

NORTHEAST SALT CREEK BASIN

20.1 NORTHEAST SALT CREEK TRUNK SEWER SYSTEM

The Northeast Salt Creek drainage basin is shown in Figure 20.1, and includes Tier I, Tier II, and Tier III growth areas. Shown in Table 20.1 are the existing and planned service areas that were used to determine the flows for the different modeling scenarios. The total area of the basin is approximately 17,056 acres, of which 3,339 acres is not developable as summarized in Table 20.2.

Basin	Existing		Existing and Tier I		Existing and Tiers I & II		Existing and Tiers I, II & III	
	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)	Area (ac)	Flow (cfs)
Northeast Salt Creek	264	2.29	2,610	17.17	4,213	26.34	13,717	76.38

1. Based on Information Provided by LWWS.
2. Areas as of July, 2006

Name	Area (acres)	Percent of Basin (%)
Biosolids Injection Site	374	2.2
Northeast WWTF Site	181	1.1
Landfill - Existing	779	4.6
Landfill - Abandoned	980	5.7
Environmentally Sensitive Area	720	4.2
Total	3,339	19.6

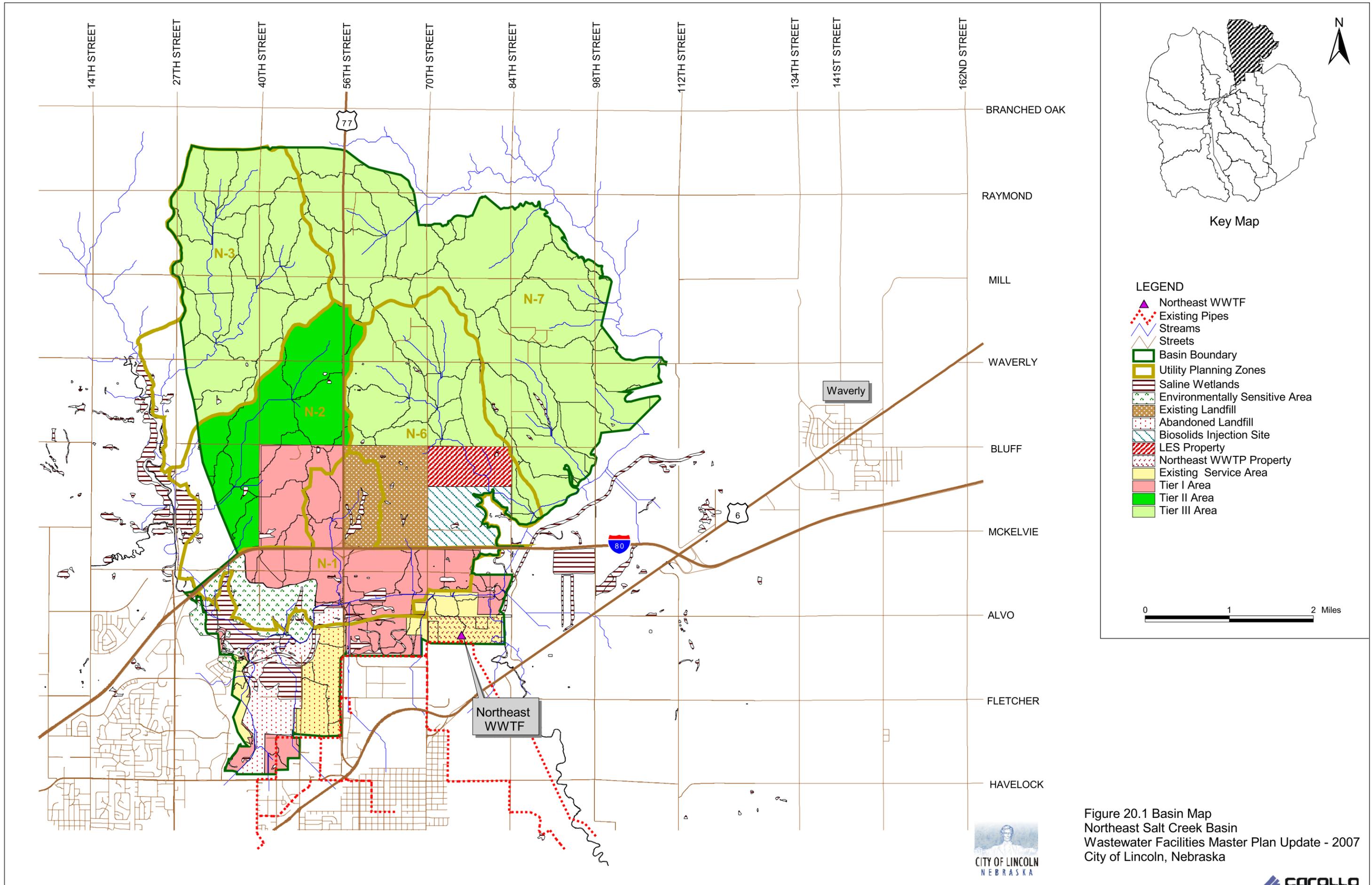


Figure 20.1 Basin Map
 Northeast Salt Creek Basin
 Wastewater Facilities Master Plan Update - 2007
 City of Lincoln, Nebraska



20.1.1 Modeling Results

The modeling results for the scenarios discussed in this Chapter are located in Appendix D.

20.1.2 Existing Conditions

As shown in Table 20.1, the Northeast Salt Creek basin currently contributes 2.29 cfs of sanitary flow to Northeast WWTF. This corresponds to a service area of approximately 264 acres. This flow was added to the Deadmans Run sewer system. The model results show that the Deadmans Run system has enough capacity to convey the existing Northeast Salt Creek sanitary flow and therefore no improvements are recommended to the Deadmans Run Trunk Sewer system at this time.

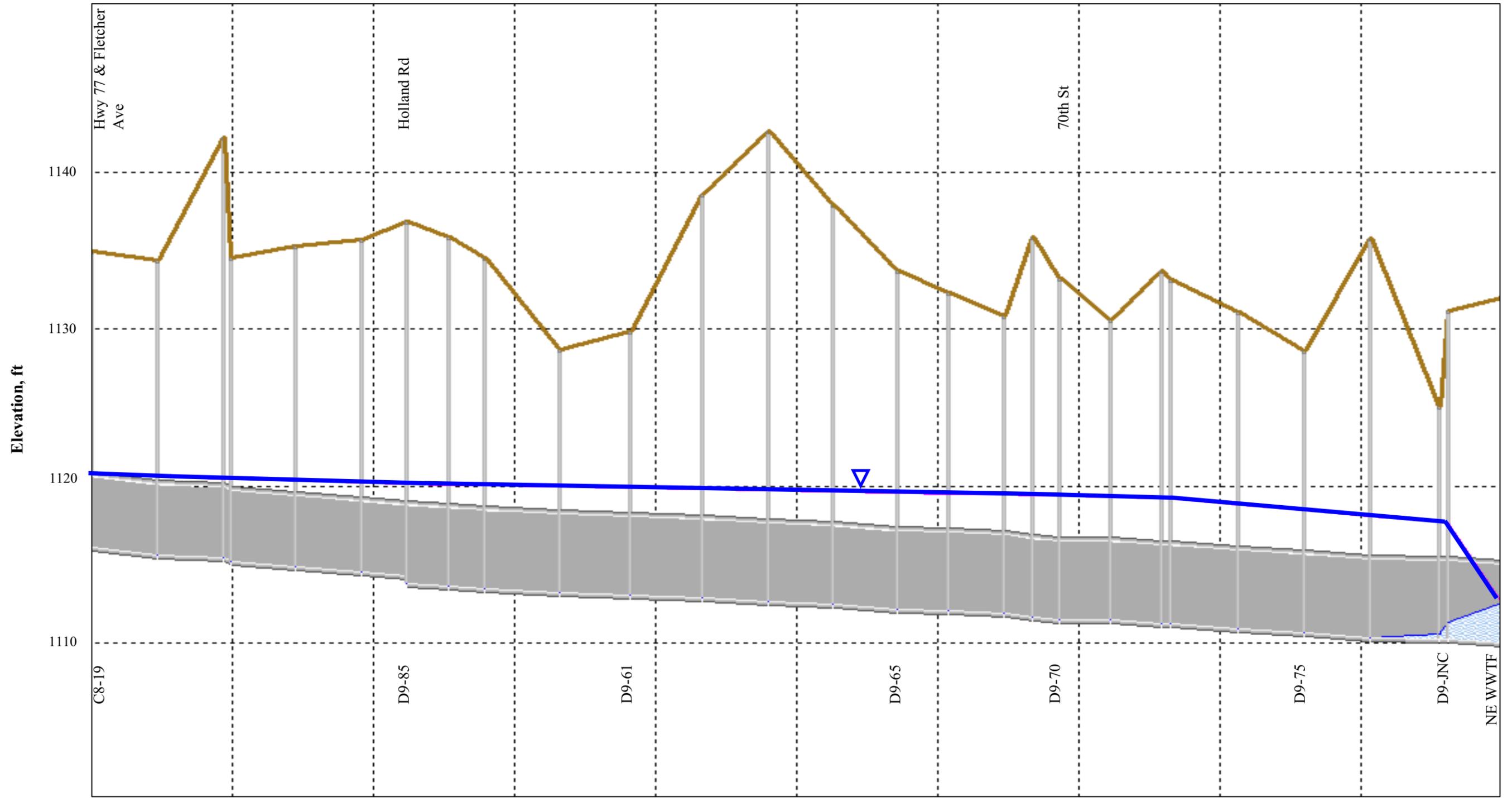
20.1.3 Tier I Conditions

Under the Tier I planning conditions, the Northeast Salt Creek basin is anticipated to contribute about 17.17 cfs of sanitary flow to the Northeast WWTF. This corresponds to a developed service area of approximately 2,610 acres. Regarding Tier I conditions, the City has developed a phased basin development plan. The plan is summarized in Table 20.3 and presented in Figure 20.1.

Table 20.3 Northeast Salt Creek Tier I Phased Basin Development Plan Wastewater Facilities Master Plan Update - 2007 City of Lincoln, Nebraska		
Tier	Area (acres)	Conveyance Method
Phase I	2,000	Convey flow through a new trunk sewer to Deadmans Run system at Manhole D9-72
Phase II	610	Convey flow through a new trunk sewer directly to Northeast WWTF

The simulation results indicate that conveying the Phase I flows (13.55 cfs) to the Deadmans Run system will cause surcharged conditions in the Deadmans Run system from manhole C8-19 to D9-JNC. As shown in Table 20.4, the d/D ratios were from 1.12 to 1.61. The surcharged conditions are caused by the limited conveyance of the sewers downstream of where the Phase I flow discharges into the Deadmans Run system at Manhole D9-72 (north of N. 70th St and McCormick Dr). The hydraulic profile of the Deadmans Run Trunk Sewer surcharged pipes including the Phase I flows is shown in Figure 20.2.

If the proposed 84th Street Sewer between manhole D7-445 to manhole D8-229 as discussed in Chapter 21 is implemented, approximately 6.1 cfs of flow will be diverted from the Deadmans trunk sewer to the Stevens Creek Basin Trunk Sewer. Diverting this



Manholes

- Modeled water surface
- Ground surface
- Sanitary sewer pipe



Figure 20.2 Hydraulic Profile – Northeast Basin Tier I Phase I Flows
 Deadmans Run Trunk Sewer
 Wastewater Facilities Master Plan Update - 2007
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flow will provide additional capacity for Tier I flows from the Northeast Basin in the Deadmans Trunk Sewer.

20.1.4 Tier II and III Conditions

As indicated in Table 20.1, the Tier II and III conditions will respectively contribute approximately 76.38 and 26.34 cfs to the Northeast WWTF. New pipes were designed and added to the model to convey the anticipated Tiers II and III flows to the Northeast WWTF.

20.2 IMPROVEMENTS

The design characteristics and model results for the improvements are outlined in Tables 20.5 and 20.6 and shown in Figure 20.3. To relieve hydraulic loading from the Theresa Street WWTF, especially during the Tier II and III growth periods, and to minimize disruption to the saline wetlands and Little Salt Creek the flows from this basin are directed to the Northeast WWTF.

20.2.1 Tier 1

In order to convey the Tier I flows in the SWMM model, new pipes were designed and added to the model. The proposed sewer alignment identified in Figure 20.3 was modeled to verify the anticipated flows. The modeling of the sanitary sewer system was based on a variety of parameters, including topography and future land use (growth tiers). Based on the topography of the undeveloped areas, the sewer sub-basins were created and the locations for future trunk lines were determined. The modeling results are summarized in Table 20.6.

20.2.2 Tier II

New sewers were determined and added to the existing Tier I SWMM model to verify the anticipated flows. The Tier II flows are conveyed through proposed sewers as displayed in Figure 20.3 and closely follows natural drainage networks. Approximately 31,000 ft of 21-inch diameter to 60-inch diameter pipe is proposed to convey Tier II flows. The simulation results indicate that the new pipes have sufficient capacity to convey the Tiers II flows to the Northeast WWTF without surcharging.

20.2.3 Tier III

20.2.3.1 Pipelines

New sewers were added to the Tier II SWMM model as shown in Figure 20.3. These sewers closely follow natural drainage ways. Approximately 96,000 ft of 24-inch diameter to 48-inch diameter pipe is proposed to convey Tier III flows. The simulation results indicate the new pipes have sufficient capacity to convey the Tiers III flows to the Northeast WWTF without surcharging.

20.2.3.2 Regional Concept

As the City develops to the Northeast, particularly in Sub-basin N-7, the concept of regionalization and working in cooperation with Waverly should be explored. Given the terrain of Sub-basin N-7, and the fact that wastewater collected from this basin will need to flow southwest along the Salt Creek, this will result in not only a deep pipeline since it is sloping against the grade of the land, but several expensive siphons will be needed to cross the tributaries that flow southerly to the Salt Creek.

As an example (refer to drawing 20-3), the flows could be diverted from Manhole ULS18, ULS21, ULS23, or ULS31 northeast toward Waverly. Regardless, for the purpose of generating planning costs it has been assumed that the flows will be directed from Sub-basin N-7 to the Northeast WWTF.

20.3 SUMMARY OF RECOMMENDED IMPROVEMENTS

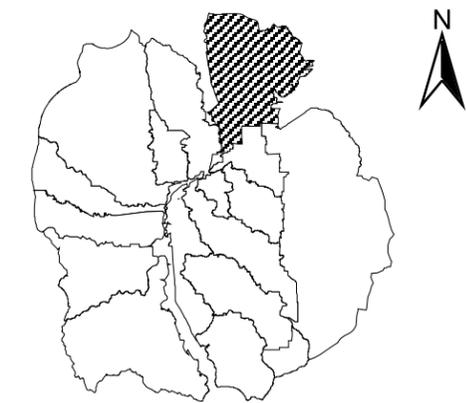
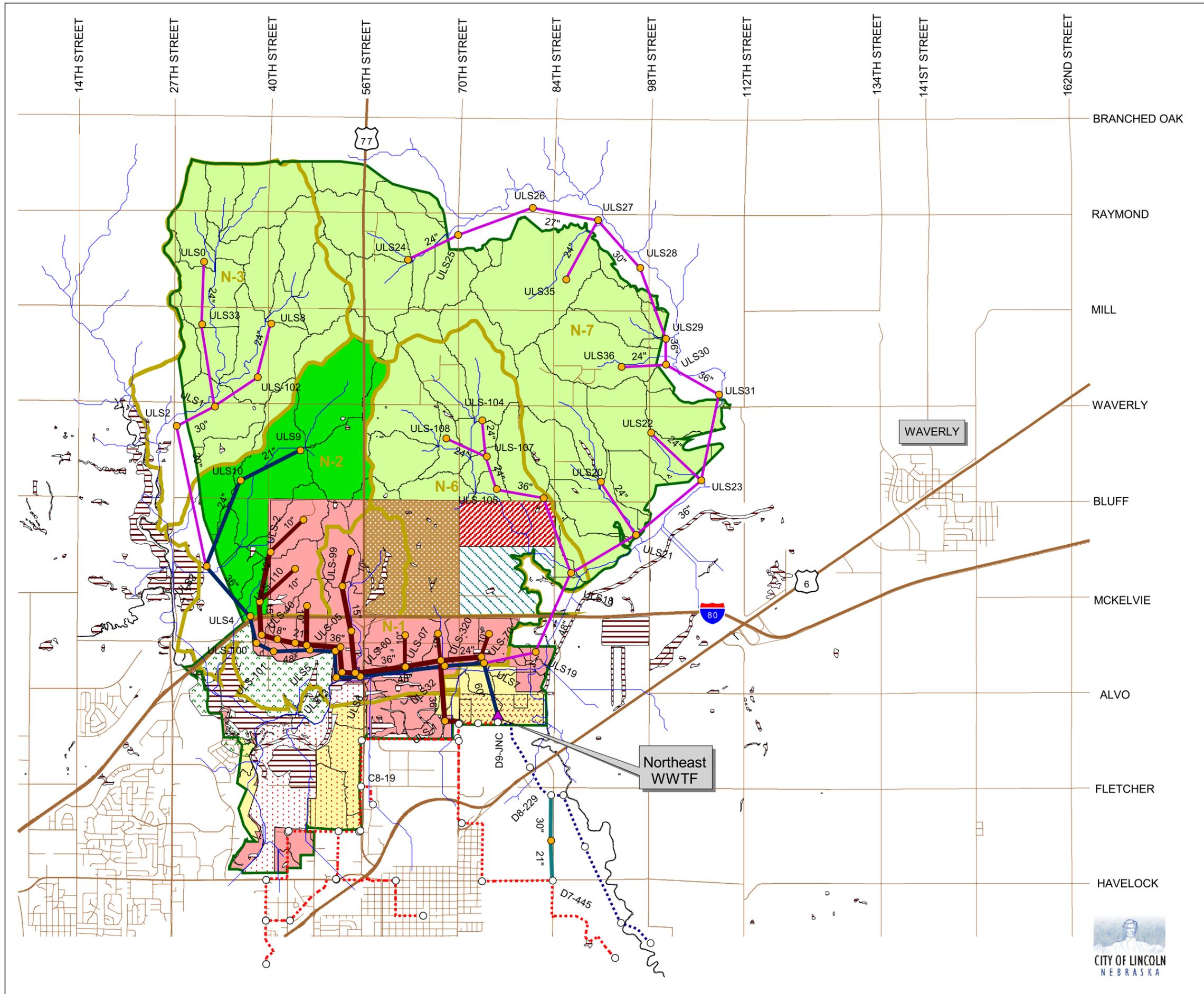
Recommendations for maintenance and improvements of the Northeast Salt Creek Basin Sewer System include:

- Tier I Flows:
 - Construct new sewer lines to service the Tier I area.
- Tier II Flows:
 - Construct new sewer lines to service the Tier II area.
- Tier III Flows
 - Construct new sewer lines to service the Tier III area.

The proposed improvements have been located outside of the designated saline wetland areas within this basin. The wetlands are environmentally protected, which would be difficult to obtain approval for construction within this area.

The proposed alignments of the sanitary sewers are preliminary and developed for planning purposes. It is recommended that a detailed study be performed prior to designing the improvements to make certain conformance with existing and proposed development and to determine project phasing. In most cases, the alignments shown closely follow natural drainage ways. Until full development of the system, some pipes will be oversized with regard to interim flows. These sewers should be periodically inspected to determine if deposition is occurring.

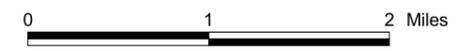
A summary of the improvement projects identified with planning costs is outlined in Table 20.7.



Key Map

LEGEND

- Northeast WWTF
- Tier I Pipes
- Tier II Pipes
- Tier III Pipes
- Proposed Tier I Diversion Pipe
- Deadmans Run - Existing Pipes
- Stevens Creek - Existing Pipes
- Streams
- Streets
- Basin Boundary
- Utility Planning Zones
- Saline Wetlands
- Environmentally Sensitive Area
- Existing Landfill
- Abandoned Landfill
- Biosolids Injection Site
- LES Property
- Northeast WWTP Property
- Existing Service Area
- Tier I Area
- Tier II Area
- Tier III Area



Notes:
 Pipes less than 15-in are shown for planning purposes.
 Additional 10-in, 12-in, or 15-in pipes may be required depending on the actual land use and development.



Figure 20.3 Proposed Sewer Improvements
 Northeast Salt Creek Basin
 Wastewater Facilities Master Plan Update - 2007
 City of Lincoln, Nebraska

Table 20.5 Design Characteristics of Proposed Sewers - Northeast Salt Creek Basin Wastewater Facilities Master Plan Update - 2007 City of Lincoln, Nebraska							
Pipe ID	US Manhole	DS Manhole	Diameter (ft)	Length (ft)	Slope (%)	Design Capacity (cfs)	Tier
LNE-7	ULS-2	ULS-110	1.00	2,794	0.25	1.78	I
LNE-2	ULS-110	ULS-40	1.25	1,853	0.25	3.23	
LNE-1	ULS-40	ULS-50	1.50	905	0.25	5.25	
LNE-10	ULS-50	ULS-80	1.50	1,046	0.25	5.25	
LNE-11	ULS-80	ULS-05	1.75	701	0.20	7.09	
LNE-9	ULS-4	ULS-05	0.83	2,174	0.25	1.10	
L1667	ULS-05	N1624	3.00	1,884	0.09	20.54	
L1668	N1624	ULS-130	3.00	1,382	0.09	20.55	
LNE-3	ULS-130	ULS-60	3.00	724	0.20	29.83	
LNE-15	ULS-99	ULS-5	1.25	2,538	0.25	3.23	
LNE-8	ULS-5	ULS-60	1.25	2,309	0.25	3.21	
LNE-13	ULS-60	ULS-07	3.00	2,754	0.20	29.83	
LNE-14	ULS-07	ULS-320	3.00	2,002	0.20	29.83	
LNE-6	ULS-70	ULS-320	2.00	2,260	0.20	10.11	
LNE-4	ULS-320	ULS-1	3.00	3,337	0.20	29.83	
LNE-5	ULS-1	D9-72	3.00	834	0.20	29.83	
ULSP12	ULS9	ULS10	1.75	3,694	0.25	7.92	
ULSP133	ULS10	ULS3	2.00	5,142	0.25	11.31	
ULSP55	ULS3	ULS4	3.00	3,663	0.25	33.35	
ULSP18	ULS4	ULS-100	4.00	1,513	0.10	45.42	
ULSP17	ULS-100	ULS-101	4.00	1,075	0.10	45.43	
ULSP66	ULS-101	ULS5	4.00	2,004	0.10	45.43	
ULSP7	ULS5	ULS-103	4.00	1,434	0.10	45.42	
ULSP14	ULS-103	ULS13	4.00	1,518	0.10	45.43	
ULSP15	ULS13	ULS6	4.00	1,328	0.10	45.43	
ULSP88	ULS6	ULS32	4.00	4,719	0.10	45.42	
ULSP9	ULS32	ULS7	4.00	2,196	0.10	45.42	
L1666	ULS7	D9-WWTF	5.00	3,004	0.10	82.45	
ULSP22	ULS20	ULS21	2.00	3,530	0.25	11.38	III
ULSP24	ULS22	ULS23	2.00	3,838	0.25	11.31	
ULSP27	ULS24	ULS25	2.00	3,104	0.25	11.31	
ULSP28	ULS25	ULS26	2.00	4,348	0.25	11.31	
ULSP29	ULS26	ULS27	2.25	3,696	0.25	15.49	
ULSP34	ULS35	ULS27	2.00	3,721	0.25	11.31	
ULSP30	ULS27	ULS28	2.50	3,532	0.25	20.51	
ULSP31	ULS28	ULS29	2.50	4,172	0.25	20.51	
ULSP32	ULS29	ULS30	3.00	1,423	0.25	33.35	
ULSP35	ULS36	ULS30	2.00	2,477	0.25	11.31	
ULSP33	ULS30	ULS31	3.00	3,375	0.25	33.35	
ULSP26	ULS31	ULS23	3.00	4,844	0.25	33.35	
ULSP25	ULS23	ULS21	3.00	4,706	0.25	33.35	
ULSP23	ULS21	ULS18	3.00	4,196	0.25	33.35	
ULSP100	ULS-104	ULS-107	2.00	2,075	0.25	11.31	
ULSP101	ULS-108	ULS-107	2.00	2,464	0.25	11.31	

**Table 20.5 Design Characteristics of Proposed Sewers - Northeast Salt Creek Basin
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Pipe ID	US Manhole	DS Manhole	Diameter (ft)	Length (ft)	Slope (%)	Design Capacity (cfs)	Tier
ULSP102	ULS-107	ULS-105	2.00	1,905	0.25	11.31	
ULSP103	ULS-105	ULS-106	3.00	2,642	0.25	33.35	
ULSP104	ULS-106	ULS18	3.00	4,418	0.25	33.35	
ULSP20	ULS18	ULS19	4.00	4,795	0.25	71.82	
ULSP21	ULS19	ULS7	4.00	2,896	0.10	45.42	
ULSP1	ULS0	ULS33	2.00	3,488	0.25	11.31	
ULSP2	ULS33	ULS1	2.00	4,600	0.25	11.31	
ULSP11	ULS8	ULS-102	2.00	3,058	0.25	11.31	
ULSP16	ULS-102	ULS1	2.00	2,813	0.25	11.31	
ULSP3	ULS1	ULS2	2.50	2,390	0.25	20.51	
ULSP4	ULS2	ULS3	2.50	7,919	0.25	20.51	

**Table 20.6 Modeling Results of Proposed Sewers - Northeast Salt Creek Basin
Wastewater Facilities Master Plan Update - 2007
City of Lincoln, Nebraska**

Pipe ID	US Manhole	DS Manhole	Capacity cfs	Tier I Conditions		Tier I & II Conditions		Tier I, II, III Conditions		Tier
				Q, cfs	d/D	Q, cfs	d/D	Q, cfs	d/D	
LNE-7	ULS-2	ULS-110	1.78	1.65	0.96	NA	NA	NA	NA	I
LNE-2	ULS-110	ULS-40	3.23	3.04	0.80					
LNE-1	ULS-40	ULS-50	5.25	4.13	0.69					
LNE-10	ULS-50	ULS-80	5.25	4.24	0.69					
LNE-11	ULS-80	ULS-05	7.09	4.36	0.68					
LNE-9	ULS-4	ULS-05	1.10	1.05	0.78					
L1667	ULS-05	N1624	20.54	6.72	0.41					
L1668	N1624	ULS-130	20.55	6.72	0.41					
LNE-3	ULS-130	ULS-60	29.83	6.80	0.42					
LNE-15	ULS-99	ULS-5	3.23	2.20	4.08					
LNE-8	ULS-5	ULS-60	3.21	4.21	4.08					
LNE-13	ULS-60	ULS-07	29.83	10.97	0.45					
LNE-14	ULS-07	ULS-320	29.83	12.42	0.64					
LNE-6	ULS-70	ULS-320	10.11	3.29	0.98					
LNE-4	ULS-320	ULS-1	29.83	15.52	1.92					
LNE-5	ULS-1	D9-72	29.83	15.53	2.34					
ULSP12	ULS9	ULS10	7.92	NA	NA	5.83	0.84	5.81	0.76	II
ULSP133	ULS10	ULS3	11.31			8.82	0.73	8.98	0.90	
ULSP55	ULS3	ULS4	33.35			8.82	0.42	28.12	0.78	
ULSP18	ULS4	ULS-100	45.42			9.90	0.32	29.05	0.58	
ULSP17	ULS-100	ULS-101	45.43			9.90	0.32	29.04	0.58	
ULSP66	ULS-101	ULS5	45.43			9.90	0.32	29.04	0.58	
ULSP7	ULS5	ULS-103	45.42			9.90	0.32	29.03	0.58	

**Table 20.6 Modeling Results of Proposed Sewers - Northeast Salt Creek Basin
Wastewater Facilities Master Plan Update - 2007
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Pipe ID	US Manhole	DS Manhole	Capacity cfs	Tier I Conditions		Tier I & II Conditions		Tier I, II, III Conditions		Tier
				Q, cfs	d/D	Q, cfs	d/D	Q, cfs	d/D	
ULSP14	ULS-103	ULS13	45.43			9.90	0.32	29.03	0.58	
ULSP15	ULS13	ULS6	45.43			9.90	0.32	29.03	0.59	
ULSP88	ULS6	ULS32	45.42			9.90	0.32	29.02	0.68	
ULSP9	ULS32	ULS7	45.42			9.90	0.32	29.01	0.92	
L1666	ULS7	D9-WWTF	82.45			9.89	0.25	71.79	0.74	
ULSP22	ULS20	ULS21	11.38	NA	NA	NA	NA	4.55	0.85	III
ULSP24	ULS22	ULS23	11.31					5.07	0.97	
ULSP27	ULS24	ULS25	11.31					7.60	0.70	
ULSP28	ULS25	ULS26	11.31					9.00	0.70	
ULSP29	ULS26	ULS27	15.49					9.00	0.69	
ULSP34	ULS35	ULS27	11.31					5.56	0.78	
ULSP30	ULS27	ULS28	20.51					14.55	0.63	
ULSP31	ULS28	ULS29	20.51					14.53	0.63	
ULSP32	ULS29	ULS30	33.35					16.50	0.56	
ULSP35	ULS36	ULS30	11.31					3.56	0.84	
ULSP33	ULS30	ULS31	33.35					20.02	0.56	
ULSP26	ULS31	ULS23	33.35					20.25	0.65	
ULSP25	ULS23	ULS21	33.35					25.23	0.73	
ULSP23	ULS21	ULS18	33.35					29.61	0.74	
ULSP100	ULS-104	ULS-107	11.31					5.70	0.80	
ULSP101	ULS-108	ULS-107	11.31					4.47	0.80	
ULSP102	ULS-107	ULS-105	11.31					10.55	0.80	
ULSP103	ULS-105	ULS-106	33.35					13.34	0.44	
ULSP104	ULS-106	ULS18	33.35					13.34	0.74	
ULSP20	ULS18	ULS19	71.82					42.86	0.82	
ULSP21	ULS19	ULS7	45.42					42.83	0.92	
ULSP1	ULS0	ULS33	11.31					5.98	0.61	
ULSP2	ULS33	ULS1	11.31					7.69	0.96	
ULSP11	ULS8	ULS-102	11.31					5.42	0.68	
ULSP16	ULS-102	ULS1	11.31					9.04	0.96	
ULSP3	ULS1	ULS2	20.51					19.26	0.77	
ULSP4	ULS2	ULS3	20.51	19.32	0.84					

**Table 20.7 Recommended Improvements – Northeast Salt Creek Basin
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Tier	ID	Description	Location ⁽¹⁾	Parameters	Unit Price	Planning Cost ⁽²⁾
I	NE-1	Trunk Sewer (CIP Project 4.a)	N. 49th St to 70th St, N. of Salt Creek			\$3,590,000 ⁽³⁾
I	NE-2	Trunk Sewer (CIP Project 4.b)	Salt Creek to near Bluff Rd, W. of Hwy 77			\$1,200,000 ⁽³⁾
I	NE-3	Trunk Sewer (CIP Project 4.c)	N of Salt Creek 56th to 40th Streets			\$50,000 ⁽³⁾
I	NE-4	36-inch	ULS-5 to D9-72	12,916 lf	\$360.00	\$4,650,000
I	NE-5	24-inch	ULS-70 to ULS-320	2,260 lf	\$240.00	\$542,000
I	NE-6	21-inch	ULS-80 to ULS-05	701 lf	\$210.00	\$147,000
I	NE-7	18-inch	ULS-40 to ULS-40 to ULS-80	1,951 lf	\$180.00	\$351,000
I	NE-8	15-inch	ULS-110 to ULS-40, ULS-99 to ULS-60	6,700 lf	\$150.00	\$1,005,000
I	NE-9	12-inch	ULS-2 to ULS-110	2,794 lf	\$120.00	\$335,000
I	NE-10	10-inch	ULS-4 to ULS-05, See Figure 20.3.	13,893 lf	\$100.00	\$1,389,000
I	NE-11	Siphon	Under Salt Creek	1	\$1,000,000	\$1,000,000
II	NE-12	60-inch	ULS7 to D9-WWTF	3,004 lf	\$600.00	\$1,802,000
II	NE-13	48-inch	ULS4 to ULS7	15,787 lf	\$480.00	\$7,578,000
II	NE-14	36-inch	ULS3 to ULS4	3,663 lf	\$360.00	\$1,319,000
II	NE-15	24-inch	ULS10 to ULS3	5,142 lf	\$240.00	\$1,234,000
II	NE-16	21-inch	ULS9 to ULS10	3,694 lf	\$210.00	\$776,000
II	NE-17	Siphon	Under Salt Creek	1	\$1,000,000	\$1,000,000

**Table 20.7 Recommended Improvements – Northeast Salt Creek Basin
Wastewater Facilities Master Plan Update - 2007
City of Lincoln, Nebraska**

Tier	ID	Description	Location ⁽¹⁾	Parameters	Unit Price	Planning Cost ⁽²⁾
III	NE-18	48-inch	ULS18 to ULS7	7,691 lf	\$480.00	\$3,692,000
III	NE-19	36-inch	ULS29 to ULS18, ULS-105 to ULS18	25,604 lf	\$360.00	\$9,217,000
III	NE-20	30-inch	ULS27 to ULS29, ULS1 to ULS3	18,013 lf	\$300.00	\$5,404,000
III	NE-21	27-inch	ULS26 to ULS27	3,696 lf	\$270.00	\$998,000
III	NE-22	24-inch	ULS24 to ULS26, ULS35 to ULS27, ULS36 to ULS30, ULS22 to ULS23, ULS20 to ULS21, ULS-104 to ULS-105, ULS-108 to ULS-107, ULS0 to ULS-1, ULS8 to ULS1	41,421 lf	\$240.00	\$9,941,000
III	NE-23	Siphon	Under Tier III tributaries	5	\$1,000,000	\$5,000,000

Notes:

1. Upstream and downstream nodes for each pipe section.
2. ENR CCI for Kansas City = 8512 (July 2006).
3. Costs from current City CIP, March 27, 2006.