SHEPARD INDUSTRIAL AREA STRUCTURE PLAN:

SERVICING STUDY

ROCKY VIEW COUNTY, ALBERTA

Prepared for:

Shepard Development Corporation

Prepared by:

IDEA Group Inc.

February 2021

SHEPARD INDUSTRIAL AREA STRUCTURE PLAN: SERVICING STUDY

ROCKY VIEW COUNTY, ALBERTA

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1. INTRODUCTION

This Servicing Study is provided in support of the Shepard Industrial Area Structure Plan (ASP). This study does not provide a detail site servicing plan for the ASP, as the project has not reached a detailed stage in planning. As part of subsequent planning process more detailed serving analysis and reports will be submitted in accordance with County planning application requirements. This ASP servicing study will provide the following information:

- Sanitary System:
  - A description of the required water infrastructure inclusive of size, alignment and location of the proposed sanitary lift stations and force main;
  - A description of how the proposed sanitary flows will be transported to the existing Langdon Wastewater Treatment Plant (WWTP);
  - An overview of the sanitary flows generated by an industrial development of this size;
  - An overview of capacity improvements required at the Langdon WWTP;
- Water System:
  - A description of the required water infrastructure inclusive of size, alignment and location of the proposed reservoir and transmission main;
  - A description of how the proposed water demands will be transported from the Langdon Water Treatment Plant (WTP);
  - An overview of the water demands generated by an industrial development of this size;
- A phasing strategy;
- An opinion of probable costs.

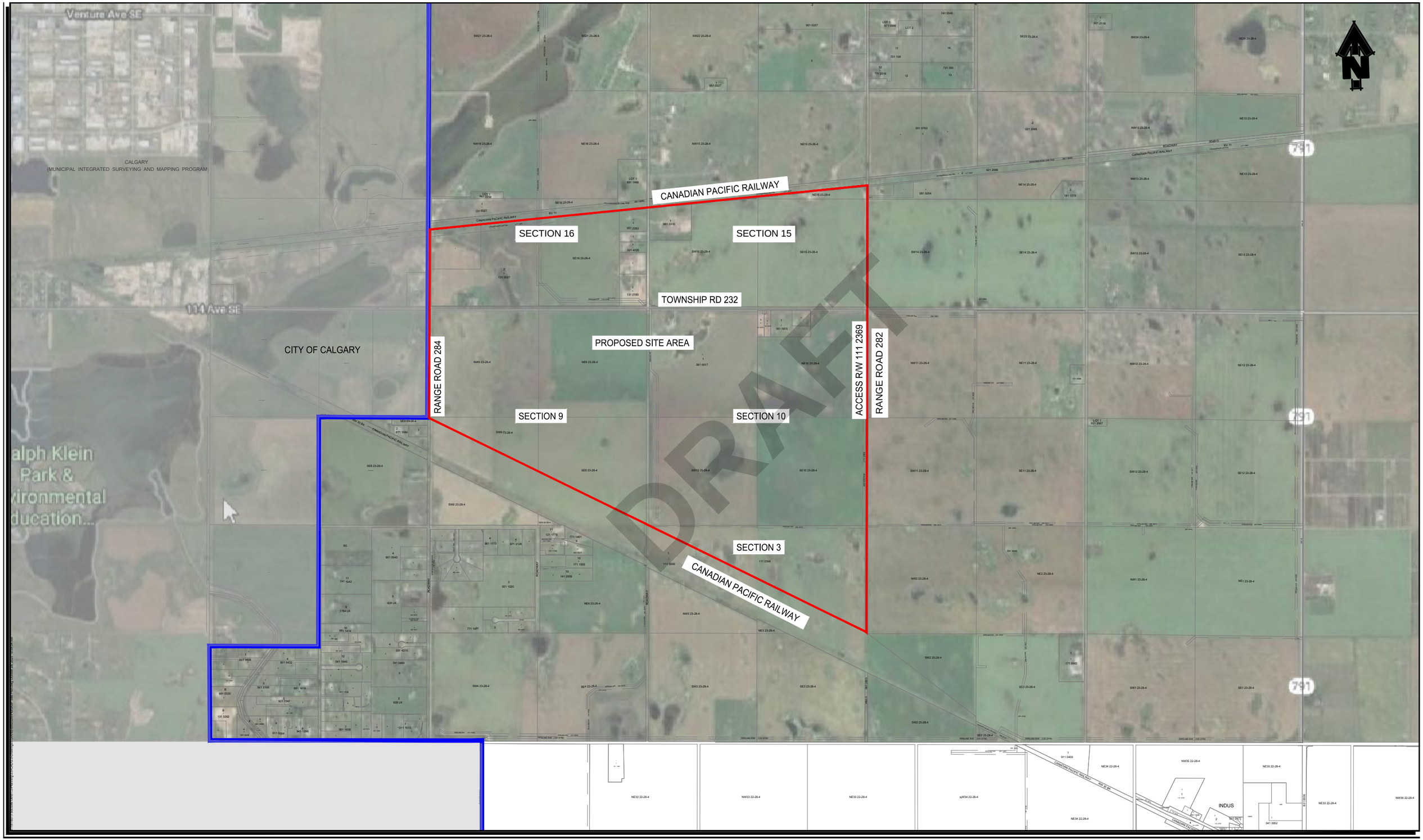
2. SITE CHARACTERISTICS

The ASP proposes a mix of industrial and commercial uses in Rocky View County, AB (RVC) east of the City of Calgary. The existing land uses within the ASP mainly consists of agricultural with some light industrial.

The ASP lands includes approximately 773 hectares (1910 acres) of land and proposes a mix of industrial and commercial uses located in Rocky View County, AB. The ASP lands are located east of the City of Calgary within the future growth corridor for industrial development in the Intermunicipal Development Plan (IDP) between Rocky View County and the City of Calgary. The ASP lands are bound by the CP Rail mainline right of way to the south, the abandoned CP railway right of way, approximately one-half mile north of Township Road 232 to the north, Range Road 284 to the west and the undeveloped Range

Road 282 AR/W Plan 1112369 to the east. As shown in Sketch SK-00, the ASP lands are inclusive of the below legal parcels:

- NW¼-3-23-28-W4, NE¼-3-23-28-W4, SE¼-9-23-28-W4 and SW¼-9-23-28-W4 north of the Canadian Pacific Railway
- NW¼-9-23-28-W4
- NE¼-9-23-28-W4
- SE¼-16-23-28-W4, SW¼-16-23-28-W4, NE¼-15-23-28-W4 and SW¼-15-23-28-W4 south of the Canadian Pacific Railway
- SE¼-15-23-28-W4
- 10-23-28-W4



Owner	Consultant	Legend	Project	Drawing Title	Project Lead	Scale	Drawing
SHEPARD	IDEA GROUP	CITY OF CALGARY LIMITS	SHEPARD INDUSTRIAL ASP	PROPOSED SITE	JB	1:25,000	SK-00
		PROPOSED SITE AREA			Project # 18073	Date (YY-MM-DD) 20-10-29	

Issued For/Revisions		
No.	Description	Date YY.MM.DD
1	ISSUED FOR INFORMATION	20.10.29

3. SANITARY SYSTEM

The existing topography is a slightly rolling landscape with a high ridge running roughly diagonally from the SW vicinity to the NE corner of the ASP area. The ASP existing drainage topography will generally remain through post development. As such, the ASP will require two (2) major sanitary catchment areas, with each catchment area requiring a lift station. Catchment area 1 (NW corner) will service sections 9, 15, and 16 within the ASP boundary, via Sanitary Lift Station #1. Catchment area 2 (SE Corner) will service sections 3 and 10 within the ASP boundary, via Sanitary Lift Station #2. The Catchment areas have been delineated and are presented in Sketch SK-01.

A proposed sanitary force main (SFM) running along Township Road (TWP) 232 is required to service the two catchment areas. Sanitary Lift Station #1 will be required on the upstream end of the 300mm sanitary force main, and Sanitary Lift Station #2 will tie upstream of the upsized 525 mm sanitary force main (SFM).

The SFM extends past the ASP boundary, eastward along TWP 232 and turning north along RR 275 to parallel the existing East Rocky View Wastewater Transmission Main (ERVWWTM) at the corner of RR 275 and TWP 233. The SFM ultimately discharges directly to the Langdon WWTP. See Sketch SK-02 for a schematic of the site showing the SFM, lift station locations and proposed SFM sizing based on the estimated daily flows.

3.1. SANITARY FLOW ANALYSIS

Two average flow generation estimates ($\mathbf{Q_{AVG}}$) were considered when reviewing the anticipated wastewater demands for the ASP area.

The first scenario was based on actual demands generated by the existing East Balzac development between 2014 to 2020 and recorded by Rocky View County (RVC), refer to the Appendix A – East Balzac Wastewater Flows 2014 to Present. The East Balzac development is a similar development to the proposed ASP in use, and as such the data provided by RVC is considered to be a real-world representation of the anticipated demands from the proposed ASP. The provided 2019 average daily flow was utilized for the first scenario, 1,427 m^3/day (refer to Table 1 below).

2019	Total Monthly Flow	Average Daily Flow
	m³	m³
January	30,407	981
February	27,305	975
March	38,477	1,241
April	40,689	1,356
May	38,595	1,245
June	52,166	1,739
July	60,939	1,966
August	51,919	1,675
September	50,288	1,676
October	47,201	1,523
November	43,195	1,393
December	41,998	1,355
Total	523,179	-
Minimum	27,305	975
Maximum	60,939	1,966
Average	43,598	1,427

Table 1: East Balzac Wastewater Flows 2019

In accordance with the *East Balzac Water Modelling Study* prepared by MPE Engineering Ltd dated October 2009 (EBWMS), the developed portions of the Study Area as presented within the EBWMS as Drawing#1, and SK-03, refer to Appendix B. The developed area was determined via review of 2019 aerial imagery of the East Balzac Area, refer to Sketch SK-03. Total developable land is approx. 848 ha. (Shown in red outline). There is 351 ha developed in 2019. The green (86 ha) outlines the commercial development and the blue (266 ha) represents the industrial development. This represents a commercial to industrial ratio of 75% industrial and 25% commercial. For the proposed ASP the commercial to industrial land use ratio is estimated at 95% industrial and 5% commercial which would result in lower average daily flows than what was observed in the East Balzac Area. The ASGMWWS 4.1.1.2.1 states that actual documented usage is an acceptable method for determination of average flow. In addition for high level planning purposes industrial uses are grouped as a common use for the determination of average daily flow.

Moreover, approximately 848Ac/351Ha of developed lands resulted in an Average Flow ($\mathbf{Q_{AVG}}$) = 0.05 L/s/Ha. The ASP being 772.16 Ha in size results in an average daily flow of Average Dry Weather Flow ($\mathbf{Q_{ADWF}}$) = 0.05 L/s/Ha x 772.16 Ha = 38.61 L/s = 3,335 m³/day.

The second scenario was based on the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* prepared by Alberta Environment and Parks dated March 2013 (ASGMWWS), for Industrial Land Uses the lower limit for average flow generation equates to 0.35 L/s/Ha. The ASP being 772.16 Ha in size results in an average daily flow of $\mathbf{Q_{AVG}}$ = 0.35 L/s/Ha x 772.16 Ha = 270.26 L/s = 23,350 m^3/day. In comparison to the real-world flow values for East Balzac (obtained from RVC) the suggested lower limit for Industrial Land Uses based on the ASGMWWS is deemed excessive and a $\mathbf{Q_{AVG}}$ = 0.05 L/s/Ha was used in the sanitary flow analysis as presented in the equations below.Determination of $\mathbf{Q_{ADWF}}$:

$$\mathbf{Q_{ADWF} = Q_{AVG} \times Area}$$

Where:

$\mathbf{Q_{AVG}}$ = 0.05 L/s/Ha

Area = 772.16 Ha

A Peaking Factor ($\mathbf{P_f}$) must be applied to the $\mathbf{Q_{ADWF}}$, to a maximum value of 5.0, to determine the peak dry weather flow ($\mathbf{Q_{PDW}}$). The $\mathbf{P_f}$ is calculated as follows:

$$\mathbf{P_f = 6.659 \times Q_{ADWF}^{-0.168}}$$

From this the $\mathbf{Q_{PDW}}$ is calculated as follows:

$$\mathbf{Q_{PDWF} = P_f \times Q_{ADWF}}$$

An Extraneous Inflow/Infiltration Allowance (**I+I**) is applied to account for the wet weather inflow ($\mathbf{Q_{I+I}}$) to the system. The general allowance is stipulated within the ASGMWWS to be 0.28 L/s/Ha and is added to the $\mathbf{Q_{PDW}}$ to determine a peak wet weather flow rate ($\mathbf{Q_{PWWF}}$). Due to modern advances in the materials and installation techniques, and previous considerations given by RVC to reduce infiltration rates, a reduced **I+I** = 0.10 L/s/Ha was utilized for the purposes of this study.

Determination of $\mathbf{Q_{I+I}}$:

$$\mathbf{Q_{I+I} = I+I \times Area}$$

Where:

I+I = 0.10 L/s/Ha

Determination of $\mathbf{Q_{PWWF}}$ or Total Peak Design Flow Rate:

$$\mathbf{Q_{PWWF} = Q_{PDW} + Q_{I+I}}$$

The projected sanitary flow calculations for the ASP have been summarized in the Table 2 below.

Area (Ha)	Q_{AVG} (L/s/ Ha)	Q_{ADWF} (L/s)	P_f	Q_{PDW} (L/s)	I+I (L/s/Ha)	Q_{I+I} (L/s)	Q_{PWWF} (L/s)
772.16	0.05	39	4	139	0.10	77	216

Table 2: ASP Sanitary Flow Calculations

The SFM sizes (Total Flow) were calculated utilizing the **Q_{PWWF}** in L/S for each sanitary Catchment Area (as shown in Table 3 below), flowing into LS#1 and LS#2. These **Q_{PWWF}** rates were modified by the elevation change induced Hydraulic Head Loss (**HHL**) change, and the length of the force main Friction Loss (**FL**) induced **HH** change values which are measured in Kilopascal (**kPa**). The **kPa** values obtained for each pipe system in the network, is used with the **Q_{PWWF}** value to obtain a Pipe size from the standard sizing tables in the Cameron Hydraulic Data 20th Edition manual.

Sanitary Catchment Area 1	Q_{PWWF} (L/s)	Sanitary Catchment Area 2	Q_{PWWF} (L/s)
Phases 1	60	Phase 3	99
Phase 2	41		
Phase 5	50	Phase 4	61
Phase 6	61		
Totals	**212**		**161**

Table 3: ASP Sanitary Catchment Area Flow Rates

The resistance to flow represented as **HHL** due to length of pipe must take into account, as well as **HHL** due to **FL** in each pipe network section. **HHL** due to length of pipe is calculated as a 0.017 meter(**m**) vertical **HHL** for each **m** of pipe length, represented in the following formula:

HHL pipe length = 0.017 x Length of Pipe in (m)

The **HHL** due to elevation change from the beginning of the pipe section to the end of the pipe section is represented as the difference between the two elevations. When the **HHL** is obtained, the **HHL** is converted to Kilopascal (**kPa**) using the formula provided below:

KPa = HHL(m) x 2.2 x 6.89

The lengths and elevation change of each pipe network section is provided in Table 4 with the calculated **HHL** and the **FL** values in **kPa** for the three pipe network sections.

	Length (m)	Head Loss/ Gain (PSI) Due To Friction Loss	Elevation Change (m)	Head Loss/ Gain (PSI) Due To Elevation Change
Lift Station #1 Sanitary Main	2,520 m	-295.37 KPa	+5.00	-77.36 KPa
Lift Station #2 Sanitary Main	1,130 m	-132.45 KPa	-2.00	+30.32 KPa
Sanitary Trunk Main	13,300 m	-1,558.90 KPa	-19.00	+288.00 KPa

Table 4: ASP Sanitary Main HHL Losses

Utilizing the **Q_{PWWF}** L/s flow rates and the **kPa** resistance to flow calculations above, the pipe size requirements are obtained from the standard sizing table in Cameron Hydraulic Data 20th Edition manual, obtaining the pipe sizes for the three pipe network sections in Table 5 below.

Lift Station #1 Sanitary Main	Lift Station #2 Sanitary Main	Sanitary Force Main
375 mm	300 mm	525 mm

Table 5: ASP Sanitary Main Sizes

Utilizing a 525 mm SFM throughout removes the requirement for an additional lift station, reducing the cost of the system and increasing the reliability of the system.

3.2. LANGDON WASTEWATER TREATMENT PLANT (WWTP)

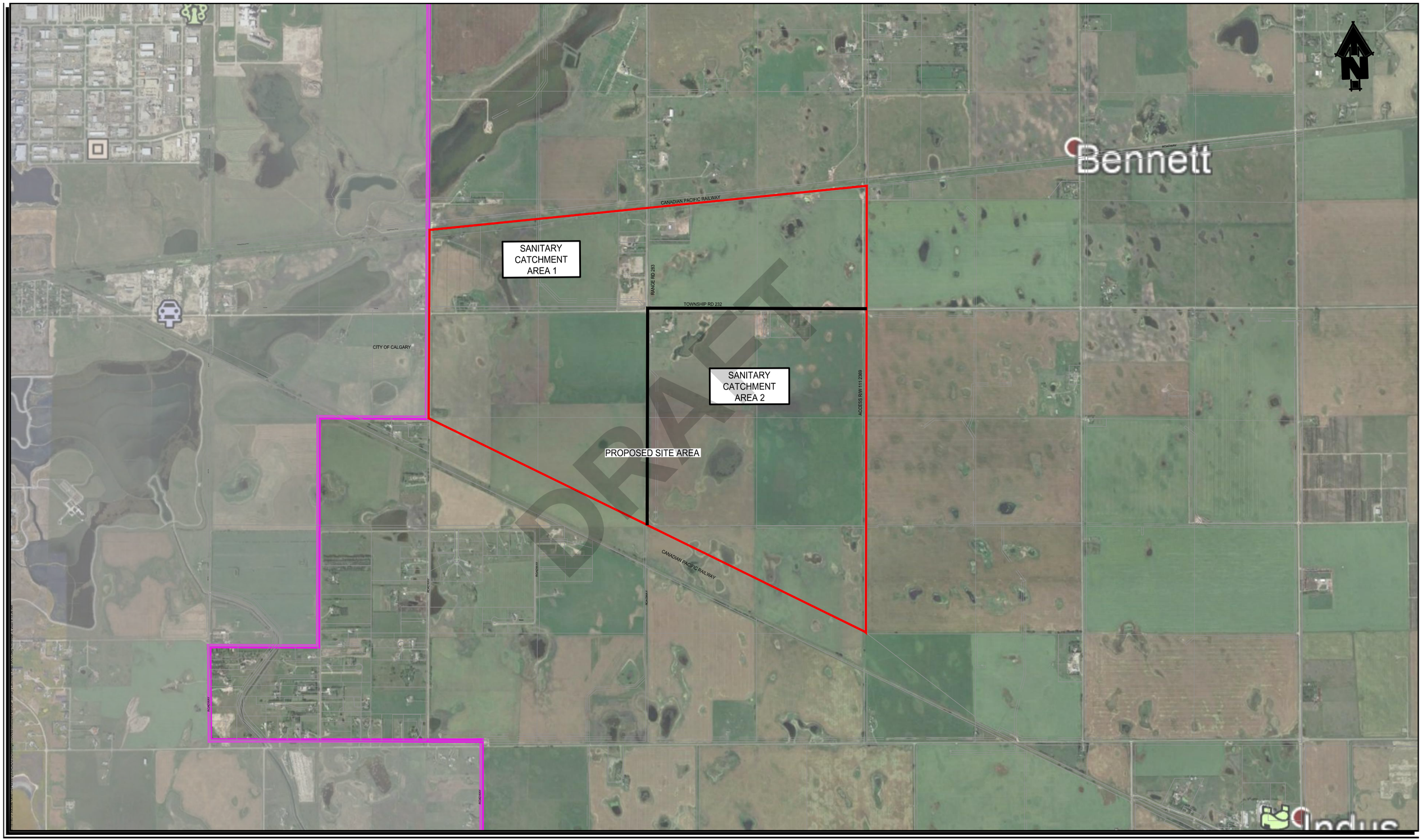
As per the RVC 2020 Off-site Levy Update, Stage 1A Expansions are currently underway for the existing Langdon WWTP, increasing the total design capacity to treat a maximum of 5,300 m3/day, derated to an effective average daily flow capacity of 3,710 m^3/day. RVC has collected levies equivalent to a commitment of 3,815 m^3/day, indicating that the Stage 1A capacity is in effect already designated.

Subsequent proposed upgrades to the Langdon WWTP are listed in Table 6 below, as stipulated in the *Langdon Wastewater Treatment Plant Stages 1B & 2 Expansion – Preliminary Design Report (Draft)* prepared by AMEC Environmental & Infrastructure dated June 15, 2015.

Stage	Capacity Increase (m^3/day)	Total Design Capacity (m^3/day)	Effective Average Daily Capacity (m^3/day)
1B	2,000	7,300	5,100
2	4,200	11,500	8,000

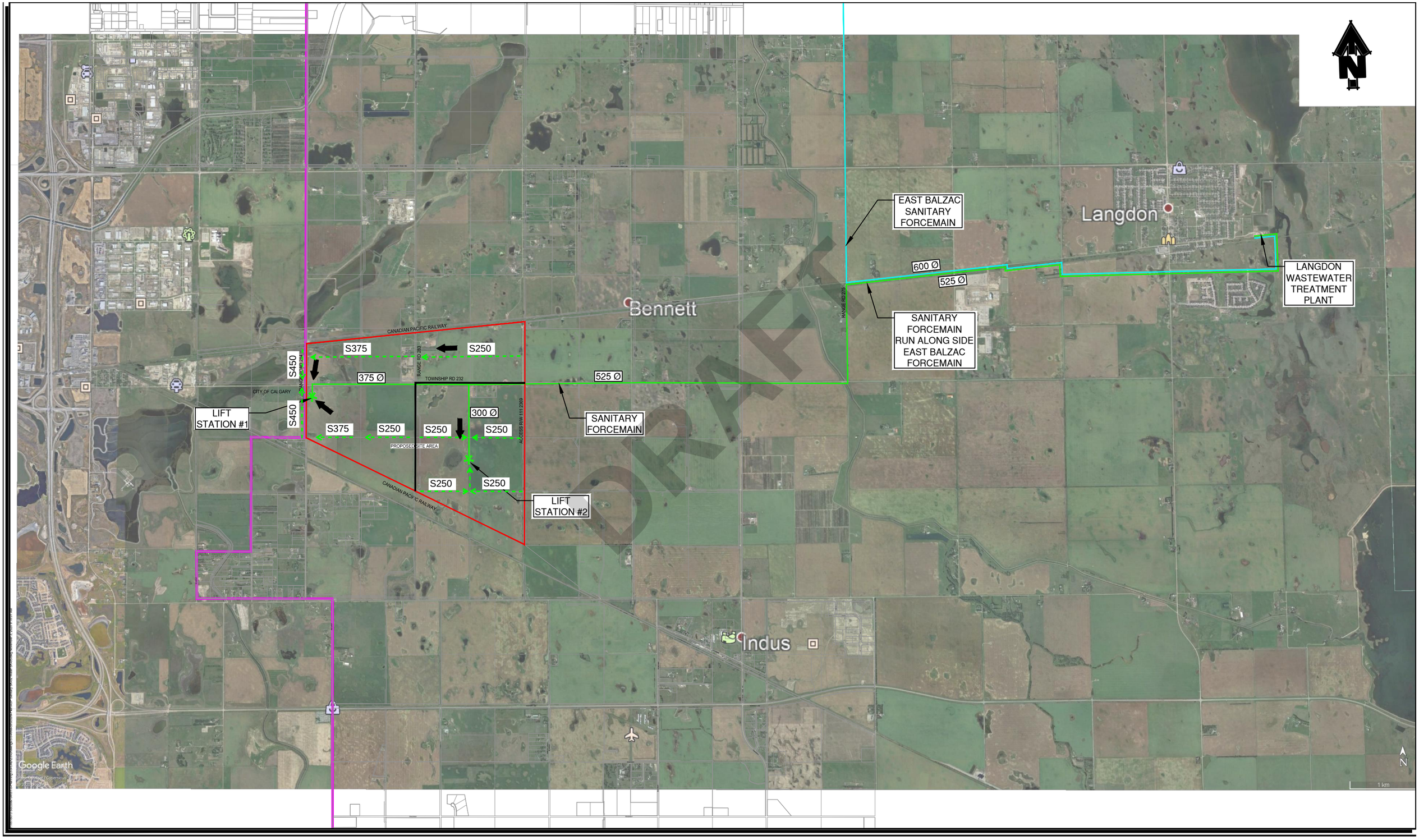
Table 6: Future Langdon WWTP Upgrades

It is understood that the *OMNI Area Structure Plan: Servicing Strategy* prepared by MPE Engineering Ltd. dated August 21, 2017 (OMNI ASP), projects an average daily flow of at 4,032 m3/day at full build out. When considering the the projected average daily flows from the proposed ASP of 3,335 m^3/day and the OMNI ASP of 4,032m^3/day at full build outs, in combination with the committed capacity of 3,815m3/day, additional upgrades beyond Stage 2 to the Langdon WWTP will be required. Moreover, an update to the Offsite Wastewater Levy Bylaw (#C-8009-2020) may be required to include the ASP, as the current bylaw does not identify the ASP area as a potential service area for the Langdon WWTP, as shown on Sketch SK-04.



Owner	Consultant	Legend	Project	Drawing Title	Project Lead	Scale	Drawing
SHEPARD	IDEA INNOVATION ENGINEERING DESIGN BUILD ARCHITECTURE GROUP	CITY OF CALGARY LIMITS PROPOSED SITE AREA	SHEPARD INDUSTRIAL ASP	PROPOSED SANITARY CATCHMENT AREAS	JB Project # 18073	1:25,000 Date (YY-MM-DD) 20-11-03	SK-01

Issued For/Revisions		
No.	Description	Date YY.MM.DD
1	ISSUED FOR INFORMATION	20.11.03



Owner

SHEPARD

Consultant

IDEA INNOVATION ENGINEERING DESIGN BUILD ARCHITECTURE GROUP

Legend

- CITY OF CALGARY LIMITS
- PROPOSED SITE AREA
- SANITARY FORCEMAIN
- PROPOSED LIFT STATION
- ERVWWTM
- CONCEPTUAL SANITARY MAIN
- SAN CATCHMENT AREA

Project

SHEPARD INDUSTRIAL ASP INFRASTRUCTURE

Drawing Title

PROPOSED SANITARY

Project Lead

JB

Project #

18073

Scale

1:50,000

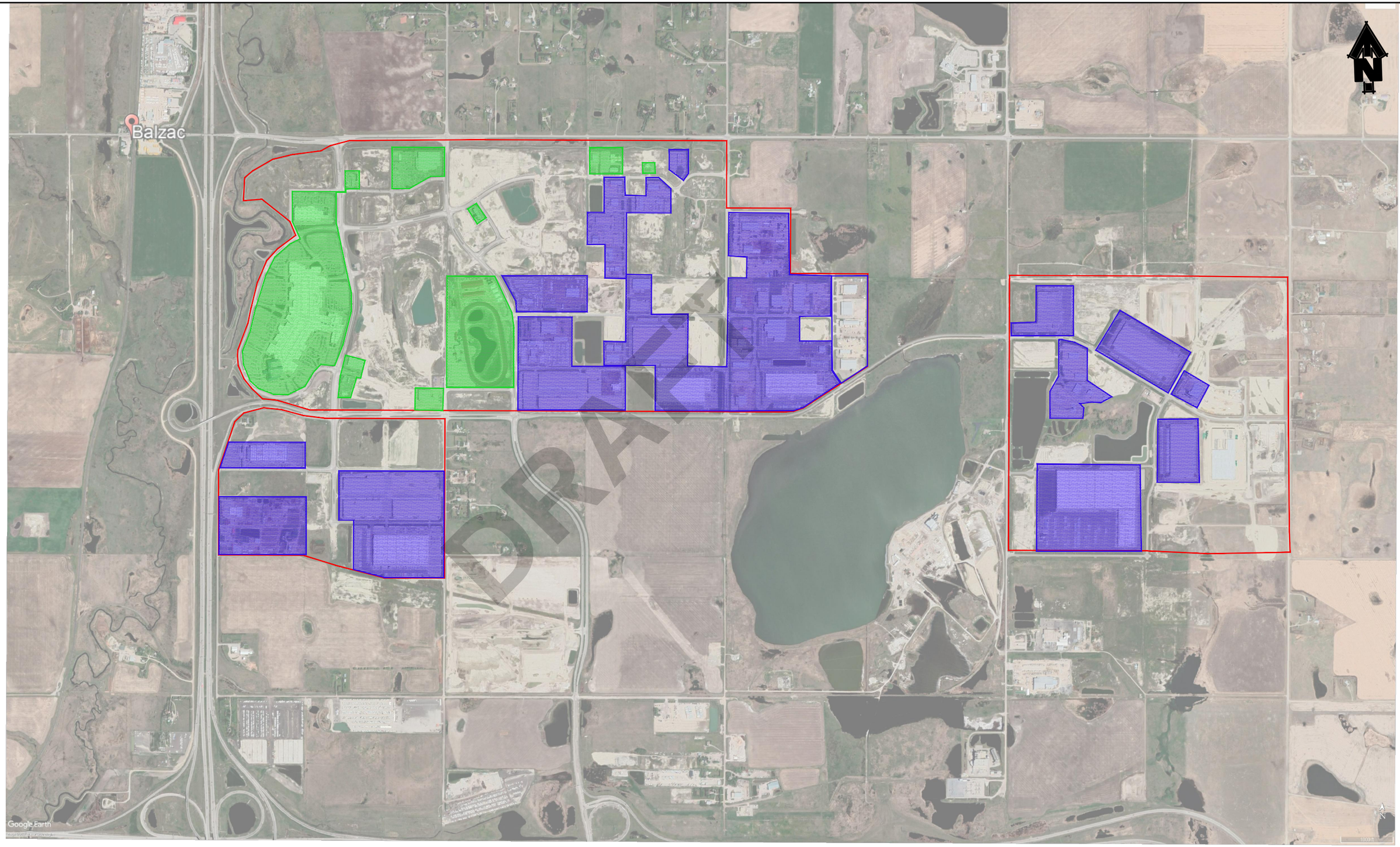
Date (YY-MM-DD)

20-11-03

	Issued For/Revisions	
No.	Description	Date YY,MM,DD
1	ISSUED FOR INFORMATION	20.11.03

Drawing

SK-02



Owner

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Consultant

IDEA GROUP
INNOVATION | ENGINEERING
DESIGN BUILD | ARCHITECTURE

Legend

COMPARABLE EXISTING SITE
ONLY USED BUILD OUT AREAS

COMMERCIAL AREAS

INDUSTRIAL AREAS

Project
SHEPARD INDUSTRIAL ASP

Drawing Title
EAST BALZAC 2019
DEVELOPMENT

Project Lead
JB

Project #
18073

Scale
1:20,000

Date (YY-MM-DD)
21-01-02

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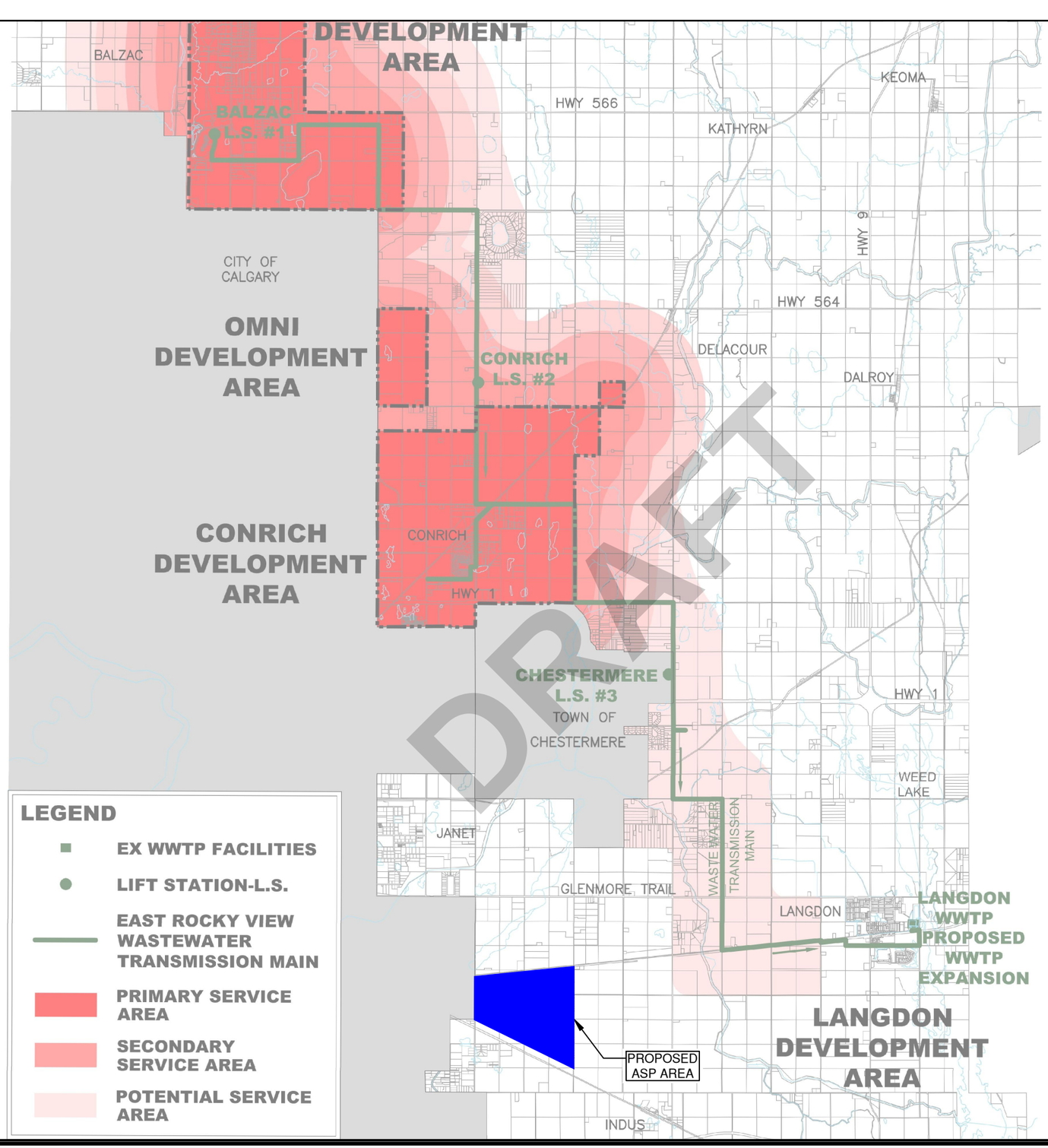
No.	Description	Date YY.MM.DD
1	ISSUED FOR INFORMATION	21.01.02

Drawing
SK-03



Owner
SHEPARD

Consultant
IDEA GROUP

Legend
PROPOSED ASP AREA

Project
SHEPARD INDUSTRIAL ASP

Drawing Title
PROPOSED WASTEWATER LEVY BYLAW MAP

Project Lead
JB

Project #
18073

Scale
1:150,000

Date (YY-MM-DD)
20-11-03

No.	Issued For/Revisions	Date YY.MM.DD
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Drawing
SK-04

4. WATER SYSTEM

The ASP will receive treated water from Langdon Waterworks via a 400mm concrete water transmission main (WTM) spanning between the ASP area and the Town of Langdon along TWP 232, with a booster station along the way. The WTM will serve to replenish the required ASP reservoir at the intersection of RR 283 and TWP 232. Refer to Sketch SK—05 for a schematic representation of the proposed alignment of the WTM and location of the ASP reservoir.

4.1. WATER DEMAND

The water demand for the ASP was determined based on 110% of the projected sanitary average flow $\mathbf{Q_{AVG}}$ = 0.05L/s/Ha for an anticipated average daily demand (**ADD**) = 42.47 L/s = 3,670 m^3/day and is calculated as follows:

ADD = Q_{AVG} x AREA x 110%

Where:

Q_{AVG} = 0.056 L/s/Ha

AREA = 772.16 Ha

Consequently, maximum daily demand (**MDD**) and peak hour demand (**PHD**) are determined as follows:

MDD = ADD x 2

PHD = MDD x 2

The projected water demand calculations for the ASP have been summarized in Table 7 below.

Area (Ha)	Q_{AVG} (L/s/Ha)	ADD (L/s)	MDD (L/s)	PHD (L/s)
772.16	0.056	43	86	173

Table 7: ASP Water Demand Calculations

The ASP WTM will be sized in Phase 1 to ensure that all phases can be brought online without a requirement to twin/upgrade the WTM as the project progresses to full buildout of the ASP.

As the water supply will be provided by Langdon Waterworks via the Langdon WTP the the WTM will be sized to convey the projected **MDD** for the ASP, where the Fire Flow Demand

(**FFD**) and **PHD** will be met through an onsite reservoir and pumping station. The WTM therefore will use the **MDD** flow rate modified by the **HHL** calculations, and the estimated length of the WTM **FL** induced **HHL** values are measured in **kPa.** The **kPa** values obtained are used in conjunction with the **MDD** value of 86 L/s to obtain a pipe size from the standard sizing tables in the Cameron Hydraulic Data 20th Edition manual. Upon further details pertaining to the project, the pipe size value will be confirmed by utilizing the Bentley Systems OpenFlows WaterCAD pressurized pipe network simulation software to evaluate the WTM sizing requirements.

The resistance to flow represented as **HHL** due to length of pipe must take into account, as well as **HHL** due to **FL** in each pipe network section. **HHL** due to length of pipe is calculated as a 0.017 meter(**m**) vertical **HHL** for each **m** of pipe length, represented in the following formula:

HHL pipe length = 0.017 x Length of Pipe in (m)

The **HHL** due to elevation change from the beginning of the pipe section to the end of the pipe section is represented as the difference between the two elevations. When the **HHL** is obtained, the **HHL** is converted to Kilopascal (**kPa**) using the formula provided below:

kPa= HHL(m) x 2.2 x 6.89

The lengths and elevation change of each pipe network section is provided in Table 8 with the calculated **HHL** and the **FL** values in **kPa** for the three pipe network sections.

kPa = HHL(m) x 2.2 x 6.89

	Length (m)	Head Loss/ Gain (psi) Due To Friction Loss	Elevation Change (m)	Head Loss/ Gain (psi) Due To Elevation Change
WTM	15,822 m	-268.97 kPa	19.00 m	-288.00 kPa

Table 8: ASP Water Main Trunk HHL Losses

Utilizing the **MDD** L/s flow rates and the **kPa** resistance to flow calculations above, the pipe size requirements are obtained from the standard sizing table in Cameron Hydraulic Data 20th Edition manual, obtaining the pipe size for the ASP WTM in Table 9 below.

ASP Water Main Trunk
400 mm

Table 9: ASP Sanitary Main Sizes

4.2. FIRE FLOW AND STORAGE

In accordance with the Fire Flow Requirements set forth within the 2013 Rocky View Servicing Standards (RVSS) for industrial developments, the minimum fire flow rate (**FFR**) for industrial use is 250L/s for 3.5 hours. The draw in the system will need to accommodate the **FFR** in combination with the **MDD** during a fire at 22psi minimum. In conversation with Langdon Waterworks, they will only be able to supply the WTM with **MDD** at a minimum pressure of 10psi, indicating the need for a reservoir and pump station to service the ASP with minimum required flows and pressures.

In reviewing the storage volume (**SV**) for the reservoir, a fire of 3.5hrs in duration must be considered along with the **MDD** for the ASP. The anticipated **SV** was determined as per ASGMWWS accounting for emergency storage (**E_mS**), equalization storage (**E_qS**), fire flow and was determined as follows:

$SV = E_mS + E_qS + FV$

Where:

E_mS = ADD x 15%

E_qS = MDD x 25%

FV = 250L/s x 3.5hrs

The SV calculations for the ASP have been summarized in Table 10 below.

E_mS (m^3)	E_qS (m^3)	FV (m^3)	SV[1] (m^3)
560	1868	3,150	5,600

1. Value rounded to the nearest hundred

Table 10: ASP Fire Demand Calculations

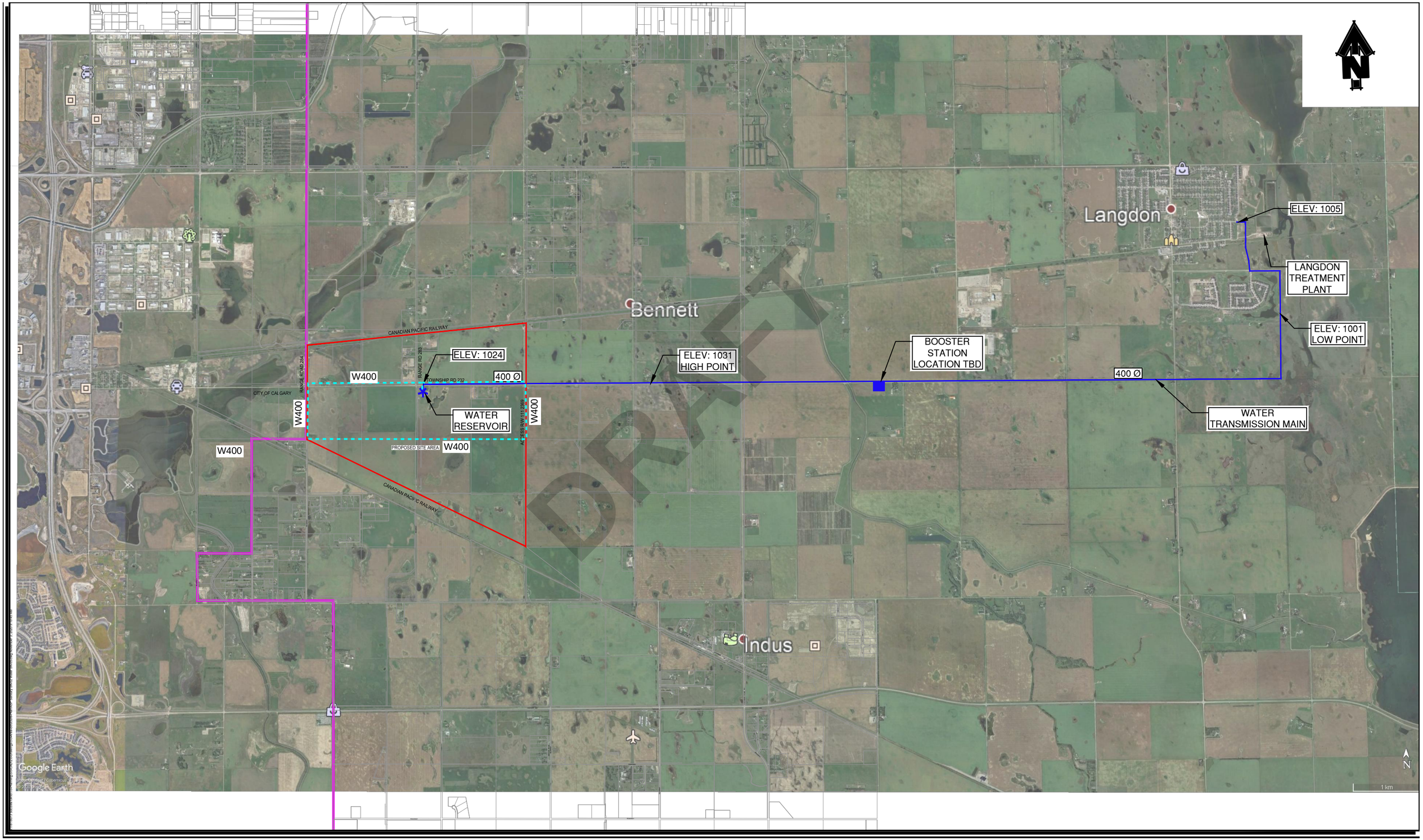
The reservoir will be required to accommodate the fire demand for the ASP and account for the total required volume of 5,600 m^3.

4.3. LANGDON WATER TREATMENT PLANT (WTP)

The ASP requires treated water directly from Langdon Waterworks, via the WTM from the Langdon WTP to the reservoir. In direct conversations had with Langdon Waterworks, an upgrade to the existing Langdon WTP would entail the addition of pumping power and a booster station would be require along the WTM to supply the ASP with MDD. At This time, Langdon Waterworks is estimating the addition of a 200 HP pump at the Langdon WTP.

4.4. WATER LICENSING INVENTORY AND ANALYSIS

Langdon Waterworks Ltd. currently in possession of seven (7) water licenses for the purposes of municipal distribution. The total maximum annual quantity that maybe diverted from their sources totals approximately 800,000m3. The proposed ASP at full build out has a demand of 3,670m3 per day requiring an annual draw of 1,340,000m3. Langdon Waterworks has confirmed that there is licensing availability to service the proposed ASP area.



Owner

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Legend

- CITY OF CALGARY LIMITS
- PROPOSED SITE AREA
- CONCEPTUAL WATER MAIN
- WATER TRANSMISSION MAIN

Project
SHEPARD INDUSTRIAL ASP

Drawing Title
PROPOSED WATER INFRASTRUCTURE

Project Lead
JB

Project #
18073

Scale
1:50,000

Date (YY-MM-DD)
20-11-03

	Issued For/Revisions	
No.	Description	Date YY.MM.DD
1	ISSUED FOR INFORMATION	20.11.03

Drawing
SK-05

5. CONCEPTUAL DESIGN

5.1. WATER DISTRIBUTION SYSTEM

5.1.1. PIPE NETWORK

The conceptual water distribution system design as shown in SK-05 with the main spines of the potable water distribution system consisting of a 400mm diameter loop as shown in drawing SK-05. This is a conceptual layout and will be subject to alignment changes due to subsequent detailed road layout and parcel delineation. The overall loop is required to supply fire flow throughout the ASP area.

In addition to the main loop, pipes not shown on SK-05 a grid network of 300mm diameter and smaller water mains are generally required in accordance with City of Calgary Guidelines for Subdivision Servicing (Calgary 2012). The bird system would be constructed by developers and is not shown on drawing SK-05 as it will be provided as road and lot configuration details are developed through subsequent planning activities. Actual water main diameter and locations required will be evaluated as development phases commence.

5.2. WASTEWATER COLLECTION SYSTEM

5.2.1. PIPE NETWORK

The proposed gravity mains were sized using the AEP municipal wastewater guidelines (AEP 2013) using the following criteria:

- Required sewer capacity was determined using the estimated design flow divided by 0.86
- Mannings equation for the calculation of pipe sizes for the gravity mains
- Assumed that PVC pipe for the gravity mains with a roughness coefficient of 0.01
- Minimum cover for sanitary pipe was 2.5m
- Maximum cover of 5m

Using the above design parameters the gravity collection mains would vary from 250mm to 525mm in diameter. For the purpose of the ASP serving study the sanitary gravity mains have been located along the quarter section boundary lines as the details of the road network and lot layouts are unknown at the time

of this report. The sanitary gravity system will need to be refined as market conditions require and development phases are determined.

5.3. CONCEPTUAL ONSITE DESIGN PHASING

Infrastructure phasing will depend on market demand and development patterns within the ASP boundary. The conceptual servicing plan will encourage development within the area to occur in an orderly manner.

From the perspective of the water infrastructure it is recommended that the initial phasing of the water main loop be constructed west and south out of the proposed reservoir and pump station located in the centre of the ASP Area. The Langdon Waterworks will provide the potable water demands through the WTM and the proposed Shepard Industrial water reservoir and pumping station.

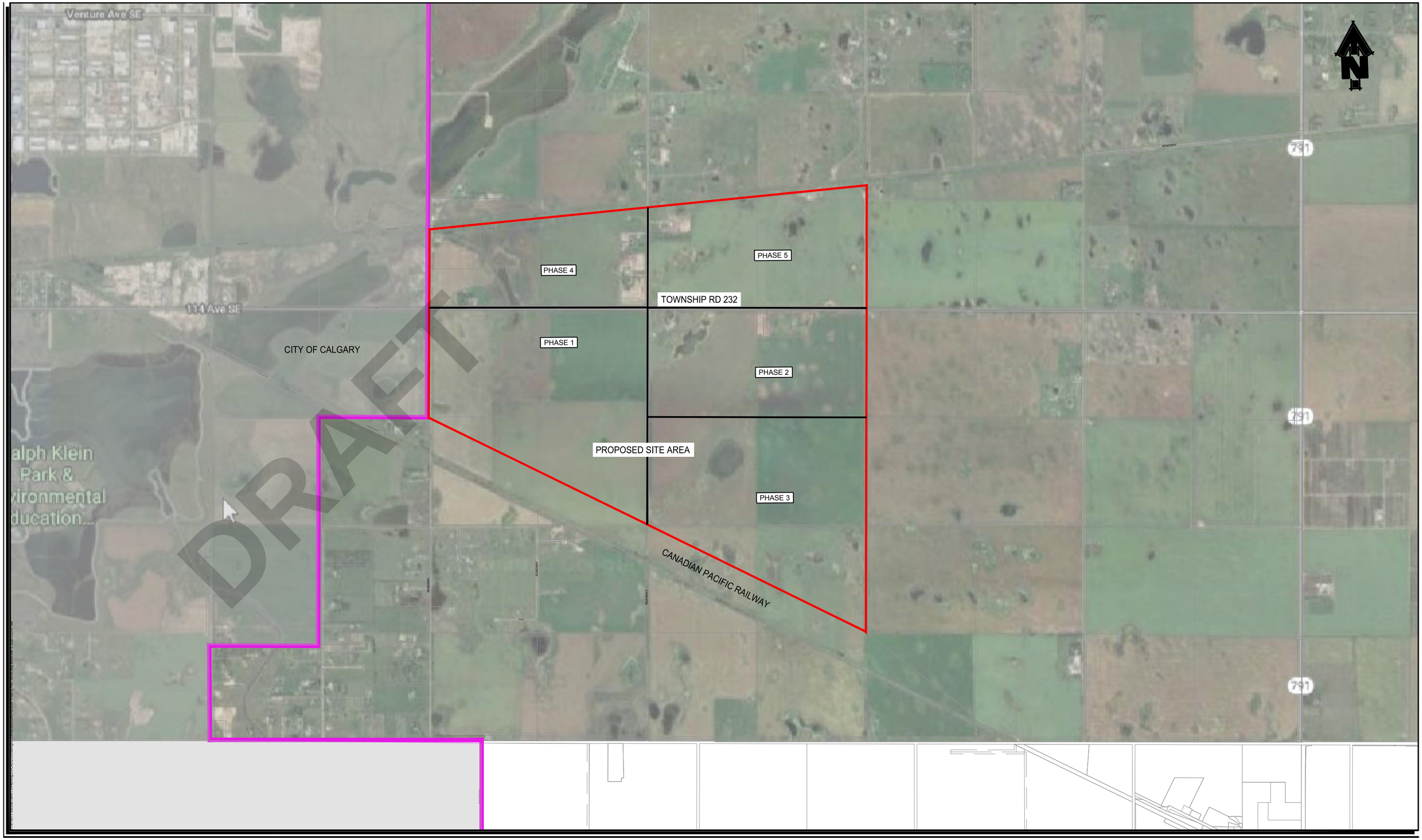
Due to the topography of the site with a high point running down the centre of the ASP area splitting the sanitary collection area into two separate drainage basins, two lift stations will be required to service the ASP area. It is anticipated that development phases would progress north from the CP Rail line right of way. The west portions of the ASP would require a lift station and connection points in the gravity system. The south east area of the ASP would require a second lift station and connection points in the gravity system. Both lift stations would be tied into the Langdon Wastewater Treatment Plant.

6. PHASING

Phasing has been reviewed in conjunction with all servicing requirements for the ASP, inclusive of stormwater management, sanitary and water servicing concepts, and a potential phasing option is presented in Sketch SK-06. The first phase is governed by the proximity to TWP 232, the proposed alignments for the SFM the WTM, and the stormwater trunk for NW catchment area. Subsequent Phases 4 and 5 are presumed to make use of/expand the infrastructure within Phase 1, i.e. Lift Station #1, Water Reservoir and Stormwater Trunk #1. While Phase 3 is presumed to make use of/expand on the infrastructure within Phase 2.

Servicing is to be provided as the parcels are being completed as market and development phasing is determined. Should development proceed in advance of the proposed offsite infrastructure interim solutions would be required to service the parcels. The interim solutions would consist of truck in water and truck out wastewater or alternatively if site specific subsurface reports allow for drilled wells and septic fields as potential interim servicing solutions.

While a phasing schematic has been presented in this study, considerations should be given to the fact that phasing is wholly dependant on market conditions, and as such, the proposed phasing plan requires flexibility as project details progress.



Owner

SHEPARD

Consultant

IDEA GROUP — INNOVATION ENGINEERING DESIGN BUILD ARCHITECTURE

Legend

CITY OF CALGARY LIMITS

PROPOSED SITE AREA

Project
SHEPARD INDUSTRIAL ASP

Drawing Title
PHASING PLAN

Project Lead
JB

Project #
18073

Scale
1:25,000

Date (YY-MM-DD)
20-11-03

No.	Issued For/Revisions	Date YY.MM.DD
1	ISSUED FOR INFORMATION	20.11.03

Drawing
SK-06

7. OPINION OF PROBABLE COST

Capital costs associated with the required sanitary and water infrastructure for the ASP were reviewed for the purposes of this study. The estimated values presented within his study are construction values associated with similar projects completed by IDEA Group in the past, and where required, pro-rated to current 2020 values. Summarized total values representative of the total ASP build out are presented in Table 11 below.

COMPONENT	CAPITAL COSTS[1]	SERVICING COST[2] ($/Ha)
Sanitary Infrastructure		
Sub-total Sanitary Infrastructure	$ 12,000,000	$ 15,600
25% Contigency	$ 3,000,000	$ 3,900
10% Engineering & Administration	$ 1,500,000	$ 2,000
1.5% Geotechnical	$ 300,000	$ 400
TOTAL SANITARY	**$ 16,800,000**	**$ 21,900**
Water Infrastructure		
Sub-Total Water Infrastructure	$ 19,600,000	$ 25,400
25% Contigency	$ 4,900,000	$ 6,400
10% Engineering & Administration	$ 2,500,000	$ 3,300
1.5% Geotechnical	$ 400,000	$ 600
TOTAL WATER	**$ 27,400,000**	**$ 35,700**
TOTAL	**$ 44,200,000**	**$ 57,600**

1. Values have been rounded to the nearest 100,000
2. Values have been rounded to nearest 100

Table 11: ASP Opinion of Probable Cost

For further reference, a more detailed estimate is provided in Appendix C - Opinion of Probable Cost. The costs to service the ASP area, as identified, should be shared by all benefiting. The costs for the ASP could potentially be front ended by the ASP developers or as part of an Offsite Levy Bylaw. All cost to service the ASP should be shared by all benefiting. Furthermore, costs associated to upgrades required at the existing Langdon WWTP are not presented and are presumed to be covered by RVC and recovered via an

update to the Offsite Wastewater Levy Bylaw (#C-8009-2020) to include the ASP area. As the project progresses, the presented costs will require additional detailed analysis.

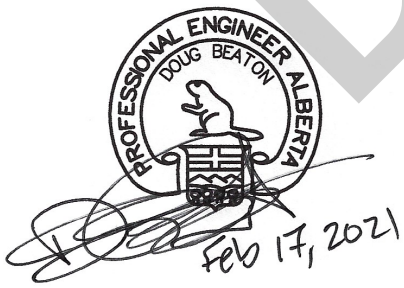
8. CONCLUSION

In summary, the sanitary infrastructure at full buildout will consist two (2) sanitary lift stations conveying wastewater through a 525mm sanitary force main running along TWP 232 from the ASP area to the Langdon WWTP. The proposed sanitary forcemain is projected to convey an average dry weather flow rate of 39 L/s and a peak wet weather flow rate of 216 L/s. The capital costs associated to the required sanitary infrastructure amount to $16,800,000. Upgrades will be required to the existing Langdon WWTP to accommodate the projected ASP sanitary flows and upgrades were not included in the forecasted estimate for the sanitary costs.

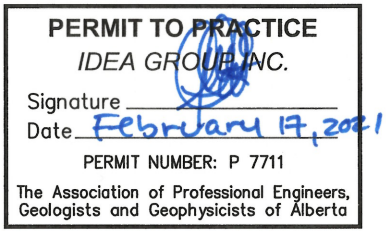
The water infrastructure at full buildout will consist of an onsite reservoir, pump station, 400mm water transmission main and booster station from the existing Langdon WTP to the ASP area along TWP 232. The proposed water transmission main is projected to convey an ADD of 43L/s and a MDD of 86L/s, with the PHD of 173L/s accommodated via the onsite reservoir and the pump station. The capital costs associated to the required water infrastructure amount to $27,400,000. Upgrades will be required to the existing Langdon WTP to accommodate the projected ASP water demands and the upgrades were included in the forecasted estimate for the water costs.

Authored by: Doug Beaton, P.Eng.

Reviewed by: Brad O'Keefe, P.Tech. (Eng.)



RESPONSIBLE ENGINEERS



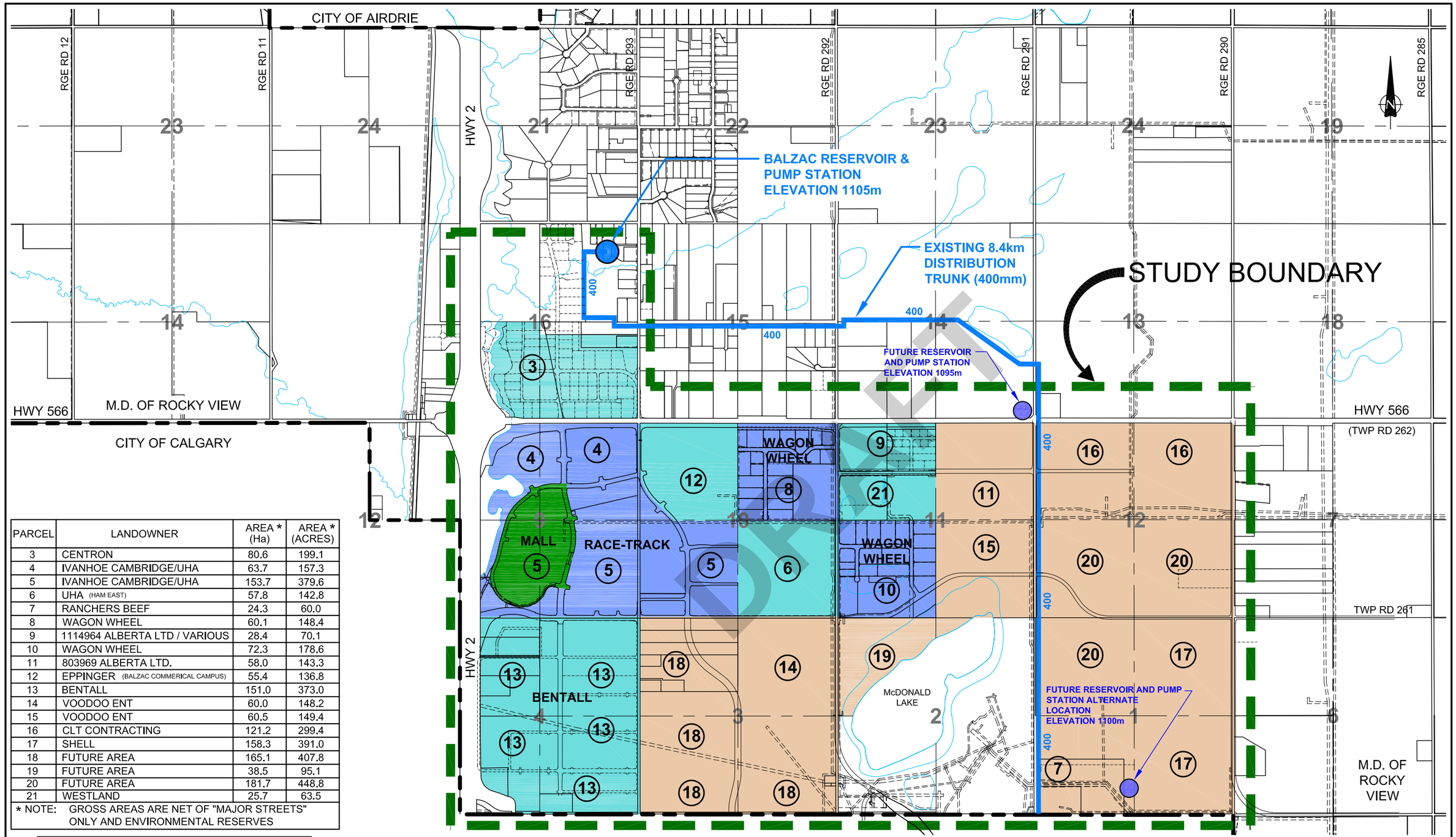
CORPORATE AUTHORIZATION

Appendix A - East Balzac Wastewater Flows

EAST BALZAC WASTEWATER FLOWS 2014 to Present

2014	Total Monthly Flow	Average Daily Flow	2015	Total Monthly Flow	Average Daily Flow	2016	Total Monthly Flow	Average Daily Flow	2017	Total Monthly Flow	Average Daily Flow	2018	Total Monthly Flow	Average Daily Flow	2019	Total Monthly Flow	Average Daily Flow	2020	Total Monthly Flow	Average Daily Flow
	m^3	m^3		m^3	m^3		m^3	m^3		m^3	m^3		m^3	m^3		m^3	m^3		m^3	m^3
January	16,565	534	January	21,607	697	January	17,896	577	January	20,146	650	January	17,936	579	January	30,407	981	January	39,836	1,285
February	16,177	578	February	22,256	795	February	17,800	614	February	18,055	645	February	15,460	552	February	27,305	975	February	35,562	1,226
March	25,084	809	March	25,960	837	March	19,143	618	March	22,487	725	March	19,473	628	March	38,477	1,241	March	37,391	1,206
April	26,889	896	April	23,104	770	April	18,611	620	April	24,514	817	April	23,626	788	April	40,689	1,356	April	40,838	1,361
May	24,584	793	May	24,283	783	May	21,819	704	May	23,911	771	May	23,379	754	May	38,595	1,245	May	38,922	1,256
June	25,712	857	June	23,364	779	June	23,703	790	June	26,576	886	June	25,700	857	June	52,166	1,739	June	60,982	2,033
July	27,695	893	July	28,726	927	July	33,206	1,071	July	35,635	1,150	July	29,462	950	July	60,939	1,966	July	62,525	2,017
August	30,278	977	August	39,717	1,281	August	38,824	1,252	August	35,234	1,137	August	27,625	891	August	51,919	1,675	August	46,238	1,492
September	29,153	972	September	40,177	1,339	September	29,411	980	September	30,270	1,009	September	22,830	761	September	50,288	1,676	September		0
October	26,846	866	October	38,896	1,255	October	29,101	939	October	28,230	911	October	22,157	715	October	47,201	1,523	October		0
November	21,687	723	November	24,206	807	November	24,703	823	November	25,212	840	November	19,737	658	November	43,195	1,393	November		0
December	24,463	789	December	23,090	745	December	22,101	713	December	24,718	797	December	21,500	694	December	41,998	1,355	December		0
Total	**295,133**	**-**	**Total**	**335,386**	**-**	**Total**	**296,318**	**-**	**Total**	**314,988**	**-**	**Total**	**268,885**	**-**	**Total**	**523,179**	**-**	**Total**	**362,294**	**-**
Minimum	**16,177**	**534**	**Minimum**	**21,607**	**697**	**Minimum**	**17,800**	**577**	**Minimum**	**18,055**	**645**	**Minimum**	**15,460**	**552**	**Minimum**	**27,305**	**975**	**Minimum**	**35,562**	**0**
Maximum	**30,278**	**977**	**Maximum**	**40,177**	**1,339**	**Maximum**	**38,824**	**1,252**	**Maximum**	**35,635**	**1,150**	**Maximum**	**29,462**	**950**	**Maximum**	**60,939**	**1,966**	**Maximum**	**62,525**	**2,033**
Average	**24,594**	**807**	**Average**	**27,949**	**918**	**Average**	**24,693**	**808**	**Average**	**26,249**	**862**	**Average**	**22,407**	**735**	**Average**	**43,598**	**1,427**	**Average**	**45,287**	**990**

Appendix B – Referenced Drawing



PARCEL	LANDOWNER	AREA * (Ha)	AREA * (ACRES)
3	CENTRON	80.6	199.1
4	IVANHOE CAMBRIDGE/UHA	63.7	157.3
5	IVANHOE CAMBRIDGE/UHA	153.7	379.6
6	UHA (HAM EAST)	57.8	142.8
7	RANCHERS BEEF	24.3	60.0
8	WAGON WHEEL	60.1	148.4
9	1114964 ALBERTA LTD / VARIOUS	28.4	70.1
10	WAGON WHEEL	72.3	178.6
11	803969 ALBERTA LTD.	58.0	143.3
12	EPPINGER (BALZAC COMMERICAL CAMPUS)	55.4	136.8
13	BENTALL	151.0	373.0
14	VOODOO ENT	60.0	148.2
15	VOODOO ENT	60.5	149.4
16	CLT CONTRACTING	121.2	299.4
17	SHELL	158.3	391.0
18	FUTURE AREA	165.1	407.8
19	FUTURE AREA	38.5	95.1
20	FUTURE AREA	181.7	448.8
21	WESTLAND	25.7	63.5

* NOTE: GROSS AREAS ARE NET OF "MAJOR STREETS" ONLY AND ENVIRONMENTAL RESERVES

NOTE:
TIME LINES FOR DEVELOPMENT ARE FOR ILLUSTRATIVE AND ANALYSIS PURPOSES ONLY. ACTUAL DEVELOPMENT SEQUENCING MAY VARY.

LEGEND

- YEAR 1
- YEAR 5
- YEAR 10
- BUILD OUT (SECOND RESERVOIR AND PUMP STATION REQUIRED)

Rocky View ALBERTA CANADA
MUNICIPAL DISTRICT OF ROCKY VIEW No. 44

MPE Engineering Ltd.

EAST BALZAC WATER MODELLING STUDY
STUDY AREA

DATE: MAY 2009
SCALE: 1:30 000
JOB: 2285-022-00
DRAWING: 1

Appendix C – Opinion of Probable Costs

Opinion of Probable Cost Water

Item	Description	Unit	Budget Quantity	Budget Unit Price	Budget Amount
	Watermains				
04.01	400mm PVC (0.0-3.0m)	M	17,400	$ 410	$ 7,134,000
04.02	400mm Main Valve	Ea	6	$ 9,000	$ 54,000
04.03	Tie to Existing	Ea	1	$ 100,000	$ 100,000
04.04	Pump House	LS	1	$ 525,000	$ 525,000
04.05	Pumps/controls/treatment/Electrical	LS	1	$ 2,100,000	$ 2,100,000
04.06	Concrete Resevoir	LS	1	$ 2,940,000	$ 2,940,000
04.07	Sitework	LS	1	$ 2,730,000	$ 2,730,000
04.08	Booster Station	LS	1	$ 1,000,000	$ 1,000,000
04.09	200Hp Pump at Langdon	LS	1	$ 300,000	$ 300,000
04.10	Road Ditch Premium (stripping, topsoil, seeding)	M	17,400	$ 120	$ 2,088,000
04.11	Erosion and Sedimentation Control	M	17,400	$ 5	$ 87,000
04.12	Mobilization	LS	1	$ 250,000	$ 250,000
04.13	Survey (1.5%)	LS	1	$ 290,000	$ 290,000
				Sub Total - Watermains:	**$ 19,600,000**
				25% Contigency	$ 4,900,000
				10% Engineering & Administration	$ 2,500,000
				1.5% Geotechnical	$ 400,000
				Total	**$ 27,400,000**

Opinion of Probable Cost - Sanitary

Item	Description	Unit	Budget Quantity	Budget Unit Price	Budget Amount
	Sanitary				
03.01	300mm PVC (0.0-3.0m) Forcemain	M	1,130	$ 225	$ 255,000
03.02	375mm PVC (0.0-3.0m) Forcemain	M	2,520	$ 275	$ 693,000
03.03	525mm PVC (0.0-3.0m) Forcemain	M	13,302	$ 400	$ 5,321,000
03.04	Tie to Existing	Ea	1	$ 50,000	$ 50,000
03.05	Lift Stations	Ea	2	$ 1,500,000	$ 3,000,000
03.06	Video and Deflection Test	M	16,952	$ 15	$ 255,000
03.07	Road Ditch Premium (stripping, topsoil, seeding)	M	15,822	$ 120	$ 1,899,000
03.08	Erosion and Sedimentation Control	M	16,952	$ 5	$ 85,000
03.09	Mobilization	LS	1	$ 250,000	$ 250,000
03.10	Survey (1.5%)	LS	1	$ 178,000	$ 178,000
				Sub Total - Sanitary:	**$ 12,000,000**
				25% Contigency	$ 3,000,000
				10% Engineering & Administration	$ 1,500,000
				1.5% Geotechnical	$ 300,000
				Total	**$ 16,800,000**