Appendix C

NW Clairmont ASP Servicing Report

NORTHWEST CLAIRMONT ASP SERVICING

COUNTY OF GRANDE PRAIRIE NO. 1

PROJECT NO.: 151-04424-00
DATE: NOVEMBER 2017

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November 17, 2017

Mr. Mathew Konowalchuk
COUNTY OF GRANDE PRAIRIE NO. 1
10001 – 84 Avenue
Clairmont, AB T0H 0W0

Dear Mr Konowalchuk

Subject: **Northwest Clairmont ASP Servicing**

WSP is pleased to submit the Northwest Clairmont ASP Servicing report.

The servicing report identifies the proposed servicing for water distribution, sanitary collection and stormwater management in support of the Northwest Clairmont ASP. The proposed servicing schemes are for ultimate development of the ASP, including approximately 1,650 hectares. The sanitary servicing has also allowed for contributions from areas outside the ASP as indicated in the 2013 Water Distribution and Wastewater Collection System Master Plan.

Yours sincerely,

Blair E. Raymond

Blair E. Raymond, M.Sc., P.Eng.
Water Resources Engineer, Infrastructure

/ber
Encl.
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SIGNATURES

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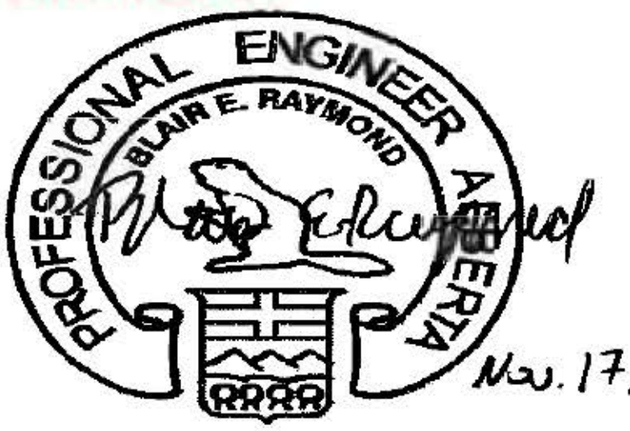

Nov. 17, 2017

Blair E. Raymond, M.Sc., P.Eng.
Water Resources Engineer

REVIEWED BY

PERMIT TO PRACTICE
WSP CANADA INC.
Signature
Date Nov. 17, 2017
PERMIT NUMBER: P07641
The Association of Professional Engineers and Geoscientists of Alberta

R. Vaughn Shears, P.Eng.
Manager Municipal Infrastructure

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1 INTRODUCTION

1.1 GENERAL

The following report outlines the proposed water, sanitary and stormwater servicing for the NW Clairmont Area Structure Plan (ASP). This work was undertaken by WSP on behalf of the County of Grande Prairie No. 1.

1.2 LOCATION

The NW Clairmont ASP is located approximately 10 km north of the City of Grande Prairie, immediately west of Highway 2 and north of Township Road 724 within the Hamlet of Clairmont. The location of the NW Clairmont ASP is shown in **Figure 1-1.**

The study area consists of approximately 1651 hectares. The study area is bounded by Highway 2 and the CN Rail line to the east, Township road 724 to the south, the quarter line half a mile west of Range Road 63 to the west, and the quarter lines half a mile and a mile north of Township Road 730 to the north. The study area generally consists of the following:

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- SE and SW 3 73-6-6
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1.3 TOPOGRAPHY AND FEATURES

The topography within the study area generally grades from east to west, with the highest elevation of approximately 705 m occurring in the northeast corner of the study area and the lowest elevation of 670 m occurring along the east boundary of the study area. The existing topography is shown in **Figure 1-2.**

Notable features within the study area include:

- Ferguson Lake – located in the southeast portion of the study area
- Unnamed drainage course coming from Clairmont Lake to the east into Ferguson Lake, and continuing through the study area to the west
- CN Rail line in the eastern portion of the study area
- Unnamed drainage courses entering the study area from the northeast and north which join the drainage course from Ferguson Lake before exiting the study area.
- Clairmont Waste Management Facility
- Aquatera (Clairmont) Lagoon

1.4 PROPOSED DEVELOPMENT

The proposed development consists of predominantly industrial development with a commercial development proposed for the southeast corner of the study area and some institutional developments along the southern boundary of the study area. The proposed land use plan is shown in **Figure 1-3**.

TOWN OF SEXSMITH

TOWNSHIP RD 734

HIGHWAY 672

HIGHWAY 672

TOWNSHIP RD 732

RANGE RD 65

RANGE RD 64

RANGE RD 63

RANGE RD 62

HIGHWAY 2

LEGEND:

ASP BOUNDARY

BEAR CREEK

TOWNSHIP RD 730

ASP BOUNDARY

RANGE RD 60

RANGE RD 55

TOWNSHIP RD 725A

AQUATERA LAGOONS

FERGUSON LAKE

TOWNSHIP RD 725

CLAIRMONT LAKE

TOWNSHIP RD 724

CLAIRMONT

CITY OF GRANDE PRAIRIE

84 AVE

CLAIRMONT TOWNSHIP Rd 723

HIGHWAY 2

TOWNSHIP RD 722A

TOWNSHIP RD 722

HIGHWAY 43X

116 STEET

108 STEET

92 STEET

CITY OF GRANDE PRAIRIE

ANSI A S:\PROJECTS\5216028000 NW CLAIRMONT ASP\CAD\FIGURES\ASP\FIGURE 1.1 - LOCATION PLAN Plot Date: 2017/11/16 8:48 AM By: Ma, Stellar

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NORTHWEST CLAIRMONT ASP SERVICING

TITLE:
LOCATION PLAN

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FIGURE 1-1

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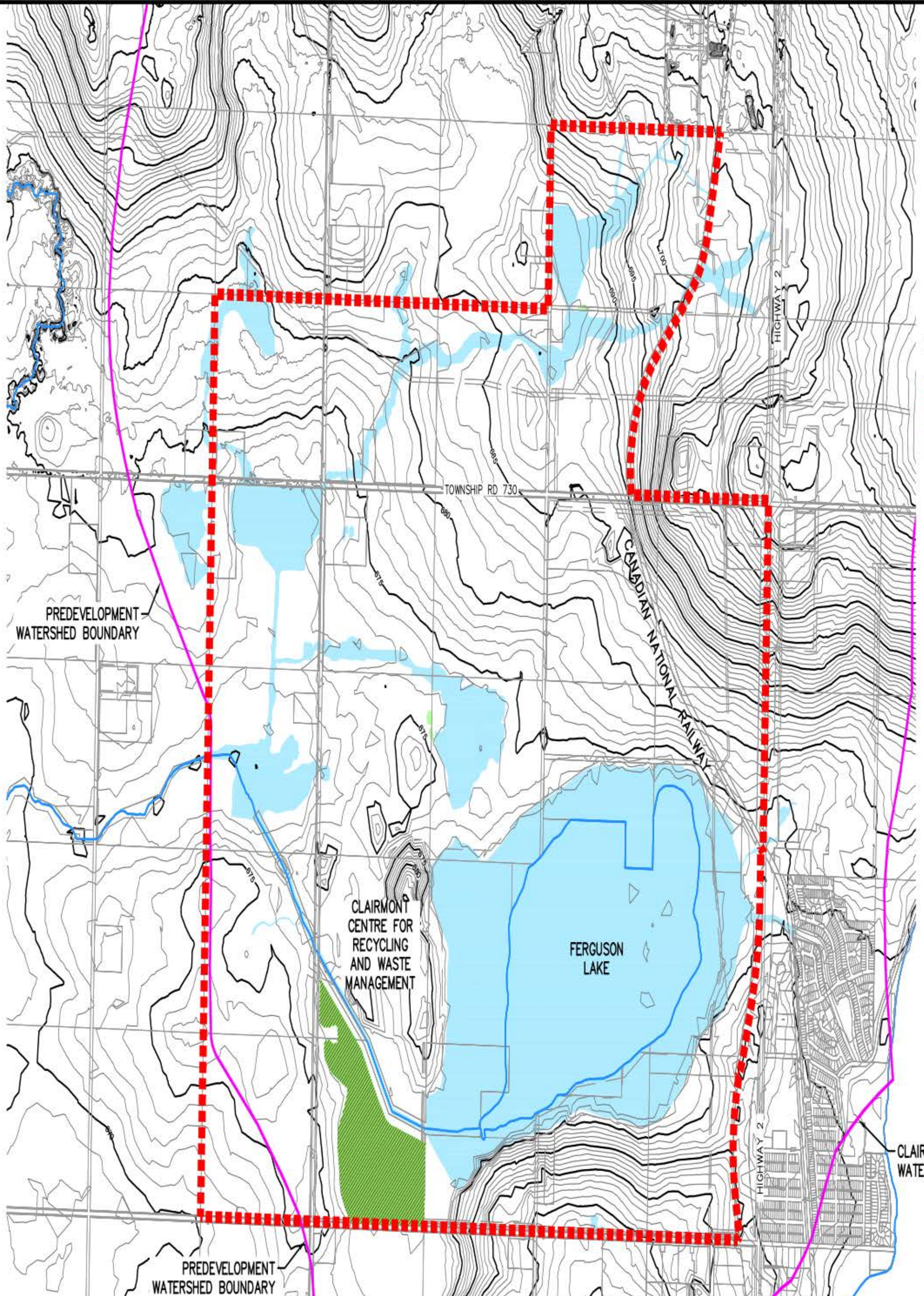

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LEGEND

- ASP BOUNDARY
- PERMANENT WETLAND/WATERCOURSE*
- NON PERMANENT WETLAND/WATERCOURSE*

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TITLE: EXISTING TOPOGRAPHY

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—	CIVIL	FIGURE 1-2	DRAFT REPORT MAY 12, 2017	A
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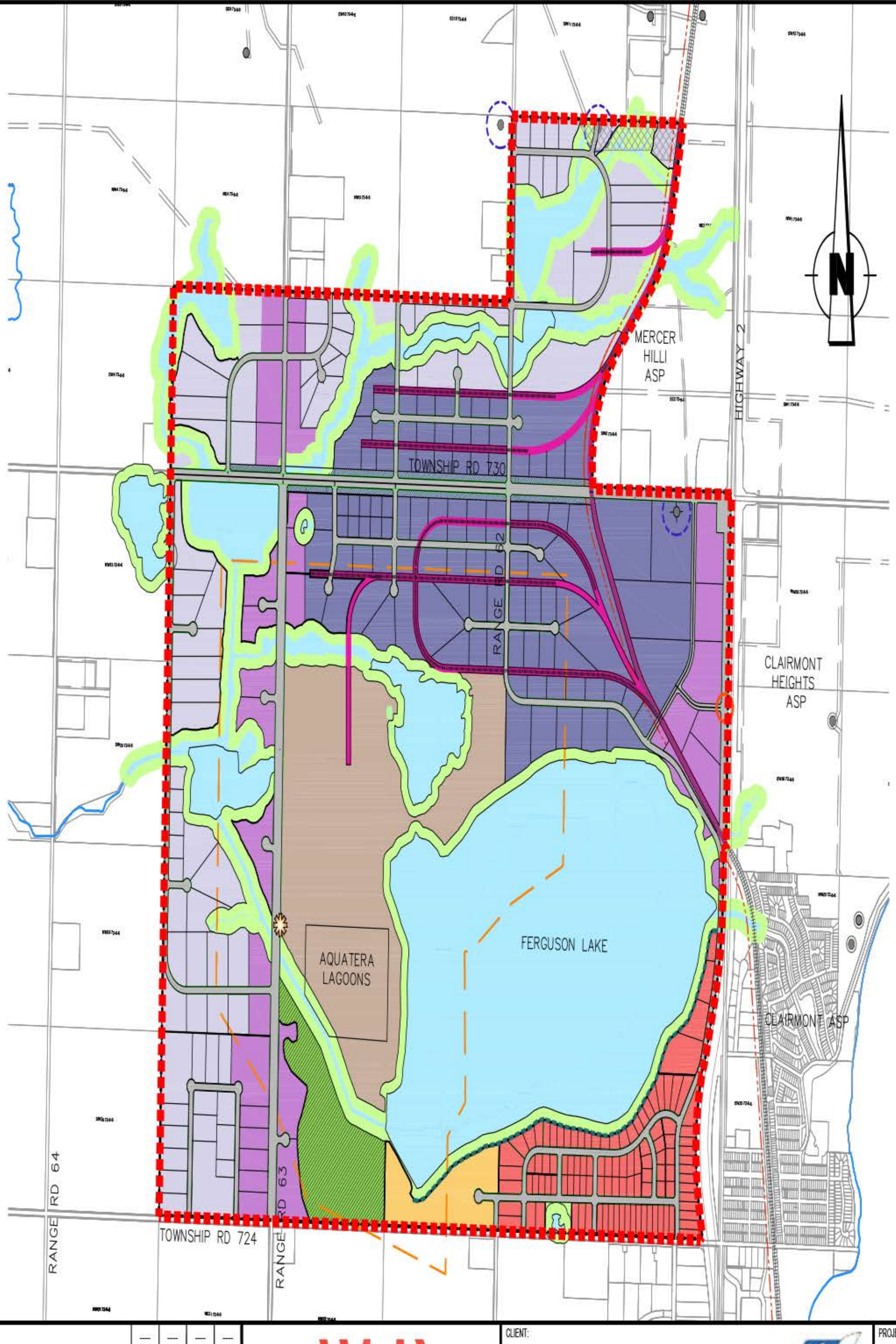
Ansi B, S:\Projects\521602800 0 NW CLAIRMONT ASP\CAD\Figures\ASP\Figure 1.2 - Existing Topography.dwg, Plot Date: 2017/05/11 2017/05/11 By: Arlay, Jennifer

NW Clairmont ASP

Land Use Plan



LEGEND

- ASP BOUNDARY
- ACTIVE WELL HEAD 100M SETBACK
- EXISTING RAILWAY
- PROPOSED RAILWAY
- 450M LANDFILL AND SEWAGE LAGOON SETBACK
- 100M SETBACK FROM SOUR GAS LINE
- LANDFILL AND SEWAGE LAGOON
- PERMANENT WETLAND/WATERCOURSE*
- FLOOD MANAGEMENT AREA
- ENVIRONMENTAL RESERVE*
- PROPOSED INDUSTRIAL
- PROPOSED INSTITUTIONAL
- PROPOSED COMMERCIAL
- SPECIAL POLICY AREA
- PROPOSED SERVICE ROAD
- HIGHWAY 2 PROPOSED ACCESS

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PROJECT NO: 151-04424-00

PROJECT: NORTHWEST CLAIRMONT ASP SERVICING

TITLE: PROPOSED DEVELOPMENT

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2 WATER SERVICING

2.1 DESIGN PARAMETERS

The water system for Clairmont has been created based upon the proposed roadway plan. It is assumed that the water supply for the area will be provided from three separate pump houses and reservoirs as shown in the 2013 Water Distribution & Wastewater Collection System Master Plan (Servicing Strategy for the City of Grande Prairie and Hamlet of Clairmont) produced by Morrison Hershfield. As two of the three pump houses and reservoirs are not yet constructed, this report will outline the minimum boundary conditions required for adequate servicing in Clairmont. These boundary conditions should be taken under consideration in the design of the future pump houses and reservoirs. Boundary condition locations were assumed based upon the ultimate pipe network shown in the aforementioned master plan. The ultimate pipe network can be seen on **Figure 7.2B** in **Appendix D**.

The parameters used in developing the proposed water distribution system and in the hydraulic network analysis are listed in **Table 2-1** below. These parameters are generally consistent with the county of Grand Prairie's Minimum Design Standards. The demands calculated for the system are included in **Table A-1** located in **Appendix A**.

Table 2.1 Water System Design Parameters

	PARAMETER	VALUE
Industrial Demand	Average Day Demand	20,000 L/ha/day
	Maximum Day Demand	30,000 L/ha/day
	Peak Hour Demand	40,000 L/ha/day
Institutional Demand	Average Day Demand	30,000 L/ha/day
	Maximum Day Demand	45,000 L/ha/day
	Peak Hour Demand	60,000 L/ha/day
Commercial Demand	Average Day Demand	20,000 L/ha/day
	Maximum Day Demand	30,000 L/ha/day
	Peak Hour Demand	40,000 L/ha/day
Minimum Pressures	Peak Hour	280 kPa
	Max Daily + Fire Flow	140 kPa
Maximum Pressure		690 kPa
Friction Coefficient	Hazen Williams "C"	140
Minimum Pipe Size		250 mm

2.2 PROPOSED WATER SERVICING

The proposed water distribution system was generally delineated following the pressure zones boundaries shown in Figure 7.1 from the Master Plan (**Appendix D**) with the following adjustments:

— The C3/C2 boundary north of Ferguson Lake was shifted to the west to allow for improved looping in the C-2 area.
— The portion of the study area which lies within the Emmerson Trickle zone to the north was shifted into the C-2 pressure zone and as a result will require a 225 L/s fire flow.

The water distribution system generally consists of 300 mm diameter watermains in the south pressure zone (C-1), 300-350mm diameter watermains in the west pressure zone (C-3), and 250-400 mm diameter watermains in the northeast pressure zone (C-1). The proposed water distribution system is shown in **Figure 2-1**. Boundary conditions in each pressure zone were adjusted to meet the minimum pressure and flow requirements under the Average Day Demand (ADD), Peak Hour Demand (PHD) and Max Daily Demand + Fire Flow (MDD+FF) scenarios. The required boundary conditions are shown below in **Table 2-2**.

Table 2.2 Boundary Condition Requirements

ZONE	RESERVOIR	ELEVATION (m)	ADD (m)	MDD+FF (m)	PHD (m)
C-3	R-1	676.0	708.0	719.0	709.0
	R-2	670.6	708.0	719.0	709.0
C-2	R-3	717.4	743.0	733.0	744.0
C-1	R-4	692.0	710.0	713.0	711.0
	R-5	684.3	710.0	713.0	711.0

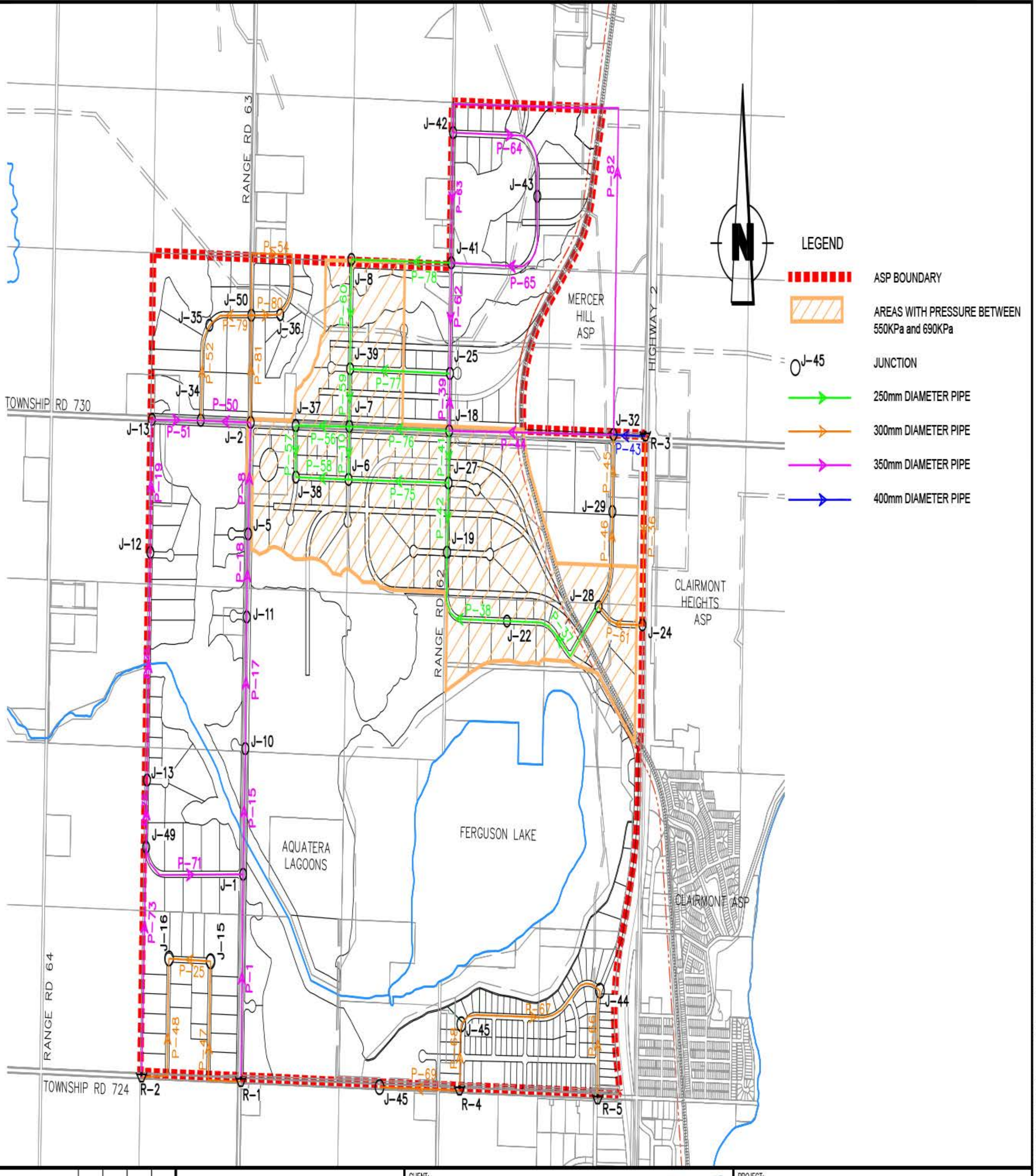
High pressures were experienced in the southwest portion of Zone C-2 for the ADD and PHD scenarios and under select fire flow scenarios. This is a result of the low elevations at these locations. These areas should be further reviewed during the design of the future pump house and reservoir that will service C-2 to determine whether pressure reducing valves will be required. Areas with pressures between 550 kPa and 690 kPa are highlighted in **Figure 2-1**.

2.3 INTERIM SERVICING

It is understood that there is development interest in the southwest corner of the ASP area. The reservoir and water network for the ultimate servicing of this portion of the ASP area will not be available in the short term. It may be possible to extend service west along Township Road 724 from zone C-1.

Analysis of interim servicing options for individual developments should be conducted by the developer directly with Aquatera. This analysis will require boundary conditions from Aquatera to determine the feasibility of getting the required flows and pressures in the southwest corner by extending the system along Township Road 724.

It should be noted that Aquatera standards state the maximum length of un-looped watermain is 150m.



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3 SANITARY SERVICING

3.1 DESIGN PARAMETERS

The sewer system for the Northwest Clairmont ASP has been created based on the proposed roadway plan for the area and the general system layout shown in the Master Plan, refer to **Figure 8.2** and **Figure 8.7** in **Appendix D** for the ultimate Master Plan sanitary servicing. It is assumed that the existing lagoon located in the NW 10-72-3 W6M will remain. The parameters used in developing the proposed sanitary servicing plan are listed below in Table 3-1. These parameters are generally consistent with Aquatera's Sanitary Sewer System Standards.

Table 3.1 Sanitary System Design Parameters

PARAMETER	VALUE
Commercial Flow Generation	20,000 L/ha/d
Industrial (Light) Flow Generation	10,000 L/ha/d
Institutional Flow Generation	15,000 L/ha/d
Peaking Factor	$2 < 6.659\ (Q_{avg})^{-0.168} < 5$
Infiltration	0.28 L/s/ha
Sag Manholes Inflow	0.40 L/s/MH
Manning's roughness "n"	0.013
Required Design Flow (Pipe Capacity)	$\frac{Design\ Flow}{0.864}$
Minimum Velocity	0.6 m/s
Maximum Velocity	3.0 m/s

In order to include for sag manhole inflow the number of sag manholes were estimated based on 1 sag manhole for every 5 hectares of land serviced.

3.2 PROPOSED SANITARY SERVICING

As shown in the Master Plan there are two locations where the proposed system for the study area will receive flows from future development outside the study area. These future development areas include:

— Approximately 820 ha of industrial development north of Township Road 730 in the Mercer Hill and Emerson Trail ASPs

— Approximately 384 ha of industrial development south of Township Road 724 at Range Road 63

The proposed sanitary servicing has assumed that the proposed lift station 10 (LS10) will be situated along Township Road 724 south of the Aquatera Lagoons in the vicinity of the quarter line between SE and SW 27-6-6.

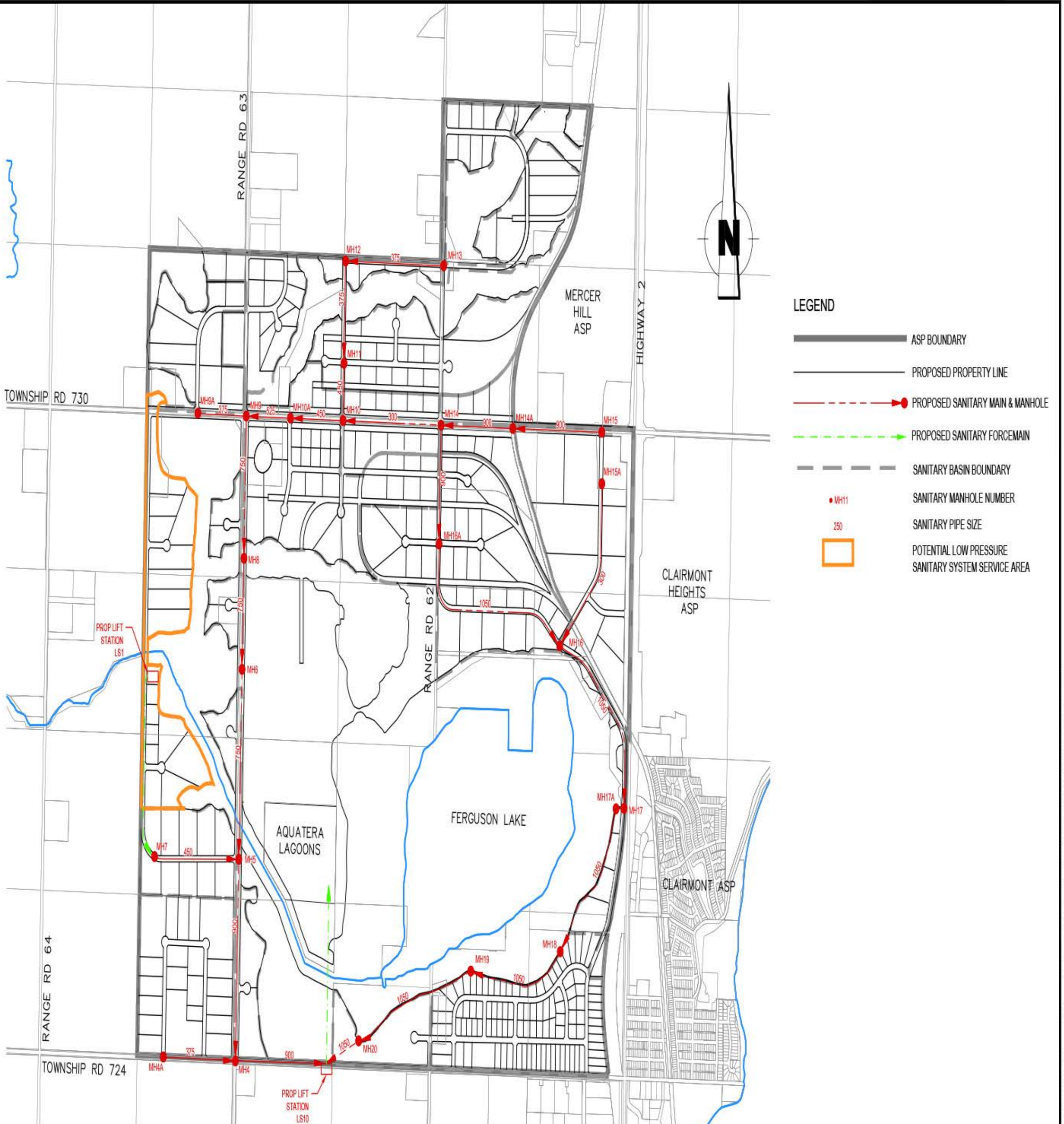
The proposed sanitary collection system consists of gravity sewer mains and a lift station located in the SE ¼ 33-72-6-6 that generally services the lands along the west boundary of the study area in NE 33, SE 33 and NE 28. The proposed sanitary servicing plan is shown in Figure 3-1. Detailed sanitary calculations are included in Appendix B.

Another option for the lift station along the west boundary of the study area would be the use of a low pressure sanitary system for the lower areas along that would be serviced by the lift station. The potential low pressure sewer service area is also shown in Figure 3-1.

There are several locations where the gravity sewer reaches depths of 9 metres or greater, these location include:

- MH5 to MH4 on Range Road 63 at Township Road 724 and MH4 to LS 10 on Township Road 724. At this point the ground is rising to the south in the direct of flow in the gravity sewer.
- MH4A to MH4 on Township Road 724 at Range Road 63. This is another example where the ground is rising in the direct of flow in the gravity sewer. Options for this sewer would be the use of a lift station or low pressure sewer to service SE 28 72-6-6, discharging to the gravity sewer at MH4.
- MH15 to MH16 starting at Township Road 730 south of the Mercer Hill ASP area. The sewer needs to be deep at this location to areas to the north the lands in the Mercer Hill ASP also fall to the north of this location. In order to make the sanitary sewer shallower the sanitary sewer from Mercer Hill and north would have to follow contours closer to the CN Rail line, or connect via a pump station in the Mercer Hill area.

It should be noted that the sewer that will provide capacity for the areas north of this study area will have to coordinate with servicing for the Mercer Hill ASP to ensure it is deep enough to provide gravity servicing to the areas north.



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TITLE: PROPOSED SANITARY PLAN

DRAWING NO: FIGURE 3-1

ISSUE: DRAFT REPORT MAY 12, 2017

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4 STORMWATER MANAGEMENT

4.1 DESIGN PARAMETERS

The design parameters used in developing the stormwater management system for the Northwest Clairmont ASP are listed below in **Table 4-1**. These parameters are generally consistent with the County of Grande Prairie's Minimum Design Standards.

Table 4.1 Stormwater Management Design Parameters

PARAMETER	VALUE
Commercial Imperviousness	80%
Industrial Imperviousness	75%
Institutional Imperviousness	70%
Manning's n for Impervious areas	0.015
Manning's n for Pervious areas	0.25
Depression storage for Impervious areas	2 mm
Depression storage for Impervious areas	5 mm
Maximum infiltration rate	15 mm/hr
Minimum infiltration rate	3 mm/hr
Infiltration decay rate	4.14 /hr

Design of stormwater management facilities are to be determined based on the largest storage requirement of the following three design storms.

- 4 hour Chicago distribution
- 12 hour AES (Atmospheric Environment Service) distribution
- 24 hour SCS (Soil Conservation Service) distribution

4.2 PREDEVELOPMENT FLOW RATE

There currently is no release rate specified for stormwater management purposes for the Northwest Clairmont area, therefore, the predevelopment flow rate will be used for determining preliminary stormwater management requirements. The predevelopment flow rate was estimated by performing a flood frequency analysis on gauged streams of a similar nature to the study area.

A flood frequency analysis considers the annual peak flows at a gauging site for the available years of record. This analysis provides the magnitudes of flood peaks of a desired recurrence interval or return period, but does not provide information on the hydrograph or flow volumes.

The frequency analysis involves a statistical analysis of measured stream flow data in order to determine design floods based on a specified allowable risk. It typically involves an analysis of annual flood peaks. The maximum instantaneous peak discharge is preferred for the analysis.

Five gauging stations were selected for the purpose of this analysis, these gauges, and their pertinent information, is shown below in **Table 4-2**. The hydrometric data for these gauging stations was obtained from the Water Survey of Canada's archived hydrometric data.

Table 4.2 WSC Gauging Stations

STATION NUMBER	STATION NAME	PERIOD OF RECORD	DRAINAGE AREA (km^2)
07FD912	Montagneuse River near Hines Creek	1975-2014	230
07FD910	Rycroft Survey No. 3 near Rycroft	1982-2011	13.0
07GD001	Beaverlodge River near Beaverlodge	1968-2013	1,610
07GE003	Grande Prairie Creek near Sexsmith	1969-2014	140
07GE007	Bear River near Valhalla Centre	1984-2013	181

The flood frequency analysis performed with a Log Pearson Type III distribution results in 1:100 year flow rates as shown in **Table 4-3**. The flood frequency calculations are:

Table 4.3 Flood Frequency Analysis Results

STATION NUMBER	STATION NAME	1:100 YEAR FLOW (m^3/s)	BASIN UNIT AREA DISHCARGE (L/s/ha)
07FD912	Montagneuse River near Hines Creek	36.8	1.60
07FD910	Rycroft Survey No. 3 near Rycroft	9.8	7.52
07GD001	Beaverlodge River near Beaverlodge	177.0	1.10
07GE003	Grande Prairie Creek near Sexsmith	46.6	3.33
07GE007	Bear River near Valhalla Centre	49.6	2.74

In order to use these flow rates for the Northwest Clairmont ASP, a Basin Transfer technique must be used. In this technique the discharge is adjusted by the ratio of the drainage basin areas using a power exponent, typically 0.85. This is shown in the equation below:

$$Q_u = Q_g \left(\frac{A_u}{A_g}\right)^n$$

Where: Q_u = Ungauged site

Q_g = Gauged site

A_u = Ungauged drainage basin area

A_g = Gauged drainage basin area

n = exponent

As previously shown on the topography plan in **Figure 1-2**, there is drainage entering the study area from the north and northeast. The basin area used for the predevelopment flow calculation is 49. km^2, and is shown in **Figure 4-1**. The resulting discharge rates transferred to this basin are shown in **Table 4-4**. The detailed basin transfer results are included in **Appendix C**.

Table 4.4 Basin Transfer Results

STATION NUMBER	STATION NAME	BASIN UNIT AREA DISHCARGE (L/s/ha)	SITE UNIT DISHCARGE (L/s/ha)
07FD912	Montagneuse River near Hines Creek	1.60	2.02
07FD910	Rycroft Survey No. 3 near Rycroft	7.52	6.16
07GD001	Beaverlodge River near Beaverlodge	1.10	1.85
07GE003	Grande Prairie Creek near Sexsmith	3.33	3.90
07GE007	Bear River near Valhalla Centre	2.74	3.33
		Average	3.45

The average of the basin transfer results shown in **Table 4-4** is 3.45 L/s/ha. Based on these calculations a discharge rate of 3.4 L/s/ha will be used for the Northwest Clairmont ASP.

4.3 UPSTREAM STORMWATER MANAGEMENT

There are also several ASPs for lands adjacent to and upstream of the Northwest Clairmont ASP area that will contribute flows to the study area and downstream. These areas include:

— Clairmont Heights ASP

— Mercer Hill ASP

— Emerson Trail ASP

In general the stormwater from these areas will be contained in stormwater management facilities within the plan areas and released at predevelopment flow rates. These stormwater discharges as well as the runoff from undeveloped areas will pass through the Northwest Clairmont ASP area in the existing watercourses and wetlands. The proposed stormwater management in the adjacent plan areas is shown in **Figure 4-2**.

4.4 STORMWATER MANAGEMENT PLAN

Utilizing a release rate of 3.4 L/s/ha and the design parameters indicated in Section 4.1, the storage requirements for each landuse were determined by modeling the landuse with PCSWMM, the resulting storage requirements for each landuse are shown in **Table 4-5**. The storage requirements were determined for the three design storms provided in the County's standards with the largest value used for facility sizing, with the discharge rate utilized the 1:100 year 24 hour SCS storm resulted in the largest storage requirement.

Table 4.5 Storage Requirements by Landuse

LANDUSE	STORAGE REQUIREMENT (m^3/ha)
Commercial	732
Industrial	707
Institutional	683

The landuse for each stormwater management facility (SWMF)/storm catchment was then used to determine the storage requirements for that facility. The storage requirement was then used to determine a preliminary area required for each SWMF based on the following criteria.

- 1.5 m depth of storage for the 1:100 year event (Storage depths will need to be confirmed at the time of development when site grading is known)
- Side slopes of 7:1 (horizontal:vertical)
- 1.0 m freeboard (at the time of development this may be reduced if there is an adequate overflow available)
- 4:1 length to width ratio

The resulting storage requirements and areas required are shown in in **Table 4-6**, and the proposed stormwater management plan is shown in **Figure 4-3**. It should be noted that the SWMF locations shown in **Figure 4-3** are preliminary and may change with detailed planning and design.

Table 4.6 Stormwater Management Facility Preliminary Sizing

SWMF	STORAGE REQUIREMENT (m^3)	APPROXIMATE AREA REQUIRED (ha)
C1	4,600	0.80
C2	41,300	3.90
C3	17,500	2.00
C4	14,900	1.75
C5	10,800	1.40
C6	42,400	4.00
C7	29,500	3.00
C8	6,000	0.95
C9	16,900	1.95

C10	6,100	0.95
C11	24,200	2.55
C12	5,600	0.90
C13	55,100	5.00
C14	28,600	2.90
C15	47,000	4.35
C16	20,100	2.20
C17	6,700	1.00
C18	62,800	5.60
C19	33,500	3.30
C20	19,100	2.10
C21	42,800	4.05
C22	7,400	1.10
C23	27,400	2.80
C24	22,100	2.35
C25	9,200	1.25

It should be noted that the values in **Table 4-6** have not accounted for the incorporation of retained wetlands within the development. In order for retained wetlands to remain viable after development of the surrounding lands they will need to be incorporated into the drainage system to ensure they receive an adequate amount of water.

At the time of development when the detailed planning is being conducted and the site grading is being reviewed the pond locations and available storage depths will need to be reviewed.

4.5 STORMWATER QUALITY

Currently the minimum stormwater quality standard set by Alberta Environment in the Municipal Policies and Procedures Manual is to remove 85% of sediment with a particle size of 75 µm or larger. It is expected that all new developments will meet this standard.

The use of wet ponds or wetlands is generally preferred for providing the required stormwater quality improvement prior to discharge to receiving water courses. The permanent pool in these facilities slows the runoff entering the facility, provides a place for the suspended sediments to settle and helps reduce the re-suspension of sediments by subsequent storm events. Also, the facilities should be designed so that runoff entering the facility doesn't enter in close proximity to the outlet in order to increase the residence time for settlement of solids. Adding vegetation, especially in wetlands enhances the removal of some constituents, typically nutrients from stormwater.

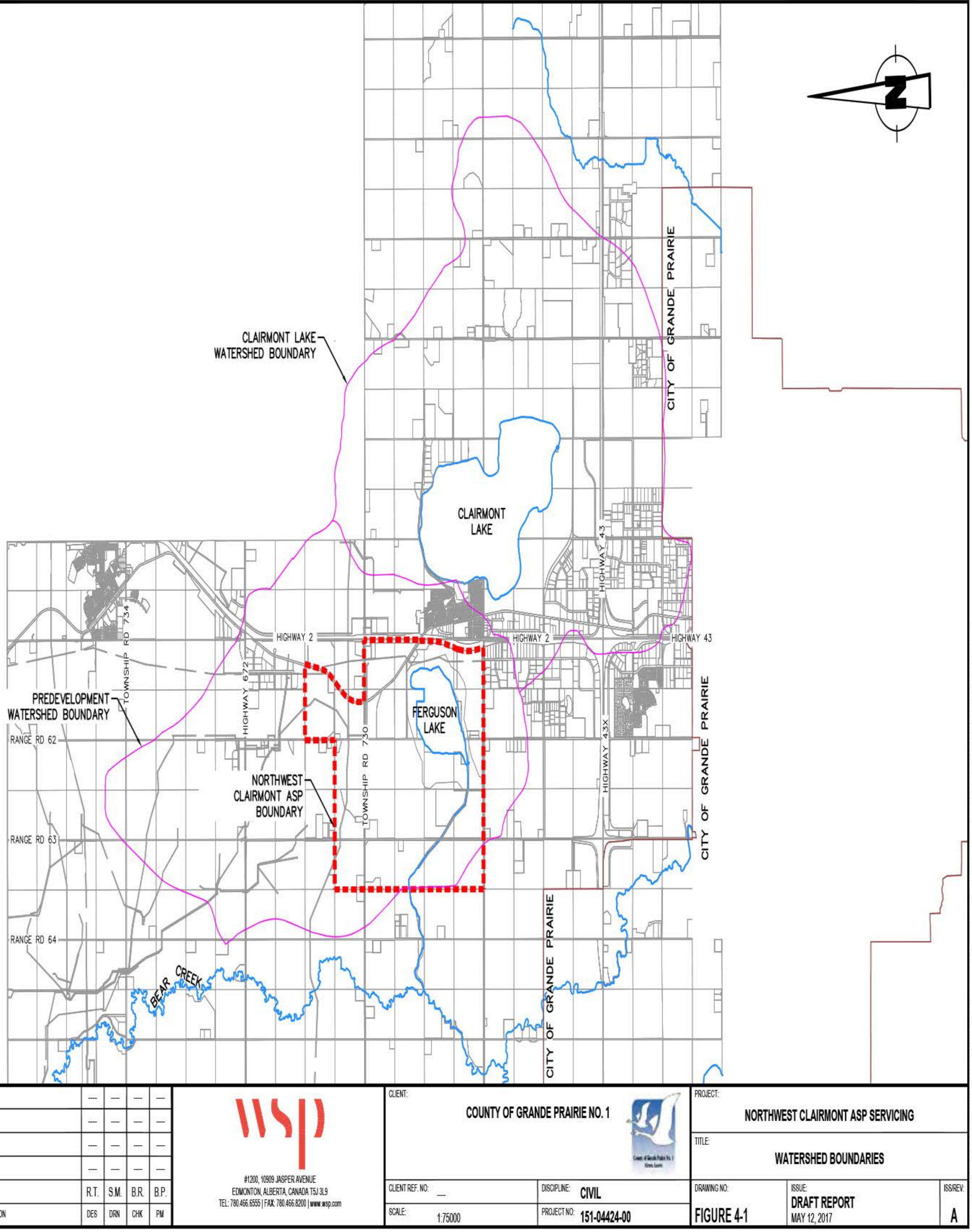
Dry ponds typically do not provide the water quality improvement and therefore need additional treatment. This treatment can be accomplished by routing the discharge from a dry pond through a wet pond or wetland downstream in the system prior to discharge to a water body or receiving stream. Another option is to use an oil/grit separator in conjunction with the dry pond to manage both stormwater quality and quantity.

Other Best Management Practices (BMPs) that could be utilized on individual lots are listed below.

— Impervious Area Reduction: Reducing the impervious area will reduce the volume of stormwater runoff and consequently the volume of storage required. Achieving the impervious area reduction can be accomplished by

reducing parking stall requirements, reducing road widths, porous surfaces such as paving stones etc. Items such as reducing parking stall requirements or reducing road widths may require alternate planning or engineering standards in order to implement.

- Infiltration Facilities: The use of infiltration facilities such as rain gardens, biofilter swales, infiltration trenches etc., can reduce the volume of runoff and provide groundwater recharge. A geotechnical investigation would be required for any site proposing to use these systems to confirm suitability for infiltration.
- Impervious Area Redirection: Directing runoff from impervious areas or roof leaders to a pervious area where it infiltrates into the soil or across a vegetated surface where it is filtered prior to reaching a drainage system.
- Absorbent Landscaping: Absorbent landscaping can be used to mimic pre-development landscape functions. Soils, plants and organic mulch are utilized to reduce the amount of stormwater runoff and promote evaporation and infiltration.



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ISS/REV	YYYY-MM-DD	DESCRIPTION	DES	DRN	CHK	PM

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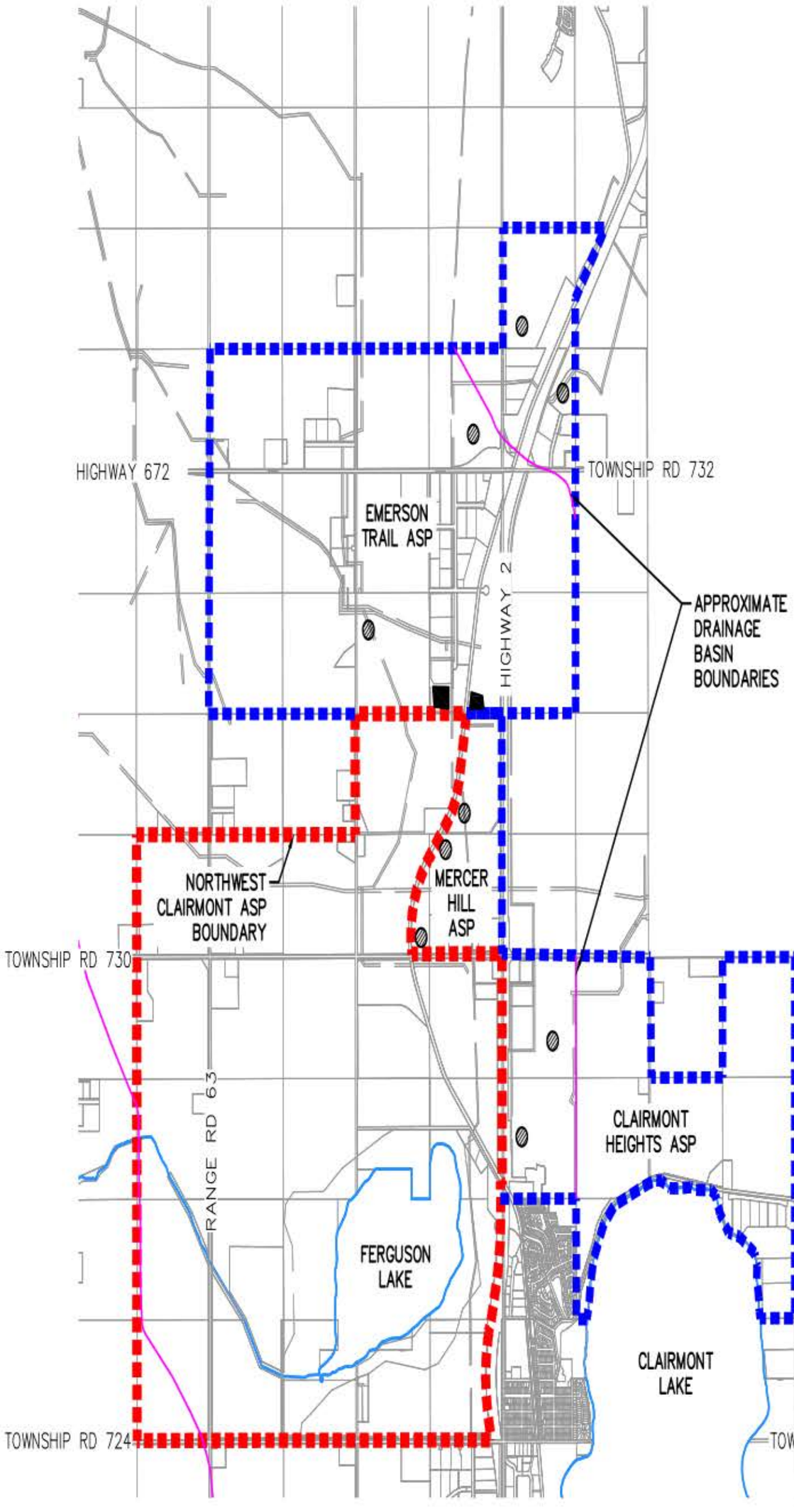
CLIENT: COUNTY OF GRANDE PRAIRIE NO. 1

PROJECT: NORTHWEST CLAIRMONT ASP SERVICING

TITLE: WATERSHED BOUNDARIES

CLIENT REF. NO: —	DISCIPLINE: CIVIL	DRAWING NO: FIGURE 4-1	ISSUE: DRAFT REPORT MAY 12, 2017
SCALE: 1:75000	PROJECT NO: 151-04424-00		ISS/REV: A

Ansi B, S:\Projects\5216028000 NW CLAIRMONT ASP\CAD\Figures\ASP\Figure 4.1 - Watershed Boundaries.dwg, Plot Date: 2017/05/11 2017/05/11 By: Arlay, Jennifer



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LEGEND:

EXISTING STORM WATER FACILITY

PROPOSED STORMWATER FACILITY

—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
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CLIENT: COUNTY OF GRANDE PRAIRIE NO. 1

PROJECT: NORTHWEST CLAIRMONT ASP SERVICING

TITLE: UPSTREAM STORMWATER MANAGEMENT

CLIENT REF. NO: —

DISCIPLINE: CIVIL

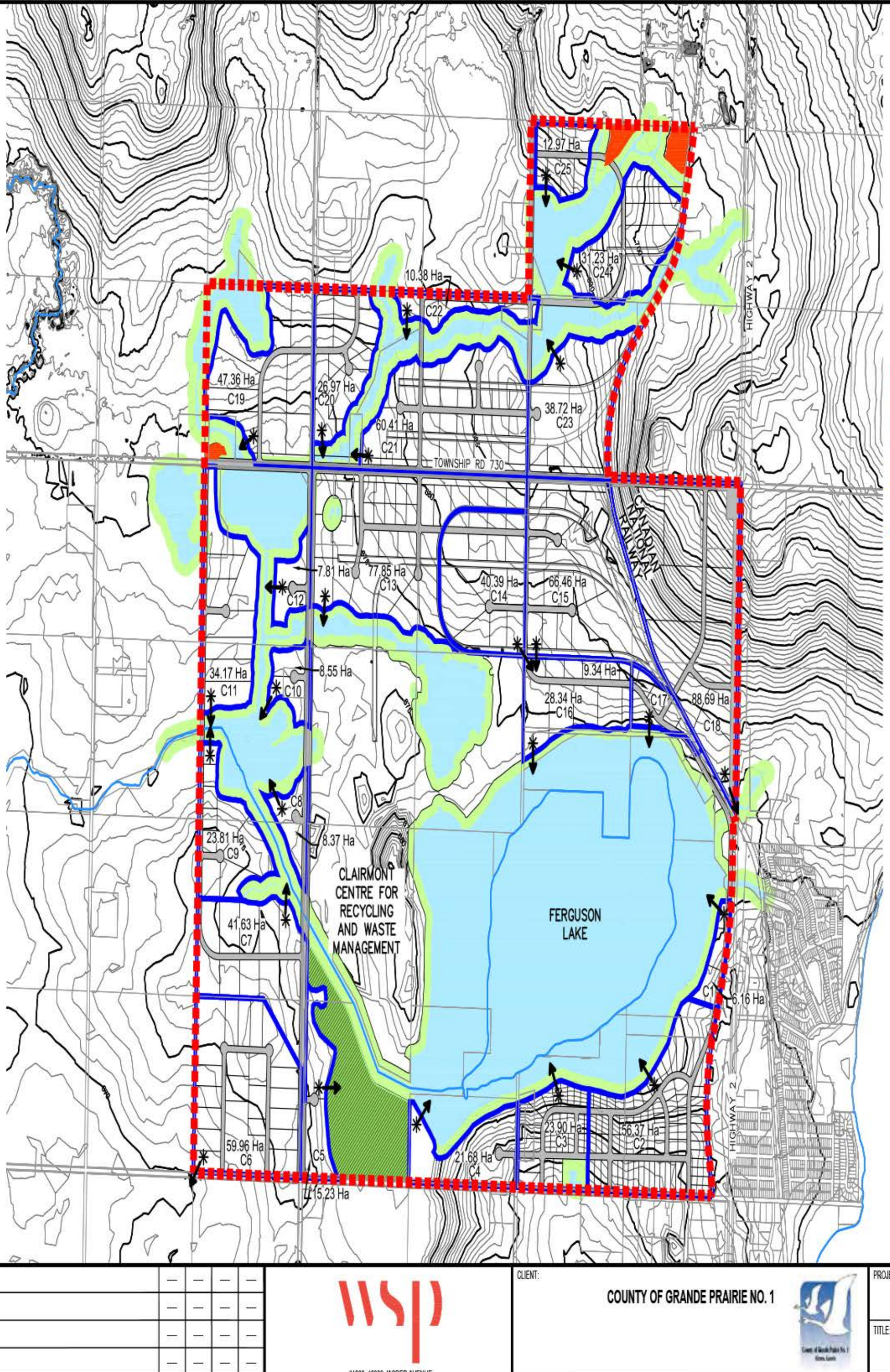
SCALE: 1:50000

PROJECT NO: 151-04424-00

DRAWING NO: FIGURE 4-2

ISSUE: DRAFT REPORT MAY 12, 2017

ISS/REV: A



ISS/REV	YYYY-MM-DD	DESCRIPTION	DES	DRN	CHK	PM
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A	20170512	DRAFT REPORT	R.T.	S.M.	B.R.	B.P.

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CLIENT: COUNTY OF GRANDE PRAIRIE NO. 1

CLIENT REF. NO: —

SCALE: 1:25000

DISCIPLINE: CIVIL

PROJECT NO: 151-04424-00

PROJECT: NORTHWEST CLAIRMONT ASP SERVICING

TITLE: PROPOSED STORMWATER MANAGEMENT

DRAWING NO: FIGURE 4-3

ISSUE: DRAFT REPORT MAY 12, 2017

ISS/REV: A

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This report presents proposed servicing schemes for water distribution, sanitary collection and stormwater management in support of the Northwest Clairmont ASP.

- Water service for the study area can be provided as shown in Figure 2-1.
- Sanitary servicing can be provided with gravity sewers and two lift stations as shown in Figure 3-1, although there are several locations where the sewer would be over 9 metres deep.
- Stormwater management can be provided by following the stormwater management plan shown in Figure 4-1.
- Prior to development submission will have to be made to Alberta Environment and Parks to determine if the province will claim any wetlands within the development area.

5.2 RECOMMENDATIONS

As development occurs in the Northwest Clairmont ASP area the following is recommended.

- Coordinate the sanitary sewer design on the east side of Ferguson Lake with the servicing requirements for the Mercer Hill and Emerson Trail ASPs.
- Consider utilizing low pressure sanitary sewer to service select areas along the west boundary of the ASP to reduce the need for local lift stations or deep gravity sewers.
- Review stormwater pond location and available storage depth when the site grading is being conducted.

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— Parioplan (2012, November). Clairmont Heights Area Structure Plan.

APPENDIX

A WATER SYSTEM DEMANDS

Node	Elevation	Area	Landuse	ADD	MDD	PHD	Required FF
J-1	672.3	33.35	Industrial	7.72	11.58	15.44	225
J-2	674.2	N/A	Industrial	N/A	N/A	N/A	N/A
J-3	674.5	N/A	Industrial	N/A	N/A	N/A	N/A
J-5	672.3	10.03	Industrial	2.32	3.48	4.64	225
J-6	679	44.57	Industrial	10.32	15.48	20.63	225
J-7	680.7	N/A	Industrial	N/A	N/A	N/A	N/A
J-8	684.8	4.32	Industrial	1.00	1.50	2.00	225
J-10	675.2	10.42	Industrial	2.41	3.62	4.82	225
J-11	672.7	10.11	Industrial	2.34	3.51	4.68	225
J-12	673.3	34.09	Industrial	7.89	11.84	15.78	225
J-13	676.3	44.44	Industrial	10.29	15.43	20.57	225
J-15	676.6	27.54	Industrial	6.38	9.56	12.75	225
J-16	675.2	35.7	Industrial	8.26	12.40	16.53	225
J-18	686	37.07	Industrial	8.58	12.87	17.16	225
J-19	678	53.66	Industrial	12.42	18.63	24.84	225
J-22	678.5	38.24	Industrial	8.85	13.28	17.70	225
J-24	684	N/A	Industrial	N/A	N/A	N/A	N/A
J-25	687.5	20.31	Industrial	4.70	7.05	9.40	225
J-27	683.4	45.67	Industrial	10.57	15.86	21.14	225
J-28	684.1	31.12	Industrial	7.20	10.81	14.41	225
J-29	698.4	59.65	Industrial	13.81	20.71	27.62	225
J-32	710	N/A	Industrial	N/A	N/A	N/A	N/A
J-34	672	N/A	Industrial	N/A	N/A	N/A	N/A
J-35	678.4	41.86	Industrial	9.69	14.53	19.38	225
J-36	678.6	21.21	Industrial	4.91	7.36	9.82	225
J-37	676	N/A	Industrial	N/A	N/A	N/A	N/A
J-38	675.6	32.5	Industrial	7.52	11.28	15.05	225
J-39	682.3	37.9	Industrial	8.77	13.16	17.55	225
J-41	687.1	3.73	Industrial	0.86	1.30	1.73	225
J-42	691.3	13.73	Industrial	3.18	4.77	6.36	225
J-43	698	31.85	Industrial	7.37	11.06	14.75	225
J-44	676.4	54.52	Commercial	12.62	18.93	25.24	225
J-45	681.3	32.21	Commercial	7.46	11.18	14.91	225
J-46	679.4	21.25	Institutional	7.38	11.07	14.76	225
J-49	676.1	0	N/A	0	0.00	0.00	0
J-50	678.52	0	N/A	0	0.00	0.00	0

APPENDIX

B SANITARY SEWER CALCULATIONS

Sanitary Sewer System Design

PROJECT: *NW Clairmont Area Structure Plan*
JOB No.: *151-04424-00*
DATE: *6-Nov-17*
COMPUTED BY: *RT*
CHECKED BY: *BR*

Residential Flow = 275 L/person/day
Commercial Flow = 0.12 L/s/ha
Industrial Flow = 0.12 L/s/ha

Residential I/I = 0.28 L/s/ha
Comm./Ind. I/I = 0.28 L/s/ha
Sag MH Inflow = 0.4 L/s/ha

Line No.	Pipe Identification: Manhole No. From	To	Population & Area Calculations: Zoning Code	Contributing Area, Lots, or Building m^2: Area (ha)	Total Res Area	Total Ind Area	Lots each	Building m^2 or bed	Population: New persons	Total persons	Peak Flow Calculation: Base Flow (m^3/s): Residential Total	Com / Ind Flow: New	Total	Peaking Factor: Use: Com / Ind	Res.	New Sag MH's	Total Sag MH's	Peak Flow (m^3/s)	I / I Total (m^3/s)	Design Flow (m^3/s)	Required Flow (m^3/s)	Pipe Information: Pipe Length (m)	Pipe Diameter (mm)	Slope (%)	Capacity (m^3/s)	Capacity Used (%)	Full Velocity (m/s)	Design Velocity (m/s)	Elevations: Upper Rim (m)	Lower Rim (m)	Upper Invert (m)	Lower Invert (m)	Upper Cover (m)	Lower Cover (m)
1	MH13	MH12	MEDIND	63.81	0	63.81			#N/A	0	0.0000	0.0148	0.0148	4.24	3.00	13	13	0.0626	0.0231	0.0856	0.0996	819	375	0.35	0.104	82.48%	0.939	1.049	687.12	684.76	681.686	678.819	5.060	5.566
1	MH12	MH11	MEDIND	0	0	63.81			#N/A	0	0.0000	0.0000	0.0148	4.24	3.00	0	13	0.0626	0.0231	0.0856	0.0996	657	375	0.35	0.104	82.48%	0.939	1.049	684.76	682.25	678.399	676.100	5.986	5.775
1			MEDIND	23.55	0	87.36			#N/A	0	0.0000	0.0055	0.0202	4.02	3.00	5	18	0.0813	0.0317	0.1129	0.1313														
1	MH11	MH10	HVYIND	43	0	130.36			#N/A	0	0.0000	0.0100	0.0302	3.76	3.00	9	27	0.1134	0.0473	0.1607	0.1868	169	450	0.80	0.255	62.94%	1.603	1.694	682.25	680.54	675.740	674.388	6.060	5.702
1	MH14	MH10	HVYIND	27.9	0	27.9			#N/A	0	0.0000	0.0065	0.0065	4.87	3.00	6	6	0.0314	0.0102	0.0416	0.0484	814	300	0.60	0.075	55.55%	1.060	1.087	685.75	680.54	679.572	674.688	5.878	5.552
1	MH10	MH10A	HVYIND	0	0	158.26			#N/A	0	0.0000	0.0000	0.0366	3.64	3.00	0	33	0.1332	0.0575	0.1907	0.2218	440	450	0.70	0.239	79.88%	1.500	1.665	680.54	675.89	674.268	671.188	5.822	4.252
1			HWYIND	8.2	0	166.46			#N/A	0	0.0000	0.0009	0.0376	3.62	3.00	2	35	0.1361	0.0606	0.1967	0.2287														
1	MH10A	MH9	HVYIND	80	0	246.46			#N/A	0	0.0000	0.0185	0.0561	3.39	3.00	16	51	0.1899	0.0894	0.2793	0.3248	373	525	0.70	0.360	77.55%	1.662	1.836	675.89	674.00	670.948	668.337	4.418	5.139
1			HWYIND	5.4	0	5.4			#N/A	0	0.0000	0.0006	0.0006	5.00	3.00	1	1	0.0031	0.0019	0.0050	0.0059														
1	MH9A	MH9	MEDIND	31.8	0	37.2			#N/A	0	0.0000	0.0074	0.0080	4.70	3.00	6	7	0.0375	0.0132	0.0507	0.0590	399	375	0.20	0.078	64.63%	0.710	0.754	672.00	674.00	669.270	668.472	2.356	5.154
1			HWYIND	29.05	0	29.05			#N/A	0	0.0000	0.0034	0.0034	5.00	3.00	6	6	0.0168	0.0105	0.0273	0.0318														
1	MH9	MH8	MEDIND	16.45	0	329.16			#N/A	0	0.0000	0.0038	0.0713	3.25	3.00	3	67	0.2317	0.1190	0.3507	0.4078	701	750	0.14	0.417	84.10%	0.943	1.056	674.00	672.00	668.097	667.115	5.154	4.135
1	MH8	MH6	HWYIND	8.6	0	337.76			#N/A	0	0.0000	0.0010	0.0723	3.24	3.00	2	69	0.2344	0.1222	0.3566	0.4146	544	750	0.14	0.417	85.52%	0.943	1.059	672.00	671.00	666.755	665.994	4.495	4.257
1	MH6	MH5	HWYIND	8.3	0	346.06			#N/A	0	0.0000	0.0010	0.0732	3.24	3.00	2	71	0.2370	0.1253	0.3623	0.4213	977	750	0.15	0.432	83.94%	0.976	1.093	671.00	672.10	665.694	664.228	4.557	7.122
1			HWYIND	7.2	0	7.2			#N/A	0	0.0000	0.0008	0.0008	5.00	3.00	1	1	0.0042	0.0024	0.0066	0.0077														
1	MH7	MH5	MEDIND	87.7	0	94.9			#N/A	0	0.0000	0.0203	0.0211	3.99	3.00	18	19	0.0843	0.0342	0.1185	0.1378	685	450	0.60	0.221	53.59%	1.389	1.412	675.80	672.10	672.248	668.138	3.102	3.512
1	MH5	MH4	HWYIND	16.8	0	457.76			#N/A	0	0.0000	0.0019	0.0963	3.09	3.00	3	93	0.2977	0.1654	0.4631	0.5384	1013	900	0.10	0.573	80.81%	0.900	1.001	672.10	676.60	663.688	662.675	7.512	13.025
1			HWYIND	18.5	0	18.5			#N/A	0	0.0000	0.0021	0.0021	5.00	3.00	4	4	0.0107	0.0068	0.0175	0.0203														
1	MH4A	MH4	MEDIND	46	0	64.5			#N/A	0	0.0000	0.0106	0.0128	4.34	3.00	9	13	0.0555	0.0233	0.0788	0.0916	597	375	0.32	0.099	79.33%	0.898	0.996	671.80	676.60	668.570	666.660	2.855	9.565
	South	MH4	IND	384	0	384			#N/A	0	0.0000	0.0444	0.0444	3.52	3.00	77	77	0.1565	0.1383	0.2948	0.3428														
1	MH4	L.S. 10 west	IND	0	0	906.26			#N/A	0	0.0000	0.0000	0.1535	2.86	3.00	0	183	0.4388	0.3270	0.7658	0.8905	814	900	0.25	0.906	84.52%	1.423	1.595	676.60	672.00	662.135	660.100	13.565	11.000
2			HWYIND	40.7	0	40.7					0.0000	0.0047	0.0047	5.00	3.00	8	8	0.0236	0.0146	0.0381	0.0444														
2	MH15A	MH16	HVYIND	40.5	0	81.2			#N/A	0	0.0000	0.0094	0.0141	4.27	3.00	8	16	0.0601	0.0291	0.0893	0.1038	830	300	3.00	0.168	53.25%	2.370	2.405	706.00	675.90	697.217	672.317	8.483	3.283
2	North	MH15	IND	820.8	0	820.8			#N/A	0	0.0000	0.0950	0.0950	3.10	3.00	164	164	0.2944	0.2954	0.5898	0.6858										692.370				
2	MH15	MH14A	HVYIND	14.0	0	834.8			#N/A	0	0.0000	0.0032	0.0982	3.08	3.00	3	167	0.3027	0.3005	0.6032	0.7014	750	900	1.00	1.812	33.29%	2.846	2.560	714.00	690.59	692.588	685.088	20.512	4.602
2	MH14A	MH14	HVYIND	30.8	0	865.6			#N/A	0	0.0000	0.0071	0.1054	3.05	3.00	6	173	0.3209	0.3116	0.6324	0.7354	610	900	1.00	1.812	34.90%	2.846	2.593	690.59	685.75	684.668	678.568	5.022	6.282
2	MH14	MH16A	HVYIND	0	0	865.6			#N/A	0	0.0000	0.0000	0.1054	3.05	3.00	0	173	0.3209	0.3116	0.6324	0.7354	600	900	1.00	1.812	34.90%	2.846	2.593	685.75	676.10	678.208	672.208	6.642	2.992
2	MH16A	MH16	HVYIND	105.55	0	971.15			#N/A	0	0.0000	0.0244	0.1298	2.94	3.00	21	194	0.3816	0.3495	0.7312	0.8502	1351	1050	0.12	0.947	77.22%	1.092	1.206	676.10	675.90	671.908	670.287	3.142	4.563
2	MH16	MH17	HWYIND	7.63	0	1059.98			#N/A	0	0.0000	0.0009	0.1448	2.89	3.00	2	212	0.4179	0.3816	0.7995	0.9297	1187	1050	0.12	0.947	84.43%	1.092	1.224	675.90	674.10	669.567	668.143	5.283	4.907
2	MH17	MH17A	COM	13.1	0	1073.08			#N/A	0	0.0000	0.0015	0.1463	2.88	3.00	3	215	0.4216	0.3865	0.8080	0.9396	59	1050	0.12	0.947	85.33%	1.092	1.226	674.10	673.20	667.543	667.472	5.507	4.678
2	MH17A	MH18	COM	0	0	1073.08			#N/A	0	0.0000	0.0000	0.1463	2.88	3.00	0	215	0.4216	0.3865	0.8080	0.9396	895	1050	0.12	0.947	85.33%	1.092	1.226	673.20	673.40	667.412	666.338	4.738	6.012
2	MH18	MH19	COM	73.3	0	1146.38			#N/A	0	0.0000	0.0085	0.1548	2.85	3.00	15	230	0.4418	0.4130	0.8548	0.9939	801	1050	0.14	1.023	83.58%	1.180	1.320	673.40	674.70	665.858	664.737	6.492	8.913
2	MH19	MH20	COM	0	0	1146.38			#N/A	0	0.0000	0.0000	0.1548	2.85	3.00	0	230	0.4418	0.4130	0.8548	0.9939	1028	1050	0.14	1.023	83.58%	1.180	1.320	674.70	672.50	664.317	662.877	9.333	8.573
2	MH20	L.S. 10 east	INST	21.7	0	1168.08			#N/A	0	0.0000	0.0038	0.1585	2.84	3.00	4	234	0.4507	0.4207	0.8714	1.0133	241	1050	0.14	1.023	85.20%	1.180	1.324	672.50	672.00	662.337	662.000	9.113	8.950

Notes:
1. Required Flow = Design Flow (Peak Wet Weather Flow) / 0.86.
2. Design velocity is the partial flow velocity for the design flow based on the pipe design (diameter, slope, etc.).
3. Minimum depth of cover is 2.75m to top of pipe.
4. Minimum velocity is 0.6, maximum velocity is 3.
5. At manholes obverts have been matched. Minimum invert drops at manholes of 20 mm for straight runs and 50 mm for deflections have been used.

APPENDIX

C FLOOD FREQUENCY ANALYSIS

Frequency Analysis and Basin Transfer - Gage Summary

County of Grande Prairie Northwest Clairmont ASP - WSP Project Number 151-04424-00

Site Drainage Area = 49.3000 km^2

Gage Data		1:2 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Effective Drainage Area (km^2)	Q_2 from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**5.550**	0.0241	0.85	1.499	0.0304	0.304
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**1.180**	0.0908	0.85	3.664	0.0743	0.743
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**26.908**	0.0167	0.85	1.390	0.0282	0.282
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**10.297**	0.0737	0.85	4.248	0.0862	0.862
07GE007	Bear River near Valhalla Centre	28	181.0	**8.702**	0.0481	0.85	2.881	0.0584	0.584
						Average	**2.7364**	**0.0555**	**0.555**
						Discharge (Q2) at 49.3 km^2 Basin (m^3/s and L/s)		**2.736**	**2736.426**

0.555

Gage Data		1:5 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Effective Drainage Area (km^2)	Q_5 from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**13.475**	0.0586	0.85	3.639	0.074	0.738
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**3.083**	0.237	0.85	9.572	0.1942	1.942
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**61.912**	0.038	0.85	3.198	0.0649	0.649
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**19.530**	0.140	0.85	8.057	0.1634	1.634
07GE007	Bear River near Valhalla Centre	28	181	**20.125**	0.111	0.85	6.662	0.1351	1.351
						Average	**6.2258**	**0.126**	**1.263**
						Discharge (Q5) at 49.3 km^2 Basin (m^3/s and L/s)		**6.226**	**6225.778**

Gage Data		1:10 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Effective Drainage Area (km^2)	Q_{10} from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**19.438**	0.085	0.85	5.249	0.106	1.065
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**4.641**	0.357	0.85	14.409	0.292	2.923
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**89.080**	0.055	0.85	4.601	0.093	0.933
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**26.118**	0.187	0.85	10.775	0.219	2.186
07GE007	Bear River near Valhalla Centre	28	181	**28.190**	0.156	0.85	9.332	0.189	1.893
						Average	**8.8736**	**0.180**	**1.800**
						Discharge (Q10) at 49.3 km^2 Basin (m^3/s and L/s)		**8.874**	**8873.623**

Gage Data		1:25 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Effective Drainage Area (km^2)	Q_{25} from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**26.891**	0.117	0.85	7.262	0.147	1.473
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**6.732**	0.518	0.85	20.902	0.424	4.240
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**124.862**	0.078	0.85	6.450	0.131	1.308
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**34.507**	0.247	0.85	14.237	0.289	2.888
07GE007	Bear River near Valhalla Centre	28	181	**37.730**	0.208	0.85	12.491	0.253	2.534
						Average	**12.2682**	**0.249**	**2.488**
						Discharge (Q25) at 49.3 km^2 Basin (m^3/s and L/s)		**12.268**	**12268.202**

Gage Data		1:50 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Effective Drainage Area (km^2)	Q_{50} from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**32.076**	0.139	0.85	8.662	0.176	1.757
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**8.284**	0.637	0.85	25.724	0.522	5.218
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**151.331**	0.094	0.85	7.817	0.159	1.586
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**40.637**	0.291	0.85	16.766	0.340	3.401
07GE007	Bear River near Valhalla Centre	28	181	**44.035**	0.243	0.85	14.578	0.296	2.957
						Average	**17.193**	**0.349**	**3.487**
						Discharge (Q50) at 49.3 km^2 Basin (m^3/s and L/s)		**17.193**	**17192.959**

Gage Data		1:100 Year Flood (Instantaneous)				Basin Transfer		Site unit area discharge	
WSC Hydrometric Station	Stream Name	Number of Records	Gross Drainage Area (km^2)	Q_{100} from LP3 (m^3/s)	Gage unit area discharge, q (m^3/s/km^2)	Coefficient	Q to site scale (m^3/s)	Site unit area discharge, q (m^3/s/km^2)	**Site unit area discharge, q (L/s/ha)**
07FD012	Montagneuse River near Hines Creek	37	230.0	**36.824**	0.160	0.85	9.945	0.202	2.017
07FD910	Rycroft Survey No. 3 near Rycroft	30	13.0	**9.782**	0.752	0.85	30.375	0.616	6.161
07GD001	Beaverlodge River near Beaverlodge	45	1610.0	**176.982**	0.110	0.85	9.142	0.185	1.854
07GE003	Grande Prairie Creek near Sexsmith	43	139.7	**46.583**	0.333	0.85	19.219	0.390	3.898
07GE007	Bear River near Valhalla Centre	28	181.0	**49.568**	0.274	0.85	16.409	0.333	3.328
						Average	**17.018**	**0.345**	**3.452**
						Discharge (Q100) at 49.3 km^2 Basin (m^3/s and L/s)		**17.018**	**17018.002**

APPENDIX

D MASTER PLAN FIGURES

PH1	AQUATERA WATER TREATMENT PLANT AND ZONE G-1 RESERVOIR AND HIGHLIFT PUMP STATION
PH2	ZONE G-2 RESERVOIR AND TOWERS AND PUMP STATION
PH3	ZONE G-3 RESERVOIRS AND PUMP STATION
PH4	ZONE G-1A RESERVOIRS AND PUMPSTATION
PH5	CLAIRMONT RESERVOIR AND PUMPSTATION
PH6	WAW TRICKLE FEED BOOSTER PUMP STATION
PH7	SEXSMITH TRANSFER PUMP STATION
PH8	SEXSMITH TRANSFER BOOSTER PUMP STATION
PH9	PROPOSED MERCER HILL RESERVOIR AND PUMP STATION
PH10	PROPOSED ZONE G-2 AUXILIARY RESERVOIR AND PUMP STATION
PH11	PROPOSED ZONE G-1D RESERVOIR AND PUMP STATION
PH12	PROPOSED ZONE G-1A AUXILIARY RESERVOIR AND PUMP STATION
PH13	PROPOSED ZONE G-1D BOOSTER PUMP STATION
PH14	PROPOSED ZONE G-2 TRANFER PUMP STATION
PH15	PROPOSED ZONE G-1B RESERVOIR AND PUMP STATION
PH16	PROPOSED ZONE G-1C RESERVOIR AND PUMP STATION
PH17	PROPOSED DIMSDALE BOOSTER PUMP STATION
PH18	PROPOSED ZONE C-3 RESERVOIR AND PUMP STATION
PH19	PROPOSED SECOND SEXSMITH BOOSTER STATION
FS 1	PROPOSED EMERSON TRAIL FIRE FLOW STORAGE
FS 2	PROPOSED BACON FIRE FLOW STORAGE
FS 3	PROPOSED E-TRICKLE FIRE FLOW STORAGE
FS 4	PROPOSED S-TRICKLE #1 FIRE FLOW STORAGE
FS 5	PROPOSED S-TRICKLE #2 FIRE FLOW STORAGE

N

SEXSMITH RESERVOIR

SEXSMITH

EMMERSON TRICKLE

FS 1

PH 9

PH 19

C-2

FERGUSON LAKE

PH 8

PH 5

CLAIRMONT LAKE

BEAR LAKE

PH 18

C-3

C-1

FS 2

BACON TRICKLE

G-1D

PH 11

G-3

PH 3

PH 7

G-1A

PH 4

PH 12

PH 13

G-2

PH 2

C-1B

PH 15

PH 10

E-TRICKLE

FS 3

FUT DIMSDALE RESERVOIR

DIMSDALE

PH 17

G-1

PH 1

PH 14

PH 16

G-1C

S-TRICKLE

FS 5

FS 4

LEGEND:

- PROPOSED PUMP HOUSE & RESERVOIR
- EXISTING PUMP HOUSE & RESERVOIR
- RESERVOIR NOT IN STUDY
- PROPOSED PRV
- EXISTING PRV
- FIRE FLOW STORAGE & PUMP HOUSE
- ULTIMATE ZONES
- PROPOSED ULTIMATE TRANSMISSION LINES
- EXISTING TRANSMISSION LINES

AQUATERA WATER EARTH INNOVATION

2013 WATER DISTRIBUTION & WASTEWATER COLLECTION MASTER PLAN

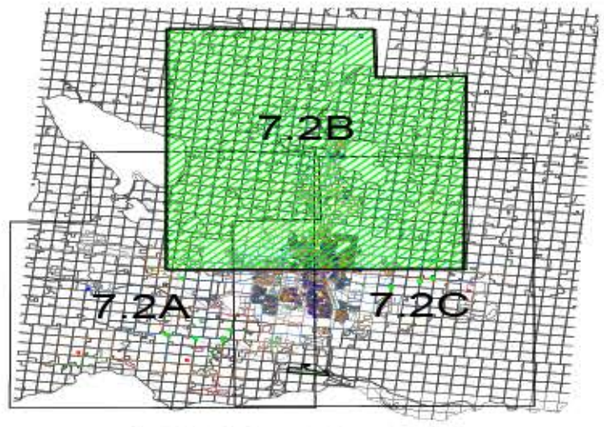
SERVICING STRATEGY FOR GRANDE PRAIRIE & CLAIRMONT

ULTIMATE WATER NETWORK

MORRISON HERSHFIELD

Date: 2015/05/19

Figure 7.1



KEY PLAN

SEE
FIGURES 7.2D TO H

LEGEND:

- PROPOSED PUMP HOUSE & RESERVOIR
- EXISTING PUMP HOUSE & RESERVOIR
- RESERVOIR NOT IN STUDY
- FIRE FLOW STORAGE
- PROPOSED PRV
- EXISTING PRV
- EXISTING CHECKVALVE
- ZONE BOUNDARIES
- PROPOSED LONG TERM
- PROPOSED MID TERM
- PROPOSED SHORT TERM
- ULTIMATE TERM

- EXISTING PIPE DIAM 150mm
- EXISTING PIPE DIAM 200mm > 250mm
- EXISTING PIPE DIAM 300mm > 350mm
- EXISTING PIPE DIAM 400mm > 450mm
- EXISTING PIPE DIAM 500mm > 550mm
- EXISTING PIPE DIAM 600mm
- EXISTING PIPE DIAM 750mm
- EXISTING PIPE DIAM 800mm
- EXISTING PIPE DIAM 900mm
- EXISTING PIPE DIAM 1050mm
- 250 PROPOSED PIPE DIAM

AQUATERA
WATER EARTH INNOVATION

2013 WATER DISTRIBUTION & WASTEWATER COLLECTION MASTER PLAN
SERVICING STRATEGY FOR GRANDE PRAIRIE & CLAIRMONT

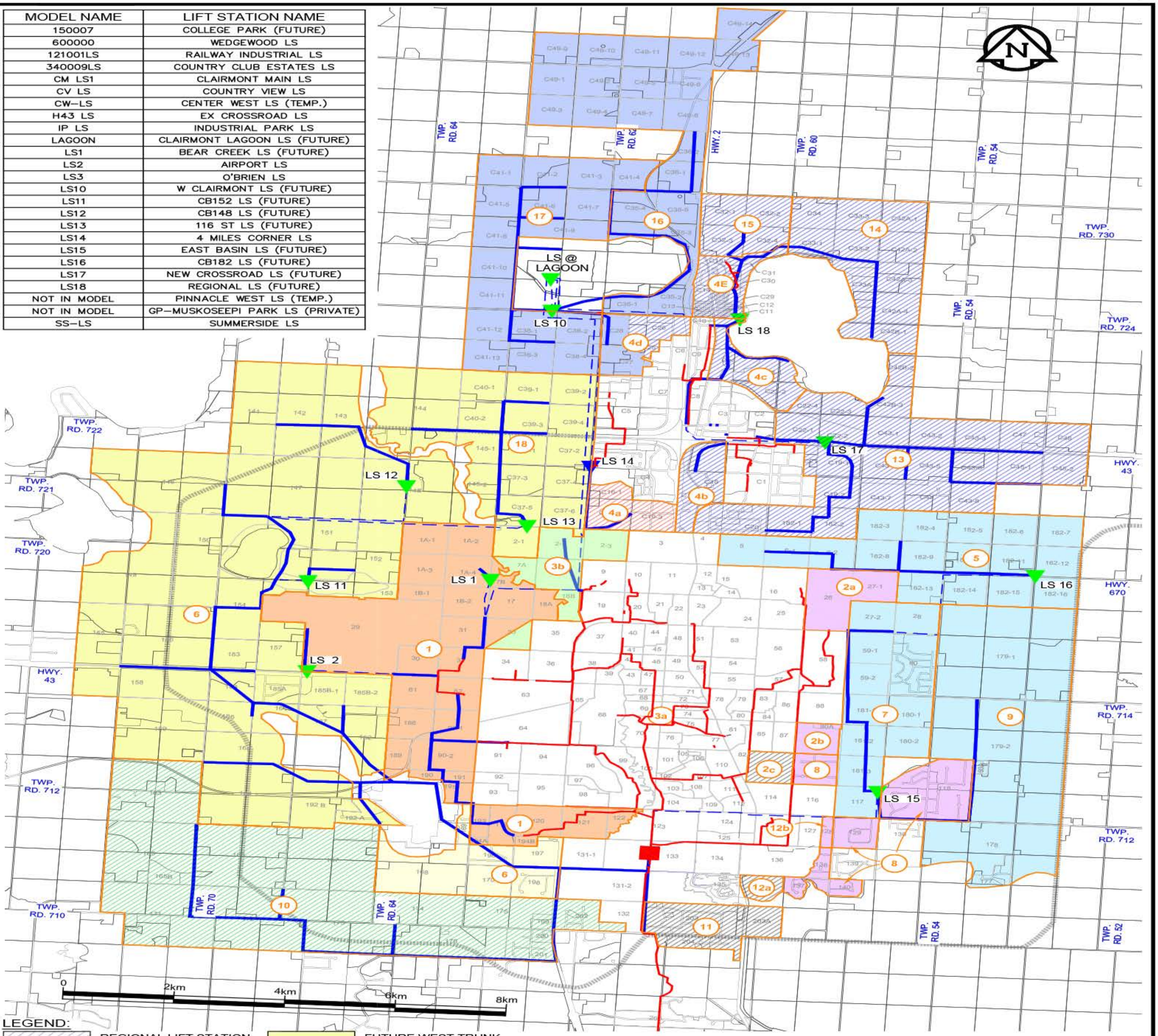
ULTIMATE NETWORK DETAILS

MORRISON HERSHFIELD

Date: 2015/05/19

Figure 7.2B

MODEL NAME	LIFT STATION NAME
150007	COLLEGE PARK (FUTURE)
600000	WEDGEWOOD LS
121001LS	RAILWAY INDUSTRIAL LS
340009LS	COUNTRY CLUB ESTATES LS
CM LS1	CLAIRMONT MAIN LS
CV LS	COUNTRY VIEW LS
CW–LS	CENTER WEST LS (TEMP.)
H43 LS	EX CROSSROAD LS
IP LS	INDUSTRIAL PARK LS
LAGOON	CLAIRMONT LAGOON LS (FUTURE)
LS1	BEAR CREEK LS (FUTURE)
LS2	AIRPORT LS
LS3	O'BRIEN LS
LS10	W CLAIRMONT LS (FUTURE)
LS11	CB152 LS (FUTURE)
LS12	CB148 LS (FUTURE)
LS13	116 ST LS (FUTURE)
LS14	4 MILES CORNER LS
LS15	EAST BASIN LS (FUTURE)
LS16	CB182 LS (FUTURE)
LS17	NEW CROSSROAD LS (FUTURE)
LS18	REGIONAL LS (FUTURE)
NOT IN MODEL	PINNACLE WEST LS (TEMP.)
NOT IN MODEL	GP–MUSKOSEEPI PARK LS (PRIVATE)
SS–LS	SUMMERSIDE LS



LEGEND:

- REGIONAL LIFT STATION SERVICE AREAS
- FUTURE SOUTHWEST TRUNK SERVICE AREAS
- LIFT STATION 14 SERVICE AREAS
- 102 TO 100 ST. TRUNK SERVICE AREAS
- 88 ST. TRUNK SERVICE AREAS
- (10) SERVICE AREAS
- WWTP
- EXISTING LIFT STATION
- FUTURE LIFT STATION
- FUTURE WEST TRUNK SERVICE AREAS
- 116 STREET TRUNK SERVICE AREAS
- 108 STREET TRUNK SERVICE AREAS
- EAST TRUNK SERVICE AREAS
- LIFT STATION 10 SERVICE AREAS
- FUTURE TRUNKS
- FUTURE FORCEMAIN
- EXISTING TRUNKS

AQUATERA WATER EARTH INNOVATION

2013 WATER DISTRIBUTION & WASTEWATER COLLECTION MASTER PLAN

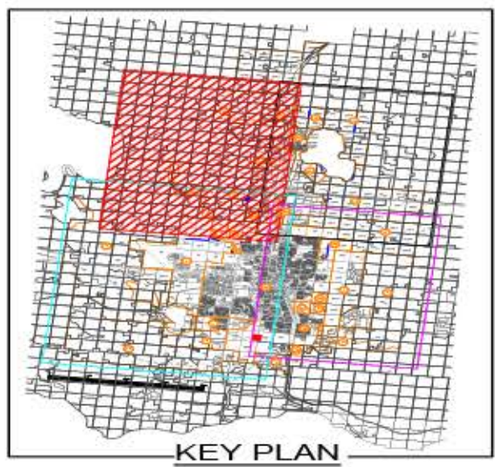
SERVICING STRATEGY FOR GRANDE PRAIRIE & CLAIRMONT

ULTIMATE SERVICING CONCEPT PLAN

MORRISON HERSHFIELD

Date: 2015/05/19

Figure 8.2



TWP. RD. 64
TWP. RD. 63
TWP. RD. 62
HWY. 2
TWP. RD. 70
TWP. RD. 65
TWP. RD. 724
TWP. RD. 722
TWP. RD. 721
TWP. RD. 720
C41-1
C41-2
C41-3
C41-4
C41-5
C41-6
C41-7
C41-8
C41-9
C41-10
C41-11
C41-12
C41-13
C36-1
C36-2
C35-4
C35-5
C35-3
C35-2
C35-1
C13
C38-1
C38-2
C38-3
C38-4
C28
C26
C25
C27
C6
C40-1
C40-2
C39-1
C39-2
C39-3
C39-4
C7
C5
C37-1
C37-2
C37-3
C37-4
C37-5
C37-6
C4
C16-1
C16-3
2-1
2-3
3
7A
9
10
11
1A-1
1A-2
1A-3
1A-4
141
142
143
144
145-1
145-2
147
148
150
151
152
17
16
18
4d
4a
3b
375
900
525
575
750
450
1050
1200 FM
600
250
250 FM
675
1200
750 FM
1350
900 FM
625
LS @ LAGOON
1000 & 400 FM
LS 10 (WEST CLAIRMONT LS)
LS 12 (CB148 LS)
LS 13 (116 ST LS)
LS 14 (4 MILES CORNER LS)
FERGUSON LAKE
HUGES LAKE

LEGEND:

- REGIONAL LIFT STATION SERVICE AREAS
- FUTURE SOUTHWEST TRUNK SERVICE AREAS
- LIFT STATION 14 SERVICE AREAS
- 102 TO 100 ST. TRUNK SERVICE AREAS
- 88 ST. TRUNK SERVICE AREAS
- WWTP
- EXISTING LIFT STATION
- FUTURE LIFT STATION
- 10 SERVICE AREAS
- FUTURE WEST TRUNK SERVICE AREAS
- 116 STREET TRUNK SERVICE AREAS
- 108 STREET TRUNK SERVICE AREAS
- EAST TRUNK SERVICE AREAS
- LIFT STATION 10 SERVICE AREAS
- FUTURE TRUNKS
- FUTURE FORCEMAIN
- EXISTING TRUNKS >375mmØ
- EXISTING TRUNKS <375mmØ

AQUATERA WATER EARTH INNOVATION

2013 WATER DISTRIBUTION & WASTEWATER COLLECTION MASTER PLAN

SERVICING STRATEGY FOR GRANDE PRAIRIE & CLAIRMONT

ULTIMATE SERVICING CONCEPT SERVICE AREAS PLAN

MORRISON HERSHFIELD

Date: 2015/05/19

Figure 8.7