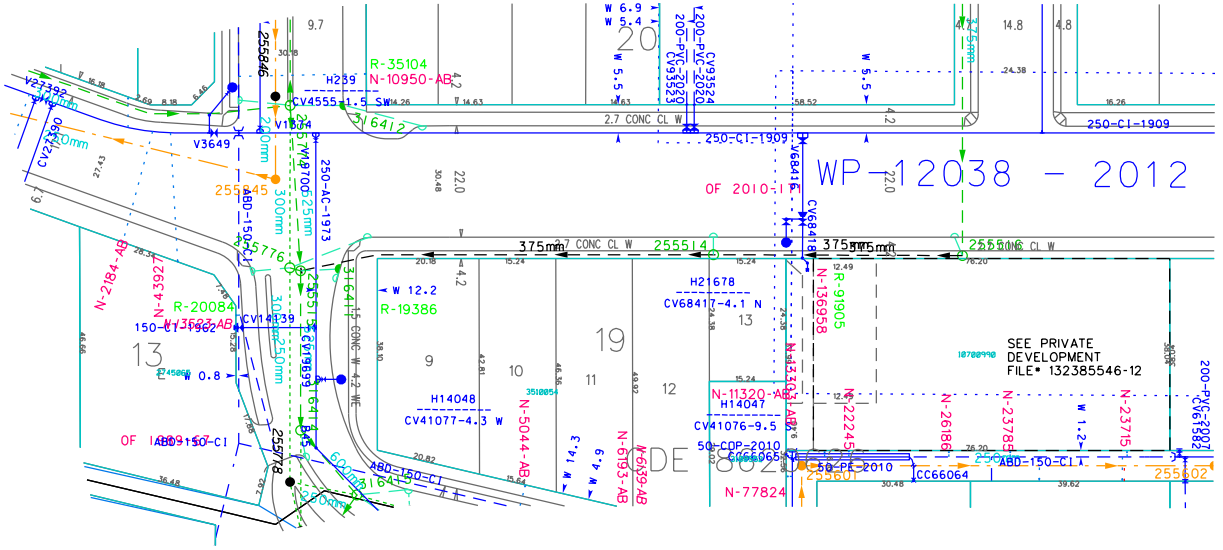
Municipal Address:	12021 JASPER AVENUE NW EDMONTON AB
Account Number:	3510054
Assessed Value:	$23,134,000
Assessment Class:	Other Residential
Neighbourhood:	OLIVER
Longitude:	-113.530073509148
Latitude:	53.5405663427778

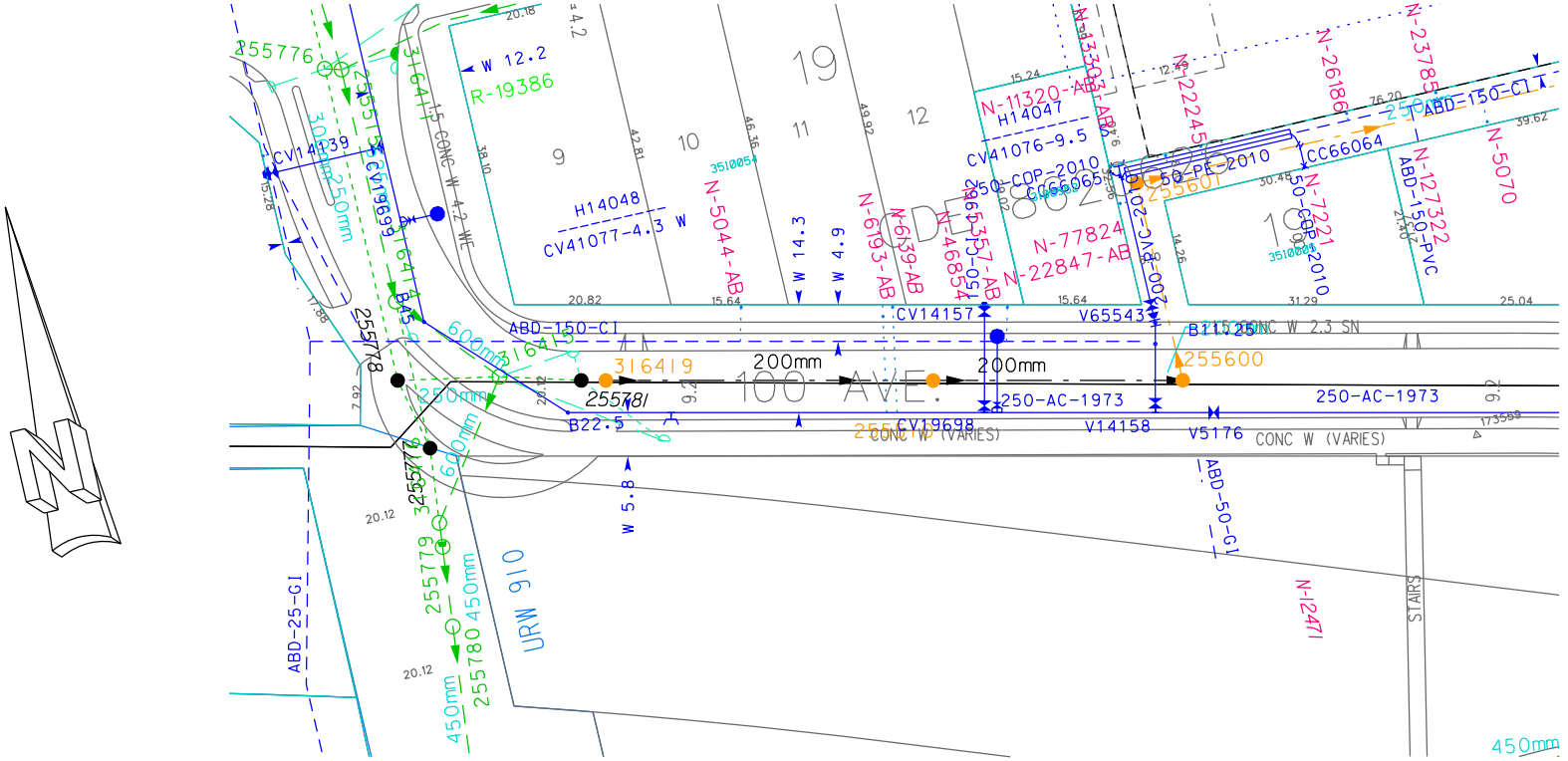

WP-12038
JASPER AVE.
100 AVE.
SEE PRIVATE DEVELOPMENT FILE* 132385546-12
STRAPPED TO TEE
250-CI-1909
250-AC-1973
ABD-150-CI
ABD-150-CI I
250-PE-2010
200-PVC-2007
150-PVC-2007
ABD-150-PVC
250-COP-2010
CV68418
CV68417-4.1 N
H21678
H14048
CV41077-4.3 W
H14047
CV41076-9.5
CV14139
CV14157
CV19698
CV65543
CV66031
CV65706-1.0
H20903
CC66064
CC66065
V3649
V5176
V14158
URW 910
R-19386
R-91905
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N-65897
N-8714-AB
255514
255516
255601
255602
255600
255781
255778
255777
316419
316417
316415
W 12.2
W 0.8
W 14.3
W 4.6
W 1.2
W 5.8
W 2.6
3.1
B22.5
B15.25
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300mm
250mm
200mm
600mm
450mm

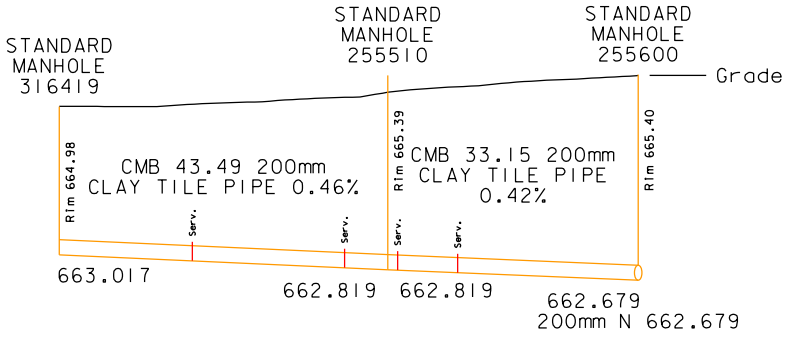




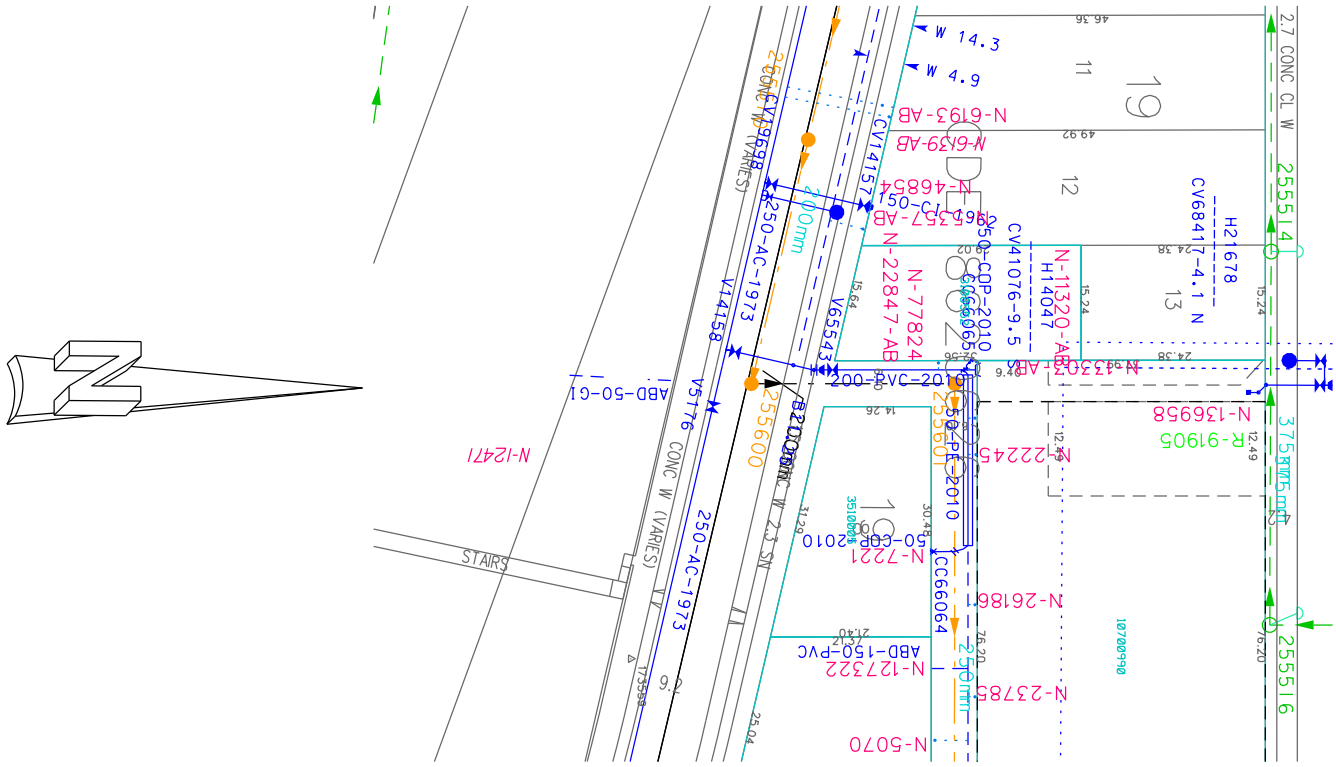
DATUM 657.000	UNKNOWN OPEN CHANNEL
Vertical Scale 10:1	CITY 1962
Grade based on 2011 contours	

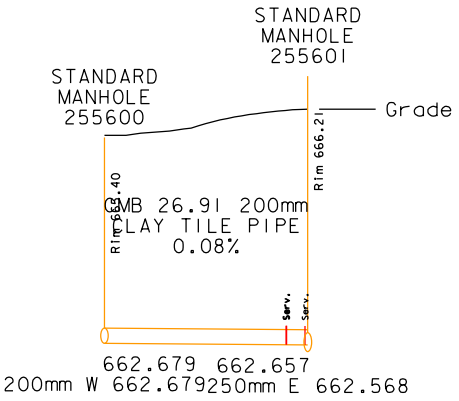

WP-12038 - 2012
SEE PRIVATE DEVELOPMENT FILE* 132385546-12
STANDARD MANHOLE 255515
STANDARD MANHOLE 255514
CB 8308-68 STANDARD MANHOLE 255516
Grade
Rim 665.91
Rim 666.38
Rim 666.44
STM 82.31 375mm NON-REINFORCED CONCRETE 0.47%
STM 49.43 375mm UNKNOWN 0.02%
661.274
525mm N&S 660.997
300mm W 661.588
661.661
661.810
661.820
375mm N 661.940
DATUM 658.000
Vertical Scale 10:1
UNKNOWN OPEN CHANNEL
CITY 1964
Grade based on 2011 contours
CURRED IN PLACE PIPE
2010 49.43m
0.0m





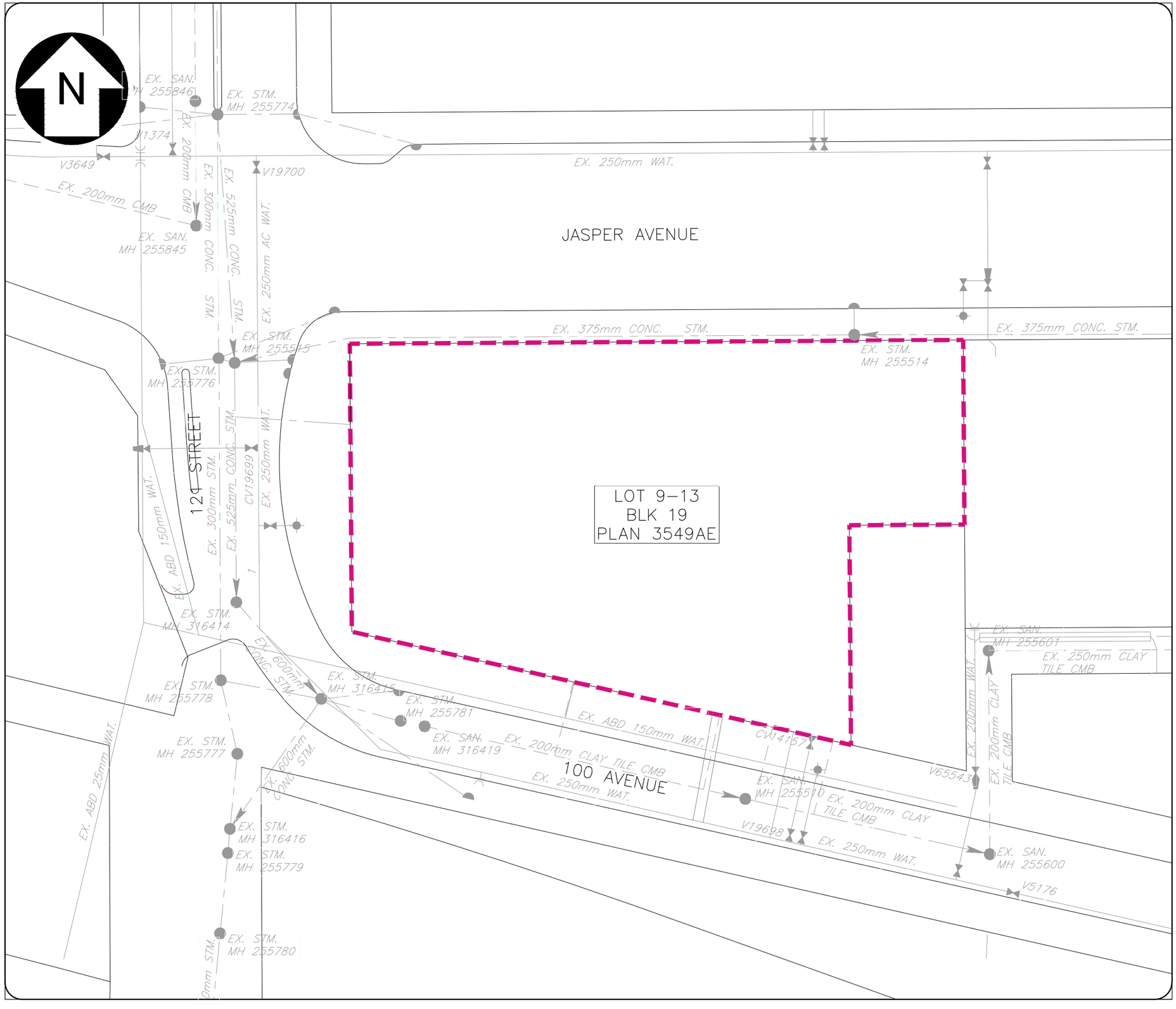
DATUM 660.000	UNKNOWN OPEN CHANNEL
Vertical Scale 10:1	CITY 1912
	Grade based on 2011 contours





DATUM 660.000	UNKNOWN OPEN CHANNEL
Vertical Scale 10:1	CITY 1912

Grade based on 2011 contours



LEGEND:

- PROPERTY LIMIT
- SANITARY LINE
- EX. COMBINED SEWER MAIN
- EX. STORM SEWER MAIN
- EX. WATER MAIN
- EX. CATCH BASIN
- EX. HYDRANT
- EX. MANHOLE
- EX. REDUCER
- EX. VALVE

TBD Architectural & Urban Planning

EDMONTON, AB.

JASPER HOUSE – NEW TOWER VICTORIA PROMENADE AND JASPER AVENUE

EXISTING SERVICING PLAN

DURRANCE
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#202 - 5920 Gateway Blvd.
Edmonton, AB T6H 2H6
Phone: (780) 991-0052
E-mail: edurrance@durranceprojects.com

SCALE: 1:500

DESIGNED BY:	VH	JOB NUMBER:	51052DT
DRAWN BY:	VH		
CHECKED BY:	TT	DRAWING NUMBER:	FIG02
DATE:	22–07–08		

LAST EDIT DATE: 22–07–08

ESTIMATED STORMWATER GENERATION FROM REDEVELOPMENT AREA:

SITE AREA = 0.34Ha

ALLOWABLE RELEASE RATE = 35 L/s/Ha

STORMWATER GENERATION = 11.9 L/s

REQUIRED STORAGE VOLUME = 113 m^3

IMMEDIATE DOWNSTREAM SEWER
(525mm CONC. @ 2.22%)
CAPACITY UTILIZATION = 1.9%

ESTIMATED SANITARY GENERATION FROM REDEVELOPMENT AREA:

RESIDENTIAL:

ASSUMING 339 RESIDENTIAL UNITS @ 1.89 pop/unit & 325 L/day/pop

LOCAL PEAKING FACTOR = 2.72

RESIDENTIAL SAN GENERATION = 6.55 L/s

COMMERCIAL:

ASSUMING 1000 m^2 OF COMMERCIAL AREA WITH 229 m^2 OF POTENTIAL FUTURE COMMERCIAL AREA; HALF RESTAURANTS (20 L/day/m2), HALF OFFICE SPACE/DEPARTMENT STORES (8 L/day/m2)

LOCAL PEAKING FACTOR = 20.67

COMMERCIAL SAN GENERATION = 4.12 L/s

INFLOW/INFILTRATION:
ASSUME 0.28 L/s/Ha w/ NO SAGS
WET WEATHER FLOW = 0.10L/s

TOTAL SANITARY GENERATION = 10.76 L/s

IMMEDIATE DOWNSTREAM SEWER
(200mm CLAY TILE @ 0.46%
CAPACITY UTILIZATION = 48%

JASPER AVENUE

100 AVENUE

124 STREET

LOT 9–13
BLK 19
PLAN 3549AE

EX. SAN. MH 255846
EX. STM. MH 255774
EX. 200mm CMB STM.
EX. 300mm CONC. STM.
EX. 525mm CONC. STM.
EX. 250mm AC WAT.
EX. 250mm WAT.
EX. 200mm CMB
EX. SAN. MH 255845
EX. STM. MH 255715
EX. STM. MH 255776
EX. 250mm STM SERV.
EX. ABD 150mm WAT.
EX. STM. MH 316414
EX. 600mm CONC. STM.
EX. STM. MH 316415
EX. STM. MH 255781
EX. SAN. MH 316419
EX. STM. MH 255778
EX. STM. MH 255777
EX. STM. MH 316416
EX. 375mm CONC. STM.
EX. STM. MH 255614
EX. 150mm SAN SERV.
EX. 200mm TILE SAN. SERV.
EX. 150mm TILE SAN. SERV.
EX. ABD 150mm WAT.
EX. 200mm CLAY TILE CMB
EX. 250mm WAT.
EX. SAN. MH 255610
EX. 200mm CLAY TILE CMB
EX. SAN. MH 255601
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EX. 200mm WAT.
EX. 200mm CLAY TILE CMB
EX. SAN. MH 255600
CV141157
V65543
V19698
V1374
V3649
V19700
CV19699

LEGEND:

- PROPERTY LIMIT
- AREA OF REDEVELOPMENT
- POTENTIAL FUTURE COMMERCIAL DEVELOPMENT
- SANITARY SERVICE
- STORM SERVICE
- EX. COMBINED SEWER MAIN
- EX. STORM SEWER MAIN
- EX. WATER MAIN
- EX. CATCH BASIN
- EX. HYDRANT
- EX. MANHOLE
- EX. REDUCER
- EX. VALVE

TBD Architectural & Urban Planning

EDMONTON, AB.

JASPER HOUSE – NEW TOWER VICTORIA PROMENADE AND JASPER AVENUE

PROPOSED SERVICING PLAN

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APPENDIX C:

- Storm Servicing Calculations

STORM WATER GENERATION CACULATIONS

Pre-development:

Total Site Area = 0.34 Ha

Surface Area Breakdown:

SURFACE	AREA (Ha)	% OF SITE AREA	RUNOFF C
Rooftop/Concrete/Asphalt	0.28	82	0.95
Landscaping	0.06	18	0.1

$$C = \frac{(0.95*\text{Rooftop/Concrete/Asphalt}) + (0.1*\text{Landscaping})}{\text{Total Area}}$$

$$C = \frac{(0.28)(0.95)+(0.06)(0.1)}{0.34}$$

C = 0.80

Peak Flow Rate

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

1:5 Year

C=0.80
Intensity = 89 mm/hr
Total Area = 0.34 Ha

$$Q = \frac{(0.80)(89mm/hr)(0.34)}{360} * 1000$$

Q = 67.24 L/s

1:100 Year Event

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

C=0.80
Intensity = 188.4 mm/hr
Total Area = 0.34 Ha

$Q = \frac{(0.80)(188.4mm/hr)(0.34)}{360} * 1000$

Q =142.35 L/s

Post Development:

Total Site Area = 0.34 Ha

Surface Area Breakdown:

SURFACE	AREA (Ha)	% OF SITE AREA	RUNOFF C
Rooftop/Concrete/Asphalt	0.29	85	0.95
Landscaping	0.05	15	0.1

$C = \frac{(0.95*\text{Rooftop/Concrete/Asphalt}) + (0.1*\text{Landscaping})}{\text{Total Area}}$

$C = \frac{(0.29)(0.95)+(0.05)(0.1)}{0.34}$

C = 0.83

Peak Flow Rate

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

1:5 Year

C=0.83

Intensity = 89 mm/hr

Total Area = 0.34 Ha

$Q = \frac{(0.83)(89mm/hr)(0.34)}{360} * 1000$

Q = 69.35 L/s

1:100 Year Event

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

C=0.80
Intensity = 188.4 mm/hr
Total Area = 0.34 Ha

$$Q = \frac{(0.83)(188.4mm/hr)(0.34)}{360} * 1000$$

Q =146.80 L/s

Controlled Release Flow for Site

$Q_{ALLOWABLE}$ = (35L/s/Ha)(Site Area)
= (35L/s/Ha)(0.34Ha)
= 11.9L/s

Site Storage Volume

Calculation for Required Storage Volumes

The following table can be used to estimate required storage

a. Outflow rate is constant 0.035cms/ha
b. Area of basin drained is 1ha
c. The 2 year, 5 year, 10 year, 25 year, 50 year, 100 year and 200 year storms are based on a 4 hour Chicago Distribution.

STORAGE VOLUME IN CUBIC METERS/Ha

Runoff Coefficient	2-Year	5-Year	10 Year	25 Year	50 Year	100 Year	200 Year	1937 Storm	1978 Storm	1988 Storm
0.10	0	0	0	0	0	3	7	0	0	0
0.15	0	0	0	5	10	15	23	0	3	0
0.20	0	1	6	14	20	30	42	0	11	0
0.25	0	6	13	23	33	45	64	0	23	0
0.30	3	12	19	34	46	64	90	0	38	0
0.35	6	17	28	45	61	84	117	0	53	1
0.40	10	23	36	57	78	105	146	0	71	2
0.45	14	30	45	71	95	128	176	0	89	4
0.50	18	36	54	85	113	152	208	0	112	6
0.55	22	43	63	99	132	177	242	0	136	8
0.60	26	50	74	114	152	203	276	0	161	12
0.65	31	57	84	130	172	229	312	0	186	18
0.70	36	65	96	146	193	257	349	4	219	23
0.75	41	74	107	162	214	285	387	13	255	28
0.80	46	82	118	180	236	314	426	22	292	34
0.85	51	91	130	197	259	344	466	43	331	39
0.90	55	100	142	214	282	375	507	68	369	45
0.95	61	109	155	232	306	406	549	92	408	50
1.00	66	118	168	251	330	438	592	117	447	56

Storage Volume 100 Year for C=0.83 = 314 + $\frac{(0.83-0.8)\ (344-314)}{(0.85-0.80)}$

= 332m³/Ha

Storage Volume Required for Site = (332m³/Ha) (Site Area)

= (332m³/Ha) (0.34)

= 113m³

SANITARY GENERATION CALCULATIONS

Current Residential Sanitary Flow Generation (RA9 Zoning)

Unit = 115
Population generation factor = 1.89 people/unit

G=per capita daily sewage flow generation = 220 L/day/person
P=design contributing population = (1.89 people/unit) (115units) = 217 people

PF = peaking factor = $2.6(P_{pf})^{-0.1}$
$= 2.6(217/1000)^{-0.1}$
$= 3.03$

$Q = \frac{(G)\ (P)\ (PF)}{86400}$
$= \frac{(220L/day/person)\ (217people)\ (3.03)}{86400}$
$= 1.67\ L/s$

Proposed Residential and Commercial Sanitary Flow Generation (RA9 Zoning)

Residential

Unit = 339
Population generation factor = 1.89 people/unit

G=per capita daily sewage flow generation = 220 L/day/person
P=design contributing population = (1.89 people/unit) (339units) = 641 people

PF = peaking factor = $2.6(P_{pf})^{-0.1}$
$= 2.6(641/1000)^{-0.1}$
$= 2.72$

$Q = \frac{(G)\ (P)\ (PF)}{86400}$
$= \frac{(220L/day/person)\ (641people)\ (2.72)}{86400}$
$= 4.43\ L/s$

Commercial

New Building Commercial Area = 1000m²
Proposed Future Commercial Area = 229m²
Total Commercial Area = 1229m²

Assume 50% for restaurants and 50% for office building / department stores commercial spaces

Commercial Sanitary Flow Generation

	% Space Usage	Future Avg. Flow Generation
Restaurants	50	20
Office/Department stores	50	8

G_{avg} = (0.50)(20) + (0.50)(8)
= 14 L/day/m²

$Q_{avg} = \frac{\text{(Commercial Area) (Avg. Flow Generation)}}{86400}$
= (1229)(14)/86400
= 0.20 L/s

$PK = 10 * Q_{avg}^{-0.45}$
$= 10(0.20)^{-0.45}$
= 20.67

Q = (0.20)(20.67)
= 4.12 L/s

Total Dry Weather Flow = 4.43+4.12
= 8.55 L/s

Inflow/Infiltration

Site Area = 0.34Ha
Assume Q = 0.28 L/s/Ha (no sag)

Total Wet Weather Flow = (0.34)(0.28)
= 0.10 L/s

TOTAL DESIGN FLOW = 8.55+0.10
= 8.65 L/s