Addendum No. 1 to the 2018 Water & Wastewater Technical Memorandum SID #5 – Cass County, Nebraska

PRELIMINARY DRAFT

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ADDENDUM #1
TO THE
2018 WATER & WASTEWATER TECHNICAL MEMORANDUM
SID #5 – CASS COUNTY, NEBRASKA

1 Introduction

The purpose of this technical memorandum is to provide an update to the 2018 Water and Wastewater Technical Memorandum dated July 2018. The update is focused on water supply alternatives, particularly around the recent regulatory changes regarding manganese. This addendum will identify and propose various alternatives as deemed necessary for both the water system. Opinions of costs for the proposed improvements will also be included. Upon the determination of these costs, the potential impact on average monthly user rates will be evaluated.

2 Community Background

Buccaneer Bay is a private community located two miles west of U.S. Highway 75. Buccaneer Bay's water and wastewater system currently services 475 connections (users).

3 Public Utility – Water System

3.1 Projected Water Use

The July 2018 report outlines the following projected water demands:

Table 3-1: Projected Water Demands

Scenario	Demand (gal per day)	Demand (GPM)
Average Day	125,000 gpd	86 gpm
Max Day	372,000 gpd	258 gpm
Peak Hour	-	347 gpm

For any water treatment plant (WTP) alternatives, the WTP will be design to supply the max day demands over a 20 hour period to allow for backwash cycles. The WTP design flow is then 24 hrs / 20 hrs * 258 gpm, or approximately 310 gpm.

3.2 Manganese Regulation

In 1987, the U.S. Environmental Protection Agency established unregulated secondary drinking water standards for manganese - .05 mg/L. The purpose of these standards is to assist communities in eliminating the problems caused by these elements. These standards are considered to be threshold values. When these values are exceeded, manganese may cause problems in the drinking water and distribution system.

In 2004, The EPA issued a health advisory to guide communities which may be exposed to drinking water contaminated with high manganese concentrations. This advisory does not mandate a standard for action, rather it provides practical guidelines for addressing manganese contamination.

Manganese is an essential nutrient for humans found in many foods. However, the EPA has determined chronic exposure to high levels of manganese in drinking water may cause negative health effects. Adults drinking water with high levels of manganese may develop impacts to the nervous system and behavioral changes. Infants are particularly at risk because exposure to high manganese levels may cause learning and behavioral problems.

The acute advisory level for infants has been established at 0.3 mg/L for no more than a total of 10 days per year. For adults, the advisory level is established at 1.0 mg/L for no more than 10 days per year. For the general population, an additional chronic advisory level has been set at 0.3 mg/L for long-term exposure.

The EPA is in the process of considering whether to regulate manganese as a primary contaminant through the UCMR4 regulations. Sampling for manganese and other contaminants is expected to continue through 2020.

3.3 Water Quality

The following water quality results are a compilation of results taken in September and October 2019. Due to levels of manganese greater than the advisory level of 0.30 mg/L, the SID had Well 74-1 put on standby status in September 2019. This leaves the SID with one operation well, as Well 93-1 is already in emergency status. The full water quality results are included within the Appendix for review.

Table 3-2: Water Quality Analysis

Analysis	Unit	Well 74-1	Well 93-1	Well 2011-1	EPA Limits/Guidelines	
Alkalinity	mg $CaCO_3$/L	258*	-	274*	-	
Arsenic	ug/L	6.0*	15.7	2.0*	10	MCL
Chloride	mg/L	47	46	24	250	SMCL
Fluoride	mg/L	0.3	0.3	0.2	4	MCL
Hardness	mg $CaCO_3$/L	210.3	10.1	19.5	300	Caution
Nitrate	mg/L	N.D.**	N.D.	4.4	10	MCL
pH	Std Units	7.28	7.25	6.87	6.5-8.5	SMCL
Potassium	mg/L	7.07*	-	3.26*	-	
Silicon	mg/L	14.53*	-	13.53*	-	
Sulfate	mg/L	27	13	27	250	SMCL
Total Calcium	mg/L	64.4*	50.6	97.8*	80	Caution
Total Dissolved Solids	mg/L	406	370	436	500	SMCL
Total Iron	mg/L	0.08	2.15	N.D.	0.3	SMCL
Total Manganese	mg/L	0.654	1.94	0.028	0.05	SMCL
Total Magnesium	mg/L	12.1	11.4	21.6	30	Caution
Total Sodium	mg/L	48.5	39.6	16.6	100	Caution

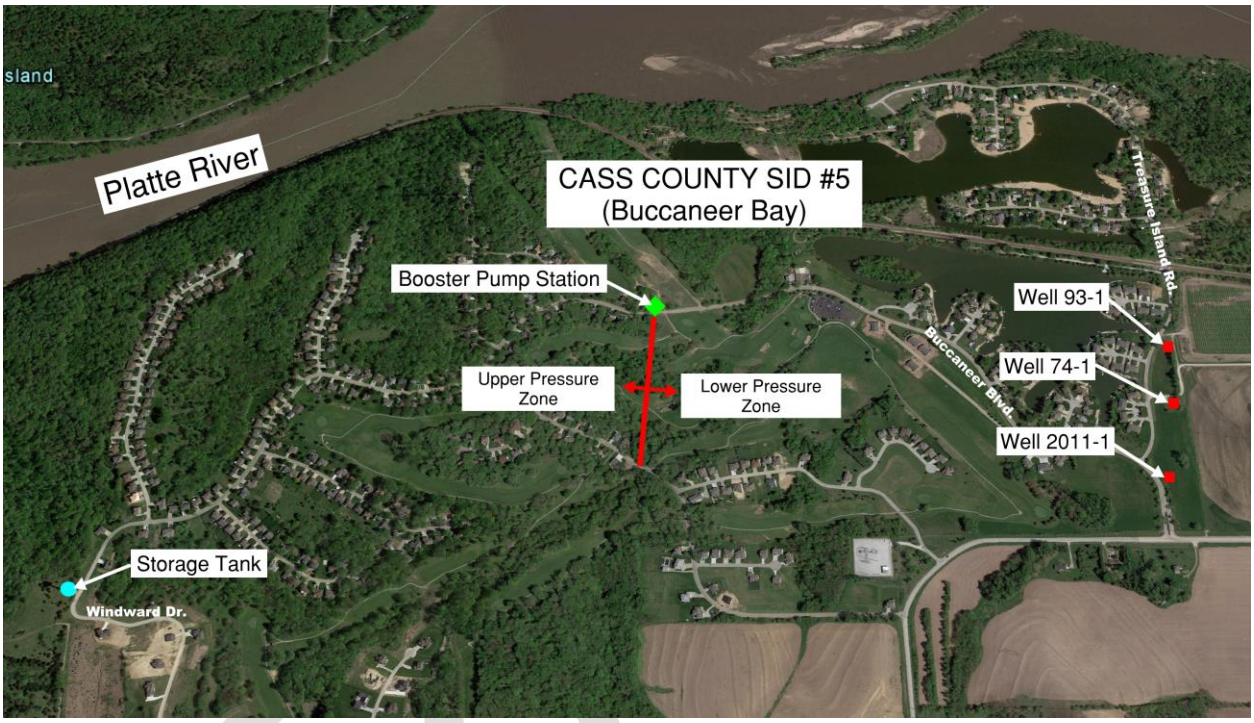
*From 2018 Report; Not tested in September 2019

**N.D. = Non-detect

3.4 Water Supply

The SID's water system consists of three groundwater wells. The locations of these wells can be viewed within **Figure 3-1,** following.

Figure 3-1: Water System Map



The current pumping capacities of the wells are shown in the following table.

Table 3-3: Well Pumping Capacities

Well	Current Pumping Capacity (gpm)
Well 74-1	1,000
Well 93-1	1,000
Well 2011-1	650

3.5 Evaluation of Public Water System

The wells are arranged in a line moving away from the Platte River with Well 93-1 closest to the river, Well 2011-1 furthest from the river, and Well 74-1 located between. As shown in the water quality analysis, the quality of the water is better the further the well is from the Platte River, however, screen lengths become limited as the total formation depth decreases. This becomes a factor when the depth to top of screen is less than 50 feet, which would trigger Ground Water Under the Direct Influence of surface water (GWUDI) regulations. None of the SID's wells are classified as GWUDI, and all have screen depths greater than 50 feet.

4 Public Utility Sanitary Sewer System

As presented in the 2018 Report, the existing WWTF is undersized compared to the projected peak flows. A new WTP would be expected to have 5%-20% waste residuals from backwash water, or 6,250 to 12,500 gpd on an average day or 19,000 to 38,000 gpd on a maximum day. These backwash waste volumes will increase the flows to the WWTF.

5 Improvement Alternatives

5.1 Water System Improvements

In addition to the alternatives presented in the 2018 Report, the following additional alternatives are presented to assist the SID in provided quality water to its users.

5.1.6 Well Blending & Controls Improvements

An alternative to reduce the manganese concentrations below the advisory level of 0.30 mg/L is to blend the high levels (Well 74-1) with the low levels (Well 2011-1). This will lower the blended concentration but does not help with the redundancy requirements. If Well 2011-1 was taken offline, then Well 74-1 would be unable to supply water to the system without exceeding the advisory level of 0.30 mg/L.

At flow rates of 250 gpm (Well 74-1) and 750 gpm (Well 2011-1), for a total flow rate of 1,000 gpm, the approximate blended manganese concentration would be approximately 0.18 mg/L. It is recommended to target a blended concentration of 0.20 mg/L since actual flow rates and concentrations may vary.

The cost for upgrading the controls for the two wells to allow for remote access and readout of the well operations is estimated at $75,000-$100,000. This alternative is identical in scope to Alternative 5.1.5 presented in the 2018 Report.

It is not recommended to pursue this alternative since the system will not have redundancy within its water source, and water will not meet secondary standards.

5.1.7 New Platte River Well

Per DHHS Standards, any new well must be located 1,000’ feet from any other well, whether domestic, municipal, irrigation, or other. A variance to this requirement may be requested. In the case of the SID’s wells, there are a few areas near the existing wells that are 1,000 feet from all wells except the existing wells. Additional drawdown and recovery testing will need to be performed on the existing wells to determine the influence they have on each other. Based on the test hole test pumping during the design of the 2011 supply well, it is expected that the recovery rate is quick enough to allow for close installation. The areas shown in the figure below are all potential areas for a fourth well. Since the location is north of Well 2011-1 and south of 74-1, it is unknown what the manganese content of a new well would be. At least 1 test hole in each of these locations should be constructed along with

water quality sampling to determine the presence or absence of iron, manganese, arsenic, and nitrate.

Table 5-1: Opinion of Probable Cost for New Platte River Well

ESTIMATE OF QUANTITIES					
Item	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total**
TEST WELL PROGRAM					
1.	Mobilization, Bonding and Insurance	LS	1	$5,500.00	$5,500
2.	Test Well	LS	2	$20,000.00	$40,000
3.	Step Drawdown and Constant Rate Pump Testing	HOUR	24	$85.00	$2,040
4.	Basic Water Quality Testing	EA	1	$750.00	$750
5.	Full Panel Water Quality Testing	EA	1	$6,500.00	$6,500
				Construction Subtotal Group A	$54,790
				Contingency 10%	$5,480
				Total Opinion of Construction Cost – Test Well Program	**$60,270**
NEW WATER SUPPLY WELL					
1.	Mobilization, Bonding and Insurance	LS	1	$15,000.00	$15,000
2.	Convert Test Well to Monitoring Well	EA	2	$2,500.00	$5,000
3.	Drill 19" Borehole	VF	100	$60.00	$6,000
4.	12" PVC Casing	LF	60	$65.00	$3,900
5.	12" SS Screen (20 Slot)	VF	40	$230.00	$9,200
6.	Gravel Pack	LS	1	$2,500.00	$2,500
7.	Bentonite, Grout, Develop & Disinfect Well	EA	1	$10,000.00	$10,000
8.	Plumbness and Alignment Test	EA	1	$1,000.00	$1,000
9.	Water Quality Testing (NE)	LS	1	$6,500.00	$6,500
10.	Pitless Adapter Unit, Complete	EA	1	$20,000.00	$20,000
11.	Submersible Pump, Motor, Drop Pipe, Check Valve, etc., Complete	LS	1	$25,000.00	$25,000
12.	Level Transducer and Air Line, Complete	LS	1	$2,500.00	$2,500
13.	Electrical Equipment & Controls	LS	1	$50,000.00	$50,000
14.	Valve Vault & Valves	LS	1	$30,000.00	$30,000
15.	Site Grading, Erosion Control, & Seeding	LS	1	$20,000.00	$20,000
16.	6" PVC Water Main, DR 18	LF	250	$40.00	$10,000
				Construction Subtotal Group B	$216,600
				Contingency 10%	$21,660
				Total Opinion of Construction Cost – New Supply Wel	**$238,260**

	Construction Subtotal - All Groups	$271,390
	Contingency	$27,140
	Total Opinion of Construction Cost - All Groups	**$298,530**
PROFESSIONAL SERVICES		
1.	Overhead (Legal, Fiscal, Engineering, Survey, Architecture, Etc.) 25%	$74,630
	Subtotal Professional Services	$74,630
	Total Opinion of Project Cost	**$373,160**

5.1.8 New Water Treatment Plant

This alternative will explore the cost for the construction of a new Water Treatment Plant for the removal of iron, manganese, and possibly arsenic.

A pressure filter water treatment plant consists of a new water treatment plant building, four pressure filters to meet redundancy requirements. Also included are two high service pumps, chemical feed systems, back-up power generator system, and other miscellaneous appurtenances. The filtration facility is proposed to be constructed at the location of the existing wells.

This alternative would use Wells 74-1 and 2011-1 to supply raw water to the plant.

In the system, chlorine or permanganate is added to the raw water to oxidize the iron and manganese. The raw water is then pumped through the pressure filters to filter out the particulates. The water flows through the pressure filters into the system. Additionally, a chlorination system would also be installed inside the water treatment facility to disinfect the water supply.

Over time the filter media will build up solids and thus must be cleaned through a process called backwashing. The backwashing process uses treated water to clean the filter media and remove accumulated solids. The backwash waste exits the units as solids-laden water is collected in a sump pit and drains into the sanitary sewer. Significant sanitary sewer improvements are necessary to properly dispose the backwash discharge. The treatment process will result in a waste stream of approximately 5-10% of the total amount of treated water, up to 38,000 gallons per day. Opinion of cost for a backwash lift station and force main is included in this alternative. The backwash waste will require the construction of a third SBR basin to accommodate the additional hydraulic loading.

The filters are preliminarily sized for 600 gpm and consist of three (3) 9.5’ diameter pressure filters.

A new filter treatment plant will increase the operations and maintenance costs for the SID. While the filter plant will be integrated into the WWTF controls system, regular

testing and sampling will be required at the WTP. The estimated annual cost increase due to operator labor, electrical usage, and chemical usage is approximately $15,000. The opinion of cost below assumes the construction of a new high pressure line to the high pressure zone, though it would be feasible to construct the WTP and renovate the booster station, tying the operations together (as it is currently with the wells and booster station).

Table 5-2: Opinion of Probable Cost for New Pressure Filter WTP

ESTIMATE OF QUANTITIES					
Item	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total**
CONSTRUCT PRESSURE FILTER WATER TREATMENT FACILITY					
1.	Mobilization	LS	1	$185,000.00	$185,000
2.	Site Work	LS	1	$35,000.00	$35,000
3.	Block WTP Building	SF	1,400	$200.00	$280,000
4.	Pressure Filter Units	LS	1	$540,000.00	$540,000
5.	Filter Unit Installation	LS	1	$100,000.00	$100,000
6.	Finished Water Clearwell	EA	1	$50,000.00	$50,000
7.	High Service Pumps	EA	2	$20,000.00	$40,000
8.	Process Piping	LS	1	$80,000.00	$80,000
9.	Valves and Flow Meters	LS	1	$50,000.00	$50,000
10.	Chemical Feed Equipment	LS	1	$100,000.00	$100,000
11.	HVAC	LS	1	$45,000.00	$45,000
12.	Building Plumbing	LS	1	$50,000.00	$50,000
13.	Electrical Improvements	LS	1	$150,000.00	$150,000
14.	Controls Improvements	LS	1	$85,000.00	$85,000
15.	Generator and Automatic Transfer Switch	EA	1	$125,000.00	$125,000
16.	Backwash Detention Tank	LS	1	$50,000.00	$50,000
17.	Water Main	LF	200	$40.00	$8,000
18.	Replace Well Pumps (2011-1 and 74-1)	EA	2	$25,000.00	$50,000
				Construction Subtotal Base Bid	$2,023,000
				Contingency 10%	$202,300
				Total Opinion of Construction Cost	**$2,225,300**
PROFESSIONAL SERVICES					
1.	Overhead (Legal, Fiscal, Engineering, Survey, Architecture, Etc.)			25%	$556,330
				Subtotal Professional Services	$556,330
				Total Opinion of WTP Project Cost	**$2,781,630**

5.1.9 Connection to MUD (Highway 75)

The cost for 10,000 LF of 8" PVC pipe, 2 – 300 LF bores, misc. valves and appurtenances, new meter pit and connecting to the SID's water system at the location of the existing Well 2011-1 is approximately $950,000 to $1,050,000.

This cost estimate does not include any costs for connection fees. Ongoing costs to purchase water from MUD are also not included.

MUD uses chloramines to disinfect the water within the system. The SID currently uses chlorine. Adjustment to the chemical feed system will be evaluated, and operations adjusted accordingly. At this time, no cost has been associated with this effort.

Table 5-3: Opinion of Probable Cost for Pipeline to MUD

ESTIMATE OF QUANTITIES					
Item	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total**
CONNECT TO MUD					
1.	Mobilization, Bonding and Insurance	LS	1	$60,000.00	$60,000
2.	8" PVC Water Main, DR 18	LF	9,400	$40.00	$376,000
3.	8" PVC Water Main, DR 18, RJ, Directionally Bored	LF	600	$150.00	$90,000
4.	8" Gate Valve and Box, MJ	EA	10	$1,750.00	$17,500
5.	Mechanical Joint Fittings	LS	1	$25,000.00	$25,000
6.	6" Fire Hydrant Assembly	EA	4	$4,500.00	$18,000
7.	Connect to Existing Water Main	EA	2	$2,500.00	$5,000
8.	Leak Detection Manhole	LS	1	$15,000.00	$15,000
9.	Meter Pit with PRV	LS	1	$30,000.00	$30,000
10.	Pavement Replacement	LS	1	$40,000.00	$40,000
11.	Erosion Control	LS	1	$15,000.00	$15,000
12.	Seeding	LS	1	$10,000.00	$10,000
13.	Convert Wells to Emergency Status	EA	3	$10,000.00	$30,000
			Construction Subtotal	Base Bid	$731,500
			Contingency	10%	$73,150
			Total Opinion of Construction Cost		**$804,650**
PROFESSIONAL SERVICES					
1.	Overhead (Legal, Fiscal, Engineering, Survey, Architecture, Etc.)			25%	$201,160
				Subtotal Professional Services	$201,160
				Total Opinion of Project Cost	**$1,005,810**

5.1.10 Connection to Cass County RWD #2

A connection to Cass County RWD #2 is feasible in a few different configurations. The SID could obtain water from Cass County RWD #2 (RWD) as their primary source of water, convert Well 2011-1 to emergency status, and abandon Wells 93-1 and 74-1. A second alternative is to keep Well 2011-1 as a primary source of drinking water for the community and connect to the RWD as a backup source of water, since no backup well is available. Wells 74-1 and 93-1 could be abandoned or kept on emergency status.

The connection to the RWD would be located at the at the existing RWD well located east of Fourmile Creek. The RWD connection at that location as a hydraulic grade line (HGL) of approximately 1305', adequate to supply the high pressure zone of Buccanner Bay (HGL = 1260). The connection to the RWD will be after the chlorination station, and no chemical addition will be required. The capacity of the RWD to supply 350 gpm to Buccaneer Bay is unknown at this time and can be determined through further conversations with the RWD.

An 8" main is recommended to allow the SID wells to supply water to the RWD system without excessive headlosses. The cost for constructing 2,500 LF of 8" water main, new meter pit, 300 LF bore under Fourmile Creek, and connecting to the existing RWD system is shown in the following table.

Table 5-4: Opinion of Probable Cost for Pipeline to RWD

ESTIMATE OF QUANTITIES					
Item	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total**
CONNECT TO CASS COUNTY RWD					
1.	Mobilization, Bonding and Insurance	LS	1	$100,000.00	$100,000
2.	8" PVC Water Main, DR 18	LF	2,200	$40.00	$88,000
3.	8" PVC Water Main, DR 18, RJ, Directionally Bored	LF	300	$150.00	$45,000
4.	8" Gate Valve and Box, MJ	EA	3	$1,750.00	$5,250
5.	Mechanical Joint Fittings	LS	1	$15,000.00	$15,000
6.	6" Fire Hydrant Assembly	EA	2	$4,500.00	$9,000
7.	Connect to Existing Water Main	EA	4	$2,500.00	$10,000
8.	Leak Detection Manhole	LS	1	$15,000.00	$15,000
9.	Meter Pit with PRV	LS	1	$30,000.00	$30,000
10.	Pavement Replacement	LS	1	$50,000.00	$50,000
11.	Erosion Control	LS	1	$15,000.00	$15,000
12.	Seeding	LS	1	$15,000.00	$15,000
13.	Abandon Well 93-1	EA	1	$5,000.00	$5,000
14.	Modify Well 2011-1	LS	1	$45,000.00	$45,000
15.	Convert Well 74-1 to Emergency Status	LS	1	$10,000.00	$10,000
16.	8" PVC Water Main, DR 18	LF	3,800	$40.00	$152,000
17.	8" PVC Water Main, DR 18, RJ, Directionally Bored	LF	500	$150.00	$75,000
18.	8" Gate Valve and Box, MJ	EA	2	$1,750.00	$3,500
19.	Mechanical Joint Fittings	LS	1	$15,000.00	$15,000
20.	6" Fire Hydrant Assembly	EA	2	$4,500.00	$9,000
21.	New 6" PRV & Bypass Line	LS	1	$15,000.00	$15,000
22.	Abandon Existing Booster Station	LS	1	$5,000.00	$5,000
			Construction Subtotal	Base Bid	$731,750
			Contingency	10%	$73,180
			Total Opinion of Construction Cost		**$711,430**
PROFESSIONAL SERVICES					
1.	Overhead (Legal, Fiscal, Engineering, Survey, Architecture, Etc.)			25%	$201,230
				Subtotal Professional Services	$201,230
				Total Opinion of Project Cost	**$1,006,160**

5.2 Sanitary Sewer Improvements

It was identified in the 2018 report that the capacity of the WWTF is limited by the effluent pumps and ISAM basins. These are undersized by 19,000 and 14,000 GPD at projected peak day flows. Alternative 5.2.1 – ISAM Expansion would increase the capacity of the WWTF to

180,000 GPD, enough to accommodate the projected peak day flows (139,000 GPD) plus additional WWTF backwash flows (up to 38,000 GPD). It is recommended to include a backwash storage tank to meter out the backwash flows to the WWTF. The costs for a 60,000 gallon detention tank have been included in the WTP alternative.