# SYSTEMS

# ASCENSION CONCEPTUAL SCHEME Servicing Design Brief

**Prepared for:** Highfield Land Management 18, 11410 27th Street SE Calgary, AB T2Z 3R6

Contact: Daniel Salamandyk, P.Eng. dsalamandyk@urbansystems.ca

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## **PREPARED FOR:**

Highfield Land Management Ltd. 18, 11410 27<sup>th</sup> Street SE Calgary, AB T2Z 3R6

Suite 101, 134 - 11 Avenue SE, Calgary, AB T2G 0X5 | T: 403.291.1193

File: 4319.0004.01

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# 1.0 INTRODUCTION

Urban Systems Ltd. (USL) was retained by Highfield Land Management. to prepare a servicing design brief in support of the Ascension Conceptual Scheme (CS) application. The Ascension development consists of 94.95 ha of gross developable area within the SW and SE <sup>1</sup>/<sub>4</sub> 19-25-2-5 and Block A, Plan 921 2196. The subject lands are located at the east end of Bearspaw, south of Highway 1A and west of 12 Mile Coulee Road. The property extends south to Blueridge Rise and west to Bearspaw Road. **Figure 1**: Location Map illustrates the location of the proposed development.

This report will primarily discuss sanitary and water servicing options as other supporting reports have been submitted for transportation (Bunt TIA, August 2020) and stormwater (LGN SMDP, August 2020).

Design parameters and utilization of existing infrastructure will be further examined and verified at detailed design stage and subdivision development.



#### Figure 1: Location Map

Subject Land

 LRT Station

 LRT Route

Parcel Boundary
Municipality Boundar
Provincial Park



# 2.0 **<u>POPULATION</u>**

The following criteria were used in the water and sanitary analysis for the proposed development. Note that this report will consider two scenarios of development: a lower density/population and a higher density/population to provide a potential range of servicing parameters.

- Ascension Total Residential Area = 49.6 ha
- Ascension Total Market Place Area = 19.3 ha

ANCENSION DEVELOPMENT ANALYSIS					
USE	LOWER UNIT COUNT	HIGHER UNIT COUNT	LOWER POPULATION	HIGHER POPULATION	
Single Family	540	1,026	1,620	3,078	
Comprehensively Planned Residential	43	43	95	95	
Total	583	1,069	1,715	3,173	

Table 1: Criteria Used in Water and Sanitary Analysis for Ascension Development

Note that the Market Place Residential identified as 300 units of seniors residential units has been included in the water demand and sanitary flow calculations for the overall Market Place area.

# 3.0 PROPOSED SANITARY SEWER SYSTEM

## 3.1 SANITARY SEWER DESIGN CRITERIA AND FLOWS

## 3.1.1 FLOW GENERATION

Using the above calculated population data, the on-site peak sanitary sewer flow was calculated.

#### A. Residential Flow Generation

Residential flows in this study are calculated using an average per capita flow of 217 L/capita/day (I/c/d) which corresponds to the rate used in the 2011 BRWWTP design criteria (80% of the projected 271 I/c/d water consumption for Canadian municipalities). Past actual records from BRWWTP indicate flows of 193 I/s (2016) and 198 I/s (2019) and the assumptions noted in the 2011 Design Criteria appear to be reasonable to carry for the Ascension development. The Alberta Environment (AEP) peak dry weather design flow rate is as follows:

$$Q_{PDW} = \frac{GxPxPf}{86.4}$$

where:	Q <sub>PDW</sub>	=	the peak weather design flow rate (L/s)
	G	=	the per capita average daily design flow (L/d)
	Ρ	=	the design contributing population in thousands
	Pf	=	"peaking factor"

Harmon's Peaking Factor was used in this analysis as part of the peak flow calculation.



## Harmon's Peaking Factor = $1 + \frac{14}{4+P^{1/2}}$

Where: P = the design contributing population in thousands

Table 2: On-Site Peak Dry Weather Residential Flow

ON-SITE PEAK DRY WEATHER RESIDENTIAL FLOW				
	LOWER	HIGHER		
QPDW - Residential	15.6 L/s	27.2 L/s		

#### B. Commercial Flow Generation

Commercial flows were calculated using 90% of the water demand rate of 0.15 L/s/ha (gross developable area) for the commercial Market Place area. This is based on RVC specifications and guidelines and is slightly higher than the 0.1 l/s/ha rate applied in other recent RVC servicing documents (Conrich and Omni) – note the 90% commercial water demand /sanitary ratio has been maintained from these noted reports. This rate will provide some flexibility in the sanitary system design moving into the detailed design phase. The Ascension Conceptual Scheme total Market Place area is 19.3 ha. There are no off-site commercial areas contributing flow to the development. Hence, the on-site average commercial sanitary sever flow = 2.6 L/s.

A peaking factor of 2.5 was applied to the commercial flows to obtain the peak dry weather flow for the commercial land uses.

Table 3: On-Site Peak Dry Weather Commercial Flow

ON-SITE PEAK DRY WEATHER COMMERCIAL FLOW					
	LOWER	HIGHER			
QPDW - Commercial	6.5 L/s	6.5 L/s			

#### 3.1.2 INFLOW AND INFLITRATION

Inflow and infiltration (I&I) for the Ascension Conceptual Scheme was calculated using an allowance of 0.10 L/s/ha to account of wet weather inflow and infiltration into pipes and manholes. The flow rate noted has been adopted for this plan based on reduced infiltration resulting from the use of modern techniques and materials as well as recorded lower groundwater levels in the area. The I&I value has also been used in other recent RVC reports. Flow records received from the BRWWTP included I&I and therefore the 217 I/c/d assumption is conservative. As such, annual flows to the WWTP will not include I&I.

1&1	=	0.10 L/s/ha x 69.0 Ha
1&1	=	6.9 L/s



## 3.1.3 PEAK WET WEATHER FLOW

For this analysis, I&I was added to all peak dry weather flows to obtain the peak wet weather flow for the Ascension development, as shown in the table below:

Table 4: Peak Wet Weather Flow Generation

ASCENSION - ON-SITE PEAK FLOW GENERATION					
	LOWER	HIGHER			
Sanitary Sewer Study Population	1,715	3,713			
Commercial Area	19.3 ha	19.3 ha			
Peak Dry Weather Flow Rate	22.1 L/s	33.8 L/s			
I&I Contribution	6.9 L/s	6.9 L/s			
Peak Wet Weather Flow Rate	29.1 L/s	40.7 L/s			

## 3.2 SANITARY MAIN DESIGN

Sanitary flows generated by the proposed Ascension development will be conveyed via gravity sewer pipe systems of newly constructed pipes within proposed roadways. The sanitary systems will be designed and constructed with minimum slope and minimum cover, where possible; details and more defined alignments of the proposed sanitary sewer system will be provided during preliminary and detailed design. Pipe sizes are expected to be 200mm depending on design slope available.

A wastewater lift station for the site will be accommodated at the south west corner of the development site within the road right-of-way (see **Figure 2**: Internal Wastewater Servicing Plan). The lift station will be built to provincial standards and incorporate the necessary fail-safe controls within the design.

The Ascension development ties-in to the south via a proposed sanitary main extension through the existing Blueridge Mountain Estates subdivision and connection at an existing sanitary sewer manhole at the north edge of the Watermark Phase 2 development. The sanitary main extension is expected to follow minimum cover and slope requirements and the alignment is proposed within the existing road right of way. The sewer system network will be ultimately directed through the Watermark Phase 1 and 2 sanitary system and tie into the Bearspaw Regional Waste Water Treatment Plant (BRWWTP). An expansion to the BRWWTP is required to service the Ascension development.





#### Figure 2: Internal Wastewater Servicing Plan

#### 3.2.1 OFFSITE GRAVITY CONNECTION

An existing forcemain was installed within Watermark to service Ascension. The proposed strategy has been modified from the plans initiated during the design of Watermark and intends to use the existing forcemain through a connection from an existing gravity main located within Watermark. The proposed tie at the existing sanitary gravity main at north end of Watermark Phase 2 will flow towards the existing forcemain in Watermark Avenue. The main will be installed between existing lots within an established utility rights of way – revisions or additions to the existing URW will be reviewed at detailed design. See **Figure 3**: Watermark Existing Forcemain Connection and **Figure 4**: Regional Waterwater Servicing Plan below for the proposed offsite sanitary alignment. A connection to the forcemain will be completed within the existing roadway and utilize the forcemain to convey gravity flows through to the BRWWTP. The pipe is not expected to surcharge based on our calculations; however, in higher than anticipated flow events to the gravity/forcemain transition, the system would discharge through Watermark Phase 2 gravity sanitary sewer down to the BRWWTP. The forcemain will likely be abandoned east of the tie in location depending on direction from Rocky View County.





Figure 3: Watermark Existing Forcemain Connection

Figure 4: Regional Wastewater Servicing Plan





## 3.3 BEARSPAW REGIONAL WASTEWATER TREATMENT PLANT

Wastewater from the development area will be collected and conveyed in a conventional piped system to Bearspaw Regional Wastewater Treatment Plant (see **Figure 4**: Regional Wastewater Servicing Plan), which is operated by Macdonald Watermark Properties under an operating lease. Developer funded expansion of the facility will be required to accommodate growth. The existing Stage 1, 350 m<sup>3</sup>/day treatment capacity will not accommodate any flows from the proposed development. Three more future stages are available providing an additional plant capacity of 1,050 m<sup>3</sup>/day. The development will require two to three of these stages to accommodate full buildout, subject to actual site density and sanitary flow generation. Space is available on the treatment site for the plant expansion but it will require an expansion to the facility – the proposed expansion concept plan was created by Worley Parsons as per **Figure 5**: BRWWTP Expansion Concept Plan.

BRWWTP EXPANSION REQUIREMENTS					
	LOWER	HIGHER			
Existing BRWWTP Capacity	350 m3/day	350 m3/day			
Existing BRWWTP Available Capacity	0 m3/day	0 m3/day			
Ascension Average Daily Flow	597 m3/day	914 m3/day			
Stages of Expansion Required	2 Stages	3 Stages			
Proposed Additional BRWWTP Capacity	700 m3/day	1,050 m3/day			
Proposed BRWWTP Capacity	1,050 m3/day	1,400 m3/day			







## 3.4 EFFLUENT DISPOSAL

Treated wastewater from the Bearspaw Regional Wastewater Treatment Plant is discharged to the Bow River through an existing outfall located downstream of the City of Calgary's raw water intake to ensure no negative impact on the City's drinking water. The discharge pipe has a capacity of 2,600 m<sup>3</sup>/day and therefore no upgrades are required for the development area.

# 4.0 PROPOSED WATER SYSTEM

## 4.1 ONSITE WATER SERVICING

Watermains for the plan area are illustrated in **Figure 6:** Internal Water Servicing Plan. 250mm watermains are proposed adjacent to the commercial and multi-family with 200mm and 150mm watermains (where applicable) for the remainder of the residential portion of the development.

The detailed design for the water distribution system, on a per phase basis, will be completed in accordance with the current Rocky View County Servicing Standards, and all applicable Provincial guidelines. The water distribution system is to be sized to provide sufficient fire flow rates to service the development. The site will be designed with two pressure zones as there is significant elevation change within the site – 1,250.7m at the NE corner, 1,179.7m at the SW corner.



#### Figure 6: Internal Water Servicing Plan



## 4.1.1 WATER DEMANDS

Water servicing will be provided by Blazer Water Systems. The Ascension development area is contained within Blazer's franchise service area (see **Figure 7**: Regional Water Servicing Plan for the regional servicing strategy). Blazer's potable water is sourced from the Bow River and is treated at its facility at the corner of Bearspaw Meadow Way and Lynx Meadows Drive.

In consultation with Blazer Water Systems, actual average day demand was noted to be 272 l/c/d in 2019. Although the actual demand was less than the water system design parameters, the original design parameters are being held for consistency. The following rates are being proposed for this CS area:

- A water demand rate of 0.15 L/s/ha (gross developable area) for the commercial Market Place area. This is based on RVC specifications and guidelines and is slightly higher than the 0.1 l/s/ha rate applied in other recent RVC servicing documents (Conrich/Omni). This rate will provide some flexibility in the water system design moving into the detailed design phase.
- A water demand rate of 278 l/c/d and 202 l/c/d for single and multi-family residential developments, respectively. This is based on the 2014 exp Water Supply and Distribution System Report Proposed Water Service Expansion R1. Methods of reducing irrigation usage will be reviewed at time of detailed design to verify the water demand rates noted above.
- A fire flow requirement of 250 L/s with a 3.5-hour duration which equates to 3,150 m<sup>3</sup> volume plus Maximum Day Demand as per RVC specifications.

Average Day Demand (ADD) is calculated based on the demand rates noted above for commercial, single, and multi-family residential.

Maximum Day Demand (MDD) = 2 x ADD

Peak Hour Demand (PHD) = 3.5 x ADD

These values are consistent with the 2014 exp *Water Supply and Distribution System Report Proposed Water Service Expansion R1* and could be subject to review with Blazer Water Systems at time of detailed design.





#### Figure 7: Regional Water Servicing Plan

 Table 6: Ascension Water Demands

BRWWTP EXPANSION REQUIREMENTS						
AREA ADD MDD PHD						
Ascension Conceptual Scheme Lower	69 ha	720 m³/day (8.3 L/s)	1,440 m³/day (16.7 L/s)	29.2 L/s		
Ascension Conceptual Scheme Higher	69 ha	1,126 m³/day (13 L/s)	2,251 m³/day (26.0 L/s)	45.6 L/s		

Note that irrigation demand will be reviewed at detailed design. The rates applied are consistent with the 2019 water demand and sanitary annual flow records provided by Blazer Water Systems and BRWWTP of 272 l/c/d and 198 l/c/d. These rates indicate the per capita rate for sanitary is about 73% of water when it might typically range from 80% to 85%. This suggests a higher irrigation or outdoor water use for the communities.

For Ascension, landscape design to limit irrigation requirements and lawn watering restrictions will be considered to decrease water demands.



## 4.2 OFFSITE WATER SERVICING

## 4.2.1 EXISTING SYSTEM TIE-IN LOCATIONS

Ascension is proposed to connect to existing watermains located within the Blueridge Mountain Estates area and Watermark Phase 2 as shown on **Figure 7**: Regional Water Servicing Plan. Blazer Water Systems has indicated that a single feed connection from the existing Blueridge Mountain Estates would be sufficient for servicing Ascension, however discussions with the residents would be required as this main was installed and funded by the residents as part of a recent system expansion. Back feeding to the Blueridge main should be considered as part of the servicing design to provide improved level of service to Blueridge due to existing lower than normal pressures for that community.

Another alternative is to extend the existing watermain from Watermark Phase 2 and follow a similar alignment to the Blueridge Mountain Estates watermain and install adjacent to the existing roadway up to the edge of the Ascension development. This would reduce impacts on the existing residents in Blueridge Mountain Estates.

A third option exists where connections are made to both Blueridge and Watermark systems. This would provide additional reliability to the Ascension and Blueridge water supply. Offsite servicing design will be reviewed in more detail at time of subdivision.

Both of these options noted above are not shown in **Figure 7**: Regional Water Servicing Plan but would follow similar alignments to the water mains shown.

Existing pressures at the tie-in points at Blueridge and Watermark are approximately 26 PSI and 73 PSI respectively (as identified in 2014 exp *Water Supply and Distribution System Report Proposed Water Service Expansion R1*). Anticipated pressure at Ascension is approximately 20 PSI based on these tie-in locations and existing pressures. Note more detailed water model analysis is required to determine the extent of impacts or upgrades to the existing network.

Upgrades for the existing system will also include expansion of the Blazer Water Treatment Plant at its existing location plus the addition of a treated water reservoir and booster station within the development site as described in Section 4.3. There will be no impact on groundwater levels or on existing wells on adjacent rural properties because the water supply will come directly from the Bow River.

The raw water supply line from the Bow River consists of a 200mm diameter pipe, which then tees off into a 100mm pipe to the Blazer WTP and a 200mm pipe to an irrigation pump station. It is understood the 100mm supply line has a capacity of roughly 14 L/s, which is equivalent to 1,210 m3/day. Therefore, the 100mm water supply will need to be upgraded or twinned in order to meet existing and proposed water demands. As well, upgrades to the intake are expected at some stage of the development. These upgrades will be coordinated with Blazer Water Systems as required.



## 4.2.2 EXISITING WATER LICENSE

Highfield owns sufficient diversion licenses that allow for water to be diverted to support the Ascension development. Highfield will engage in further discussions with Blazer Water Systems upon approval of the Conceptual Scheme.

## 4.2.3 BLAZER WATER TREATMENT PLANT

Capacity is available within the Blazer Water Treatment Plant, but upgrades will be required for ultimate development of the plan area. The City of Calgary (as per C2013-0651, Bylaw 74D2013) limited the gross floor area of the Blazer WTP to 575 m<sup>2</sup> and limited the annual capacity of the Blazer WTP to 591,407 m<sup>3</sup>/year.

According to Blazer, the WTP has a maximum day output of 24 L/s with 16 L/s already spoken for. Plant expansion capacity for another 25 L/s (total 49 L/s max day) is possible within the existing building. Ascension MDD is estimated to be between 17 L/s to 26 L/s, depending upon ultimate density. Therefore, even with the higher density MDD of 26 L/s, there is sufficient capacity within the WTP since the total MDD would be 42 L/s (26 L/s + 16 L/s). If a 110% factor is applied in accordance with Alberta Environment guidelines, this equates to 46 L/s which is still below the 49 L/s potential capacity.

Ascension average day demand is estimated to be 720 m3/d to 1126 m3/d. Blazer's committed customers account for 691 m3/d (average day) so the total, including Ascension, would range from 1411 m3/d to 1817 m3/d or approximately 515,000 m3/yr to 663,000 m3/yr. The City Bylaw limited the annual capacity to 591,407 m3/yr which means a bylaw amendment would be required for the higher density range in Ascension.

The Blazer Water Systems existing franchise area serviced by the Blazer Water Treatment Plant is shown on **Figure 8**: Blazer Water Systems Franchise Area below.





Figure 8: Blazer Water Systems Franchise Area

## 4.3 FUTURE RESERVOIR AND PUMP HOUSE

The combined Ascension reservoir and pump station is proposed to be located near the proposed Market Place, as shown in **Figure 6**: Internal Water Servicing Plan.

The reservoir and pump station will be constructed in a single stage to allow for fire storage and emergency & equalization storage for the Conceptual Scheme area. The table below illustrates the storage requirements to service Ascension. If connection to Blueridge occurs and there is an intention to back feed the existing residents, the reservoir and pump sizing will be adjusted accordingly.



#### Table 7: Ascension Storage Requirements

ACESNSION STORAGE REQUIREMENTS											
Storage Component	Ascension CS – 69 ha	Ascension CS – 69 ha									
	Lower	Higher									
Equalization Storage (25% MDD)	360 m <sup>3</sup>	563 m <sup>3</sup>									
Emergency Storage (15% ADD)	108 m <sup>3</sup>	169 m <sup>3</sup>									
Fire Storage (250 L/s for 3.5 hrs + MDD)	3,223 m <sup>3</sup>	3,223 m <sup>3</sup>									
TOTAL	<b>3,691 m</b> <sup>3</sup>	<b>3,955</b> m <sup>3</sup>									

Land provisions for a future expansion to the reservoir are deemed beneficial to the operation of the Blazer distribution system and will be established at time of detailed design.

## 5.0 <u>CONCLUSIONS</u>

The proposed sanitary sewer and water servicing strategy for the Ascension Conceptual Scheme has been identified in the contents of this report.

Sanitary flows generated by the proposed Ascension development will be ultimately conveyed by gravity sewer systems to the existing Watermark sanitary system and Bearspaw Regional Waste Water Treatment Plant. The existing sewer mains have sufficient capacity for both development scenarios and a WWTP expansion is required to service the development. The WWTP expansion was anticipated as part of the original planning process.

The anticipated watermain pipe sizes within the system will range from 150 mm to 250 mm to provide adequate service throughout the development. Servicing of the onsite system will be carried out by one of three options which, with a more conservative approach, could include extending a dual watermain from Watermark Phase 2 through Blueridge Mountain Estates up to the southern extents of Ascension. Expansion to the WTP and a booster station/reservoir is required to service the entirety of the Ascension development and was anticipated as part of the original planning process.

Population and water demand/flow generation assumptions should be verified prior to Ascension detailed design and in conjunction with the Blazer Water Systems and Bearspaw Regional Waste Water Treatment Plant teams. Design details, alignments of the proposed sanitary sewer and water distribution systems will be provided during preliminary and detailed design, as designs are further refined.



# 6.0 <u>REFERENCES</u>

Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems - Part 2 Guidelines for Municipal Waterworks Alberta Environment and Parks, 2012

Rocky View County Servicing Standards, 2013

Water Supply and Distribution System Report Proposed Water Service Expansion R1 exp Services Inc., May 2014

Rocky View County Conrich Potable Water Servicing Plan MPE 2020

Rocky View County Conrich Wastewater Servicing Plan MPE 2020

Omni Area Structure Plan Servicing Strategy MPE August 2017

Design Basis Memorandum for the First Stage of the WWTP From BRWWTP, 2011

BRWWTP Annual Reporting Requirements for Year Ending Dec 31, 2019 BRWWTP, Feb 2020

Blazer Water Systems Annual Reporting Requirements for Year Ending Dec 31, 2019 Blazer Water Systems, Feb 2020

Design Basis Memorandum for the First Stage of the WWTP (to service Watermark & Damkar only). 2011 - Provided by BRWWTP

BRWWTP Influent Results Jan 2015 to Dec 2016 Provided by BRWWTP



# 7.0 CORPORATE AUTHORIZATION

This document, entitled *Ascension Servicing Design Brief*, is prepared by Urban Systems Ltd. for Highfield Land Management. The material in this report reflects the best judgment of Urban Systems Ltd. based on the information available at the time of preparation. Any use a third party makes of this report, or reliance on or decisions made based on it, is the responsibility of the third party. Urban Systems Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Prepared By:



<sup>2020-12-18</sup> Daniel Salamandyk, P.Eng. Project Engineer

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The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Phil Nottveit, P.Eng. Senior Engineer/Principal



# APPENDIX A: WATER DEMAND AND SANITARY FLOW CALCULATIONS



ASCENSION SANITARY SEWER CALCULATIONS	PER CAPITA FLOW (RES)	217	L/day/person
Sept 2020 Conceptual Scheme	COMMERCIAL FLOW	0.14	L/s/ha
Lower Unit Count	INFILTRATION/INFLOW	0.10	L/s/ha
	WATERMARK SF DENSITY	3.2	People/Lot

MAN	HOLE	CATCHMENT	INCR.	# OF	INCR.	INCR.	CUMM	CUMM.	Unpeaked		Q		TOTAL	SLOPE	CALC	NOMINAL	ACTUAL	PIPE	PIPE	MANNING'S	FULL	PIPE	PERCENT
NUM	1BER	AREA #	AREA	LOTS	POP.	Q	AREA	POP.	Q	PEAKING	(L/s)	INFIL.	Q	(%)	PIPE	PIPE	PIPE	LENGTH	MATERIAL	N	VELOCITY	CAPACITY	FULL CAPACITY
FROM	TO		(ha)			(l/s)	(ha)		(l/s)	FACTOR		(L/s)	(L/s)		DIAMETER	DIAMETER	DIAMETER	(m)			(m/s)	(L/s)	(%)
	ASCENS	SION RESIDENTIAL	49.6				49.62	1715	4.303	3.64	15.65	5.0	20.6	2.000%	139	200	201.16		PVC	0.011	1.75	55.6	37.04%
	ASCENS	ION COMMERCIAL	19.3				68.96		2.611	2.50	6.53	1.9	8.5	2.000%	99	200	201.16		PVC	0.011	1.75	55.6	15.21%
													29.1	2.000%	158	200	201.16		PVC	0.011	1.75	55.6	52.25%
FM Option																							
	WATERMA	RK CATCHMENTS																					
1-A	1-B	W1	0.41	2	6	0.02	50.03	1721	4.319	3.64	15.70	5.0	29.2	1.234%	173	200	201.16	59.474	PVC	0.011	1.38	43.7	66.73%
1-B	2-A	W2	0.59	6	19	0.05	50.62	1741	4.368	3.63	15.86	5.1	29.4	2.965%	147	200	201.16	69.27	PVC	0.011	2.13	67.7	43.37%
2-A	2-B	WXX			0	0.00	50.62	1741	4.368	3.63	15.86	5.1	29.4	0.720%	192	200	191.77	436	PE	0.011	1.02	29.4	99.97%
		<u>CHECK</u> RESIDENTIAL COMMERCIAL	50.6 19.3					1740.6	4.368 2.611	3.63 2.50	15.86 6.53	5.1 1.9	20.9 8.5										
													29.4	0.720%	192	200	191.77	564.744	PE	0.011	1.02	29.4	99.97%

Slope based on HGL

Date

By File 27-Oct-20 DS

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#### BRWWTP Upgrade Requirement

ADWF 6.91 l/s

ADWF 597.4 m3/day Note: Peaking Factor not included for comparison to existing average capacity

Commerical and Residential

ASCENSION SANITARY SEWER CALCULATIONS	PER CAPITA FLOW (RES)	217	L/day/person
Sept 2020 Conceptual Scheme	COMMERCIAL FLOW	0.14	L/s/ha
Higher Unit Count	INFILTRATION/INFLOW	0.10	L/s/ha
	WATERMARK SF DENSITY	3.2	People/Lot

MAN	HOLE	CATCHMENT	INCR.	# OF	INCR.	INCR.	CUMM	CUMM.	Unpeaked		0		TOTAL	SLOPE	CALC	NOMINAL	ACTUAL	PIPE	PIPE	MANNING'S	FULL	PIPE	PERCENT
NUM	<b>IBER</b>	AREA #	AREA	LOTS	POP.	Q	AREA	POP.	Q	PEAKING	(L/s)	INFIL.	Q	(%)	PIPE	PIPE	PIPE	LENGTH	MATERIAL	N	VELOCITY	CAPACITY	FULL CAPACITY
FROM	TO		(ha)			(l/s)	(ha)		(l/s)	FACTOR		(L/s)	(L/s)		DIAMETER	DIAMETER	DIAMETER	(m)			(m/s)	(L/s)	(%)
	ASCENS	SION RESIDENTIAL	49.6				49.62	3173	7.962	3.42	27.24	5.0	32.2	2.000%	164	200	201.16		PVC	0.011	1.75	55.6	57.88%
	ASCENS	SION COMMERCIAL	19.3				68.96		2.611	2.50	6.53	1.9	8.5	2.000%	99	200	201.16		PVC	0.011	1.75	55.6	15.21%
													40.7	2.000%	179	200	201.16		PVC	0.011	1.75	55.6	73.08%
FM Option	i i																						
	WATERMA	ARK CATCHMENTS																					
1-A	1-B	W1	0.41	2	6	0.02	50.03	3179	7.978	3.42	27.29	5.0	40.8	1.234%	196	200	201.16	59.474	PVC	0.011	1.38	43.7	93.25%
1-B	2-A	W2	0.59	6	19	0.05	50.62	3199	8.026	3.42	27.44	5.1	41.0	2.965%	167	200	201.16	69.27	PVC	0.011	2.13	67.7	60.46%
2-A	2-B	WXX			0	0.00	50.62	3199	8.026	3.42	27.44	5.1	41.0	1.399%	192	200	191.77	436	PE	0.011	1.42	41.0	99.98%
		CHECK																					
		RESIDENTIAL	50.6					3198.6	8.026	3.42	27.44	5.1	32.5										
1		COMMERCIAL	19.3						2.611	2.50	6.53	1.9	8.5										
													41.0	1.399%	192	200	191.77	564.744	PE	0.011	1.42	41.0	99.98%

Slope based on HGL

#### BRWWTP Upgrade Requirement

ADWF	10.57 l/s	Commerical and Residential
	040 5	

ADWF 913.5 m3/day Note: Peaking Factor not included for comparison to existing average capacity



ASCENSION WATER DEMAND CALCULATIONS Sept 2020 Conceptual Scheme Lower Unit Count	5	AVERAGE D MAX PEAK H	AILY DEMAN DAY DEMAN OUR DEMAN	ID (RES) ID (RES) ID (RES)	278 L/day/person 556 L/day/person 973 L/day/person		AVERAGE MA PEAK	DAILY DEMA X DAY DEMA HOUR DEMA	AND (MF) AND (MF) AND (MF)	)	202 L/day/person 404 L/day/person 707 L/day/person	Date By File	27-Oct-20 DS 4319.0004.01
		AVERAGE DA	LY DEMAND	(Comm)	0.15 L/s/ha	N	NDD PHD	2 3.9	5	xADD xADD			
Distribution System													
Land Use People	ADD (I/d)	ADD (I/s)	MDL 5.04	D (I/S) I	PHD (I/s) Commercial A	rea (ha) ADD(l/s)		MDD (I/s)		PHD (I/s)			
Single Family Residential	1620 4	10100	5.21	10.43	18.24								
Commorcial (Market Place)	95	19190	0.22	0.44	0.78	10.24	2.0	0	E 90	<b>`</b>	10.15		
	1715 4	469550	5	11	19	19.34	2.3	3	6	) }	10		
Total ADD			8.34 l/s		720 m3/d	ADD Com	m (m3/d)		251	I			
Total MDD			16.67 l/s		1440 m3/d	ADD Res (	(m3/d)		470	)			
Total PHD			<b>29.17</b> l/s										
Fire Flow Requirements	Flow	Base Fire Flo	w (L/s) MDD	D (I/s)	Fire Flow (I/s) Duration (hou	rs) Volume		Base Volur	me (m3)	Volume	m3)		
Single Family Residential	100 l/s + MDI	D	100	10.43	110	2 720m3+MI	DD		720	)	795		
Multi-Family Residential	166 l/s + MDI	D	166	0.44	166	2 1200m3+N	/IDD		1200	)	1203		
Commercial	166-250 l/s +	MDD	250	5.80	256	3.5 1200-2700	m3+MDD		3150	)	3223		
Total					256 l/s						3223 m3		
Potable Water Storage Requirements	Storage (m3)	)											
Equilization Storage (25% of MDD)		360											
Emergency Storage (15% of ADD)		108											
Fire Storage		3223											
Total Reservoir Size		3691											
Min Pressure Requirements	Pressure (kP	Pa) Pressure (ps	i)										
Max Daily Demand + Fire Flow		150	22										
Min Residual Pressure under Peak Hour Demand		300	44										
Existing Pressures in Blueridge and Watermark	00												

BRR3	26 psi
30A	73 psi

ASCENSION WATER DEMAND CALCULATIONS Sept 2020 Conceptual Scheme Higher Unit Count	5	AVERAGE DA MAX D PEAK HO	ILY DEMAND ( AY DEMAND ( UR DEMAND (	RES) RES) RES)	278 L/day/person 556 L/day/person 973 L/day/person	AVE	ERAGE DAILY D MAX DAY D PEAK HOUR D	EMAND (MF EMAND (MF EMAND (MF	) ) )	202 L/day/person 404 L/day/person 707 L/day/person	Date By File	27-Oct-20 DS 4319.0004.01
		AVERAGE DAIL	/ DEMAND (Co	omm)	0.15 L/s/ha	MDD PHD		2 3.5	xADD xADD			
Distribution System Land Use People	ADD (I/d)	ADD (I/s)	MDD (I/	s) PHD (I/s)	Commercial Area	a (ha) ADD(I/s)	MDD (I	/s)	PHD (I/s)			<u> </u>
Single Family Residential	3078 8	855684	9.90	19.81	34.66	(iiii) / i==(iiii)						
Multi Family Residential	95	19190	0.22	0.44	0.78							
Commercial (Market Place)						19.34	2.90	5.8	D	10.15		
ii	3173 8	874874	10	20	35	19	3	(	6	10		
Total ADD			13.03 l/s		1126 m3/d	ADD Comm (m	3/d)	25	1			
Total MDD			26.05 l/s		2251 m3/d	ADD Res (m3/c	(t	87	5			
Total PHD			45.59 l/s									
Fire Flow Requirements	Flow	Base Fire Flow	(L/s) MDD (I/	s) Fire Flow	(I/s) Duration (hours)	Volume	Base V	/olume (m3)	Volume (n	n3)		
Single Family Residential	100 l/s + MD	D	100	19.81	120	2 720m3+MDD		72	D	863		
Multi-Family Residential	166 l/s + MD	D	166	0.44	166	2 1200m3+MDD		120	D	1203		
Commercial	166-250 l/s +	MDD	250	5.80	256	3.5 1200-2700m3+	MDD	315	D	3223		
Total					256 l/s					3223 m3		
Potable Water Storage Requirements	Storage (m3	)										
Equilization Storage (25% of MDD)		563										
Emergency Storage (15% of ADD)		169										
Fire Storage		3223										
Total Reservoir Size		3955										
Min Pressure Requirements	Pressure (kl	Pa) Pressure (psi)										
Max Daily Demand + Fire Flow		150	22									
Min Residual Pressure under Peak Hour Demand		300	44									
Existing Pressures in Blueridge and Watermark												
BRR3	26 psi											
30A	73 psi											

30A