2040 Sanitary Sewer Plan

For the City of

Elko New Market, Minnesota

BMI Project No. T17.112950

February 10, 2018
Revised April 18, 2021

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

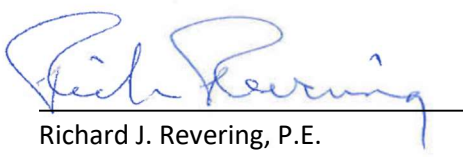
By: 

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Table of Contents

Appendix

I. EXECUTIVE SUMMARY

The City of Elko New Market had historically been a remote and isolated rural community relative to the Twin City Metropolitan Area. Today, it has changed to that of a bedroom community and in the near future it will reach the status of a full suburb to the Twin Cities. The City has significant residential, commercial and industrial growth potential. These changes will place new demands on the infrastructure and public services. For this Sanitary Sewer System Study the following two study areas were chosen: 1) The ultimate boundary of the City, and 2) The 2040 boundary of the City.

The topography, wetlands presence, interstate, and location of the Metropolitan Council's interceptor sewer all influence the ultimate configuration and sequence of construction of the wastewater collection system. The 2040 system will rely on 17 lift stations within the 2040 growth boundary, with forcemains to transport the wastewater to the MCES Interceptor or a gravity branch sewer. During the growth process, some lift stations will be interim to serve areas where gravity sewer may not yet be available. The areas served by this type of station will be served by future development of the gravity system, so interim designs should facilitate decommissioning of the interim lift station.

Eventually, when the entire system is developed the following will result:

1. Approximately 30 permanent lift stations and forcemains will be in use (nine of which are already in service).
2. Seven locations where connections to the MCES interceptor have been provided as it was constructed as described below. Three were installed along with the County Road 2 reconstruction project in 2006. MCES prefers connection at these locations; however, exceptions have historically been granted under certain circumstances in other communities. MCES approval would be required for any variance to the following points:
    a) #1: East side of CR 91, south of CR 2.
    b) #2: West side of Xerxes Avenue, south of CR 2.
    c) #3: East side of Newton Circle, north of CR 2.
    d) #4: West side of I-35, south of the Vermillion River.
    e) #5: West side of I-35, north of the Vermillion River.
    f) #6: East side of I-35, intersection of 250th St. & Dupont Avenue.
    g) #7: East side of I-35, on CR 62 east of Pillsbury Avenue.

A. RECOMMENDATIONS

1. It is suggested that the City of Elko New Market periodically revisit this study to update the underlying assumptions and make such adjustments as are appropriate.
2. The characteristics of actual development such as density of residential, wet industry, percentage of higher density residential, will change the sizing of the proposed lift stations.
3. The City should continue to seek ways to ensure sump pumps are never connected or remain disconnected after enforcement action from the sanitary sewer.
4. The City has a policy of requiring rear-yard drainage systems to prevent the development of chronically wet turf grass areas due to tight soils, dense lawns, irrigation, and builder/homeowner alterations that can affect drainage ways over time. The policy requires the provision of connections for sump pump systems to the drainage system. It is recommended this policy be retained and enforced. While intended primarily to benefit drainage, the sump connections offer the additional benefit of dis-incenting illicit connections of sump pumps to the sanitary system by homeowners fed up with wet yards. The inflow from illicit connections means clear water must be unnecessarily treated, raising costs and taking up capacity needed for wastewater. The inflow also is not metered at the house by the City, which would increase treatment costs yet not generate revenue to cover the costs incurred. The clear water does show up at the MCES meter for the City's wastewater flow and affects City charges.

B. ESTIMATED COSTS

1. The costs incurred to achieve these improvements should be borne by new development by application of the City's Sewer Trunk Fee. The fee should be updated and published annually in the City's Fee Schedule.
2. The trunk fee collected from new development on an area or unit basis as adopted by the Council is intended to offset sewer system investments made by the City to prepare for and/or accommodate new development. Trunk fees cover those costs that will be incurred by the development whether the lots or parcels develop. These are the "make-ready" costs.

The minimum fee recommended would recover oversizing of systems illustrated at a conceptual level in this report. At any time during implementation of this system there may be other factors affecting the trunk fee the City would charge in order to maintain a minimum projected fund balance and protect existing rate payers. These factors may include the development climate, debt service for past sewer investments, existing fund balances, or other factors. A "floor-level" trunk fee based on an estimate of the costs for the 2040 system in this report follows:

ESTIMATED COSTS	
ITEM	**COST**
Lift Stations	$1,760,000
Forcemain	$831,550
Power Generation	$400,000
Gravity Sewer Over-sizing	$2,126,644
Subtotal	$5,118,194
Price Contingency, Engineering & Administration	$1,791,368
Total	$6,909,562
Net Acreage Served	3,570
Approximate Cost Per Acre	**$1,935**

II. INTRODUCTION

A. Purpose of Study

The purpose of this study is to examine the wastewater collection system for the city. The study provides a layout of a future system required to serve the City as it grows. This layout is based on topography, constraints such as wetlands and highways, and planned land uses. The layout includes gravity pipes and lift stations with forcemains. The layout will be referenced to influence investment decisions as development occurs. The intention is to avoid under-building initial sewer facilities so they can be expanded in an efficient manner, avoiding the need to re-build them as the City grows. The layout offers a base of estimating the minimum cost the City will need to recover from development as it occurs.

The study also seeks to identify challenges the City may face related to wastewater collection and provide recommendations to meet these challenges.

The age and condition of individual elements in the collection system were not a part of this study. Conclusions and recommended priorities may have to be adjusted in the future if failures in the existing system occur or as development conditions or technology changes. Comprehensive televising, rating and consistently performing preventative maintenance of the sewers in the existing system could lessen the impact of these unexpected events.

III. BACKGROUND

A. Location

The City of Elko New Market is located approximately 30 miles south of Minneapolis and is bisected by CR 91/Natchez Avenue. Its northern boundary on the east side of CR 91 is approximately the Vermillion River headwaters (see Figure 1).

B. Flow Characteristics

A conceptual understanding of the flow characteristics of sanitary sewers is helpful to appropriately interpret the information in this report.

1. The vast majority of the time, sanitary sewers appear virtually unused, and the sewer is barely flowing.
2. However, given the normal patterns of human habitation, there is a consistency in the total volume of water used per person that is focused during a limited number of hours in the day.

3. In order avoid sewage backups into peoples' homes, sanitary sewers must be designed to accommodate this maximum peak rate of flow that occurs during that focused period each day.

4. The City first started installing a wastewater system in the 1980s, but most of the existing system has been constructed since 1990. The piping materials used have modern joints that are capable of resisting infiltration. Analysis presented in this study indicates; however, that direct inflow during large events and indirect inflow via illicit sump pump connections or undetected foundation drains is an issue of concern.

C. Topography of the Area

1. The unusual landforms that dominate the City of Elko New Market can be described as:

> *"Dead ice moraine" - It is a rugged landscape that formed as the last glaciers were melting at the end of the Ice Age, between about 12,000 and 9,000 years ago.....They are rough, boulder-strewn, and undrained. They do, however, include a lot of excellent rangeland and thousands of undrained depressions - lakes, ponds, and sloughs known collectively as prairie potholes - that serve as important nesting and feeding areas for waterfowl*. [1]

2. This landform presents unique challenges to the efficient and orderly collection of wastewater in that there are very few natural tributary flow patterns that could be described as being like the branches of a tree. Rather, the underlying dead ice moraine left numerous individual low pockets with intermediate high points that are fifty to seventy feet higher. This topography is a significant obstacle to the efficient use of gravity sewers to collect wastewater for treatment. The protocol to overcome these obstacles is:

    a) Analyze the natural tributary patterns that do exist to maximize the use of gravity sewers.
    b) This analysis will identify the locations of the "pockets" which can only be drained by either:
        (1) Extending deeper interceptor sewers through the intermediate high areas.
        (2) Constructing gravity sewers to deliver wastewater to lift stations that pump it through forcemains to the treatment plant or other drainage districts closer to the treatment plant.

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[1] Bluemle, John P.; North Dakota Geological Survey as described in *NORTH DAKOTA NOTES NO. 14* published on May 19, 2004 at http://www.state.nd.us/ndgs/ndnotes/ndn14_h.htm.

(3) Constructing pressure sewer systems where every home has a small lift station which pumps into a pressurized sewer system that eventually reaches the treatment plant. At this time, the use of pressurized sewer systems is limited for financial and maintenance reasons to special circumstances like around lakes or through historic districts. Therefore, little consideration was given to this option.

3. Superimposed on the drainage patterns are the potential developable and non-developable areas. Non-developable properties include:

a) Protected waters of the state.

b) Wetland areas that would require mitigation. Given that the first rule of mitigation is "avoidance", which is in conformity with the stormwater management plan, it is anticipated that little or no development will occur in these areas.

D. Sewer Routing

1. Five system constraints have a major influence on the ultimate sewer pattern to serve the City of Elko New Market. They are:

a) Vermillion River Corridor - Shared Goal #1 in the Southeast Comprehensive Plan Update is to: Protect and preserve the Vermillion River, and "exceptional" and "high quality" sites identified in the Natural Resource Inventory as unique and valuable state and regional resources. Therefore, it is recommended that a protective 100 to 200-foot natural buffer be maintained from the Vermillion River through the City.

b) Metropolitan Council Environmental Services (MCES) Interceptor Sewer – A Metropolitan Council interceptor sewer provides wastewater collection service to the Elko New Market area. The wastewater from Elko New Market is carried by this interceptor pipe to the MCES Empire WWTF for treatment. Flow from Elko New Market is metered for billing purposes downstream of the City's future service boundary. The interceptor will have service connections for the City of Elko New Market at seven (7) locations, as previously discussed.

c) Interstate 35 – The I-35 freeway runs north/south on the east side of the city. This influences the wastewater system in two ways:

(1) Development patterns are expected to focus commercial, industrial and high residential land uses on either side of the highway.

(2) The highway presents a physical barrier against the efficient routing of sanitary sewers and forcemains. The future system will largely rely upon the interceptor sewer that already provides a crossing of this freeway. This means; however, that what would appear on the map to be the "closest" available sewer may not offer the most effective route because of the high cost associated with boring or drilling under the freeway.

d) Development Pressure – The Twin City Metropolitan Area is gradually enveloping the City of Elko New Market. As such, developers will investigate sites, purchase property, establish development plans and approach the City for the extension of municipal services. These requests will come at times that are opportune to the developers. It may be difficult or impossible for the City to meet these requests in the developers' timeframes. It is also not possible to reliably predict when development requests will occur, or where.

E. Existing Facilities

1. Collection System - The existing wastewater collection system in the City of Elko New Market consists of sewers ranging in size from 8-inches to 18-inches and eight lift stations. The sewer locations, manhole and pipe sizes are shown on Figure 1.

	EXISTING PUMP STATIONS				
Service Area	**Commonly Used Name**	**Location**	**Discharges to:**	**Pumps/Voltages**	**Capacity**
LS #1	City Hall Lift Station	City Hall	MH approx. 600 LF west of CR 91 and CR 2; MH is behind curb	KSB 15hp, 1750rpm, 84 TDH/ 3ph. 124-215-124	350
LS #1A	Dakota Lift Station	CR 2 @ Dakota Ave	MH approx. 600 LF west of CR 91 and CR 2; MH is behind curb	KSB 28hp, 1750 rpm/3ph. 126-221-126	210
LS #1B	Carter Lift Station	Carter Street @ James Pkwy	MH approx. 250 ft west of Carter/James intersection on James Pkwy; in the future will discharge to MH in James Pkwy @ at Riley/James intersection	KSB 5 hp, 1750 rpm, 32 TDH 1ph 121	200
LS #2	Elko Downtown Lift Station	Main St. @ Chowen Ave	MH 3001 in CR 2 @ France Ave.	KSB, 10hp, 1750 rpm, 34 TDH/ 3ph. 123-214-123	200
LS #2A	Ptarmigan Lift Station	Ptarmigan Drive @ Woodcrest	MH 2001 in Xerxes Avenue, 210 LF northeast of Xerxes/Main intersection.	KSB, 10hp, 1750rpm 32 TDH/ 1ph 124	200
LS #4	Glenborough Lift Station	Glenborough @ Chowen	MH 3064 in Glenborough, 200 LF southeast of Stirling Court	Hydromatic, 7.5hp, 1750 rpm, 42 TDH/3ph. 121-121-121	200
	Boulder Heights Lift Station	275th St and Oxford Lane	Gravity system at Oxford Lane north of 275th	KSB, 6.5 hp, 1160 rpm, 24.2 ft TDH, 3ph 460V	100
	Public Works Lift Station	Public Works Campus	MCES Interceptor at CRs 91 and 2 intersection	KSB, 10 hp, 1100 rpm/3ph 126-126-126	500
LS #6	Oxford Lift Station	Beard Ave @ Oxford Ln	MH 4043 in Xerxes @ Beard Ave	KSB, 5 hp, 1750 rpm/3ph 282-283-282	110

a) Given the relatively young age of most of the collection system, no investigation or assessment of the materials or condition of these sewer lines was included in this study.

2. Subsurface Sewage Treatment Systems (SSTS) – Currently the City has approximately 73 SSTSs within the city limits, see Figure 1. Scott County is the regulative authority for administering ordinances related to SSTS permitting and inspections. There are no community systems within the City. Scott County has no point-of-sale compliance inspection requirement; however, inspections are triggered by certain building permits. Scott County officials estimate a third or more of systems in the City would not pass a compliance inspection.

3. Existing SSTSs will be connected to the municipal sanitary sewer system when these services become available or are made so by the City to address compliance issues or demand from the neighborhood. The City has established a policy for providing City sewer in the Woodcrest neighborhood, for example, where lots relatively undersized for SSTS, tight soils, and extensive tree cover are expected to make it infeasible for many parcels to replace SSTS systems as they age. Seven of the 42 homes in the neighborhood have already hooked up and forcemain is in place for several more to gain sewer availability by adding individual packaged pump stations at their properties.

IV. CONDUCT OF THIS STUDY

A. Standards

1. The Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers have developed a standard for wastewater facilities that is commonly referred to as Ten States Standards. The development of this study followed these standards.

B. Methods Employed

1. Two features determine the potential extension of an existing sewer.

a) The Elevation of the Existing Sewer Versus the Topography - Given the required slope for the sewer, there is established a gravity service area boundary. Properties beyond this boundary cannot be directly served with gravity sewers.

b) The Size and Grade of the Existing Sewers - These determine a maximum flow capacity that the existing system can carry.

2. Sanitary sewer service to areas beyond this gravity service boundary, can only be serviced by either:

a) Constructing a new interceptor sewer, or

b) Constructing lift stations and forcemains to pump the sewage, or

c) Constructing pressure sewer systems to transport the wastewater.

3. Existing Capacities

a) The driving energy of flow in a sanitary sewer is gravity. Therefore, the pipes must be laid on a grade (or slope) to force the flow. Slopes are expressed in percentage (%) and represent the number of feet of fall in 100 feet of length. i.e., a grade of 1.00% is one foot of fall in 100 horizontal feet.

b) The slope, together with the diameter and material type, are used to calculate the actual volume of flow that a full pipe can carry. Typically, this volume is expressed in cubic feet per second (cfs) or gallons per minute (gpm). This rate of flow is the actual capacity of the sewer line.

4. Required Capacities

a) The 2030 sewer plan relied on land use data from the Southeast Comprehensive Plan Update - Land Use Plan prepared by the City and Scott County. All areas were identified with an anticipated land use and density to model wastewater generation rates as follows:

(1) For areas that are already developed, actual lot counts were used. For undeveloped low-density residential areas, a 2.7 units per acre lot count was predicted.

(2) For areas designated as "mixed use" the distribution of land use is:

(a) Seventy percent - low density residential (2.7 units per acre).

(b) Twenty percent – high density residential (8 units per acre).

(c) Ten percent commercial / industrial.

(3) Commercial and industrially zoned areas - 1,000 gallons per acre per day. This is much more difficult to predict, since the character and size of specific occupants is unknown at this time. Further, the water use patterns of commercial and industrial property can easily change. For example, a warehouse could be replaced by a much larger user, resulting in a significantly higher flow. Therefore, any temptation to lessen the design standards could prove to be ill advised.

(4) Institutional use was predicted at the same rate as commercial.

(5) Recreational areas, cemeteries, ravines, escarpments, flood plain, and wetlands were not considered to contribute wastewater flow.

b) For the 2040 plan we reviewed effects of the land use plan proposed by the City for the 2040 Comprehensive Plan update. Our finding is that wastewater generation either stayed the same or was reduced. Where commercial or industrial uses replaced single family, the higher generation rate was offset by a reduced peaking factor. No changes in pipe sizes due to

land use changes were made. Our opinion is that the 2030 plan provided conservative pipe sizes that allow for increased density or other flexibility in development without unduly affecting minimum required trunk fees. The alignment, size, material, and depth of any future facility will need to consider this layout, but also the developments preceding and proposed at the time and other conditions present.

V. LAND USE / DESIGN FLOW

A. General

1. The rolling nature of the topography requires that the sanitary sewer system collection system make extensive use of lift stations and forcemains to service the area.

2. The land use of each sub-district for 2040 flow modeling is summarized in the Appendix. The 2040 plan's design flows* remain the basis for determining the necessary pipe sizing and lift station capacities for future improvements.

   * The flow rate numbers have been designed for purposes of sizing the City's sanitary sewer piping network for future development and may not represent the flows to be expected by the MCES.

3. For planning purposes, the city has been divided into nine service districts and those districts have been further divided into forty sub-districts, see Figure 2. Each sub-district is served by a lift station that pumps wastewater to a gravity sewer line. The lift stations are summarized in the following table:

LIFT STATION SUMMARY					
	Lift Station Number	**Lift Station Capacity (GPM)**	**Located in District:**	**Location**	**Discharges to:**
District	LS 1S-2	292	1S-2	Glenborough Dr./Chowen Ave.	Gravity sewer at Glenborough Dr./Stirling Ct.
	LS 1S-3	97	1S-3	Beard Ave./Oxford Ln.	Gravity sewer at Xerxes Ave./Beard Ave.
	LS 1S-4	174	1S-4	990' west of CR 91/Glenborough Dr.	Gravity sewer at CR 91/ Glenborough Dr.
	LS 1S-5	632	1S-5	1500' north of 275th St./CR 91 on CR 91	Gravity sewer at CR 91/ Glenborough Dr.
	LS 1S-6	201	1S-6	275th St./Oxford Ln.	Gravity sewer 525' west of 275th St./Oxford Ln. on 275th St.
	LS 1S-7	361	1S-7	1040' north of 280th St. on CR 91	Trunk gravity line 450' west of 275th/CR 91

LIFT STATION SUMMARY					
East	LS 5A-3	424	5A-3	460' west of Pillsbury Ave./270th St. on 270th St.	Gravity sewer line at Pillsbury Ave./270th St.
Elko	LS 2S-2	514	2S-2	Chowen Ave./Main St.	Trunk gravity line at 265th/Beard
	LS 2S-3	264	2S-3	Xerxes Ave./Ptarmigan Ave.	Trunk gravity line at Xerxes Ave./Ptarmigan Ave
New Market	LS NM-2	7048	NM-2	City Hall	Trunk gravity line 600' west of CR 91/CR 2; MH is behind curb
	LS NM-3	153	NM-3	320' north of Carter Ave./James Pkwy on Carter Ave.	Gravity sewer. 250' west of Carter/James intersection on James Pkwy
Southeast	LS 3S-2	4985	3S-2	1290' north of Logan Rd./280th St. on Logan Rd.	Trunk gravity line 2348' east of Thomas Ave./270th St. on 270th St.
	LS 3S-2A	Not Available	3S-2	1700' west of Pillsbury Ave./280th and 1855' south of 280th St.	1700' west of Pillsbury Ave./280th St. on 280th St.
	LS 3S-3	1576	3S-3	6250' south of Beard Ave./280th St.	Trunk gravity line 2630' south of Beard Ave./280th St.
	LS 3S-4	868	3S-4	2740' south of CR 91/280th St.	Trunk gravity line 4000' south of CR 91/280th St.
	LS 3S-5	229	3S-5	Thomas Ave./273rd St.	Trunk gravity line at Thomas Ave./270th St.
	LS 3S-6	1097	3S-6	9130' south of I35/280th St.	Trunk gravity line 7515' south of I35/280th St.
	LS 3S-7	465	3S-7	5700' south of 280th St. (CR 86)/CR 46 on CR 46	Trunk gravity line 4150' south of 280th St. (CR 86)/CR 46 on CR 46
	LS W-1	7000	W-1	CR2/Dakota Ave.	Trunk gravity line 600' west of CR 91 and CR 2; MH is behind curb
	LS W-2	694	W-2	2620' south of CR 2/Texas Ave. on Texas Ave.	Trunk gravity line 1480' east of CR 2/Texas Ave. on CR 2
West	LS W-3	236	W-3	880' north of CR 2/Texas Ave. on Texas Ave.	Trunk gravity line 1480' east of CR 2/Texas Ave. on CR 2
	LS W-5	368	W-5	Nevada Ave./255th St.	Gravity sewer at James Pkwy./Nevada Ave.
	LS W-6	5555	W-6	2200' west of CR 2/Texas Ave. on CR 2	Trunk gravity line 1480' east of CR 2/Texas Ave. on CR 2
	LS W-7	548	W-7	1870' south of Harvest Dr./Saxon Dr.	Gravity sewer at Harvest Dr./Cedric Lane
	LS W-8	1111	W-8	1830' north of CR 2/ Jonquil Ave.	Trunk gravity line at CR 2/Jonquil Ave.
	LS W-9	3534	W-9	4130' north of 280th St./Texas Ave. on Texas Ave.	Trunk gravity line at 5510' north of 280th St./Texas Ave. on Texas Ave.

LIFT STATION SUMMARY					
	LS W-10	1215	W-10	2050' west of 280th St./ Vernon Ave and 1450' south of 280th St.	Trunk gravity line 2050' west of 280th St./ Vernon Ave. on 280th St.
	LS W-11	854	W-11	730' west of 280th St./Vernon Ave. and 2650' south of 280th St.	Trunk gravity line 730' west of 280th St./Vernon Ave. and 1040' south of 280th St.
North	LS 4A-3	417	4A-3	950' east of 250th St/Dakota and 200' south of 250th St.	2600' east of 250th St/Dakota Ave. on 250th St.

4. The table below shows the population, household, employment and estimated wastewater flows projected by the Metropolitan Council through the year 2040.

Forecast of population, households, employment and wastewater flow:

Population, Housing, & Employment Sewer Allocation Forecasts				
Forecast Year	**Forecast Component**	**Population**	**Households**	**Employment**
2010	MCES Sewered	3849	1179	297
	ISTS/SSTS	261	80	20
2020	MCES Sewered	5887	1930	1610
	ISTS/SSTS	213	70	20
2030	MCES Sewered	8484	2989	1765
	ISTS/SSTS	116	41	15
2040	MCES Sewered	11868	4388	1925
	ISTS/SSTS	32	12	15

The 2040 population of 11,868 will all be located on the westerly side of I-35. No residential land use is proposed east of I-35 in that time frame. 2040 Employment is anticipated to consist of 1,635 jobs in areas west of I-35 and 290 jobs east of I-35. A breakdown of population and employment by connection point is not available. All computations related to wastewater generation for facility sizing purposes were focused on estimating average and peak flows based on land use and area in districts and subdistricts rather than computing population and employment.

VI. INFLOW AND INFILTRATION

A. Requirements and Standards for Minimizing Inflow and Infiltration

The City of Elko New Market disallows discharge from sump pumps, foundation drains, and/or rain leaders to the sanitary sewer system per City Code of Ordinances Title 9, Chapter 2, Section 5, Part G as follows:

Title 9, Chapter 2, Section 7, Sub-section 1, Part A also restricts clear water discharges to the sanitary system as follows:

A. Stormwater And Surface Water Runoff:

1. No person shall discharge or caused to be discharged any waters such as stormwater, groundwater, roof runoff, surface drainage or noncontact cooling water to any sanitary sewer.

2. Stormwater and all other unpolluted drainage shall be discharged to those sewers as are specifically designed as storm sewers or to a natural outlet approved by the city and other regulatory agencies. Industrial cooling water or unpolluted process waters may be discharged to a storm sewer or natural outlet on approval of the city and upon approval and the issuance of a discharge permit by the MPCA. (Elko 2004 Code § 51.080)

Title 9, Chapter 2, Section 10 provides the process for which violations and penalties are handled, including notice of the violation and corrections (disconnections) to be made and penalties for failure to comply:

A. Notice Of Violation: Any person found to be violating any provisions of this chapter, with the exception of article A of this chapter, shall be served by the city with written notice stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in the notice, permanently cease all violations.

B. Misdemeanor Violation; Penalty: Any person who shall continue any violation beyond the time limit provided in subsection A of this section shall be punished as provided in section 1-4-1 of this code. Each day in which any violation occurs shall be deemed as a separate offense.

C. Liability Of Violator; Costs Assessed:

1. Any person violating any of the provisions of this chapter, with the exception of article A of this chapter, shall become liable to the city for any expense, loss or damage occasioned by the city by reason of that violation. (Elko 2004 Code § 51.999)

2. In addition to any penalties that may be imposed for violation of any provision of this chapter, the city may assess against any person the cost of repairing or restoring sewers or associated facilities damaged as a result of the discharge of prohibited wastes by that person, and may collect the assessment as an additional charge for the use of the public sewer system or in any other manner deemed appropriate by the city. (Elko 2004 Code § 51.005)

D. Lien Provisions: Each and every sewer service charge levied by and pursuant to article A of this chapter is made a lien upon the lot or premises served, and all charges which are, on October 31 of each year, past due and delinquent shall be certified to the county auditor by November 29 for collection. Nothing in article A of this chapter shall be held or construed as in any way stopping or interfering with the right of the city to levy taxes or assessments against any premises affected any delinquent or past due sewer

B. Sources, Extent, and Significance of Existing Inflow and Infiltration

Residential Housing Stock Breakdown: Of Elko New Market's 1,547 homes, 108 were built prior to 1970. None of the older homes have been formally evaluated (beyond illicit connections noticed during meter servicing or other calls) for I/I susceptibility and repair since Elko New Market's public wastewater collection system was installed in the 1980s. Prior to that time homes had private SSTSs. Homes were reviewed for clear water discharge potential and necessary disconnects made when first connected to the new system. The City does not evaluate private systems for I and I potential until such time as these homes would hook up to the public system.

1. Measured/Estimated Clearwater Flow:

Quantification of Elko New Market I and I Based on MCES Metered Flow and City Wastewater Sales																			
	Annual MGal Sold	*Est. Daily Base Sanitary Flow from Sales*	*Annual Mgal Metered*	*Est. Annual I and I*	*I and I as a Percent of Metered*	*Annual Rain Total*	*Winter Ave Month Metered*	*Winter Ave Month Sold*	*Est. Monthly Dry Season I and I*	*Est. Daily Dry Season I and I*	*BSF and GWI Dates*	*Apparent Wet Season GWI from Meter Data*	*Average Dry Weather, Wet Season Flow*	*Est. Base Sanitary Flow from Meter Data*	*Est. Wet Season GWI from Metered and Sales*	*Peak Month*	*Peak Month Flow*	*Peak Month Inflow and Infiltration*
	MG	Mgd	MG	MG		Inches	MG	MG	MG	Mgd		Mgd	Mgd	Mgd	Mgd		MG	MG
2018	74.6	0.204384	91.2	16.6	18%	28.26	7.33	6.22	1.11	0.037	4/19 to 4/30	0.151	0.29	0.139	0.086	April	8.2	2.07
2019	75.0	0.205479	101.6	26.6	26%	50.15	8	6.25	1.75	0.058	3/19 to 3/30	0.144	0.27	0.126	0.065	May	9.82	3.66
2020	72.8	0.199452	98.6	25.8	26%	35.88	7.7	6.07	1.63	0.054	4/17 to 4/26	0.146	0.29	0.144	0.091	March	10.02	4.04

Examination of MCES records of flow and rainfall for 2018 through 2020, along with City wastewater sales (based on Dec.-Feb. water sales) resulted in the above table. Comparing spikes in daily flow to rainfall, it appears that significant inflow tends to only occur during and after rainfall events of about 1 inch or more. It is recommended the City observe low areas during heavy rains to try to identify any manholes that may be admitting surface runoff so those covers can be retrofit with chimney seals and appropriate lids to attempt to reduce these spikes.

While inflow appears to be a factor in large rain events, the lag between rainfall and peak flow for smaller events, the peaks from probable snow melt, and the multi-day decline in flows after rainfalls cease is an indication that rainfall is primarily infiltrating the soil and being drained by the sanitary system or illicit sump connections rather than flowing in from direct surface connections.

The oldest part of the City's collection system dates back to the late 1980's, with much of it installed by various developers in the late 1990's and early 2000's. The collection system consists of PVC piping with elastomeric joints – generally viewed as state of the art for resistance to infiltration. While it is probable that some leakage occurs in the collection system, Engineering and Public Works staff believes the illicit connection of sump pumps to the sanitary sewer system is more likely the major contributor to I and I in Elko New Market. Enforcement has not been effective because residents have no good alternative to dealing with sump discharges. Based on the level of drainage complaints received by staff, especially in wet years, we know there is little tolerance for chronically wet lawns from sumps. We think it is likely that discharges are redirected back to the sewer system post inspection.

The City has retrofitted a few of the worst areas with tile systems and connected sumps to discourage discharge to the sanitary system. The City is prepared to address more

neighborhoods as funding opportunities are identified or as residents might petition. It is also City policy to require tile systems in all new developments with connections for sump pumps for each lot unless they back onto a wetland or storm pond.

C. New Trunk Sewer Systems

The City Currently has five trunk sewers connected to the westerly end of the MCES interceptor; all five are at one connection point (#1 shown on Figure 2). Six more connection points are planned for the system (#2 - #7 shown on Figure 2). While the timing of connections is driven by development which in turn is driven by market forces, one connection at Dupont and 150th Street (#6) is tentatively planned for 2021. Another three- at Xerxes, Logan, and the west side of I-35 - would be anticipated prior to 2030 based on landowner preparations for Development that the City has been involved in. The connection northeast of the City (#7) is outside the City's 2040 planned growth area.

VII. SUMMARY

The topography, wetlands presence, interstate, and location of the Metropolitan Council's interceptor sewer all influence the ultimate configuration and sequence of construction of the wastewater collection system. The system will rely on 17 local and regional lift stations within the 2040 growth boundary, with forcemains to transport the wastewater to the MCES Interceptor or a gravity branch sewer. During the growth process, some lift stations will be interim to serve areas where gravity sewer may not yet be available. The areas served by this type of station will be served by future development of the gravity system, so interim designs should facilitate decommissioning of the interim lift station.

Eventually, when the entire system is developed the following will be a result:

1. Approximately 30 permanent lift stations and forcemains will be in use.
2. Seven locations where connections to the MCES interceptor have been provided as it was constructed as described below. MCES prefers connection at these locations; however, exceptions have historically been granted under certain circumstances in other communities. MCES approval would be required for any variance to the following points:
    a) #1: East side of CR 91, south of CR 2.
    b) #2: West side of Xerxes Avenue, south of CR 2.
    c) #3: East side of Newton Circle, north of CR 2.
    d) #4: West side of I-35, south of the Vermillion River.

e) #5: West side of I-35, north of the Vermillion River.

f) #6: East side of I-35, intersection of 250th St. & Dupont Avenue.

g) #7: East side of I-35, on CR 62 east of Pillsbury Avenue.

3. For areas designated as "mixed use" the distribution of land use is:

a) Seventy percent - low density residential (2.7 units per acre).

b) Twenty percent – high density residential (8 units per acre).

c) Ten percent commercial / industrial.

VIII. RECOMMENDATIONS

1. It is suggested that the City of Elko New Market periodically revisit this study to update the underlying assumptions and make such adjustments as are appropriate.
2. The characteristics of actual development such as density of residential, wet industry, percentage of higher density residential, will change the sizing of the proposed lift stations.
3. The City should continue to seek ways to ensure sump pumps remain disconnected from the sanitary sewer following sump pump inspections, including retrofitting sump pump discharge collection systems w/ rear yard drainage improvements in existing neighborhoods where they were not originally provided.
4. The City has a policy of requiring rear-yard drainage systems to prevent the development of chronically wet turf grass areas due to tight soils, dense lawns, irrigation, and builder/homeowner alterations that can affect drainage ways over time. The policy requires the provision of connections for sump pump systems to the drainage system. It is recommended this policy be retained and enforced. While intended primarily to benefit drainage, the sump connections offer the additional benefit of dis-incenting illicit connections of sump pumps to the sanitary system by homeowners fed up with wet yards. The inflow from illicit connections means clear water must be unnecessarily treated, raising costs and taking up capacity needed for wastewater. The inflow also is not metered at the house by the City, which would increase sewer bills and generate revenue to cover the costs incurred by the City for it. The clear water does show up at the MCES meter for the City's wastewater flow and affects City charges.

IX. ESTIMATED COSTS

A summary of costs and computation of minimum recommended trunk fee in 2018 dollars is provided in the Executive Summary at the beginning of this document.

Appendix A: Figure 1 – Existing Sanitary Sewer Map

CITY OF ELKO NEW MARKET
SMALL-TOWN CULTURE. EMERGING POSSIBILITIES.

2040 Comprehensive Plan

Elko New Market, MN

Figure 1 - Existing Sanitary Sewer System

February 2018

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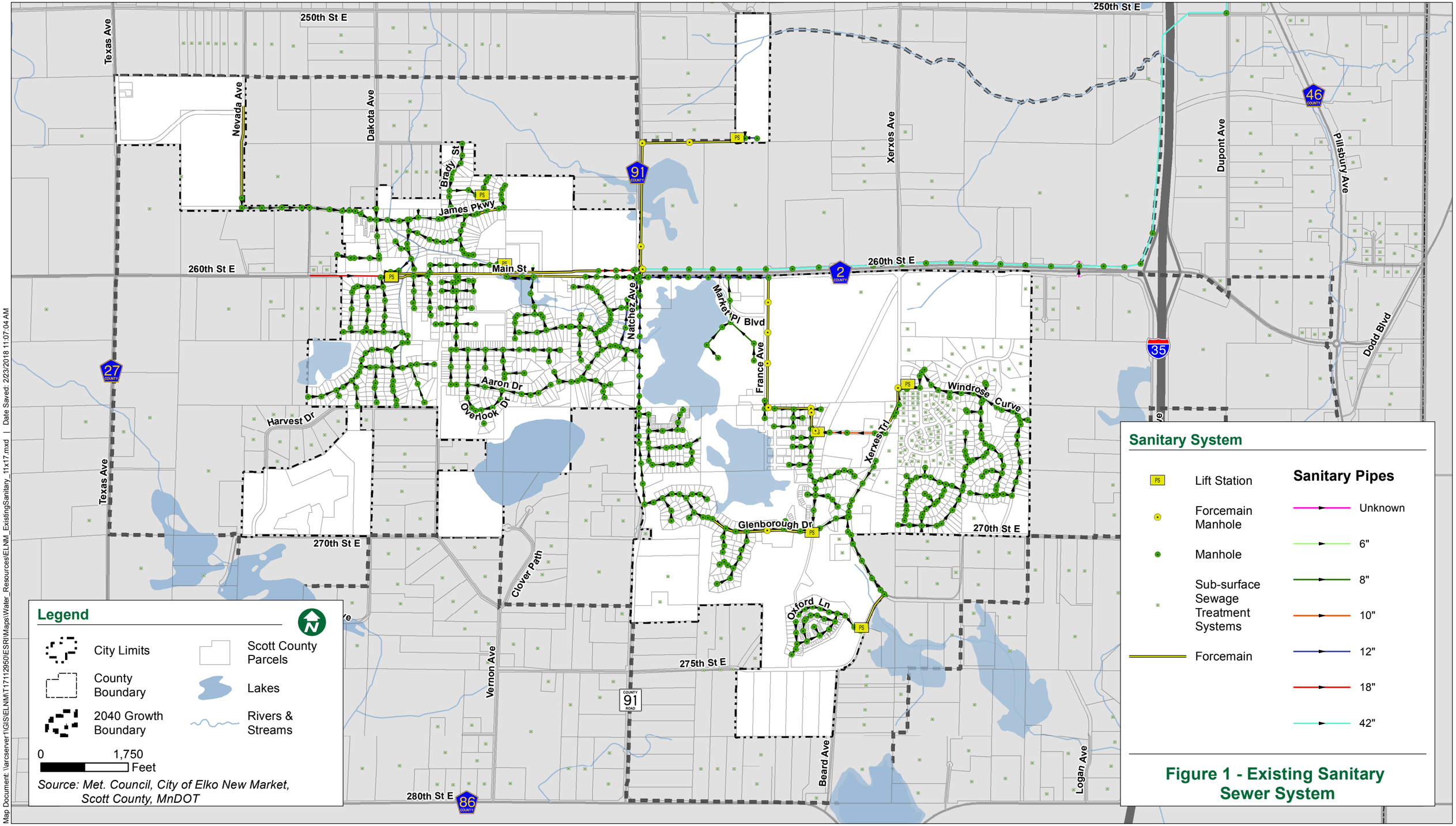
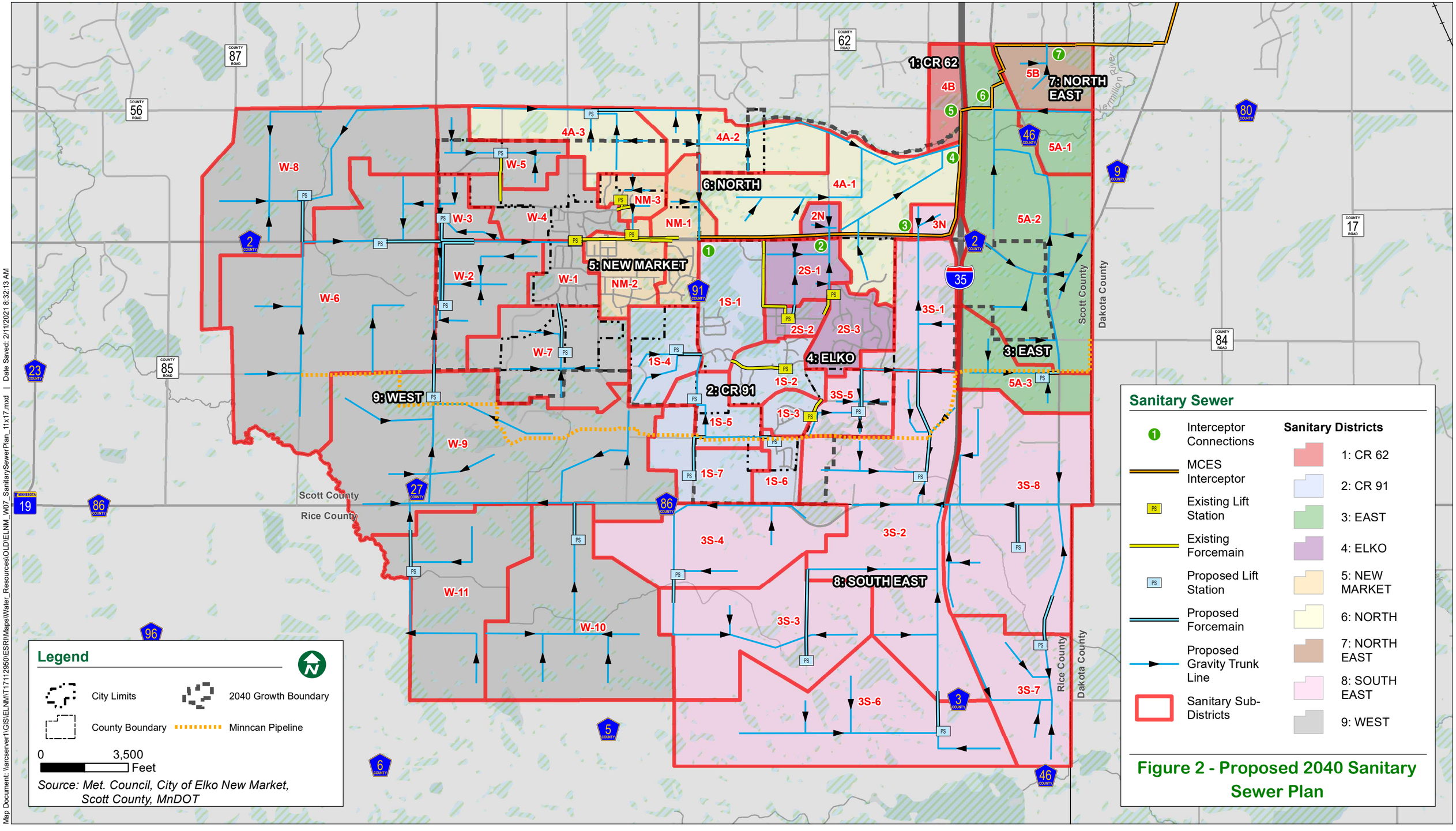


Map Document: \\arcserver1\GIS\ELNMT\17112950\ESRI\Maps\Water_Resources\ELNM_ExistingSanitary_11x17.mxd | Date Saved: 2/23/2018 11:07:04 AM

Appendix B: Figure 2 – Future Sanitary Sewer Map



Legend

- City Limits
- 2040 Growth Boundary
- County Boundary
- Minncan Pipeline

0 3,500 Feet

Source: Met. Council, City of Elko New Market, Scott County, MnDOT

Sanitary Sewer

- Interceptor Connections
- MCES Interceptor
- Existing Lift Station
- Existing Forcemain
- Proposed Lift Station
- Proposed Forcemain
- Proposed Gravity Trunk Line
- Sanitary Sub-Districts

Sanitary Districts

- 1: CR 62
- 2: CR 91
- 3: EAST
- 4: ELKO
- 5: NEW MARKET
- 6: NORTH
- 7: NORTH EAST
- 8: SOUTH EAST
- 9: WEST

Figure 2 - Proposed 2040 Sanitary Sewer Plan

Appendix C: Design Flow Tabulation

LAND USE / DESIGN FLOW (ULTIMATE POTENTIAL)										
District	Area	Total Area (Acres)	Wetland Area (Acres)	Residential – Low Density (Acres)	Mixed Use (Acres)	Comm/ Industrial (Acres)	Town Center (Acres)	Average flow (MGD)	Design Flow (MGD)	MCES Connection Point
West	W-3	95	4	0	55	0	0	0.085	0.31	1
	W-5	221	18	112	91	0	0	0.137	0.47	1
	W-7	490	74	416	0	0	0	0.208	0.69	1
	W-2	357	33	0	0	0	0	0.269	0.83	1
	W-4	305	38	68	68	0	9	0.196	0.59	1
	W-11	712	104	510	98	0	0	0.342	1.03	1
	W-8	934	111	706	116	0	64	0.456	1.32	1
	W-10	983	124	728	64	0	68	0.514	1.49	1
	W-9	1542	241	651	650	0	0	0.901	2.16	1
	W-6	1493	128	896	469	0	0	0.863	1.81	1
	W-1	137	23	8	1	0	0	0.060	0.13	1
CR-91	1S-3	77	9	0	0	0	0	0.034	0.13	1
	1S-4	226	100	126	0	0	0	0.063	0.23	1
	1S-6	105	3	46	57	0	0	0.073	0.27	1
	1S-2	180	38	212	0	0	0	0.071	0.25	1
	1S-7	253	33	162	58	0	0	0.133	0.45	1
	1S-5	175	17	157	0	0	0	0.079	0.24	1
	1S-1	377	133	39	0	28	8	0.191	0.55	1
New Market	NM-3	100	9	52	0	0	6	0.054	0.21	1
	NM-2	212	26	0	0	0	0	0.145	0.30	1
	NM-1	132	15	0	52	0	66	0.136	0.27	1
***Total to MCES connection point 1 =**									**12.02**	

LAND USE / DESIGN FLOW (ULTIMATE POTENTIAL)										
District	Area	Total Area (Acres)	Wetland Area (Acres)	Residential – Low Density (Acres)	Mixed Use (Acres)	Comm/ Industrial (Acres)	Town Center (Acres)	Average flow (MGD)	Design Flow (MGD)	MCES Connection Point
Elko	2N	49	3	0	33	13	0	0.042	0.16	2
	2S-3	196	8	28	0	0	0	0.094	0.34	2
	2S-2	75	13	14	0	0	13	0.057	0.19	2
	2S-1	179	18	38	98	9	17	0.139	0.40	2
***Total to MCES connection point 2 =**									**12.29**	
Southeast	3N	57	1	0	0	0	0	0.056	021	3
	3S-5	181	30	135	16	0	0	0.082	0.30	3
	3S-7	433	90	343	0	0	0	0.172	0.57	3
	3S-4	597	71	305	221	0	0	0.348	1.04	3
	3S-6	1041	140	901	0	0	0	0.451	1.31	3
	36-3	733	51	682	0	0	0	0.341	0.95	3
	3S-2	2264	375	956	467	221	0	1.347	2.96	3
	3S-1	324	48	106	87	18	0	0.208	.46	3
***Total to MCES connection point 3 =**									**17.53**	

LAND USE / DESIGN FLOW (ULTIMATE POTENTIAL)										
District	Area	Total Area (Acres)	Wetland Area (Acres)	Residential – Low Density (Acres)	Mixed Use (Acres)	Comm/ Industrial (Acres)	Town Center (Acres)	Average flow (MGD)	Design Flow (MGD)	MCES Connection Point
North	4A-3	341	36	305	0	0	0	0.153	0.52	4
	4A-2	328	27	18	283	0	0	0.260	0.78	4
	4A-1	741	129	0	400	0	18	0.562	1.46	4
***Total to MCES connection point 4 =**									**19.58**	
CR 62	4B	133	15	0	109	3	0	0.104	0.36	5
East	5A-1	141	33	0	108	0	0	0.095	0.34	6
	5A-3	261	24	141	97	0	0	0.157	0.53	6
	5A-2	1102	106	40	470	465	0	0.923	2.86	6
***Total to MCES connection point 6 =**									**21.20**	
Northeast	5B	216	47	0	87	83	0	0.159	0.54	7
***Total to MCES connection point 7 =**									**21.52**	

Appendix D: 2040 Trunk Sewer Design and Capacity Tabulation

TRUNK SEWER DESIGN 2040 PROJECTED MAX. DAILY FLOW AND CAPACITY INFORMATION

From Point	To Point	Design Flow (MGD)	Limiting Pipe	FM Size (in.)	Gravity Size (in.)	Slope (%)	Inlet Control Flow Rate (cfs)	Inlet Control (MGD)	Outlet Control Flow Rate (cfs)	Outlet Control (MGD)	Capacity (MGD)	Design Flow /Capacity by 2040
CR 91												
1S-1	**Interceptor**	1.01	Exist. Gravity		12	0.22	3.34	2.16	1.97	1.28	1.28	79%
1S-2	**1S-1**	0.42	Exist. FM	Ex 6	8	0.40	NA	NA	NA	NA	0.63	66%
1S-3	**1S-2**	0.14	Exist. FM	Ex 4	8	0.40	NA	NA	NA	NA	0.30	45%
1S-4	**1S-1**	0.15	Prop. FM	4	0	0.00	NA	NA	NA	NA	0.30	51%
1S-5	**Interceptor**	0.83	Prop. FM	8	15	0.15	NA	NA	NA	NA	1.13	74%
1S-6	**1S-5**	0.29	Prop. FM	4	8	0.40	NA	NA	NA	NA	0.30	98%
1S-7	**1S-5**	0.27	Prop. FM	6	8	0.40	NA	NA	NA	NA	0.63	42%
East												
5A-2	**Interceptor**	0.61	Prop. FM	8	21	0.10	NA	NA	NA	NA	1.10	56%
Elko												
2N	**Interceptor**	0.17	Prop. Gravity	--	8	0.40	1.21	0.78	0.90	0.58	0.58	29%
2S-1	**Interceptor**	1.50	Prop. Gravity	--	15	0.15	5.83	3.77	2.96	1.91	1.91	78%
2S-2	**2S-1**	0.74	Prop. Gravity	Ex 6	10	0.28	2.12	1.37	1.37	0.89	0.89	84%
2S-3	**2S-1**	0.38	Exist. Gravity	Ex 6	8	0.40	1.21	0.78	0.90	0.58	0.58	64%
North												
4A-1	**Interceptor**	2.36	Prop. Gravity	--	21	0.1	13.53	8.74	5.92	3.83	3.83	62%
4A-2	**4A-1**	0.59	Prop. Gravity	--	16	0.14	5.83	3.77	3.39	2.19	2.19	27%
4A-3	**4A-2**	0.17	Prop. Fm	8	8	0.40	NA	NA	NA	NA	1.10	16%
New Market												
NM-1	**Interceptor**	1.36	Exist. Gravity	Ex 12, Ex 6	18	0.400	9.20	5.94	7.85	5.07	5.07	27%
NM-2	**NM-1**	0.56	Exist. Gravity	Ex 12, Ex 6	8	0.4	1.21	0.78	0.90	0.58	0.58	97%
NM-3	**NM-1**	0.22	Prop. Gravity	--	8	0.40	1.21	0.78	0.90	0.58	0.58	37%
Southeast												
3N	**Interceptor**	0.22	Prop. Gravity	--	8	0.40	1.21	0.78	0.90	0.58	0.58	38%
3S-1	**Interceptor**	1.00	Prop. Gravity	--	36	0.046	52.06	33.63	16.91	10.92	10.92	9%
3S-5	**3S-1**	0.25	Prop. FM	6	8	0.4	NA	NA	NA	NA	0.63	39%
West												
W-1	**Interceptor**	2.98	Prop. FM	14	24	1.500	NA	NA	NA	NA	3.50	85%
W-2	**W-1**	1.27	Prop. FM	10	8	4.500	NA	NA	NA	NA	1.80	71%
W-3	**W-2**	0.34	Prop. FM	20, 12 & 6	24	5.500	NA	NA	NA	NA	0.60	56%
W-4	**W-1**	1.20	Exist. Gravity	Ex 12	12	0.200	3.34	2.16	1.88	1.22	1.22	98%
W-5	**W-4**	0.53	Exist. FM	6	8	0.40	NA	NA	NA	NA	0.63	85%
W-7	W-1	0.71	Prop. FM	8	12	0.22	NA	NA	NA	NA	1.10	65%

Subdistricts highlighted are partially outside the 2040 growth boundary. Figures in these rows reflect only growth inside the 2040 and neglect areas outside the boundary.