Stantec

Technical Memo

To:	City of Oronoco, MN	From:	Joseph Palen, PE Mark Hanson, PE 6188 Rome Circle NW Rochester, Minnesota 55901-4846
File:	193804990	Date:	July 31, 2020

Reference: Sanitary Sewer Flow Projections and Routing Update

Introduction

The City of Oronoco has been developing a sanitary sewer plan to serve its existing and future areas since the summer of 2017. The effort over the last three years has included, but was not limited to completing the following studies/plans:

- Regional Wastewater Study (Oronoco, Pine Island, NW Rochester) dated December 2017
- Oronoco Regional Wastewater / Water Facility Plan (WWFP) dated December 2018
- Oronoco Antidegradation Alternatives Analysis dated October 2019
- Oronoco Wastewater System EAW – Completed January 2020
- Oronoco NPDES Permit – Issued February 2020

The above documents identify and support the process to construct an Oronoco Regional Wastewater Treatment Facility serving the City of Oronoco and Oronoco Estates Mobile Home Community (OEMHC). The purpose of this document is to provide an update to the WWFP identifying the projected sanitary sewer flows, proposed trunk sanitary sewer facility conveyance capacities, and trunk sewer configuration options for Oronoco's Phase 1 and 2 improvements. The following items are addressed within this memorandum.

- Land Use
- Phasing
- Sanitary Sewer Districts
- Projected Sanitary Sewer Flows
- Trunk Sewer Layout and Conveyance Capacity

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Land Use

The City of Oronoco Future Land Use Plan is shown on Figure 1 and is the most current plan developed by the city's Planning Commission and was adopted by the City Council on July 21, 2020. The Future Land Use Figure shows the existing city limits and the ultimate service boundary. The Future Land Use Plan (FLUP) shows the classifications of planned land use for existing and future development areas. Table 1 summarizes the future land use classifications by total area based on developable acres for each land use. Developable acres in undeveloped areas accounts for future acres to be dedicated for open space, stormwater management, and right-of-way requirements as follows.

- Single Family Residential; 1/3 of total acres (Developable Acres = 2/3 of gross land area)
- High Density Residential & Commercial/Industrial; (Developable Acres = 1/2 of gross land area)

Table 1 also compares the total acreage by land use between the current future land use plan and Figure 7 future land use plan from the WWFP and originally prepared in 2012. The differences between the two iterations of the future land use plans for Oronoco and the surrounding area reflects the additional detail of future planning in the July 2020 version.

TABLE 1 – ORONOCO FUTURE LAND USE AREAS

DEVELOPED/DEVELOPABLE LAND (Acre)								
	Residential		Non-Residential					
			Commercial/Industrial					
	R-1	R-2	B-1	B-2	B-3		M-1	
Land Use Plan Version	Low Density Residential	High Density Residential	Historic Business District	Highway Comm.	Ped-Oriented Comm.	Public/ Inst.	Low Density Comm. – Ind.	Total Developable Area (Acres)
July 2020	1,688	250	247				298	2,484
Feb. 2012*	1,892	414	444					2,750
Diff.	-204	-164	+101					-266

*See Previous Figure 7 from Oronoco Regional Wastewater Facility Plan, dated Dec. 2018

As shown above, the current land use plan has increased the amount of commercial and reduced the amount of low density and multi-family future development. Some of these reductions are a result of planned future parks and the addition of delineated wetland areas. The above differences are considered relatively minor in the scope of estimating these uses.

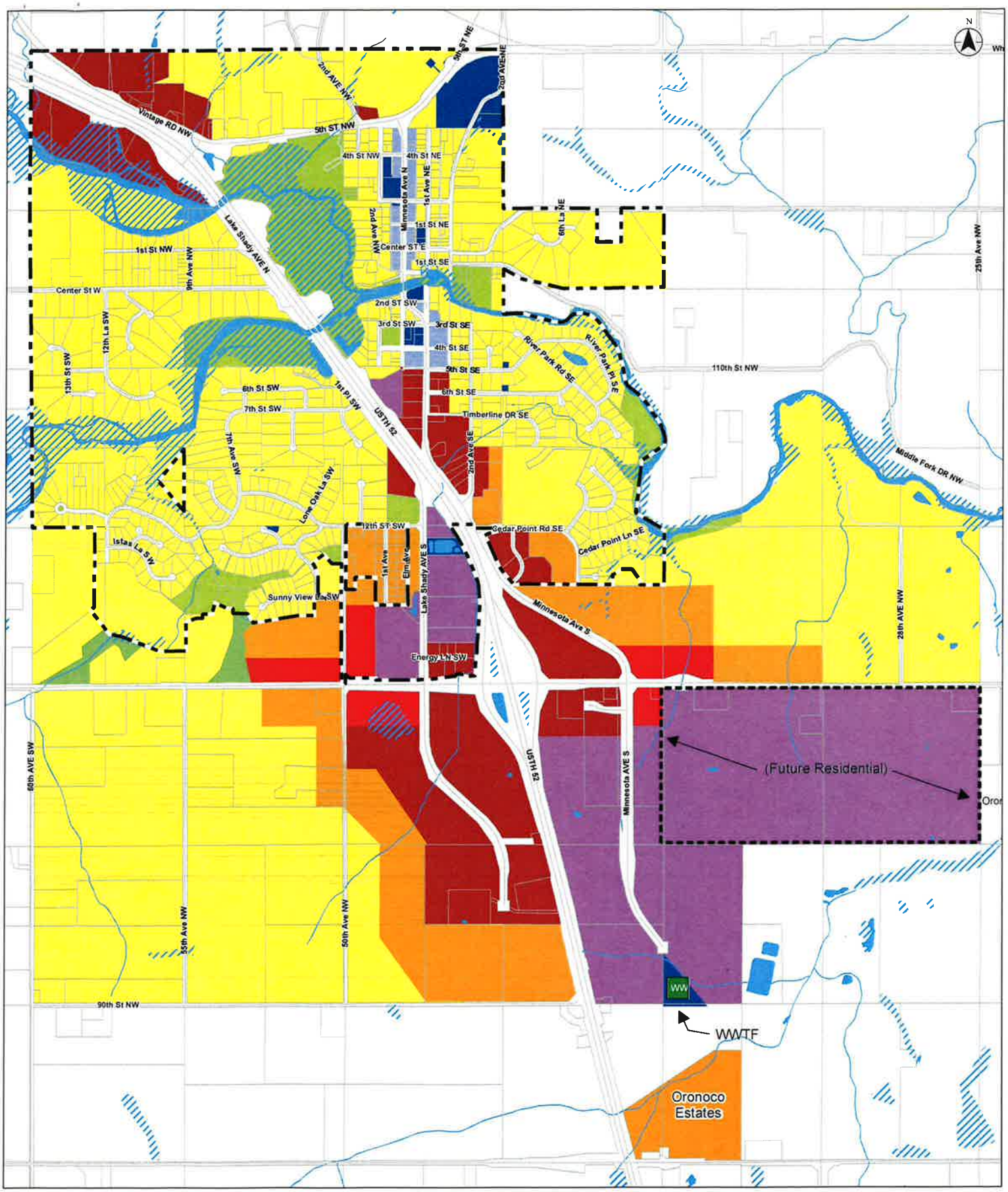

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Figure No.
1

July 2020

Oronoco Comprehensive Sanitary Sewer Plan
Ultimate Service Area Future Land Us

Revised: 2020-07-31 By: emenksen

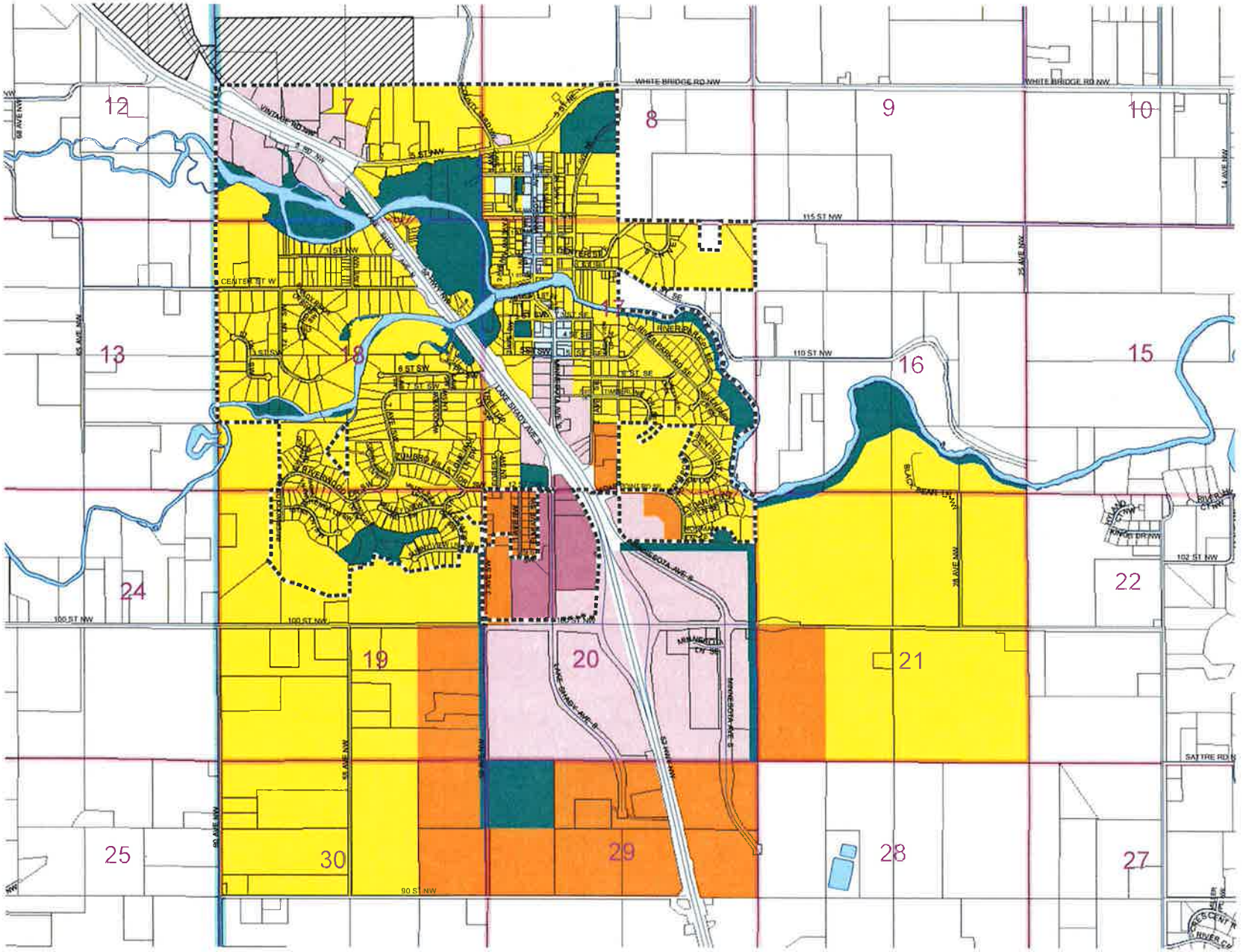


Figure 7
Future Land Use Plan
City of Oronoco,
Olmsted County,
Minnesota

Map prepared by:
Rochester - Olmsted Planning Dept.
Geographic Information Systems Division
February 2012

Map Size; 11 x 17

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Phasing Plan

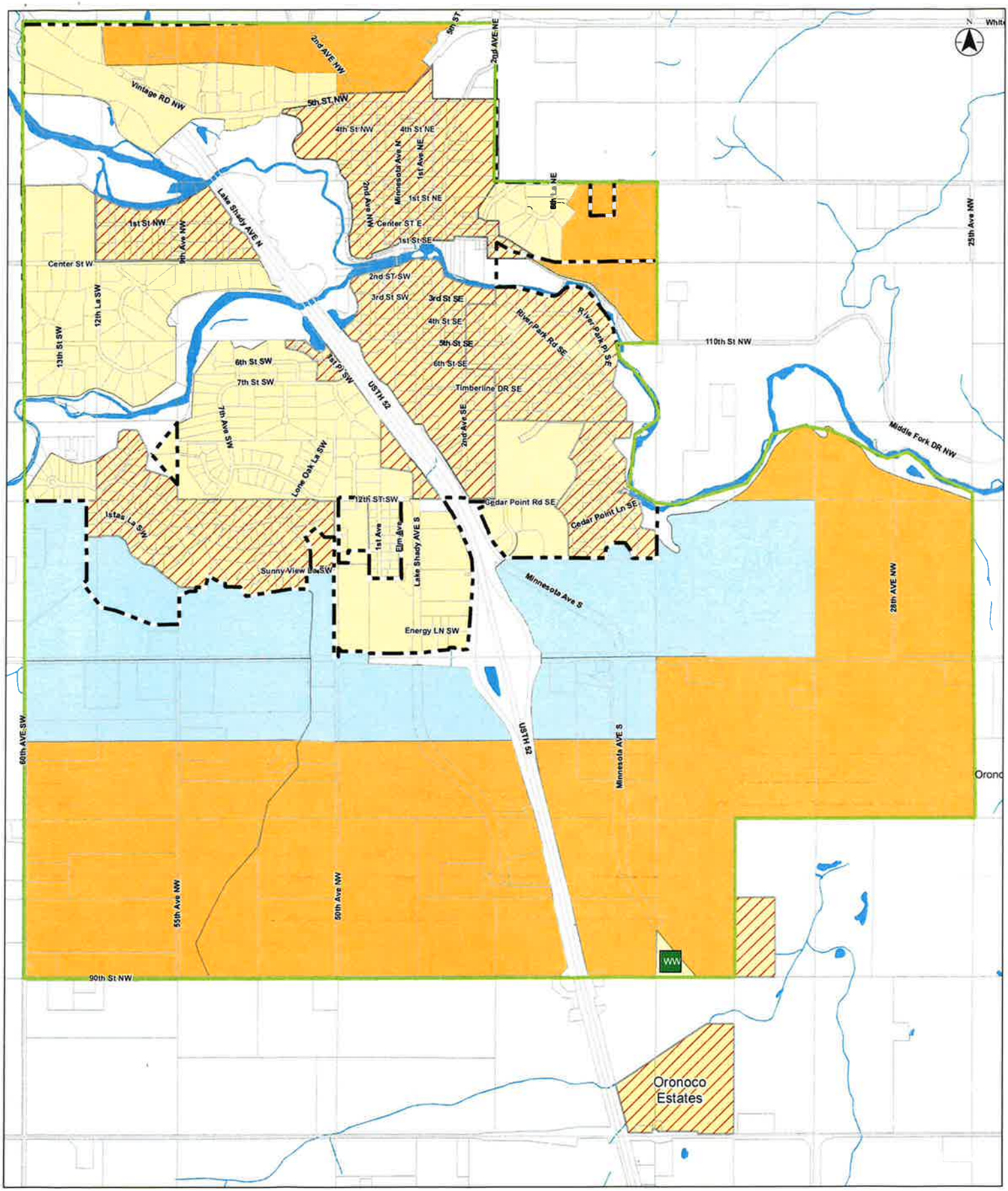
The City of Oronoco Sewer Phasing Plan is shown on Figure 2 and is divided between Phase 1 and Phase 2. Phase 1 is further divided between Phase 1A, 1B, and 1C. The sanitary sewer collection and conveyance system is designed to serve all of Phase 1 which is planned between 2023 and 2043. The WWTP design capacity is based on projected population and commercial growth by 2043, as discussed in the WWFP dated December 2018, in Tables 3-2 and 3-3. Phase 2 is planned to be served beyond 2043. A brief description of Phase 1 is below.

- Phase 1A; existing areas that will be served with sanitary sewer between now and 2023. The areas in Phase 1a are presently served with existing on-site treatment sites for each parcel or subsurface treatment community systems. Due to some lot configurations/size there is some opportunity for infill/redevelopment in these areas.
- Phase 1B; existing areas that are planned to be served with sanitary sewer within the next 10 years (or by ~2030). These areas for the most part include large lot subdivisions (larger than 1 acre) that are served with existing subsurface treatment sites. Similar to Phase 1a lot configuration/size does provide for the opportunity for infill/redevelopment, although due to existing terrain and the likelihood of new development opportunities are limited.
- Phase 1C; undeveloped areas which are generally planned to be developed between 2023-2043.
- Phase 2; undeveloped areas and planned to be developed beyond 2043.

Table 2 shows the distribution of Land Use between the Phases based upon Oronoco's 2020 Future Land Use as shown in Figure 1 and Figure 7 from WWFP.

TABLE 2 – ORONOCO LAND USE BY PHASE

Land Use by Phase								
Phase	**Low Density Residential (Acres)**		**High Density Residential (Acres)**		**Commercial/ Industrial (Acres)**		**Total Developable Area (Acres)**	
Report Comparison	**July 2020**	**Dec. 2018**	**July 2020**	**Dec. 2018**	**July 2020**	**Dec. 2018**	**July 2020**	**Dec. 2018**
1A	433	437	67	14	34	56	534	507
1B	505	464	43	11	80	121	629	596
1C	202	245	72	23	82	112	356	380
Total Phase 1	**1,140**	**1,146**	**182**	**48**	**196**	**289**	**1,519**	**1,483**
2	548	746	68	366	349	155	965	1,267
Total Phase 1 & 2	**1,688**	**1,892**	**250**	**414**	**545**	**444**	**2,484**	**2,750**
Diff.	-204		-164		+101		-266	



Oronoco Ultimate Service Area

Roads

WWTF

City Limits

Parcels

Phase 1A (2021 - 2022 Construction)

Phase 1B (**Serve by 2030**)

Phase 1C (2021 - 2043 Growth)

Phase 2 (Service Area Beyond 2043)

Open Water

0 1,000 2,000 Feet

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Figure No.
2

July 2020

Oronoco Comprehensive Sanitary Sewer Plan
Ultimate Service Area Sewer Phasing

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Sewer Districts

Figure 3 identifies Sewer Districts 1-8. Sewer District 1 and 8 each are divided into sub districts identified as 1a-1d and 8a-8c. A brief description of each sewer district is noted below.

- Sewer District 1:
  - Subdistrict 1a: River Park Subdivision, (excluding Timberline Drive)
  - Subdistrict 1b: Cedar Woodlands 3 (Commercial), Future Cedar Woodlands 4, Hassler Subdivision, Ottman Subdivision, Oronoco Commercial Park, Oronoco Village located south of Middle Fork Zumbro River.
  - Subdistrict 1c: Woodsview Subdivisions, Zumbro Hills, Cravath's 1st Addition, Oronoco Crossings. This subdistrict's southern limit is located 1000' feet south of 100th Street NW
  - Subdistrict 1d: Northern limit of Middle Fork Zumbro River and includes the following platted subdivisions - Hidden Valley, Walnut Hills, Shady Ridge, Lakeview and Maple Grove
  - Subdistrict 1e: Northern portion of Cedar Woodlands (Residential)

- Sewer District 2: Northern City limit to Middle Fork Zumbro River including Oronoco Village, Oronoco Village Outlots and Jasik's 1st Addition.
- Sewer District 3: River Bend Subdivision, Riverwood Hills with a southern limit located 1000' feet south of 100th Street NW.
- Sewer District 4: Located east of TH 52 including the Southern portion of Cedar Woodlands (Residential), parcels bordering Minnesota Avenue South spanning to ~1000' south of 100th Street NW. This district also includes the Bremer Trust parcel located north of 100th Street NW and east of Cedar Woodlands Subdivision.
- Sewer District 5: Northern limit of Middle Fork Zumbro River, including the two parcels bordering 28th Avenue NW and the majority of the Mathy Construction parcel located south of 100th Street NW. A triangular portion of the southeastern corner of this Mathy Construction Parcel is located in another district, as determined by the geographical drainage divide.
- Sewer District 6: Northern limit located 1000' south of 100th Street NW, east of 60th Avenue SW, north of 90th Street NW and west of 50th Avenue NW.
- Sewer District 7: Northern limit located 1000' south of 100th Street NW, east of 50th Avenue NW and west of TH 52. A small rectangular slice located in the southeast corner is not included at the southern limit of 90th Street NW as determined by the geographical drainage divide.

Reference: **Sanitary Sewer Flow Projections and Routing Update**

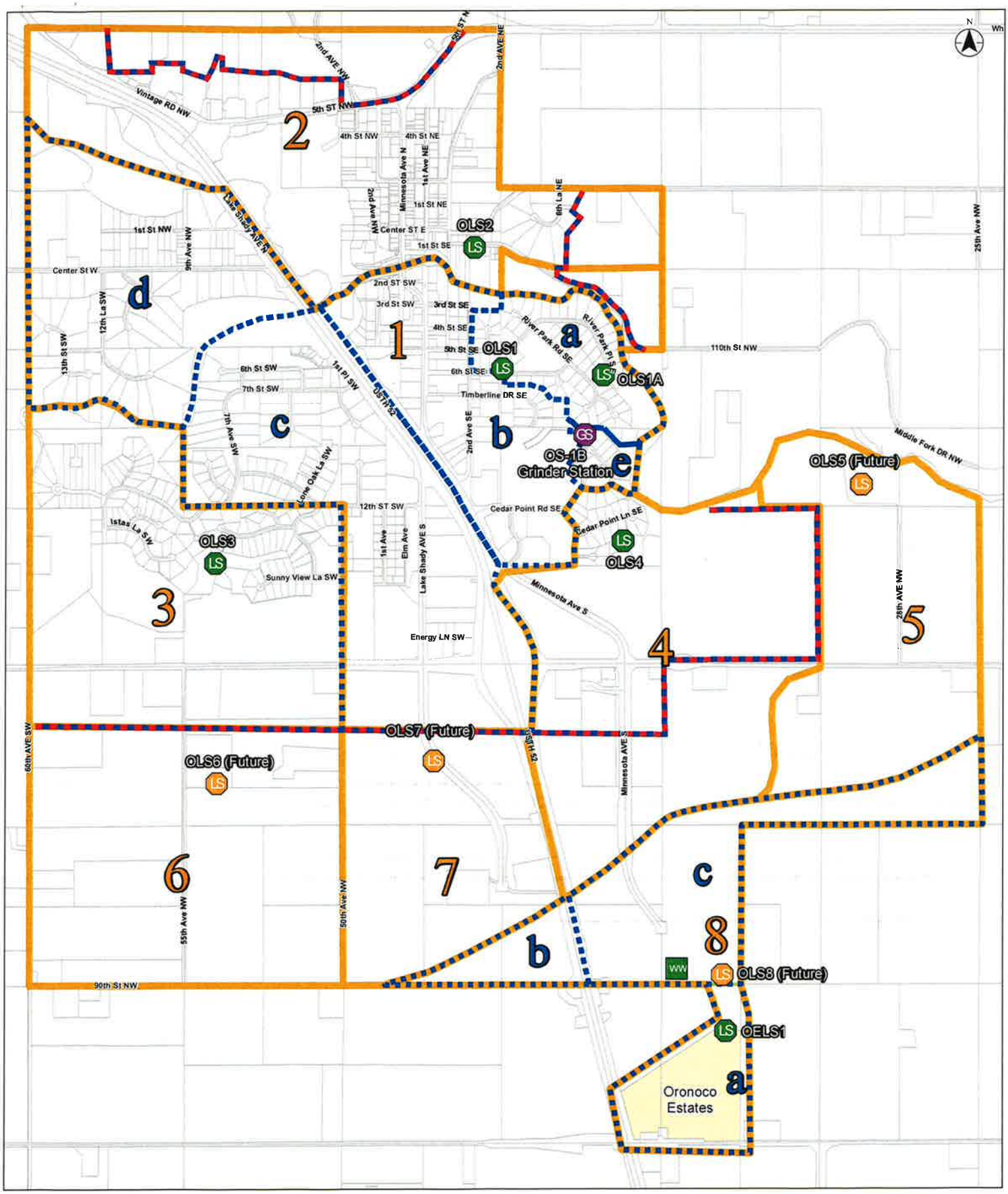
- Sewer District 8:
  - 8a: Oronoco Estates Mobile Home Community
  - 8b: Southeastern triangular portion of district 7 as determined by the geographical drainage divide which is located west of TH 52 and north of 90th Street NW.
  - 8c: Southeastern corner of ultimate service area (primarily land owned by Mathy Construction) as determined by the geographical drainage divide.

Sewer Districts in Phase 1A planned to be served with sanitary sewer in 2021-2023 have been divided between the number of parcels, parcel area and land use type (residential/non-residential) in Tables 3 and 4. As noted, there are 792 parcels included in Phase 1A, 316 of these parcels are from Oronoco Estates Mobile Home Community (where 216 lots are developed and an additional 100 parcels to be developed in the future).

- 33 parcels (12 acres) in Sewer District 2 are being shown as Commercial to reflect the Land Use map, however, these parcels are currently low density residential.
- Any undeveloped parcels that are planned high-density residential or a commercial property is shown at 50% of the total parcel area, which affected Sewer Districts 1b and 2.

TABLE 3 – ORONOCO LAND USE AREAS – PHASE 1A

Phase 1A								
Area Desig.	Residential				Non-Residential			
	Low Density		High Density		Comm./Ind.			
Sewer District	# Parcels	Area (Acres)	# Parcels	Area (Acres)	# Parcels	Area (Acres)	Total # Parcels	Total Developed Area (Acres)
1a	73	73	0	0	0	0	73	73
1b	67	83	2	3	13	16	82	102
1c	6	4	0	0	1	5	7	9
1d	47	48	2	2	0	0	49	50
1e	12	13	0	0	0	0	12	13
2	84	80	0	0	40	12	124	92
3	102	109	0	0	0	0	102	109
4	27	23	0	0	0	0	27	23
8a	0	0	316	62	0	0	316	62
Total	**418**	**433**	**320**	**67**	**54**	**34**	**792**	**533**



Lift Station
Future Lift Station
Grinder Station
WWTF

Sanitary Sewer Sub-District Boundaries
Phase 1/2 Boundary
Sanitary Sewer District Boundaries
Parcels
Roads

0 1,000 2,000 Feet

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Figure No.
3

July 2020

Oronoco Comprehensive Sanitary Sewer Plan
Sanitary Sewer Districts

Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 4 – PHASE 1A PARCEL SIZE

Phase 1A - # Parcels per Parcel Area							
Sewer District	**Land Use Type**	**Less Than 10,000 SF**	**10,000 SF to 15,000 SF**	**15,000 SF to 1 Acre**	**1-2 Acres**	**2+ Acres**	**Total**
1a	Residential	-	-	45	28	-	73
1b	Residential	3	-	37	16	10	66
	Multi-Res.	-	-	2	-	1	3
	Non-Res	-	-	3	7	3	13
1c	Residential	-	2	3	1	-	6
	Non-Res	-	-	-	-	1	1
1d	Residential	-	6	27	9	5	47
	Multi-Res.	-	-	1	1	-	2
1e	Residential	-	-	4	8	-	12
2	Residential	12	10	40	14	8	84
	Non-Res	15	4	15	4	2	40
3	Residential	-	-	73	27	2	102
4	Residential	-	-	26	1	-	27
8a	Multi-Res.	316	-	-	-	-	316
Total	Residential	15	18	255	104	25	**417**
	Multi-Res.	316	-	3	1	1	**321**
	Non-Res	15	4	18	11	6	**54**
Overall Total		**346**	**22**	**276**	**116**	**32**	**792**

Sewer Districts in Phase 1B have been divided by number of parcels which for the most part is all greater than 1 acre and land use type. Nearly all parcels in Phase 1B are not greater than 2 acres. Table 5 denotes the number parcels and land use type. As noted, there are 250 parcels Phase in 1B that are developed or developable.

TABLE 5 – ORONOCO LAND USE AREAS – PHASE 1B

Phase 1B										
	Residential				**Non-Residential**					
	Low Density		**High Density**		**Low Density Comm.**		**Comm./Ind.**			
Sewer District	**# Parcels**	**Area (Acres)**	**# Parcels**	**Area (Acres)**	**# Parcels**	**Area (Acres)**	**# Parcels**	**Area (Acres)**	**Total # Parcels**	**Total Developed Area (Acres)**
1b	2	37	1	11	0	0	4	8	7	56
1c	81	157	36	32	7	26	8	27	132	242
1d	56	223	0	0	0	0	0	0	56	223
2	23	65	0	0	0	0	15	20	38	85
3	17	23	0	0	0	0	0	0	17	23
Total	**179**	**505**	**37**	**43**	**7**	**26**	**27**	**55**	**250**	**629**

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Sewer Districts in Phase 1C have been identified by total area, number of parcels, and land use type. Different from Phase 1A and 1B the parcels are all greater than 5-10 acres. Table 6 notes area, the number of parcels and land use type. The total area of Phase 1C is 696 acres and includes 30 parcels.

TABLE 6 – ORONOCO LAND USE AREAS – PHASE 1C

Phase 1C										
Sewer District	Total Area (Acres)	Total # Parcels	Residential				Non-Residential			
			Low Density		High Density		Low Density Comm.		Comm./Ind.	
			Total Area (Acres)	Dev. Area (Acres) 67%	Total Area (Acres)	Dev. Area (Acres) 50%	Total Area (Acres)	Dev. Area (Acres) 50%	Total Area (Acres)	Dev. Area (Acres) 50%
1c	78	2	0	0	0	0	0	0	62	31
3	315	17	210	140.2	53	26	0	0	14	7
4	303	11	93	62	92	46	13	7	74	37
Total	**696**	**30**	**303**	**202**	**145**	**72**	**13**	**7**	**150**	**75**

Sewer Districts in Phase 2 have been identified similar to Phase 1C and are noted in Table 7 below. The total area in Phase 2 is 1750 acres and includes 71 parcels.

TABLE 7 – ORONOCO LAND USE AREAS – PHASE 2

Phase 2										
Sewer District	Total Area (Acres)	Total # Parcels	Residential				Non-Residential			
			Low Density		High Density		Low Density Comm.		Comm./Ind.	
			Total Area (Acres)	Dev. Area (Acres) 67%	Total Area (Acres)	Dev. Area (Acres) 50%	Total Area (Acres)	Dev. Area (Acres) 50%	Total Area (Acres)	Dev. Area (Acres) 50%
2	180	14	111	74	0	0	0	0	39	20
4	200	8	0	0	0	0	180	90	0	0
5	366	11	230	153	0	0	135	68	0	0
6	464	18	436	291	7	3	0	0	0	0
7	270	11	44	29	88	44	0	0	129	65
8b	50	2	1	1	42	21	0	0	0	0
8c	220	7	0	0	0	0	215	108	0	0
Total	**1750**	**71**	**822**	**548**	**137**	**68**	**530**	**266**	**168**	**84**

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Sanitary Sewer Flows

Sanitary Sewer flows are estimated by applying accepted unit area flow rates to each of the land use types for residential and commercial/industrial (non-residential) properties and existing parcels smaller than 2 acres. Residential properties are divided between low and high density; low density is single family homes while high density is considered multi-family homes. These two categories of residential housing have different sewage flow rates.

Oronoco sanitary sewer flows are determined by applying unit area flow rates to each of the land use types. The design criteria to calculate wastewater flows are shown in Table 8.

TABLE 8 – ORONOCO SANITARY SEWER FLOW DESIGN CRITERIA

City of Oronoco	Low Density Residential (R-1)	High Density Residential (R-2)	Low Density Commercial / Industrial (M-1)	Commercial/ Industrial (B-1,2,3)
Existing People/Unit	2.87	2.00	-	-
Future People/Unit	2.5	2.00	-	-
Gallons/Capita/Day	90	90	-	-
Future Gallons/Unit	225	180	-	-
Future Density (Equivalent Units/Acre)	2.5	6.00	2.5	6.00
Gallons/Acre/Day	562.5	1,080	562.5	1360

*Calculated density rate based on existing parcel sizes, and existing large lot subdivisions from Table 2. Used for Phase 1A and Phase 1B

The ultimate projected sanitary sewer flow for each sewer district and land use category are identified by phase in the following Tables 9-12. The sewer districts lift station locations and their service areas are shown on Figure 3 Sanitary Sewer Districts.

Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 9 – SANITARY SEWER FLOWS BY LAND USE – PHASE 1A

Phase 1A				
Sewer District	Residential		Commercial/ Industrial	Total Avg. Est. Flow
	Low Density	High Density		
	MGD	MGD	MGD	MGD
1a	0.0151	0	0	0.0151
1b	0.0138	0.0003	0.0219	0.0360
1c	0.0012	0	0.0074	0.0086
1d	0.0097	0.0003	0	0.0100
1e	0.0025	0	0	0.0025
2	0.0174	0	0.0164	0.0337
3	0.0211	0	0	0.0211
4	0.0056	0	0	0.0056
8a*	0	0.0550	0	0.0550
Total	**0.0864**	**0.0556**	**0.0456**	**0.1876**

*District 8a – Oronoco Estates; 316 units with 2.5 people/unit at 70 gpcd

TABLE 10 – SANITARY SEWER FLOWS BY LAND USE – PHASE 1B

Phase 1B						
Sewer District	Residential		Non-Residential			Total Avg. Est. Flow
	Low Density	High Density	Low Density Commercial	Commercial/ Industrial	Total	
	MGD	MGD	MGD	MGD	MGD	MGD
1b	0.0004	0.0001	0	0.0106	0.0106	0.0111
1c	0.0167	0.0052	0.0144	0.0367	0.0511	0.0731
1d	0.0116	0	0	0	0	0.0116
2	0.0048	0	0	0.0272	0.0272	0.0320
3	0.0035	0	0	0	0	0.0035
Total	**0.0370**	**0.0053**	0.0144	0.0745	**0.0889**	**0.1312**

Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 11 – SANITARY SEWER FLOWS BY LAND USE – PHASE 1C

Phase 1C						
Sewer District	Residential		Non-Residential			Total Avg. Est. Flow
	Low Density	High Density	Low Density Commercial	Comm/ Industrial	Total	
	MGD	MGD	MGD	MGD	MGD	MGD
1c	0	0	0	0.0422	0.0422	0.0422
3	0.0789	0.0285	0	0.0095	0.0095	0.1168
4	0.0349	0.0497	0.0037	0.0503	0.0540	0.1385
Total	**0.1137**	**0.0781**	0.0037	0.1020	**0.1057**	**0.2975**

TABLE 12 – SANITARY SEWER FLOWS BY LAND USE – PHASE 2

Phase 2						
Sewer District	Residential		Non-Residential			Total Avg. Est. Flow
	Low Density	High Density	Low Density Commercial	Commercial/ Industrial	Total	
	MGD	MGD	MGD	MGD	MGD	MGD
2	0.0416	0	0	0.0265	0.0265	0.0681
4	0	0	0.0506	0	0.0506	0.0506
5	0.0863	0	0.0380	0	0.0380	0.1242
6	0.1635	0.00351	0	0	0	0.1670
7	0.0165	0.04752	0	0.0877	0.0877	0.1517
8b	0.0004	0.02268	0	0	0	0.0231
8c	0	0	0.0605	0	0.0605	0.0605
Total	**0.3083**	**0.0737**	**0.1491**	**0.1142**	**0.2633**	**0.6453**

Table 13 summarizes the projected ultimate sanitary sewer flows by Sewer District from Tables 9-12 for each Phase and identifies the ultimate total estimated average sewer flow.

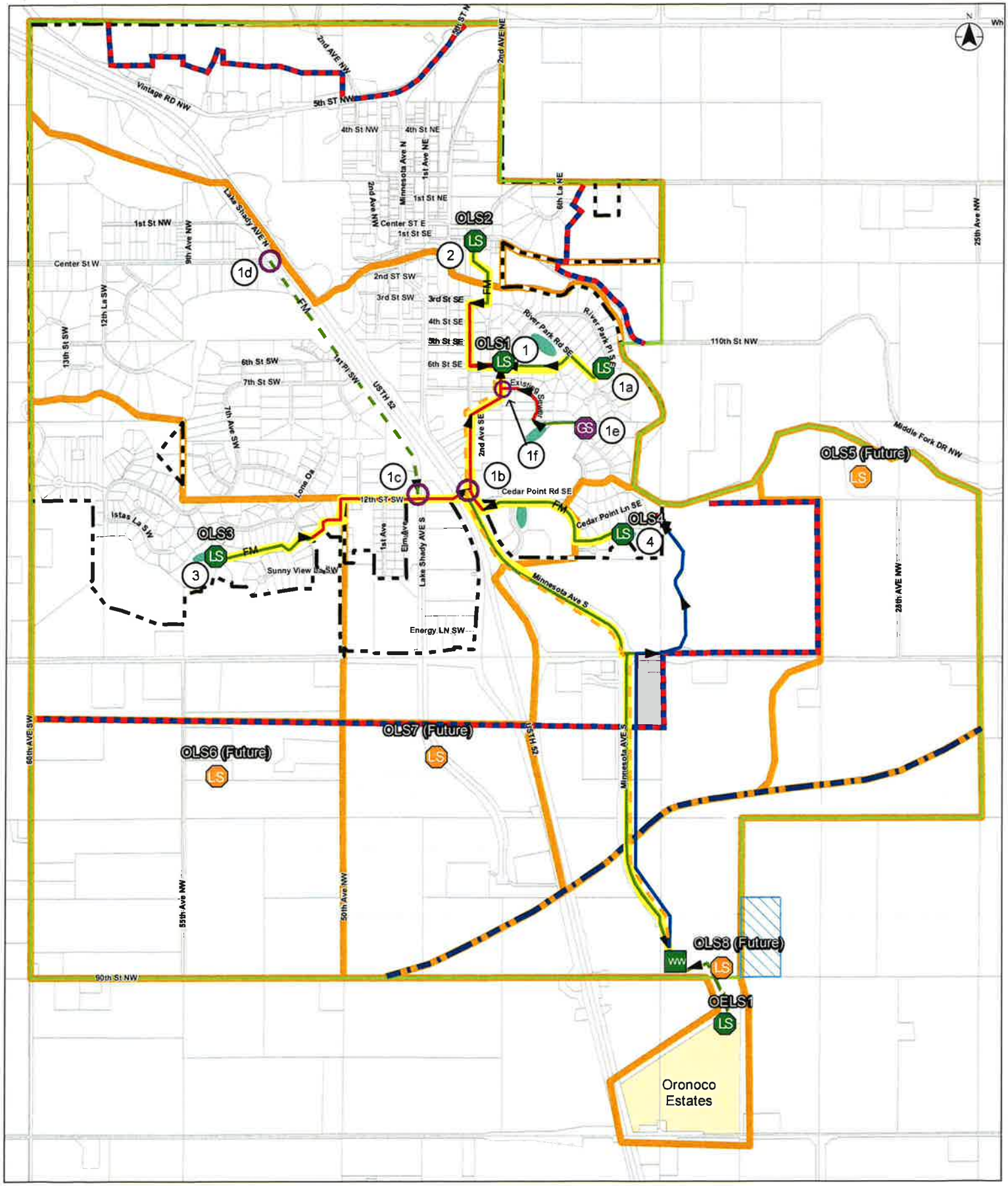
Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 13 – SANITARY SEWER FLOWS USING FUTURE LAND USE

Sewer District	Ultimate Total Average Flow MGD	Phase 1A Avg. Flow MGD	Phase 1B Avg. Flow MGD	Phase 1C Avg. Flow MGD	Phase 2 Avg. Flow MGD
1					
1a	0.0151	0.0151	-	-	-
1b	0.0471	0.0360	0.0111	-	-
1c	0.1239	0.0086	0.0731	0.0422	-
1d	0.0216	0.0100	0.0116	-	-
1e	0.0025	0.0025	-	-	-
Subtotal 1	**0.2101**	**0.0722**	**0.0958**	**0.0422**	-
2	0.1338	0.0337	0.0320	-	0.0681
3	0.1414	0.0211	0.0035	0.1168	-
4	0.1947	0.0056	-	0.1385	0.0506
5	0.1242	-	-	-	0.1242
6	0.1670	-	-	-	0.1670
7	0.1517	-	-	-	0.1517
8					
8a	0.0550	0.0550	-	-	-
8b	0.0202	-	-	-	0.0202
8c	0.0605	-	-	-	0.0605
Subtotal 8	**0.1357**	**0.0550**	**0**	**0**	**0.0807**
Total	**1.2616**	**0.1876**	**0.1312**	**0.2975**	**0.6453**
Phase 1 Total	**1.2616**		**0.6163**		**0.6453**

Trunk Sewer Layouts

The Trunk Sewer Layout for Phase 1 is shown on Figure 4a. The lift station locations and trunk sewer alignments connecting the different sewer districts and the force main alignment to the wastewater treatment facility serving Phase 1 including the outflow to the river is also included. The proposed lift station locations for OLS 5, 6, and 7 from Figure 18 of the WWFP dated December 2018 to serve Phase 2 are noted and the existing OELS 1 serving OEMHC is also shown. Table 14 identifies the point to point estimated wastewater flows to serve Phase 1 from Table 13 based on the alignments shown in Figure 4a.



Lift Station
Grinder Station
WWTF
Future Lift Station

FM to WWTF
Sewer Outfall
Forcemain
Gravity Sewer

Proposed Oronoco Trunk Phase 1A
Oronoco Estates Treatment Pond
Phase 1/2 Boundary
Existing Drainage Divide
(#) Node Numbers

Oronoco Ultimate Service Areas
City Limits
Cluster Drainfields
Lift Station Subdistrict Boundaries

0 1,000 2,000 Feet

Stantec

Figure No.
4A

July 2020

Oronoco Comprehensive Sanitary Sewer Plan Oronoco Trunk Sewer Layout Phase 1

Reference: **Sanitary Sewer Flow Projections and Routing Update**

The sanitary sewer system must be capable of conveying the anticipated peak sanitary sewer flow rate including any Inflow and Infiltration (I/I). The design peak flow rate can be expressed as a variable ratio to the average flow rate. Curves used to describe this ratio, called Peak Flow Factor (PFF), indicate a decreasing ratio of peak flow to average flow with increasing average flow. The PFF values applied in Table 14 are published in the "Ten States Standard" and are accepted as the standard for sizing sanitary sewer conveyance facilities. For the City of Oronoco the system will be new, therefore the likelihood for any areas with excessive I/I is low.

TABLE 14 – PHASE 1 POINT TO POINT WASTEWATER FLOWS

Oronoco Sanitary Sewer Flows by District – Phase 1 Full Development										
From Point	To Point	Sub District Area Added	Average Flow Added (MGD)	Total Sewer Flow (MGD)	Peak Flow Factor	Design Flow (MGD)	Pipe Size (Inch)	Slope	Pipe Capacity N = 0.011	Pipe Capacity / Total Design Flow
1a	1	1a	0.0151	0.0151	4.0	0.060	4 FM	-	-	-
2	1	2	0.1338	0.1338	3.9	0.522	10	0.28	0.885	1.7
1d	1c	1d	0.0216	0.0216	4.0	0.086	8	0.40	0.584	6.8
3	1c	3	0.1414	0.1414	3.9	0.552	8	2.29	0.939	1.7
1c	1b	1c	0.1239	0.2869	3.7	1.061	15	0.22	2.313	2.18
4	1b	4	0.1441	0.1441	3.9	0.562	10	6.45	1.641	2.9
1b	1f	1b	0.0471	0.4781	3.5	1.673	18	0.12	2.778	1.7
1e	1f	1e	0.0025	0.0025	4.0	0.010	8	1.21	0.859	86.6
1f	1	1f	-	0.4806	3.5	1.682	18	0.12	2.778	1.7
1	WWTF	-	-	0.6295	3.4	2.140	14 FM	-	-	-
OELS1	WWTF	8a	0.0550	0.0550	4.0	0.220	6 FM	-	-	-
WWTF	Outfall	-	-	0.6845	3.3	2.259	14 FM	-	-	-

Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 15 – PHASE 1 POINT TO POINT PIPE DESIGN

From Point	To Point	Design Flow (MGD)	Prop. FM or Gravity	Pipe Size (in.)	Avg. Slope (%)	Inlet Control Flow Rate		Manning's Equation			Pipe Capacity (MGD)	Capacity/ Design Flow
								Vel.	Flow Rate			
						(cfs)	(MGD)	(fps)	(cfs)	(MGD)		
1a	1	0.060	FM	4	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	18	0.12	11.04	7.13	2.43	4.30	2.78	2.78	46.04
2	1	0.522	FM	6	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	10	0.28	2.54	1.64	2.51	1.37	0.89	0.89	1.70
1d	1c	0.086	FM	3	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	8	0.40	1.45	0.94	2.59	0.90	0.58	0.58	6.77
3	1c	0.552	FM	6	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	8	2.29	1.45	0.94	6.20	2.16	1.40	0.94	1.70
1c	1b	1.061	Gravity	12	0.40	4.01	2.59	3.38	2.65	1.71	1.71	3.10
			Gravity	12	1.08	4.01	2.59	5.58	4.38	2.83	2.59	2.44
			Gravity	15	0.22	7.00	4.52	2.92	3.58	2.31	2.31	2.18
4	1b	0.562	FM	8	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	10	6.45	2.54	1.64	12.06	6.58	4.25	1.64	2.92
1b	1f	1.673	Gravity	18	0.12	11.04	7.13	2.43	4.30	2.78	2.78	1.66
1e	1f	0.010	FM	4	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	8	1.21	1.45	0.94	3.81	1.33	0.86	0.86	86.57
1f	1	1.682	Gravity	18	0.12	11.04	7.13	2.43	4.30	2.78	2.78	1.65
1	WWTF	2.140	FM	14	NA	NA	NA	NA	NA	NA	NA	NA
OELS1	WWTF	0.220	FM	6	NA	NA	NA	NA	NA	NA	NA	NA
WWTF	Outfall	2.259	FM	14	NA	NA	NA	NA	NA	NA	NA	NA
			Gravity	15	0.5	7.00	4.52	4.40	5.40	3.49	3.49	1.54

Reference: **Sanitary Sewer Flow Projections and Routing Update**

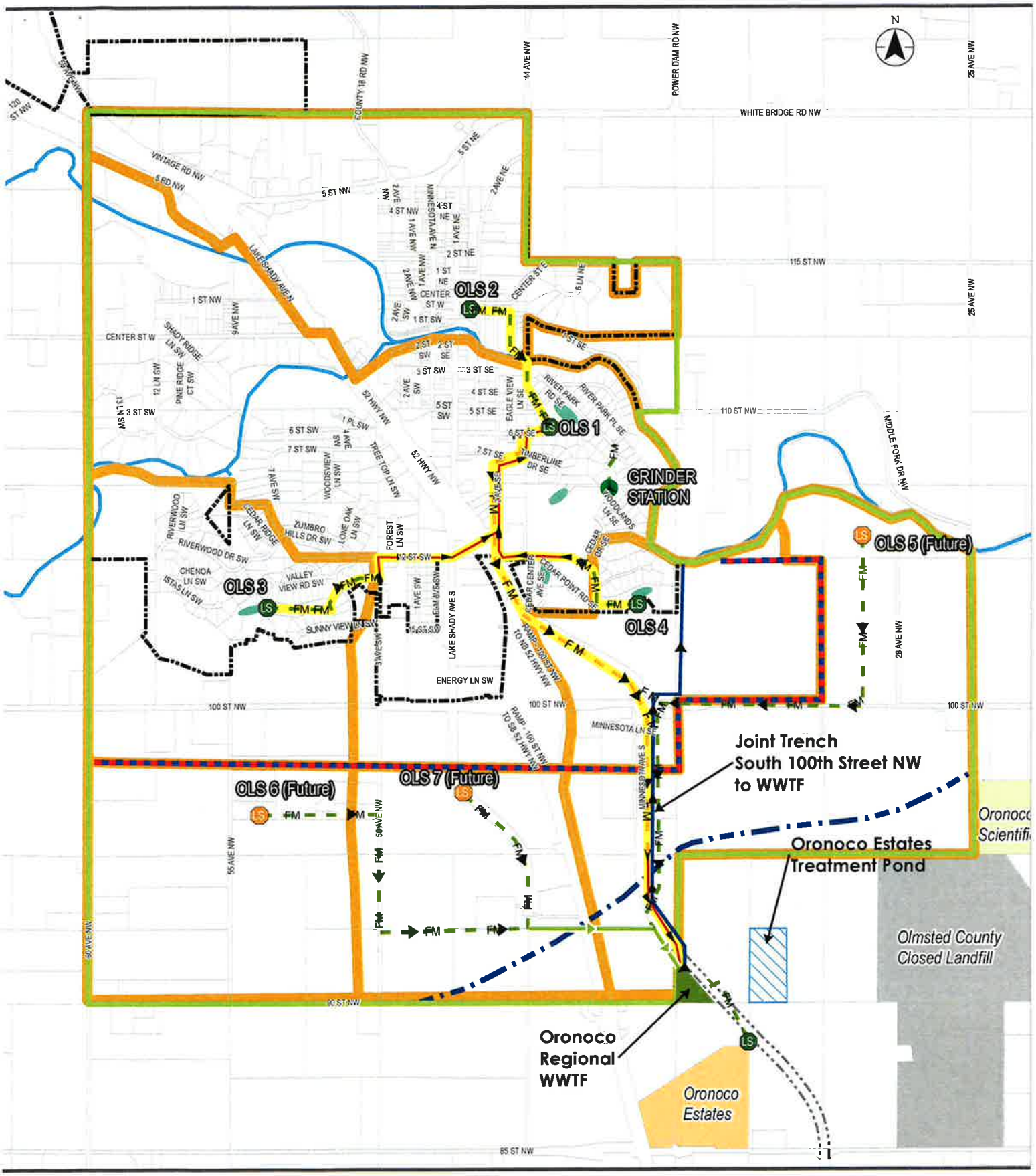
Table 16 below shows the lift station capacity for average wastewater flow for OLS 1-4 to serve Phase 1 and compares to the capacity stated in the WWFP dated December 2018. As illustrated, the flows and sizing are similar.

TABLE 16 – PHASE 1 WASTEWATER FLOWS BY LIFT STATION

Phase 1 Lift Stations				
Oronoco Lift Station	Design Average Flow (MGD)	Design GPM	Prev. Dec. 2018* Ult. Average Flows (MGD)	Prev. Dec. 2018* GPM
OLS - 1	0.210 (0.629 Total)	146 (437)	0.242 (0.659 Total)	168 (458)
OLS - 2	0.134	93	0.136	94
OLS - 3	0.141	98	0.140	97
OLS - 4	0.144	100	0.141	98

*Previous lift station flows as shown in Oronoco Wastewater Facility Plan, dated December 2018

The WWFP dated December 2018 presented a trunk sewer configuration (Option 1) to serve Phase 2 with OLS 5, 6, and 7 which are proposed to route sewer flow directly to the WWTF. The Trunk Sewer Layout for Phase 1 specifically OLS 1, 3, and 4 are not adequately sized to serve Phase 2 and the MPCA and State would typically not support funding to significantly oversize these facilities. The Option 1 – future trunk sewer layout is presented in Figure 18 from the WWFP and is included on the following page of this Memorandum. To serve development beyond 2043, we anticipate the WWTF will have to be expanded. At that time, a review will have to be completed to determine the most efficient design to serve Phase 2.



Stantec

Figure No. 18

November 2018

Title

Oronoco Regional Wastewater Facility Plan

Oronoco Trunk Sewer Layout With Future Areas

Reference: **Sanitary Sewer Flow Projections and Routing Update**

A second option is being presented at this time which could also serve Phase 2 based on estimated wastewater flows contained within this Memorandum. The Option 2 trunk sewer configuration is shown on Figure 4b and recognizes the natural drainage areas to OLS 1 and 4. This option considers the following:

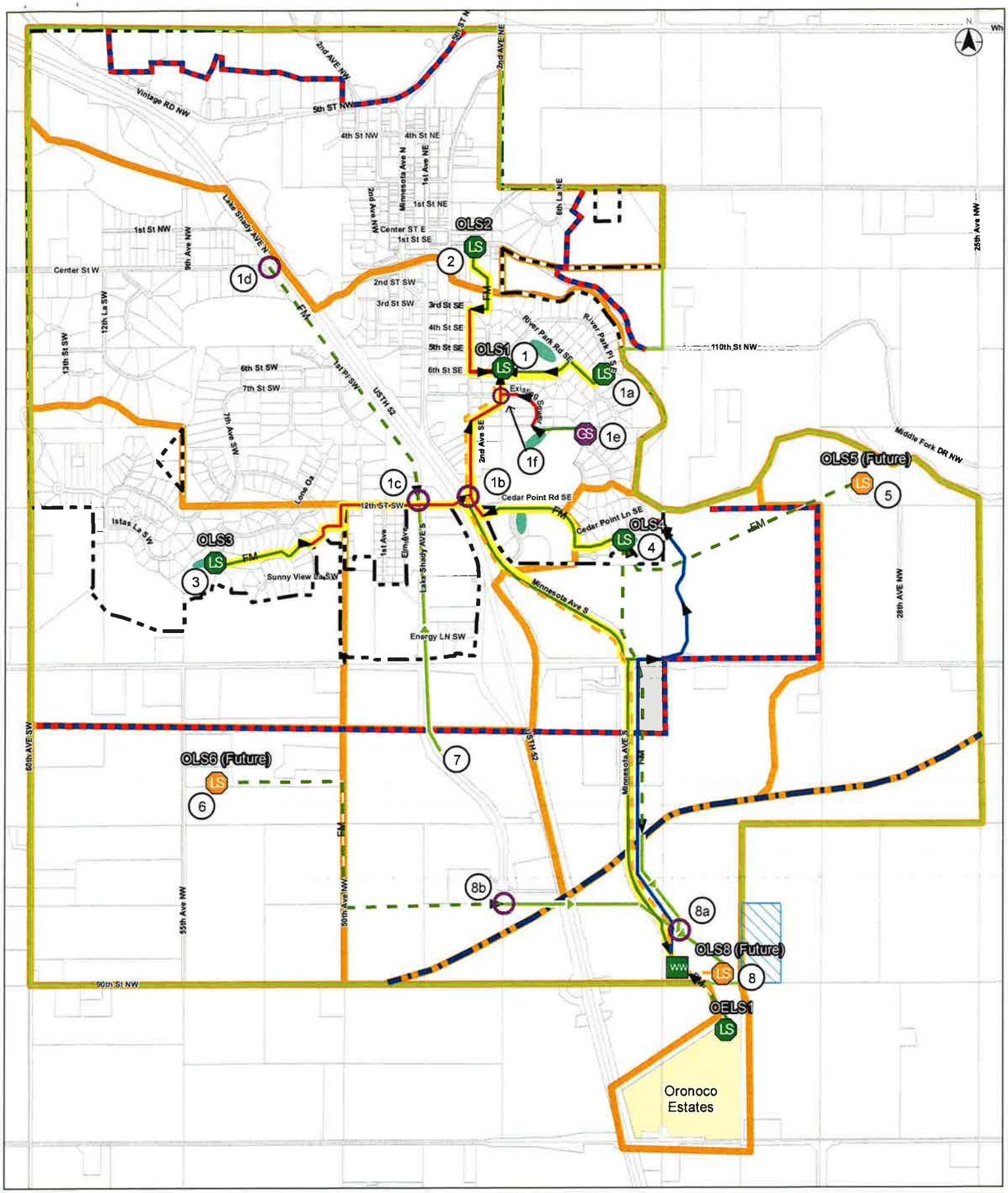
- Redirect LS 4 via new forcemain directly to WWTF thereby reducing the wastewater flow to OLS 1 such that OLS 7 could be eliminated and sanitary sewer from District 7 could gravity flow to LS-1. Note that trunk sewer to serve District 7 would need to connect to the proposed 15-inch trunk sewer flowing under TH 52 (west of 12th Street SW) and would need to be constructed up the drainageway to the south and under 100th Street to District 7.
- OLS 5 sewer flows directed to OLS 4 via a combination of future forcemain and trunk gravity sanitary sewer.
- It is important to note that there is considerable uncertainty associated Sewer Districts 4 and 5 south of 100th Street. Much of this area is being actively mined for sand and rock or may be mined over the next ~50 years. The anticipated mining and future reclamation activities will largely reshape the landscape and may result in modification the sewer district boundaries and options to serve the area with gravity sewer.

Option 2 is being presented at this time to consider the extent OLS 4 could be expanded in the future when Phase 2 is elected to be served. Table 17 (on the following page) estimates the lift station capacity for OLS 1-7 for the option shown on Figure 18 from WWFP and Figure 4b that illustrates the Option 2 Trunk Sanitary Sewer layout.

Reference: **Sanitary Sewer Flow Projections and Routing Update**

TABLE 17 – PHASE 1 & 2 LIFT STATION SIZING OPTION COMPARISON

Option 1 & 2					
Lift Station Sizing – Phase 1 & 2					
Oronoco Lift Station	Option 1 Design Average Flow (MGD)	Option 1 GPM	Option 2 Design Average Flow (MGD)	Option 2 GPM	Difference between Option 1 & 2
OLS - 1	0.629	437	0.6371	442	Increase of 5 GPM (Add OLS 4 & Remove OLS 7)
OLS - 2	0.1338	93	0.1338	93	No Change
OLS - 3	0.1414	98	0.1414	98	No Change
OLS - 4	0.1441	100	0.3190	221	Increase of 121 GPM (Flow routed directly to WWTF)
OLS – 5 (Future)	0.1748	121	0.1242	86	Route OLS 5 flow to OLS 4
OLS – 6 (Future)	0.1670	116	0.1670	116	No Change
OLS – 7 (Future)	0.1517	105	-	-	Elimination of OLS 7, route directly to OLS 1



Lift Station
Future Lift Station
Grinder Station
WWTF

FM to WWTF
Sewer Outfall
Forcemain
Gravity Sewer
Future FM
Future Gravity

Proposed Oronoco Trunk Phase 1A
Oronoco Estates Treatment Pond
Phase 1/2 Boundary
Existing Drainage Divide
(#) Node Numbers

Oronoco Ultimate Service Area
City Limits
Cluster Drainfields
Lift Station Subdistrict Boundaries

0 1,000 2,000 Feet

Stantec

Figure No.
4B

July 2020

Oronoco Comprehensive Sanitary Sewer Plan
Oronoco Trunk Sewer Layout

Reference: **Sanitary Sewer Flow Projections and Routing Update**

Conclusions:

Anticipated future land use and the associated sanitary sewer flow projections have changed slightly for Phase 1 and more significantly for Phase 2 as a result of Oronoco's updated July 2020 FLUP and additional analysis of the wastewater system conveyance requirements since the Facility Plan was originally prepared in December 2018. The Phase 1 sanitary sewer collection and conveyance system remains very similar to the system proposed within the Facility Plan and design of these facilities is proceeding based upon the projected sewer flows and phasing discussed within this memorandum. The system construction plans should be consulted for final lift station pumping capacities that will be based upon final pump selection and lift station configuration.

The Phase 2 sanitary sewer collection and conveyance system will require additional study in the future as development occurs, land use evolves, and actual sanitary sewer flows can be measured. Due to the many variables involved in projecting Phase 2 sanitary sewer flows, it is important to design Phase 1 trunk sanitary sewer systems with flexibility to accommodate future options and at the same time, limiting the size and associated cost of the Phase 1 trunk sewer system.

Based upon the best information currently available, including the analysis completed as part of this Memorandum, we think the Option 2 trunk sanitary sewer configuration is more likely to be constructed to serve Phase 2 in the distant future. To facilitate the future Option 2 trunk sewer and lift station configuration, we recommend upsizing the OLS-4 reinforced concrete structure and associated valve vault by 1-foot in diameter to a 9-foot diameter lift station and 8-foot diameter valve vault. Pumps, controls, electrical service and select piping and forcemain will all need to be upsized and replaced in the future.

Future development within both Phase 1 and Phase 2 will need to be analyzed and sanitary sewer flow rates monitored to ensure proper sizing of future sanitary sewer gravity and forcemain improvements and that lift station pumping capacities are not exceeded.